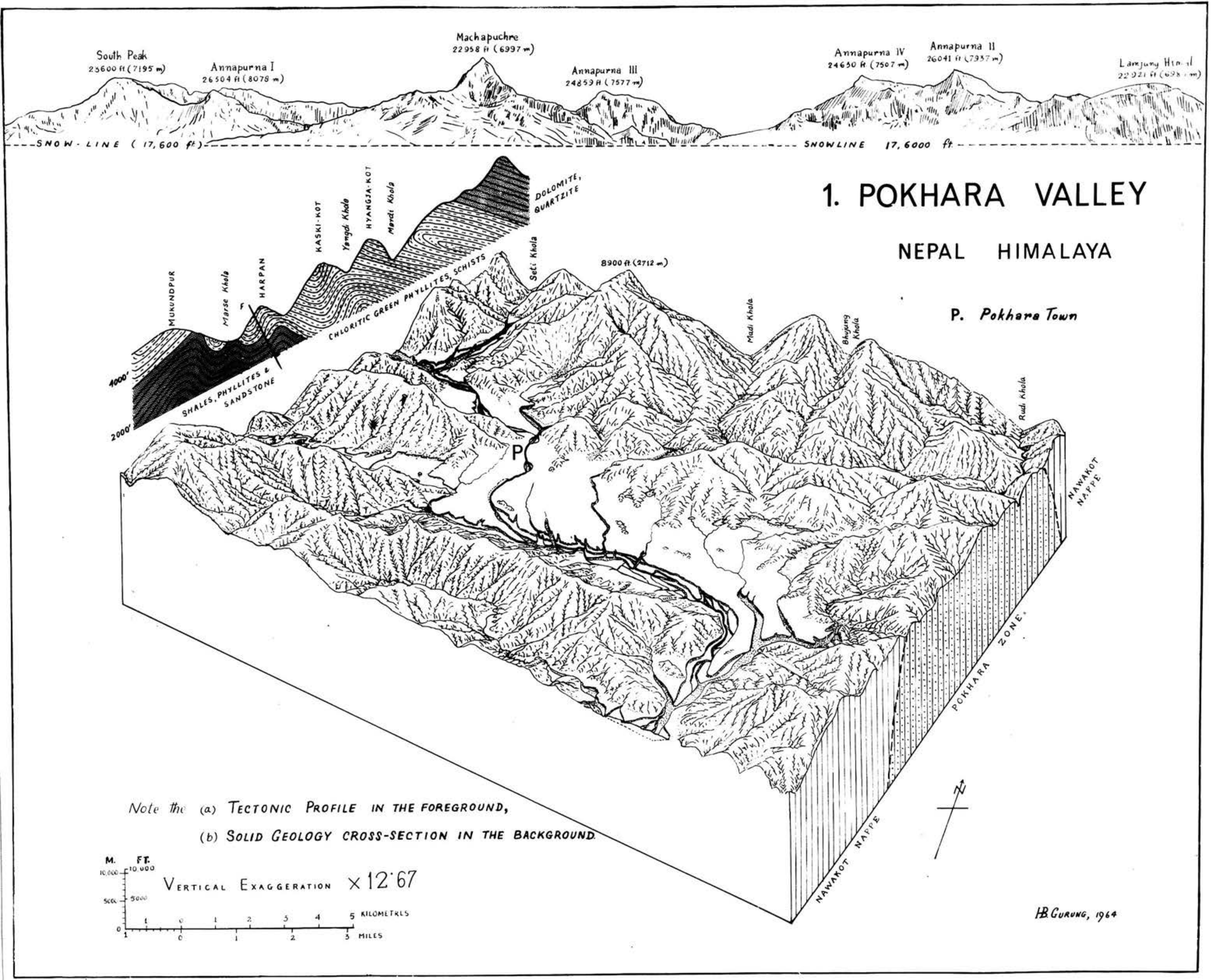
South Peak
23600 ft (7195 m)
Annapurna I
26504 ft (8078 m)
Machapuchre
22958 ft (6997 m)
Annapurna III
24859 ft (7577 m)
Annapurna IV
24630 ft (7507 m)
Annapurna II
26041 ft (7937 m)
Lamjung Himal
SNOW-LINE (17,600 ft)
SNOWLINE 17,6000 ft
1. POKHARA VALLEY
NEPAL HIMALAYA
P. Pokhara Town
DOLOMITE, QUARTZITE
CHLORITIC GREEN PHYLLITES, SCHISTS
SHALES, PHYLLITES & SANDSTONE
MUKUNDPUR
Marse Khola
HARPAN
KASKI-KOT
Yangdi Khola
HYANGJA-KOT
Mardi Khola
Seti Khola
8900 ft (2712 m)
Madi Khola
Bhujung Khola
Rudi Khola
4000'
2000'
F
P
NAWAKOT NAPPE
POKHARA ZONE
NAWAKOT NAPPE
Note the (a) TECTONIC PROFILE IN THE FOREGROUND,
(b) SOLID GEOLOGY CROSS-SECTION IN THE BACKGROUND.
M.
FT.
10,000
5000
0
VERTICAL EXAGGERATION × 12·67
KILOMETRES
MILES
H.B. GURUNG, 1964

POKHARA VALLEY, NEPAL HIMALAYA

A Field Study in Regional Geography

A dissertation submitted to the
Faculty of Social Sciences of the University of Edinburgh
in candidacy for the degree of Doctor of Philosophy

by

Harka Bahadur Gurung

August 1965

" There is, too almost underlying this great centre [of mountains], a town and a mart which always attracted my curiosity almost beyond any other town in Nepal. No one has been there, no one has seen it, but we know that its climate is almost tropical, that it cannot be more than 2,500 feet in altitude, that it is on the banks of a great lake, and that it is an open valley and lies immediately at the foot of these magnificent giants [Annapurna Himal]. Phewa Tal is the name of the lake and Pokhara that of the town. Some day and from somewhere someone will arise who will do adequate justice to what must be one of the most impressive and beautiful sights to be found in any mountain country."

— C. G. Bruce

(In <u>The Land of Gurkhas</u> by W. Brook Northey, Cambridge, 1937, 4)

ACKNOWLEDGEMENT

The research was undertaken with the grant of a Colombo Plan scholarship for which I am grateful to the Fellowships Department, U.K., who also provided the travel expenses for field-work in Nepal. The preliminary work and evaluation of field data was carried out in the University of Edinburgh, and the assistance of Earl of Moray Endowment for the purchase of surveying and meteorological instruments is gratefully acknowledged. While on my way to Nepal, the Swiss Foundation for Alpine Research, Zurich, kindly arranged my visit to the Bernese Oberland.

I am grateful to Dr. A. Geddes whose personal supervision, stimulating discussion, and critical reading of the text has much contributed to this study. To Prof. J. W. Watson, I owe much for his constant support and encouragement.

Among the numerous correspondence I particularly value the interest shown in my work by Prof. H. Boesch (Zurich), Mr. B. H. Farmer (Cambridge), Prof. C. von Fürer-Haimendorf (London), Dr. Joy Tivy (Glasgow), and Prof. M. J. Webb (Nedlands) and Prof. J. Kawakita (Tokyo). Others who have aided me are acknowledged in the relevant chapters.

In Nepal, especially helpful were the Defence Secretary, Major-General P. B. Khatri, for the loan of 'restricted' maps and air photographs; Planning Secretary, Mr. Bhekh B. Thapa, for giving access to official technical reports; Central Bureau of Statistics Director, Mr. T. B. Rayamajhi, for census data; and Survey Director, Mr. Kulbir Singh, for cadastral maps. Research in the field was successfully undertaken only because of the cooperation and aid willingly given by numerous individuals in Pokhara, too numerous to mention here.

The bibliographic work was done mainly in the University of Edinburgh Library, Royal Geographical Society Library, and India House Library. The dissertation was finalised as a Fellow in the School of Oriental and African Studies, London, where Prof. C. A. Fisher generously granted me full latitude of time to complete this work. I wish to thank Miss Yvonne Gear, for typing the thesis replete with strange place-names.

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THE SETTING

1. Pokhara Valley, lies south of Annapurṇa Himāl, and the altitudinal fall from the pyramidal peak Māchhāpuchhre (22,958 feet) to the plain (2,900 feet) exceeds 20,000 feet within a horizontal distance of 18 miles. The plate shows snow-plumes (westerly) on the peaks and the snow-fall below 9,000 feet during March. The ridge in the middle distance is about 7,000 feet high and the gap between the low hills in the centre marks the site of Pokhara town, here hidden by clumps of trees. Seti Kholā gorge on the left-hand bottom.

INTRODUCTION

a. Scope and Method

i. Assumptions
ii. Approach
iii. Arrangement

b. Study Area

i. Location
ii. Delimitation

INTRODUCTION

"Nowhere in the world are the small natural regions more sharply separated than in the Himalayas."

- Alan G. Ogilvie (1938,p.112)

a. Scope and Method

The purpose of the study is expository and interpretative description of an unreported area. It is beyond the competence of one investigator to understand and interpret all phases of a given locality. The investigator's value judgements in selecting meaningful criterias depend on his background, premises, and procedure.

(i) Assumptions. The study of areas in their compositeness involves the identification of areal phenomena in interrelationship. Regional method is an effective technique in integrating systematic data on site, form, and sequence.

Field study involving direct observation, enquiry and recording of data provides an opportunity to examine areas more closely with respect to their quality of homogeneity, internal connections and external relations.

Such a substantive field study may aid in evaluating applicable concepts and refinement of research methods. A detailed study of an area on topographic scale also contributes to comparative regional geography.

In addition, being a diagnostic survey of an under-developed area, the basic findings of such geographic enquiry may aid in planning optimum use of local resources.

The fact that the present investigator, equipped with sophisticated concepts, is native to the area[1] under

---

1. The writer's village, Tarānche, in Marsyāndi valley is 40 miles northeast of Pokharā (Fig.2). He also participated as a map advisor at a Boundary Demarcation Conference for the Gandaki Anchal held at Pokharā on 28 March, 1963.

discussion, should contribute a novel attitude to this area research.

(ii) Approach. In the absence of documentary sources and primary data on the area,[2] the factual information had to be collected by personal observation and interpretation of topographical maps and air photographs.

As far direct contact aids in understanding the personality of a region, this writer's acquaintance with Pokhara goes back to brief visits in 1952 and 1954, and a month's survey in December 1959. The result of the reconnaissance survey was embodied in the Diploma disserattion, '<u>Vale of Pokhara: Prolegomena to a Regional Study</u>'. The writer's long association with the region was particularly helpful in appreciating the operational changes through time.

The present field-work was carried out from September 1962 to April 1963 including 42 days spent in the neighbouring districts. The equipment for the survey included surveying and meteorological instruments,[3] two cameras, topographical and cadastral maps. Air photographs were made available only in the latter half of the survey, and were used for supplementing the ground surveys.

The whole Pokhara region of 180 square miles was covered by extensive traverses on foot, and observations recorded on

---

2. The Official reports specific on Pokhara and included in the bibliography dwell mainly on plans and policies.

3. The instruments were Abney Level, Aneroid Barometer, Compass-Map Measurer, Grass Minimum Thermometer, Hand Stereoscope, Humidity Slide Rule, Indian Clinometer, Linen Tape (100-feet), Prismatic Compass, Proportional Divider, Sighting Alidade, and Whirling Hygrometer.

base maps, notes, and photographs. Along with 500 black and white photographs, about 400 colour slides were taken for laboratory examination of land use. Excursions were made to peripheral areas, Dhampus, Nuwākoṭ, Siklis, and Lamjung to appreciate the comparability of the study area. Extra-regional trips included a brief visit to the foothills in Rāpti-Dun where many from Pokhara have lately settled, and two month's preliminary research in Kāṭhmāṇḍu Valley. Pokhara town was intensively surveyed as to urban land use and its 2¼ miles main street was levelled by an Indian clinometer to ascertain the town site. Interest was focussed on areal distribution and processes are touched only as far as they enlighten the patterns. In presenting the findings, qualitative description is combined with cartographic analysis and quantitative tables. Photographs illustrating specific landscapes and details have been liberally used.

(iii) Arrangement. The topical arrangement follows a conventional order of habitat, society, and economy. Physical geography is viewed as the most important scientific starting-point of area analysis and land use as human responses to the various geographic environments.

Part One starts with a discussion of uplift and glaciation as the present physical and biotic processes are consequent upon these primeval forces. Geology, physiography, climate, vegetation and soils are treated in that order.

Part Two examines population, societal content and settlement pattern. The efficiency of the population is examined on the basis of health and education status. The morphology of Pokhara town is discussed in the light of its historical growth.

Part Three opens with a chapter on the region's external relations and internal circulation. The processes of land utilization are followed up by static mapping of land use at regional and local levels.

The systematic findings are summarized in the conclusion and an attempt made to explain the man-land relationship and sequential development.

The bibliographic entry of 225 items, selected from an exhaustive survey of related literature, can be classified into Physical 75, Cultural 48, Economic 40, and General 62.

b. Study Area

The study area is clearly located and defined below to aid the appraisal of the scale of investigation and comparison.

(i) Location. Nepal extends between the longitudes 80° East and 88° East, and Pokhara is centrally located on longitude 84° East (Fig. 2). The Tibetan border is 40-miles north and the Indian border 48-miles south of Pokhara. The thesis area as such lies between longitudes 83° 50' - 84° 10' East and latitudes 25° 7' - 28° 15' North. It is about 110-miles west of Kāṭhmāṇḍu Valley* and falls within the hilly country bounded by the Great Himalaya and the Mahabharat Lekh (Fig. 4b).

The situation of Pokhara Valley under the shadow of Annapurṇa Himāl has made impact on visitors to the point of seeming unique. While the natives are more impressed by the extensive plain and the subterranean course of the Seti river, foreigners tend to rhapsodise over the scenic grandeur (Pl. I). An outsider's first recorded impression was that of a Japanese monk who visited Pokhara in 1899, "In all my travels in the Himalayas I saw no scenery so enchanting as that which enraptured me at Pokhara".[4] Three decades later, a historian calls Pokhara town "the second city in Nepal" from hearsay and

---

*Kāṭhmāṇḍu Valley extends between longitudes 85° 15' - 85° 30' East and latitudes 27° 35' - 27° 50' North.

4. Kawaguchi (1909):41.

TWO ASPECTS

II. North View, looking towards the cone of the central plain in the middle distance. The open woodlands on the plain mark the settlements and the dense woodland in the foreground is a reserved forest on Dhungāsāngu hill. The greenish flat behind the hill is of new grass after the burning in April. See p.31

III. South-west View, from Pachbhaiyā Ridge. The Barsāmi Ridge in the background averages 3,500 feet and bounds the plain in the south. The wooded hills in the centre make a contrast with the paddy fields on the central plain. The tree in the foreground is Salmalia malabaricum. See p.29.

notes, "It is not a place of wealth or of political importance, but its size, its position on the central east-and-west road of Nepal, combines with its official character to make it a town that is destined to play no small part in the future industrial development of Nepal."[5] A recent pronouncement on the area is even more significant coming from a Swiss geologist:

> Pokhara area show the greatest contrasts in landscape. Nowhere in the world, can the highest mountains reaching 8,000 metres level be admired from such a short distance and from the tropical lowland without any intermediate mountain ranges. Pokhara is certainly one of the most extraordinary and most beautiful places in the whole world.[6]

An objective description of the physical landscape is attempted in the second chapter of the present dissertation.

Administratively, Pokhara Valley falls in Gaṇḍaki Anchal (region)[7] comprising of the Central Nepal districts Syāngjā, Kāski, Lamjung, Tanhu, and Gorkhā (Fig. 3). The 180 sq. miles thesis area* includes parts of Kāski, Syāngjā, and Tanhu districts. The 33 revenue sub-divisions ('thum') of Kāski fall

5. Landon (1923), vol. II, p.18.

6. Hagen (1959b): 96.

7. The Commission for Regional Demarcation has since reconstituted the old Gaṇḍaki districts into the following development districts; Syāngjā, Kāski, Manāng, Lamjung, Tanhu, Lārke, and Gorkhā. Cf. Nepal Government (1962): 21.

*Kāṭhmāṇḍu Valley is approximately 240 square miles.

within the Pokhara region accounting for 87 per cent of the thesis area. Syāngjā and Tanhu claim only 10 per cent and 3 per cent respectively of its total area.

(ii) Delimitation. The study area has been delimited by means of watersheds except in the north-east and south-east where the boundary-line cuts across river valleys (Fig. 7). Such a physiographic delimitation stems from the belief that in mountain areas, intermont basins offer a valid framework for regional study. Thus defined, the area was investigated with the acceptance of a hypothecated compage[8] based on impression. The emphasis is on the study of the content of the area rather than on drawing precise boundaries.

A region is an area in which accordant areal relations produce some form of cohesion. The coherence between the plain and the hills of Pokhara is primarily in their economic interdependence. The two "stows"[9] are regional components of a "tract"[10] with its focus at Pokhara town. The stows as formal regions are functionally linked to the metropolitan area by lines of circulation varying in intensity and character. The resultant compage is dominated by nodal characteristics as the existence of the town is the strongest factor in tieing the environs composing the present region. In order to specify the degree of generalization, Pokhara region is ranked here as "district"[11] or a region of second order.[12]

---

8. Whittlesey (1954): 45, "The compage is, by definition, something less than a spatial totality; but it does include all the features of the physical, biotic, and societal environments that are functionally associated with man's occupance of the earth."

9. Unstead (1933): 176.

10. Ibid: 181.

11. Whittlesey (1954): 49.

12. Unstead (1933): 177.

PART ONE: PHYSICAL ENVIRONMENT

'A clear outline of the principal natural divisions of the Himalayas, is, and long has been, a great desideratum; for physical geography, which derives so many aids from the other physical sciences, is expected to render back to them, without unnecessary delay, a distinct demarcation of its own provinces, since by that alone researchers in so may departments are enabled to refer the respective phenomena they are conversant with to their appropriate local habitations in a manner that shall be readily intelligible, causally significant, and wholly independent of the shifting and unmeaning arrondissement of politics.'

B. H. Hodgson

(In J.A.S.B., XVIII (1849), p.761)

Chapter Outline

HIMALAYAN SITUATION AND GEOLOGY

a. Himalayan Location

i. Natural divisions
ii. Geographic regions

b. Uplift and Glaciation

i. Uplift
ii. Glaciation

c. Regional Geology

i. Tectonic units
ii. 'Pokhara Gravels'

Chapter 1.

HIMALAYAN SITUATION AND GEOLOGY

a. Himalayan Location

The 500-mile stretch of the main Himalaya within Nepal - called Nepal Himalaya - is the most central and extensive of all the Himalayan sections (Fig. 4a).[1] Here are congregated more than 200 peaks with altitudes exceeding 20,000 feet. The mountain chains make narrow ridges and the deep river gorges incised across them present the greatest extremes in altitude in the shortest horizontal distance.[2] It is this stupendous mountain hinterland one must reflect while investigating an interior valley such as Pokharā.

(i) Natural divisions. Nepal Himalaya has been divided into three sub-divisions corresponding to the drainage basins of Karnāli in the west, Gaṇḍaki in the centre, and Kosi in the east.[3] The Gaṇḍaki basin is drained by the traditional seven streams ('Sapt-Gaṇḍaki')[4], and Pokharā Valley lies in the central part of Seti river. Some recent attempts to establish separate mountain regions are applicable only to alpine studies,[5] and the conventional divisions according to the

---

1. Burrard and Hayden (1933): 87, classifies the Himalayas into four sections: Assam Himalaya, 450 miles; Nepal Himalaya, 500 miles; Kumaon Himalaya, 200 miles; and Punjab Himalaya, 350 miles. Mason (1955):10, separates Sikkim from the Assam Himalaya, and Karakoram from the Punjab Himalaya to recognize "six main mountain regions each with special characteristics."

2. Filippi's statement remains valid after half a century: "This [Nepal Himalaya] is indubitably the part of the Himalaya where the most important geographical discoveries still remain to be made". See Filippo de Filippi: Karakoram and Western Himalaya, London,(1912),p.2.

3. Hodgson (1849): 761-788; Mason (1934): 81-90, (1935): 83-86.

4. From the west: (1) Bari Gad; (2) Kāli-gaṇḍaki; (3) Seti; (4) Marsyāndi; (5) Chepe; (6) Buṛhi-gaṇḍaki; and (7) Trisuli-gaṇḍaki.

5. Hagen (1956): 124-230, 162-168, 169-177, 295-303. Dyhrenfurth (1960) makes the following divisions: Kangchenjungā group, Everest group, between Dudh Kosi and Trisuli, both sides of Buṛhi-gaṇḍaki, Annapurna Himāl, Dhaulāgiri Himāl, and west of Dhaulāgiri.

IV. Māchhāpuchhre massif dominates the region in the north. Annapurṇa-IV (24,630 feet) on the right skyline and Mardi Valley in the foreground. The highlands are forested mainly with oaks and rhododendrons. See p.25.

V. Lamjung Himāl is the eastern extension of Annapurṇa Himāl. Annapurṇa-II (26,041 feet) on the left and Lamjung (22,921 feet) on the right confine the headwaters of Mādi Valley. From the summit of Lamjung Himāl to the Mādi Valley bottom there is a near vertical fall of 17,000 feet. See p.15.

river systems has much geographic advantage. East of the Gaṇḍaki basin the monsoon is heavy and level lands unimportant while westwards the climate is markedly drier and the highlands extensive. Thus the Gaṇḍaki basin between Dhaulāgiri (26,795ft.) and Gosainkuṇḍ (16,799 ft.) may be appropriately called the Gaṇḍaki region or Central Nepal (Fig.3). Annapurṇa Himāl, Gorkhā Himāl, and Ganesh Himāl form the backbone of this region. Pokharā lies at the southern base of the Annapurṇa Himāl which stretches 50-miles between the trans-Himalayan gorges of Kāli-gaṇḍaki and Marsyāndi rivers.

Orographically, the Himalayan system constitutes a series of more or less parallel ranges of varying altitude and extent (Fig. 4b).[6] Approaching the mountains from the south, the first elevations are those of the Siwālik hills ('Churia' range), 5-20 mile wide and rarely exceeding 3,000 feet in height. The next series, that of the Lesser Himalaya, is 30-50 mile broad possessing a remarkable unity of height between 6,000 feet and 10,000 feet. The Lesser Himalaya is known as the Mahābhārat Lekh and extends along the entire length of the country. The third series culminates into the heights of the Great Himalaya or 'High Himāl',* most of which remain under perpetual snow. In Central and West Nepal, a fourth system, the Ladākh range, occasionally exceeding 20,000 feet, runs about 20-miles north of the main Himalayan crest-line. The Ladākh range forms the chief watershed between the rivers of the Gangā and Tsāng-po.

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6. Thus the term 'Himalayas' in plural sense is inclusive of the longitudinal sections and transverse systems.

* 'Himāl' in Nepali means snow-covered mountains.

(ii) Geographic regions. The natural divisions have created geographic regions each with a definitive name. Flanked between the low Terai plain and the high Tibetan plateau, the Himalayan system encloses three distinct regions alternating with its four parallel ranges. These valley regions are the 'dun' in the south, 'pahāṛ' in the central belt, and 'bhoṭ' in the north.

The longitudinal 'duns' between the Siwālik and the Mahābhārat Lekh are called Bhitri Madhesh (Inner Terai) because of their level topography. The 'bhoṭ' region, north of the High Himāl but south of the Ladākh range, are high valleys that can be approached only through lofty passes, and remain frontiers of the Tibetan region. Till recently, the Thāru were the only people capable of subsisting in the malarial 'duns' and in the barren 'bhoṭs' the population is still exclusively composed of the Tibetan emigrants (Bhoṭe). The 'pahāṛ' region or the typical hill country lies between the Mahābhārat Lekh and the High Himāl, a 40-65 mile broad belt interspersed by numerous ridges and valleys. Though it is well-dissected, the general elevation is subdued compared to its enclosing ranges. The topographic depression of the 'pahāṛ' region is evident in such descriptive terms as "the Midland",[7] "the Central Valley Belt",[8] and even "the Lowland"[9] applied to it. It is well-populated and extensively cultivated, and is rightly "the cradle of the native Nepalese culture and includes the heart of the Nepal State".[10] Pokharā Valley lies in the centre of the 'Pahāṛ' region, and a closer examination of this hill region per se should help in our regional analysis.

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7. Hagen (1961): 38.
8. Kawakita (1957): 7.
9. Ibid.
10. Ibid.

The natives recognize two ecological regions in the geography of the Pahāṛ country: the temperate 'Lekh' and the sub-tropical 'Kachhāṛ'. The Lekh region lies above 5,500 feet and has winter snow. In spite of its large altitudinal range the settlement zone here is limited. The villages climb up to 7,000 feet and the fields another thousand feet, but above 8,000 feet there are summer grazings only. The colder climate put a limit to the crop-growing season and hailstorms are frequent. The Lekh is the culture area of the Mongoloid tribes, and this region is represented in the present study area by the high hills in the north. The Kachhāṛ region below the Lekh has a warmer climate and grows numerous crops. Being a preferred settlement zone, much of the natural vegetation has been cleared. It is densely populated, and the settlers are derived from tribal immigrants as well as the Khasa (mixed race) and the Indid people. The Pahāṛi culture is predominantly Hinduistic. The low hills around Pokharā fall under the category of the Kachhāṛ. The lowest of the Kachhāṛ region are further distinguished as the 'Besi'. The 'Besi' sub-region lie below 3,000 feet and include the humid valleys and the low-lying plains. Malaria discourages settlement in these warmer valleys but they are utilised for growing paddy and tropical crops.

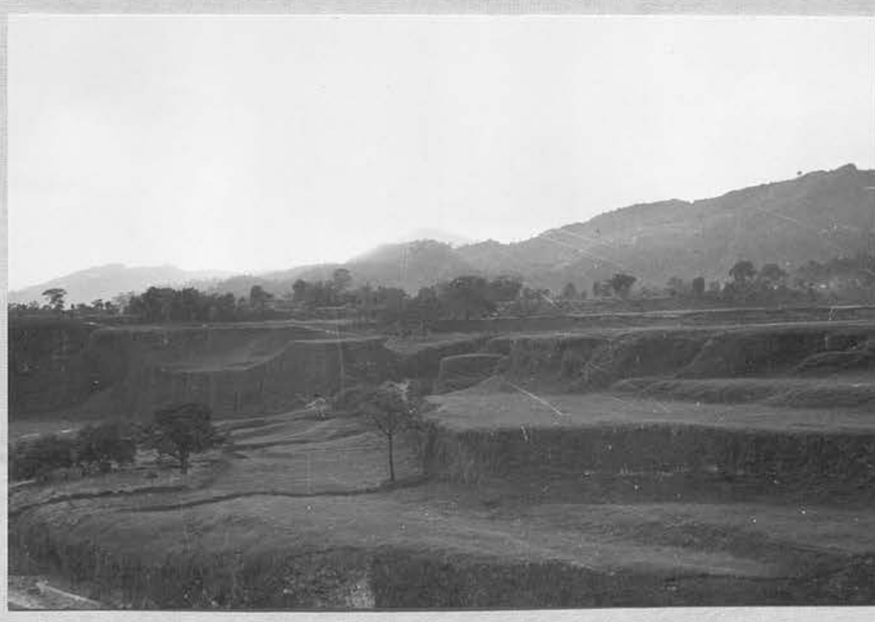
b. Uplift and Glaciation

Any study of Himalayan relief must, in addition to the subaerial processes, consider the forces and effects of orogenesis and glaciation. Both had cataclysmic phases in the past and persist to-day. If deglaciation accelerated the denudation of the Himalayas, uplift has maintained its youthful character ever since the first Tertiary tension.

(i) Uplift. The location of Pokhara within the Himalayan mobile welt has profound significance on the region's topographic expression. The convex gorge-walls, lofty terraces and irregular stream profiles all indicate considerable rejuvenation.[11] Some terrace benches are found 800-feet above the present river level. The clearest index of intermittent uplift are the intricate series of terraces on the Pokhara plain (Pls. VI, VII). The Seti river and its tributaries have excavated the thick glacio-fluviatile deposits, now that their valley-sides are flanked by flights of terraces, leaving the intervening flats ('tār') high and dry. The river terraces become more numerous downstream of the Seti, while conversely, their heights increase upstream: the maximum measured were 250-feet downstream and 400-feet upstream. The amplitude of relief between the top terrace and the Seti thalweg also increases headward (Fig. 13b). Some terrace levels can be paired and the height differences between the pairs imply differential periods of rejuvenation. Assuming the terraces to be cyclic, three major degradation phases are observable. The lowest terrace rises above the present flood-plain nowhere exceeding 60-feet in height. The intermediate terrace above the former averages 80-feet high, and the upper terrace, 100-130 feet above the intermediate terrace is both extensive and easily recognizable. Their relative heights indicate decreasing time intervals between successive rejuvenation. The long

11. Hagen (1961):53, estimates from the north-dipping lacustrine deposits of Kāṭhmāṇḍu Valley that the Mahābhārat Lekh has been raised at least 200metres in the last 200,000 years. See also Hagen (1963): 1-96.

VI. Looking North-West, above the gap between Sārānkoṭ and Kāhun hills. The large erratic boulder is marked X in the middle distance. Abandoned field on the foreground lower terrace. See p.14, p.22.



VII. Looking South-west. The trees on the top terrace mark the location of the town, and on the lower terrace are the enclosed mango trees. See p.14.

profile of the Seti also show increasing aggradational phases and corroborates the above assumption (Fig. 13b). Dating of the phases of uplift would, however, be presumptuous at the present state of knowledge.[12] Though similar river terraces have been reported from Kāli (Sārdā) valley,[13] Kāli-gaṇḍaki valley,[14] Narāyāṇghāṭ,[15] and personally observed in Marsyāndi valley, no attempt at correlation has been made. Only a tentative conclusion is offered that the terraces are of post-glacial period created possibly by three pronounced erosion phases.

(ii) Glaciation. The present limit of perpetual snow on the south slopes of Annapurṇa Himāl lies between 17,000 and 18,000 feet, and winter snow rarely occurs below 6,000 feet. The glaciers are small, short, and avalanche-fed. Topography remains the main inhibiting factor in glacier development in this area.[16] The south face of the range is a sheer wall buttressed by three south-trending ridges that enclose the headwaters of Modi Kholā in the west, the Seti in the centre, and Mādi Kholā in the east (Pls. I, IV). The South Annapurṇa Glacier is the longest (8 miles) and descends down to 13,000 feet. This western amphitheatre is scoured by three other smaller glaciers all debouching into Modi Kholā. In the east, glaciers slide westwards from the high shelf of Lamjung Himāl and descend to Mādi valley by a

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12. De Terra and Chardin (1936): 791, consider three to four phases of uplift in Kashmir since the close of the Pleistocene period.

13. Heim and Gansser (1939a):38, observed three terraces at Balwākoṭ, with levels of 60 metre, 15 metre, and 300 metre above the Kāli river.

14. Shrestha (1961):1.

15. Auden (1952):354, reports a high level terrace (1,500 ft.) of large-boulder conglomerate.

16. Müller (1958-59):198, correlates the small size of the Everest region glaciers with low precipitation.

series of ice-falls.(Pl.V) The central cwm, sustaining the Seti River, has steep walls that precipitate frequent avalanches and the upper Seti valley is choked with moraines and rock-debris. Most of the flanks of Māchhapuchhre are steep without snow-cover, and the extensive frost-zone provides constant rock-fall.

As direct evidence is lacking in the region, one might reconstruct past glaciation from comparable studies of other Himalayan areas. Old moraines on the slopes which support no glaciers to-day point to their glacial past and some assume that the present glaciers are mere vestiges of their former giants. The four glacial epochs established in the Himalayas[17] had their snow-line depressions estimated at 5,280 feet (First), 4,950 feet (Second), 4,620-4,950 feet (Third), and 2,970-3,300 feet (Fourth).[18] If these estimates seem maximalist, specific sites may be taken. In extreme west Nepal, the last glaciation terminal moraines encountered were at 10,560 feet in Nampā Valley and 7,028 feet at Mālpā (Kāli valley).[19] Near Kāṭhmāṇḍu at Chyāubās, moraines were discovered at 6,800 feet, and the snowline depression assumed at least 6,500 feet.[20] In Seti valley no moraines were found below 10,000 feet and the present narrow gorges are in fact an antithesis to glacial shaping. This does not preclude one from assuming that glaciation might have been more extensive during the Pleistocene

17. De Terra and Paterson (1939):220-231.

18. De Terra and Movius (1943):335.

19. Heim and Gansser (1939b):234.

20. Heuberger (1956):364.

period. The reversal of topography has undoubtedly been imposed by the furious work of the rivers in contrast to the action of the present lazy glaciers. Pleistocene period in the Himalayas was not a continuous ice-cover but an extensive glaciation of the valley systems.[21] It seems that the lower parts of Annapurṇa Himāl were not glaciated below an estimated altitude of 9,000 feet, and the low valley of Pokhara never experienced direct glaciation. On the other hand, its geographic proximity and topographic situation at the base of a major snow range leads one to believe that it could not have been free from peri-glacial regimes during the glacial phase. The gravel deposits submerging the entire pre-glacial valleys must have been the legacy of a glacial epoch. The examination of the gravels of the Pokhara plain will throw some light on this problem.

c. Regional Geology*

Central Nepal has a considerable bearing on the geology of Nepal as a whole since the numerous southward thrusts, geographically and chronologically, originate here (Fig.6). North of Pokhara lie the dominating heights of Annapurṇa Himāl, the base of which represents the oldest root-zone of uplift in Nepal Himalaya.[22] The para-autochthonous zone of Pokhara or the so-called 'Pokhara zone' is considered the lowest

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21. Norin (1925):165.

*This section is based on Dr. Toni Hagen's work with certain modifications. He surveyed Pokhara in 1953 during his reconnaissance geological mapping of Nepal. Mr. C. L. Shrestha kindly allowed me to use his unpublished material, and Mr. T. Glennie provided some final comments. A recent study by Bodenhausen and others (1964), it is believed will provide a considerable advance to the knowledge of the Central Himalayan stratigraphy and some of their structural interpretations may disagree with those of Dr. Hagen. However, the best systematic geological study of Nepal Himalaya concerns with the Everest region. (See Bordet, 1961).

22. Hagen (1960b):36.

VIII. <u>South-dipping Rocks</u> on Kāhun Hill at an angle of about 18 degrees is representative of the strike-ridges in the low hills. The Seti river issues out of the narrow gorge and flows to the left. See p.28.

IX. <u>Fault-truncated Spur</u>, on Kālābang Ridge south of Phewā Tāl. The north-west/south-east fault marks the contact line between the 'Nawakot nappe' system and the autochthonous 'Pokhara zone'. The fresh scar is due to quarrying. Overgrazed Schima wallichii forest on the hill. See p.29.

tectonic unit in Nepal. Between the 'Pokhara zone' and the Tibetan zone (Manāng synclinorium) are squeezed the two main nappe systems: the older 'Nawākoṭ nappe' compressed into four miles,(normally sixteen mile wide), and the average forty mile wide 'Kāṭhmāṇḍu nappe' into mere twelve miles. Such extreme narrowing of the root-zone has created the greatest difference in altitude, as the low-lying Pokhara Valley (2,900 feet) is within twenty-six mile's compass of the lofty Annapurṇa massif (26,504 feet).

(i) Tectonic units. The main tectonic units of the region are, (1) the 'Pokhara zone' in the central part, (2) the 'Nawākoṭ nappe' surrounding the 'Pokhara zone', and (3) the 'Kāṭhmāṇḍu nappe' overriding the 'Nawākoṭ nappe'. (Fig.6). Lithologically, the units differ only in degree, and the above classification is tectonic only. The near section of the block diagram (Frontispiece) on the interrelationship between the 'Pokhara zone' and the overlying 'Nawākoṭ nappe', shows the former as a 'tectonic window'. This para-autochthonous zone was recognized early in 1950 from the air.[23] The 'Pokhara zone' and the 'Nawākoṭ nappe' are separated by a thrust-plane, but their lithologic differences remain minor, as admitted by Hagen, "die formationen der Quarzite, Phyllite, und Konglomerate von Pokhara sind schwer zu deuten".[24] The 'Pokhara zone' is primarily of phyllites and quartzites, with layers of Permo-Carboniferous boulder-beds occurring within the phyllites. Some rock faces of this zone seem similar to the chloritic green phyllites and schists of the Kāli-gaṇḍaki valley.[25]

The autochthonous indications of the zone are mainly tectonic as the series within this zone exhibit numerous north-south

23. Hagen (1963):54.

24. Hagen (1959):23.

25. Shrestha (1961):42.

X. Hanging Valley, in Marsyāndi valley within the 'Kathmandu nappe' system. See p.27.

XI. Landslides, on the hills of Pokhara. The high hill here is Sabje Choyān (7,022), Annapurṇa being hidden by the afternoon cumulus clouds. The bed of Bhalam Kholā on left is a dry expanse of gravels and shingles. See p.82.

anticlinal and synclinal structures, transverse to the main east-west strike and therefore unrelated to the structures of the overlying nappes. Evidently, the transverse structures within the zone are ancient, created before the building of the Himalayas and the thrusting of the nappes.[26] The zone extends forty miles eastwards from the Mādi Kholā, attaining a maximum width of nine miles in the neighbourhood of Deorāli (Fig.6).

'Nawākoṭ nappe' consists of four nappe sheets, the lowest overriding the 'Pokhara zone' and the highest overthrust by the younger 'Kāṭhmāṇḍu nappe' system (Fig.5b). The Nawākoṭ system is composed mainly of Carboniferous and Triassic-Jurassic quartzites, and limestones, shales, breccias and phyllites.[27] Shrestha finds the inclusion of phyllites both in Nawākoṭ system and Kāṭhmāṇḍu system inconsistent and suggests instead a separate grouping of a phyllitic belt.[28] He reports the existence of a distinct phyllitic rock type, from Bāglung Bāiskhāni (south of Dhaulāgiri) comparable to those of Pokhara.

The structure of the Nawākoṭ system is of anticlinal type, mostly with fractured and faulted axes, varying in direction and strike. The anticlines are asymmetrical with a long, gentle northern slope and shorter, steep dip towards the south. They exhibit the normal east-west structure in which the underlying 'Pokhara zone' is not involved.

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26. Hagen (1960a):95.

27. Ibid., 12.

28. Shrestha, op.cit., 41.

The '<u>Kāṭhmāṇḍu nappe</u>' system, lying astride on the Nawākoṭ system, consists of five nappe sheets, the lowest approaching within eight miles of Phewā Tāl in Pokhara (Fig. 6b). This system acts as the backbone of the Nepal Himalayan nappes and in Central Nepal give rise to the Annapurṇa massif. The ridge trending south from Annapurṇa I (26,504 feet) and connecting the South Summit (23,807 feet), consists of recognizable sediments of probable Palaeozoic age, within the crystalline zone of the 'Kāṭhmāṇḍu nappe' (Fig. 3). Annapurṇa III (24,858 feet) in the centre is entirely of limestone and its southern outlier, Mācĥāpucĥre (22,958 feet)* is a sharp pyramid of granite (Pl. I). The eastern half, consisting of Annapurṇa IV (24,630 feet), Annapurṇa II (26,041 feet), and Lamjung Himāl (22,921 feet), is sedimentary in composition and structurally consists of an overturned fold (Pl. V).

The Kāṭhmāṇḍu system is crystalline in character like its Indian counterpart, the Garwhāl nappe. It consists of gneiss (Darjeeling type), phyllite (Daling type), Ordovician limestone, quartzite, sandstone, and schists of varying degree of metamorphism.[29] Intrusions of granites, pegmalites, and aplites are common in the older sections while the younger section is mainly a Lower Palaeozoic formation. Some belts of Siluro-Devonian limestone also occur and since the discovery of trilobites in the 'Chitalāng Series' of this system, this nappe group is no more considered 'unfossiliferous'.[30]

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*Viewed laterally (Pl.IV), Mācĥāpucĥre is a fluted peak, thus its name meaning the Fish's Tail.

29. Hagen (1951):357.

30. Hagen (1960a):12.

SOLID GEOLOGY

XII. Bedded Conglomerate in Pārdi Kholā where the plain impinges on the Kālābang Ridge. The conglomerate is formed from the outwash gravels.

See p.22.

XIII. Massive Conglomerate on Pachbhaiyā Ridge forming its crest-line. The massive conglomerates belong to the 'Pokhara zone' distinct from the bedded conglomerate of the Pokhara gravel.

See p.29.

XIV. Calcareous Extraction. The calcareous incrustations in the gravel stratum are extracted for making lime used in white-washing. The 3-feet high ice-axe gives the comparative scale of the boulder on the gravel plain. See p.30.

(ii) 'Pokhara Gravels'. The three tectonic units described above form the basis of solid geology of the region. However, the most striking elements in the regional geology are the extensive superficial deposits along the Seti valley. These have been called the 'alluvial plain' by Hagen[31] and 'Pokhara terrace' by Shrestha.[32] Both terms are partially correct; (the former genetically and the latter morphologically) but none describe them. The present writer's field observations establish these deposits to be glacio-fluvial in origin and suggests the nomenclature 'Pokhara gravels'.

The gravel deposits, covering a surface area of forty-eight square miles, extends for thirty miles along the Seti between Bhārbhure in the north and Dobhān in the south. Their subsurface parameters are unknown but gorge sections provide estimates ranging from a thickness of over 400-feet in the upper reaches to 200-feet in the south (Fig.13b). The average thickness of the strata decreases downstream. The maze of terraces in the south-east renders thickness estimate more difficult.

The deposits are primarily gravels, comprising rock fragments derived from the three tectonic units enumerated above. Their degree of provenance is difficult to determine in part due to lack of petrological knowledge of the rocks and in part owing to their minor lithological differences. The gravels contain gneiss, phyllite, sandstone, quartzite, slate, and dolomite. The texture generally is course with more than 50 per cent of the components as small pebbles.

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31. Hagen (1960b): map.

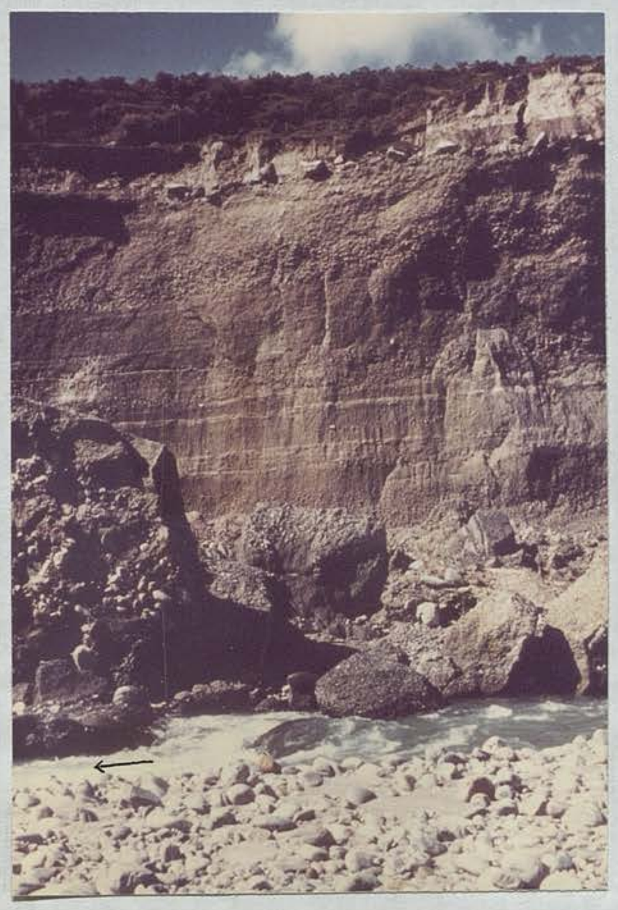
32. Shrestha (1961): map.

The over-all frame-work of sand and silt, pebbles and cobbles is illustrated by the 80-feet gorge profile at Rāmghāṭ (Pl.XVI). At places pebbles predominate while at others they grade into finer sediments. The pebbles (9 cm. diameter) and the smaller boulders are not well rounded nor have they any striation. Upstream some of the boulders attain immense size; some exposed, others remain embedded. One huge boulder about 20-feet in diameter, lies perched on the highest terrace just north of the town (Pl.VI). This conspicuous boulder may not be an 'erratic' but one that has rolled down from one of the nearby hills (?Sarānkoṭ). Boulders of smaller size are widespread all over the plains. The gravels with their sandy matrix have been banded together with calcareous cement (Pl.XII). The cement has presumably been carried down from the surrounding limestone hills in solution and the cementing occurred when drying-out after the flood. Uncemented conglomerates with interstitial sand (Pl.XXXVIII) are more extensive than the finely bedded ones (Pl.XII). The conglomerates can range from those in which all the pebbles are in contact with each other to those in which the pebbles are "floating" in a matrix of sand. Both can be found in cemented and in uncemented condition.

The degree of stratification varies from place to place and horizon to horizon. The bedding is commonly large-scale and gently dipping downstream (Pl.XVI). Though some layers of varying colour and thickness arrange themselves in order, annual varves are difficult to distinguish. The conglomerates sometimes contain sandy, loamy, and clayey beds, and where streams carry much lime in solution, beds of calcareous tufa are interstratified with gravel banks. An examination of gorge profiles along the stretch of the Seti river only confirms the diversity of deposition and stratification. Upstream at Ghāchok, a 30-feet high cliff has a calcareous crust that obliterates the bedding. Four

OUTWASH DEPOSITS

XV. Fine Conglomerate below the area shown in Pl.xii. The stream goes underground through a series of pot-holes before joining Pārdi Kholā. See p.22, p.30.



XVI. Gravels at Rāmghāṭ. The 80-feet high wall includes only the lower and intermediate terrace levels. Note the downstream dip (to the left) of the silt strata. Top terrace seen in the skyline. See p.22.

miles down, near Hyāngjābesi, a 75-feet wall is of poorly-cemented conglomerate. Near Pokhara town one section is entirely of unbedded and uncemented gravel, while at another site the pebbles are so well-cemented that it took six builders three months to excavate a 15-feet base for the new bridge. In the south, near Gagangauṇḍā, a massive 100-feet wall has sandy loam overlaid with layers of sand and silt. The heterogeneity in the drift mass is the function of deposition. It will be shown in the next chapter that the Pokhara gravels were deposited under abnormal conditions.

Chapter Outline

LAND FORM AND DRAINAGE

a. Highland Relief

i. Morphometry
ii. Relief forms

b. Pokhara Plain

i. Morphology
ii. Interpretation

c. Drainage System

i. Pattern
ii. Streams, Discharge, Profiles

d. The Lakes

i. Shape
ii. Origin

Chapter Two

LAND FORM AND DRAINAGE

The region south of the Annapurna Himal presents one of the sharpest contrasts in landscape. A description of local relief will qualify this statement. The Pokhara region as defined in this study refers to the Seti valley around Pokhara including the hills enclosing it (Fig. 1). Dissected rugged hills are typical of this mountainous terrain and the plain of Pokhara stands out as a distinct feature in the landscape. Unlike other narrow valleys, typical of the Himalayas, the plain of Pokhara is abnormally broad for a stretch of 30-miles to merit a 'vale' description. The individuality of this 48-square mile plain is accentuated by three-quarters of highland relief within the study area. The discussion starts with the nature of the immediate highlands and their morphometric analysis as a background to the understanding of the accumulative plain formation

a. Highland Relief

The Pokhara plain is confined by hills ranging in height from 3,500 feet in the south and east to 8,900 feet in the north and north-west. The highest hills, spurs of the Annapurṇa Himāl flanking the upper Seti valley, approach within eight miles of the central plain. The lower hills to the south are the ramifications of the Mahābhārat Lekh.

(i) Morphometry. The mountain slopes north of the region present a steep gradient emphasizing the flatness of the Vale floor (Fig. 8). From the summit of Māchhapuchhre to the town of Pokhara, the vertical altitude lost within 18-miles of horizontal distance is over 20,000 feet or 1,100 feet in every mile (gradient 1:57). The steepness between the same peak and the village of Bhārbhure is even more impressive with a drop of 18,700 feet within 8-miles, a gradient of

2,600 feet to a mile (1:27)! The steep upper slopes relent to a moderate gradient at about 6,000 feet. This 6,000-foot level, as a major break in the general slope of the Himalaya, has been used here to demarcate the northern mountain region and the southern hill (Pahāṛ) complex. In contrast to the steep mountain slopes, the Pahāṛ area exhibits a certain degree of older land surface and this peneplain aspect has earned it such epithets as "the lowland", and "the Midland". The central Pahāṛ belt between the High Himals and the Mahābhārat Lekh, suggests some primaeval erosion surfaces.[1] According to the altimetric frequency analysis (Fig. 9a) most of the hill summits range within 4,000-6,000 feet. At least two accordant levels, each at about 4,000 feet and 5,000 feet are recognizable from the projected profiles (Fig. 10a). Land area above 5,000 feet has a low percentage, and the maximum percentage (36) falls between 2,500 feet and 4,500 feet (Fig. 9b). The exceptionally large area (46 per cent) between 2,000 to 3,000 feet, mainly contributed by the depositional plain, should not invalidate the over-all regional pattern of erosion surfaces.

The contrast between the rugged topography of the hills and the level plain is best exemplified by the relative relief (Fig. 8b). The highlands in the north have the highest relief value and the southern hills have a slightly lower relief value. The residual hills and ridges on the plain have been masked by the lowest value. The amplitude of relief[2] of the whole region including the

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1. Heim and Gansser (1939) note similar peneplain surfaces in Kumāon Himalaya.

2. Miller (1953) 46-49.

dissected hills amounts to an average slope of 1:2.75.

(ii) Relief Forms. Looking east-south-east from the western ridge of Dhampus an anticlinal valley and its associated troughs can be followed through the valleys of Yāngdi, across the Seti, north of Kāhun, Arbā and Arghoun hills to Mādi valley (Fig. 7). This Yāngdi-Mādi anticlinal axis (assumed the crestline of the domal 'Pokhara zone') forms a morphological boundary between two types of hill topography. North of the axis lie the well-dissected highlands and southwards a series of west north-west/east south-east strike-ridges. The highland rocks dip steeply (27°) northwards and owing to the squeezing of the nappes, many varieties of rock out-crops are met within short distances of each other (Pl. X) . The more resistant crystallines, quartzites and dolomites stand-out sharply and the phyllitic exposures are most liable to landslides (Pl. XI). Numerous spurs bifurcate from the highlands, and one from the western highland (B) descends ten-miles south-east for form a narrow divide between Bijaypur Kholā and Mādi Kholā. The spur series are mostly sharp and sinuate separated by equally narrow valleys.

South of the Yāngdi- Mādi anticlinal axis the hills run west north-west/east south-east. The three systems of strike-rdiges are those of Barsāmi, Kālābang, and Kāski. The Barsāmi ridge, that separates the Vale from the Mahābhārat Lekh is the most emphatic with an average height of 3,500 feet for over ten-miles. As a south-eastern spur of Panchāse peak (8,250 feet, see Fig. 3) it runs for 21 miles connecting the local heights of Ulleri (6,942 feet), Maṭṭikhān (5,032 feet) Phoksing (3,721 feet) Barsāmi (3,630 feet), Dhārāpāni (3,757 feet), Ānpu (3,500 feet) and

EROSION FEATURES

XVII. Seti Gorge below Mahadgaundā. The two sides of the gorge meet here and the river becomes subterranean. The widest terraces occur below this point. See p.30,

XVIII. Swallow Hole near Bāṭulechaur. The limestone cave within the hill complex is overlain by the edge of the outwash drift on the left. See p.31.

Thaprek (4,000 feet) across the Seti. The second ridge-system, two miles north of the Barsāmi ridge, consists of the western Kālābang (4,743 feet) and eastern Deorāli (3,300 feet) and these two extremities can be connected through the remnant hills of Ḍhungāsāngu, Riṭhepāni, and Bhanāḍhik on the central plain. The third ridge alignment starts in the north from Kāski (5,867 feet) to Sarānkoṭ (5,223 feet), Kāhun (4,736 feet), Arbā (4,500 feet) Arghoun (4,655 feet) and Mājhṭhān (4,002). East of Arghoun a subsidiary ridge, Begnās (3,956 feet) runs parallel to the Mājhṭhān ridge. The convergence of four spurs at Arghoun allude to the combination of spur as well as scarp development, and such local complications are due to the occurrence of north-south faults transverse to the main strike parallels. For example, the ridges of Mājhṭhān and Begnās are laterally joined by a tectonic bridge of conglomerate at Jinṛithar.

The ridges have a scarp north face and gentle south slope. The scarps average 28° and it is steepest on Kāski ridge with an angle of 46°. They are too steep for cultivation and are left forested. The south-facing slopes, averaging a gradient of 18° are preferred both for cultivation and settlement. Vegetation at the most comprises of scrubs and the slopes expose a bare facade and the deep red haematic sandstones give them a distinct ochre hue. The scarp-and-dip topography of the area is not due to monoclinal structure but rather due to thrust-faults. The Kāski ridge with a pronounced hogback shape is in fact a synclinal ridge as an antithesis to the anticlinal valley of Yāngdi (Fig.1).[3]

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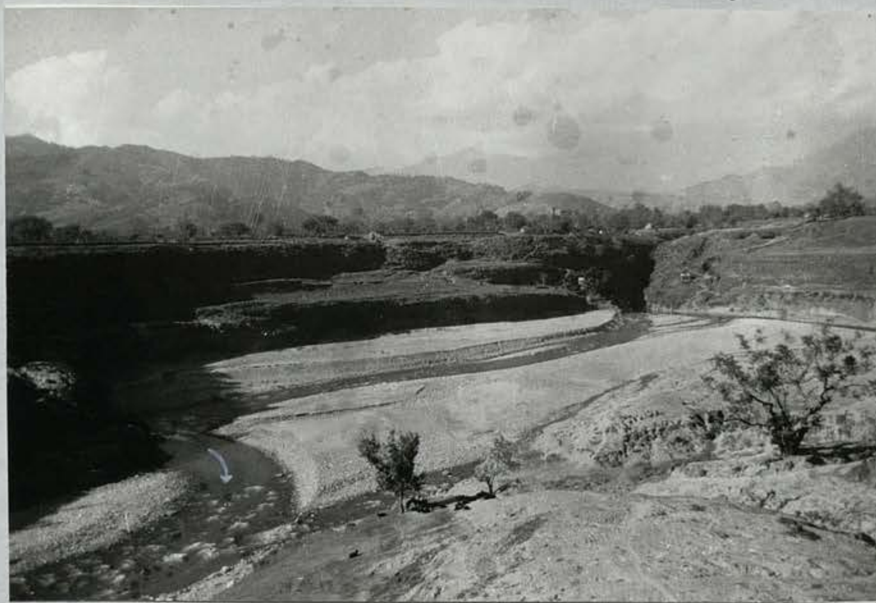
3. The geological cross-section is after Shrestha (1961).

Numerous rock-sheets thrust southwards at low angles have become isolated by erosion from the main nappes into outliers ("klippen"). One may also conjecture "decollage" ('collapse structure') wherein under favourable gravity slope and lubrication, the higher sheets of the "klippen" collapse lower than the underlying beds. The scarp relief has been further sharpened by numerous faults, north-south on local scale and west north-west/east south-east as a general case. The lines of fault are well-defined as at the truncated spur on the Kālābang ridge (Pl. IX). This fault-plane follows the contact zone of the 'Nawakot nappe' and the para-autochthonous 'Pokhara zone' along the straight northern edge of the Kālābang and Barsāmi ridges.

The fault-scarps of Barsāmi, Kālābang, and Kāski ridges confine the plain sharply. Elsewhere, the divides along the foot-hills give a sinuate border to the plain. A southern projection of Kāhun hill is preserved by two hillocks, and the maze of spurs from Arghoun enclose five lakes along the north-eastern edge of the central plain. The Pachbhaiyā hill, a promontory of Begnās ridge, separates the large lakes Begnās Tāl and Rupā Tāl. All along this narrow ridge, a central core of conglomerate stand out as high points (Pl. XIII). Five partly-buried low hills break the monotony of the level plain (Pl. III). Three of the largest inliers - Ḍhungāsāngu, Riṭhepāni, Bhanāḍhik - have the same alignment with south-dipping rock strata, and the conglomerate hill of Ḍhungāsāngu is structurally contiguous to the western Kālābang ridge. The smallest inlier (at the gap between Ānpu and Thaprek) separates outlets of the Seti and Khudi Kholā from the central plain (Pl. LXXXVI).

The salient features of low hills on the plain is contrasted by deep narrow gorges. It is even possible that the two features are related as the existence of buried hills tends to cause gorge formations. The gravel mass filling the pre-glacial valley of Pokhara has been worked-up by the Seti into extensive terraces as well as steep gorges. The first narrow gorge occurs at the gap between Sarānkoṭ and Kāhun ridges, where the Seti is deeply entrenched for three furlongs (Pl. XCVII). The second gorge develops a mile below the town. The gorge is 150-feet deep and the river cuts through a conglomerate mass at the base. This mile-long gorge terminates at Rāmghāṭ where the two banks have been cut back to enclose an amphitheatre (Pls. XIX, XX). The most intricate gorge commences below Rāmghāṭ for a stretch of 2½ miles. There are large-scale slips and cracks along the banks, which sometime coalesce to make the Seti a subterranean river. (Pl. XVII) Near Mahadgauḍā, the over-riding opposite banks provide a natural bridge, thus called 'Ḍhungā-sāngu' (stone-bridge). After Ḍhungā-sāngu the river is flanked by wide terraces, (Pl. XCII), and gorges are confined to the lowest terrace and the river is actively corroding and lowering its bed. The final gorge within the plain occurs at Gagangauḍā, where for a mile the river channel negotiates through huge blocks of boulder-conglomerate. Other streams also make deep gorges as they traverse the plain. One is struck by the small size of the streams meandering through wide, steep-sided gorges (Pl. XXII). On the other hand, the stream draining Phewā Tāl disappears completely into a series of pot-holes (Pl. XV) and debouches into Phusre Kholā through an underground channel about two furlongs long.

The streams carry much lime in solution from the surrounding hills and the lime encrustations are extracted for use as white-washing material (Pl. XIV). The sink-holes recorded north of the town are some of the karst features associated with



XIX. Rāmghāṭ, 1959. Seti river has made a wide amphitheatre between two gorges. Compare the stream discharge during December here and below during October. The Hindus cremate their dead on the 'ghat' on the left-hand bottom while the intermediate terrace across the stream is used for burial by the Gurungs and Tamāngs. See p.30.

XX. Rāmghāṭ, 1962. The changes noticeable within three years are landslips by undercutting on the far bank and the uprooting by flooding of the large tree in the foreground. See p.30, p.58.

the hills. One at Bāṭulechaur with a ten-feet diameter, is 25-feet deep and winds across thirty yards over a floor strewn with slabs of sandstone and limestone (Pl.XVIII). Stalactites and stalagmites are better formed in another limestone cavern on a west-facing cliff at Jogichaur (Fig.11). Both these two examples lie on the edge of the plain and represent hill features buried by the gravel stratum.

b. The Pokhara Plain

The Pokhara plain extends along the Seti valley between Bhārbhure (4,251 feet) in the north to Dobhān (1,425 feet) in the south-east, both being narrow gorges (Fig. 11). The over all north north-west/south-east extension of the plain is locally marked by a zig-zag pattern imposed by the underlying structure. The main strike runs west north-west/east south-east and is reflected in the recurrent ridge-and-valley forms similarly oriented. The shape of the plain is determined by four sharp turns of the Seti within the region. From its head at Bhārbhure, the plain runs south south-west for six miles till it joins the western Mardi valley. Then it turns east south-east for another six miles as far as the town of Pokhara. This 12-mile upper section of the plain, enlarged by three lateral alluvial plains, averages over a mile in width. The plain continues south through a narrow gap between the western ridge of Sarānkoṭ and eastern Kāhun hill. The descent of the plain through this bottle-neck is in the form of a large alluvial cone with its apex near the town (Pl. II). The fan spreads six miles across and merges into the central plain towards the south-east. The central plain, below Pokhara spreads out west north-west/east south-east for ten miles from Phewā Tāl to Rupā Tāl and is nowhere less than three miles broad. The lower stretch of the plain commences south of Rupā Tāl where it turns south south-east through a narrow gap between the Ānpu and Thaprek hills. The lower plain, called Khaireniṭār because of its extensive 'khair' (Acacia catechu) stands, is narrow and eight-miles long until its final termination at the Dobhān gorge.

(i) Morphology. The plain spreads over 48-square miles covering a quarter of the area under study. The plain surface slopes south and the difference in altitude between its upper part that abut the mountain base and its distal part 30-miles south is 2,826 feet, a gradient of 94 feet to a mile (1:652). Local variations along the longitudinal profile are more revealing (Fig. 13b). First four miles from Bhārbhure, the plain slopes 40-feet to a mile (1:1,584). In the next four miles the gradient increases to 170-feet a mile (1:372) and again decreases for three miles to the town: 138-feet a mile (1:450). The average gradient of the upper plain is 114-feet a mile (1:556). The gradient of the central plain below Pokhara town is 86-feet a mile (1:736) and that of the lower plain only 47-feet a mile (1:1,349). The average gradient of the central and lower plain together amounts to 71-feet a mile (1:892), showing a regressive fall downstream (Table i). In the next section, an attempt is made to interpret these changes in gradient.

The plain also slopes laterally. The existence of a higher elevation along its central stretch has caused diversions in the course of the tributary streams. Marse Khola draining Phewā Tāl makes a sharp south-eastern turn on meeting the western edge of the plain. It must have once joined the Seti by a straighter course but it is now a tributary of a much smaller stream Phusre Kholā. East of the town, Kāhun Kholā that plunges straight south for five miles through the hills, suddenly turns east into Bijaypur Kholā on reaching the plain edge. Though this river has been artificially channellised on the plain for irrigation purposes, its eastern course is still preserved as a 16-feet high trench.

Many other streams have been similarly forced to skirt the plain through narrow defiles along the contact line of the plain and the foot-hills. The Seti itself, on emerging from a gorge at Ḍhungāsāngu, is pitted against the base of the southern Barsāmi ridge. The hydrographic control of the lateral slope of the plain is nowhere better exemplified than the confinement of the numerous lakes on its periphery.

Normally, there is a sharp break of slope where the plain impinges on the hills. The remnant hills rise sharply from the central plain like islands. And where the plain extensions intrude into the hills, the narrow plains resemble fjord inlets. Normal processes of erosion are active both in modifying the angle of the hill-plain contact zone as well as degrading the plain into terraces. Summer thunderstorms washing the steep hill slopes have given rise to series of alluvial cones over the plain edge. The streams that rush downhill experience a sudden decrease in gradient on reaching the plain and drop loads of rock-waste and deposit sand and silt on the plain. The sheet-wash from the bare hill slopes converge at debouching points and override the plain for a considerable distance. The lateral valleys of larger streams have brought down large quantities of alluvia, that merge into the plain, by extending the level areas. The external limits of the old gravelly plain are buried under the recent alluvium cover. The old plain surface strewn with pebbles and embedded boulders, preserves numerous abandoned stream-beds marked by pockets of pebble concentration and lined with low banks. The channels were obviously left by the braiding streams that once oscillated freely over the plain before establishing themselves. The extensive gravelly plain has a low water-table (c. 200-feet) and unfit for crop cultivation, compared to its peripheral alluvial extensions. Swamps and marshes, features of hydrophytic condition, are confined to the margins of the retreating lakes.

(ii) Interpretation. The morphology of the Pokhara plain suggests the mode of its formation. In view of some recent interpretations, the question of the origin of this plain needs some elaboration. Hagen who made extensive geological reconnaissance surveys in Nepal[4] believes that the Pokhara plain originated from the drying-up of a huge lake.[5] According to him, the last orogenetic movement caused the entire Pahāṛ region between the High Himāl and the Mahābhārat Lekh to sink in opposition to the uplift of the Mahābhārat Lekh. The subsidence resulted in the formation of large lakes in the Pahar region south of the High Himals, similar to the marginal lakes in the Swiss Alps.[6] "All that is left in Nepal to-day is the small remnant of the Pokhara lakes."[7] Hagen places Pokhara Valley in the same category as the lacustrine valley of Kāṭhmāṇḍu.[8] However, the only similarity these two Nepalese vales present is in their intermont character. But intermont valleys may have diverse origins,[9] and many alluvial tracts which have been asserted to

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4. Hagen (1957): 274-76.

5. Hagen (1961) note to Plate 4.

6. Heim (1919-22).

7. Hagen (1963): 63.

8. The lacustrine origin of Kāṭhmāṇḍu Valley was first mooted by Medlicott (1896), and was confirmed by Auden (1935, 1939) who drew striking analogies between the Kāṭhmāṇḍu lignites and the Kashmir Valley 'Karewa' deposits.

9. Timofeyev (1963): 19

occupy the sites of ancient lakes are really the result of stream action. The gravel-filled Pokhara basin is entirely lacking in lacustrine deposits such as lignites ('kāli-māṭi') which are so characteristic in various terrace levels of Kāṭhmāṇḍu Valley. The differences in the land-use intensities of the two vales are basically due to this dissimilarity in their soil formations. The heterogenous drift materials accumulated in Pokhara basin do not indicate a slow layering process under the calm waters of a lake. Their diversity both in content and manner of deposition rather suggest a rapid dropping under diluvial conditions. While Kāṭhmāṇḍu is an enclosed basin with a centripetal drainage,[10] Pokhara lies on the course of a considerable river, a location that would favour extra-regional deposition. The deposition may be either alluvial or glaciofluvial. Some writers[11] propose that fluviatile conglomerates, as those of Pokhara, originated due to the rise of tectonic barriers which forced the resultant long subsequent streams to deposit their coarser sediments rapidly. They attribute all the enormous volume of sediments however to the normal processes of erosion.[12]

The present writer agrees that the formation of the Pokhara plain was consequent upon the uplift of the Mahabharat Lekh. The rise of this southern barrier diverted the south-plunging Seti River laterally north-west to south-east retarding its excessive transporting power. Thus a stage was set for the conservation of erosional materials from the high mountains into a tectonic sedimentary trap around Pokhara behind the Barsami ridge. But instead of the alluvial process envisaged by Glennie and Ziegler, the present thesis considers climatic changes and suggests the gravel deposits of Pokhara as a legacy of a periglacial past.

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10. Chhibber (1954): 64-66.
11. Glennie and Ziegler (1964):7.
12. Ibid. p.5-6.

At present all traces of glaciation have been obliterated by vigorous denudation to the extent that "the main history of the pleistocene [in the Himalayas] can only be unravelled in the fluvioglacial deposits of the foothill region."[13] Such remnants of a conspicuous aggradation period are reported extensively from north and south of the Himalayas regions now far below the timber line. The 'post-glacial gravels' of the upper Arun in Tibet have been dated "at the time of, and after the maximum Quarternary glaciation."[14] Kar's recent investigations on the boulder formations in the foothills of Sikkim Himalaya conclusively prove that periglacial conditions prevailed several thousand feet lower than their present limit.[15] The Jaldhaka boulders lie 18-miles south and 13,000 feet lower than the present tree-line. The gravels of Pokhara, lying only 8-miles south and 7,000 feet lower than the tree-line, give a higher probability of their glacial origin. Apart from this close proximity to a glaciated mountain region, the immense slopes* encountered here indicate the ease with which any erosion material would gravitate down to Pokhara at the base of the mountain.

Avalanches on glacially oversteepened hill-sides were particularly active during the late stages of the final dissolution of the Ice Age. Many screes were built-up and their

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13. Müller (1958): 203.

14. Wager (1937): 241.

15. Kar (1962).

*The fall in altitude between Māchhapuchhre peak (22,942 feet) and Bhārbhure village (4,251 feet) is 18,691 feet within eight miles.

transportation was facilitated by gravity flow as well as vigorous pro-glacial streams. Even though the present region was never glaciated, it is probable that the large boulders were carried by river-ice[16] or drift-ice.[17] Even at present the upper course of the Seti is choked with moraine debris and scree heaps. The exceptional steepness could facilitate the overloaded pro-glacial streams to descend long distances and the transverse valley of the Seti at Pokhara provided a receptacle to the excessive materials. The pro-glacial streams from the Annapurna glaciers could flush the glacial debris on reaching the low valley in the form of a long valley train. This valley train issuing primarily from the upper Seti valley thus flooded the pre-glacial valleys with thick outwash drift deposits. The process of deposition on the broad central plain could have been very similar to those of the present 'sandurs'.[18] The surface morphology of the Pokhara plain also conforms to similar outwash plains reported from elsewhere[19] with increasing gradient towards the source of the drift material. The excessive steepness at the Seti-Mardi confluence which subdues the slope below Bharbhure, was presumably caused by the convergence of a tributary valley train from the Mardi valley[20] into the main valley

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16. Flint (1957): 221. 17. Charlesworth (1957): 1063.

18. Hjulström (1952) 339.

19. In Germany the average slopes are 1:300 or 1:500 at the head to 1:1,000 at the distal end (Woldstedt, 1929, p. 102), and the Munich Plain falls from 12 to 13 per cent near the ice edge through 7.7 per cent and 4.4 per cent to 2.2 per cent (Troll, 1926, p. 227).

20. Mardi Khola is the only snow-fed tributary of the Seti.

train issuing from the upper Seti valley. The true apex of the valley train that originated the plain must have been further upstream above Bhārbhure of which there is no trace left to-day. But in areas of steep gradients it is quite feasible for the melt-water to sluice away all the drift materials. The present writer is of the opinion that the plain of Pokhara was built-up by a large valley train emanating at the head of the Seti valley and the outwash in-fillings are the remains of this abnormal phase.

c. Drainage System

The present relief is as much an expression of structural control as the modelling by the streams. On its course from the mountains to the Kāli-Gaṇḍaki, the Seti river traverses the present region for 26-miles. The Pokhara sub-basin of the Seti is well-defined by long ridges in the east and south. The three western feeders, Mārse, Yāngdi, and Mardi have their head-waters outside the Pokhara region. In all there are over a dozen small river basins within the region, ranging in elevation from 1,700 feet to 8,900 feet. The snow-line being above 17,000 feet the only glacier-fed streams are the Seti and Mardi Kholā* from the south slopes of Annapurṇa Himāl (Pl. IV).

(i) Pattern. The stream-strewn hills and the dry outwash plain represent two hydrographic provinces with differential slope development and diverse drainage patterns (Fig. 12). The over-all regional pattern is rectangular, with characteristic dendritic system on the local heights. The Seti river plunging straight south-west 20-miles from its source, takes four sharp turns within Pokhara Valley, and the

*'Kholā' is the Nepāli term for stream. The suffix 'di' for most streams is probably derived from the Māgari dialect in which 'di' means water.

recurrent right-angled turns are an indication of structural control. The main anticlinal and synclinal flextures run north-west to south-east, to which are aligned the strikes of the hill country. The streams negotiate the parallel strikes through some pre-orogenic transverse faults (north-east/south-west) usually occuring in the para-autochthonous 'Pokhara Zone'. The rectangular pattern is thus contributed by the south-west flowing, streams consequent to the primary Himalayan slope and through transverse faults, and south-east flowing streams subsequent to the strike parallels. The four western tributaries (Phusre, Mārse, Yāngdi, Mardi) for example, all flow into the Seti in south-easterly direction parallel to one another.

There is no surface expression of the domal shape of the para-autochthonous zone in the drainage system even though its axis, Yāngdi-Mādi anticlinal trough is marked by in-facing scarps. The only radial patterns observable are of local scale on small hills like Kāhun and Ānpu. The Seti having cut through successive nappe systems is now superimposed on the underlying 'Pokhara zone'. At Ḍhungāsāngu and other points the Seti flowing through the outwash gravel continues to deepen its course on the para-autochthonous conglomerates. North of the Yāngdi-Mādi anticline, the slopes are steep and the streams plunge down narrow defiles. South of the anti-clinal axis the amplitude of relief is subdued with a series of low strike-ridges. The <u>trellis pattern</u> of the streams with tributaries at right-angles following the strike vales is well-integrated with the rectangular pattern of the Seti. On the plain, the tributaries of the Seti flow in southerly direction and run as <u>parallel</u> streams. Emerging from the hills, only a few larger streams are capable of traversing the plain to meet the master stream and many get lost in the porous gravel. The distinctive pattern of the streams on the hills is <u>dendritic</u> in the early stages of extension involving lengthening of streams by headward erosion and multiplication of tributaries.

(ii) <u>Streams, Discharge, Profiles</u>. The hills are close-textured (1:7) and the plain coarse-textured (1:2) in stream density. The density of the streams is inverse to their order (Fig. 14b), illustrated by the lower order hill streams and the higher order streams of the plain. There are seventeen perennial streams apart from the Seti, eleven of which join the Seti directly. Except the Mardi all other tributary streams are spring or rain fed. The density of intermittent streams on the hills is 13 per square mile, but on the plain it is one to every four square miles. The over-all ratio of perennial and intermittent streams is 2:3. The monsoon that activates the intermittent streams, is also associated with a profusion of ephemeral streams with ill-defined channels. The Seti dominates all its tributaries in length, size, and volume. The longest tributary Mardi is only 16-miles compared to 67-miles that of the Seti. Bijaypur Khola replenished by Gyaunje Khola upstream is the longest (13 miles) stream that originates and empties within the Pokhara region. As compared in Fig. 14b the length of the other streams are Yangdi 11 miles, Mārse, Khudi and Dobhān 10 miles, Kāli 6 miles, Bhurjung and Ānpu, 5 miles and Kāhun and Bagādi 4 miles each.

The streams carry large amounts of silt and the Seti itself is milky white with fresh melt-water. Seasonal variations in stream discharge are great, attaining a maximum during the second half of the monsoon season. The glacier fed stream Seti also transforms into a roaring

XXI. Seti Kholā, flows close to the northern base of Sarānkoṭ Ridge. The Seti is snow-fed and called 'white' for its milky-white colour while its tributary below without melt-water source is called 'Kāli' (black). See p.40.

XXII. Kāli Kholā, meanders through an extensive gorge (too) large for its size. very The remnants of the high terrace can be seen as benches on the right. See p.42.

'Gaṇḍaki'[21] during the monsoon, undercutting and choking its narrow gorges. The ratio of maxima-minima discharge is even greater in streams that depend mostly on the rains. Mārse Kholā with a catchment area of 45-square miles is said to have a high flood discharge of 22,000 cusecs in summer against a mere 15 cusecs in winter.[22] Even the lake-sustained streams like Pārdi, Bagādi, Khudi, and Dobhān Kholā show immense fluctuations from season to season. A brief recording of Bijaypur Kholā flood-level at Tin-pipale may be taken as a representative pattern during the monsoon.

The 59-day record taken between 8 a.m. and 12 p.m. show an average flood-level of 2.69 feet (Fig. 15a); 2.67 feet in the first half and 2.78 in the second. The periodic averages for late July (2.21), entire August (3.53), early September (2.35) has an August maxima. The lowest level in July (2.47) and the highest in August (5.40) conforms to the rainfall records for the same period. In diurnal terms the peak flood occurred in the evenings and the lowest during the early hours of the following morning (Fig. 15a). During the dry months the discharge of Bijaypur Kholā at the lower dam-site was 50 cusecs (16th November, 1952) and that of the Seti above the town 150 cusecs (15th November, 1952).[23]

The longitudinal profile of the Seti is hyperbolic with a steep slope in the upper reaches (Fig. 13b). Five other Himalayan rivers,* included for comparison, give an

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21. 'Gaṇḍaki' refers to large streams or rivers comparable to the term "kosi" of East Nepal.

22. Irrigation Dept., H.M.G. Nepal.

23. Theuvenent (1953): 17.

*(1) Buṛi-Gangā (West Nepal), (2) Modi, (3) Seti (4) Mādi, (5) Darondi, in Central Nepal, and (6) Likhu Kholā in East Nepal. For location see Fig. 2.

average steep gradient of 1:250 (Fig. 13a). The average bed slope of the Seti is 1:194. It drops 9,000 feet in the first nine miles up to Bhārbhure where the Pokhara plain commences. This is the first knickpoint below which there is an aggradation of old drifts and new alluvia and the stream covers 58-miles to fall 3,000 feet. From Bhārbhure to the Pokhara town the gradient is 1:150 where there is another knick-point at the gap between Sarānkoṭ and Kāhun hills. The gradient over the central plain is 1:65, half that of above the Sarānkoṭ-Kāhun breach. The third knick-point occurs at a gap between Ānpu and Thaprek hills through which the Seti leaves the central plain. The stream gradient below Ānpu-Thaprek gap is as low as 1:17. The Seti profile is marked by a short aggradation below Bhārbhure, long down-cutting between Ghāchok and Ḍhungāsāngu, short degradation at Chiragadi and aggradation at Gagangauḍā, finally followed by a long gentle reach. The tributary streams also have irregular profiles (Fig.13b) indicating their extreme youth in descending rapidly over a newly uplifted surface. Their upper reaches have an average gradient of 1:727. All the streams that plunge down the hills, flatten out on reaching the plain and meander between high banks. Many streams on the plain flow sluggishly with a low gradient (1:47), their youthful development retarded by the lake-dams.

d. The Lakes

The region has long been known for its numerous lakes.[24] Phewā Tāl which is about three miles long may be one of the largest lakes in Nepal.[25] The eight lakes account for 3.68 square miles and Phewa Tal with an area of 1.85 square miles

24. Hodgson (1849): 12. Compare,

25. Williams (1953): 331; "Lake of Rāra Dah, the largest in Nepal, a 3-mile stretch of crystal-clear water lying in a crater-like depression in the hills at an altitude of nearly 10,000 feet".

is larger than all the rest put together. Begnās Tāl (0.96) and Rupā Tāl (0.53) are fairly large and the 0.19 square mile Maidi Tāl is undergoing rapid sedimentation. The remaining four - Khālṭe (0.08) Gunde (0.05), Dipāng (0.01), Kamal-pokhari (0.01) - are mere ponds. Except Phewā Tāl, the lakes are strung along the foot-hills bordering the plain in the north-east.

(i) Shape.[26] In shape the three larger lakes still retain their dendritic shore lines typical of drowned valleys (Pls. XXIII, XXIV). Phewā Tāl alone exhibits a shore line of submergence as can be seen from the old tree stumps along the northern shore during low water. This has been due to the successive damming for a long time[27] and the latest Pārdi Dam, 46-feet high, will give it a maximum capacity of 460 million cubic feet. Its inlet end is covered with the deltaic alluvium from Mārse Kholā, and the deepest part runs along the edge of the Kālābang ridge. In Rupā Tāl the line of depth runs along the north-south axial and in Begnās Tāl it deepens eastwards. The other lakes are shallow and Kamalpokhari is entirely choked with aquatic plants.

In spite of their youthful angular shore-lines, Begnās and Rupā Tāl are shrinking. Rupā Tāl once extended two miles further north and its southern edge also seems

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26. The terminology follows G. E. Hutchinson's A Treatise on Limnology, Vol. I, 1957.

27. The date of the first damming is unknown, but repairs were carried out in 1821 and 1936.

XXIII. Phewā Tāl below Harpan Kholā is three miles long and further damming has extended its area. See p.43.

XXIV. Rupā Tāl, bounded in the south by Mālmul-phānṭ is a typical drowned valley. The well-wooded hills are Pachbhaiyā on the right and Rupākoṭ on the left. See p.44.

retreating. The retreat of the western arm of the triangular Begnās Tāl has left behind a swampy stretch. The smaller lakes, some elongated and some sub-circular in form, are being rapidly silted-up with the hill-wash. The water balance of the lakes has fallen from the past and all except the dammed Phewā Tāl are diminishing in size. They revive temporarily during the monsoon when overflowing influents and direct precipitation cause the lake level to rise. The contribution of descrete springs from the forests beside the lakes may also be considerable (Pl.XXIV). In the larger lakes, gradient current due to the hydrographic slope is obvious as they form a part of the local drainage system. Phewā Tāl is vulnerable to wind-generated waves also which makes boating hazardous during certain hours in the afternoon. Such waves occur perhaps due to the mere size of the lake.

(ii) Origin. The occurrence of numerous lakes in juxtaposition with a gravelly plain may at first seem anomalous. However, the fact that the lakes do not override but abut the plain edge suggests their inter-relationship. This writer does not believe that the lakes are the dismembered parts of an old huge lake. The morphology of the plain has no vestige of being a lake floor, and instead there are strong evidences to believe that the lakes were formed consequent upon the development of the outwash plain.

The most important type of fluviatile lakes[28] are those formed by the damming of tributary valleys by the materials of a large river, and variously known as 'lateral lakes'[29]

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28. Hutchinson (1957): 115, "Type 52".

29. Ibid.

and 'barrier lakes'.[30] The Pokhara lakes were similarly formed when the pre-glacial drainage system was filled by the outwash drifts of the valley train. The glacio-fluvial deposits along the main Seti valley acted as barriers to the tributary valleys. Outwash materials can be impervious to retain the waters of a lake and contain sufficient coarse material as well to prevent draining of the lake by erosion of the outlet. Lakes must have been more numerous immediately after the deluge by the valley train. Remnants of lake-deposits may be observed in some tributary valleys, such as Suraudi Kholā. The small valley of Rātmātā, adjacent to the Suraudi, was according to local legend once a lake. That some lakes persisted while others were drained away, depended on the local slope, the amount of debris, and the erosive power of the streams. Larger streams were capable of incising more vigorously and maintaining their course, while the smaller streams were impounded behind the barrier. The small lake, Kamalpokhari, might have been a remnant of a larger lake formed by Kàhun and Bijaypur Kholā and that was later drained away from the south-east by Bijaypur Kholā. Many similar lateral lakes must have been obliterated by new alluvial fans and lateral erosion. The variety in the shape and size of the lakes does not reflect their diverse origin but the type of the original valley in which they were formed. Longitudinal valleys were drowned into finger lakes (Rupā Tāl) and the damming of two merging valleys formed triangular lakes (Begnās Tāl). Smaller valleys were either left as minor niches or completely obliterated. The silting from the outwash barrier is seen in the crescentic forms of Gunde and Khālṭe Tāl.

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30. Kuenen (1955): 232.

Chapter Outline

CLIMATE AND SEASONS

a. Classification

b. Weather Elements

i. Temperature
ii. Precipitation
iii. Related phenomena

c. Seasonal Rhythm

CLIMATE AND SEASONS*

The climate prevalent in the region is described by means of processing the available data for eight years (1956-1963).[1] As the hydro-meteorological station is located on the plain at Rāmghāṭ (2,750 feet), supplementary observations were made by the writer for the highland areas.[2] It is essential to emphasise the changes of climate from the low-lying plain to the highlands that rise 5,000 feet above it. Though the rate of vertical fall of temperature is remarkably low,[3] the combined effect of temperature and precipitation efficiencies on the length of growing season for natural or cultivated vegetation vary considerably from one level to the other. It implies the merging of two biogeographical provinces within a single geographic area. The region is exposed both to the summer monsoon and the winterly jet-streams, and these two air masses give a distinct seasonal character. The final section describes the seasonal rhythm of life in relation to the local economy.

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*The basic data was kindly provided by the Director-General of Observatories, Lodi Road, New Delhi-3.

1. The meteorological station was first started on 16th June, 1956, at Rāmghāṭ, 2,700 feet (917 m).

2. The instruments used during the field-work were Aneroid Barometer, Minimum Thermometer and Whirling Hygrometer.

3. According to Kawakita (1956): 10; the lapse rate of temperature is 0.5015° C/100 m. in Central Nepal.

a. Classification

The Himalayan Range form a sharp meteorological divide between the northern temperate and the southern tropical regimes, and its steep south-facing slope has caused the attenuation of numerous climatic types. In central Nepal, sub-tropical (Cw), microthermal (Df), and tundra(E) climates are encountered within short distance of each other. Intricate variations occur within the vertical zones, owing to locational factors. The relief factors influencing local ~~relief~~ climate may be exemplified by comparing the weather records of three stations: Kāṭhmāṇḍu (40-years), Pokhara (8-years), Nunkhāni (3-years). Nunkhāni (3,400 feet) in Marsyāndi Valley* though most northerly of the three stations, records twice as heavy rainfall than at Kāṭhmāṇḍu, and higher values in dry-and-wet temperature than those of Pokhara or Kāṭhmāṇḍu (Table XIII). Normally one would expect a decrease in temperature and precipitation closer to the main range of the Himalaya. The discrepancy at Nunkhāni is obviously due to the station's location in a narrow trans-Himalayan gorge through which the monsoon funnels deep north. Again, the general pattern of the south-west monsoon in the Himalayas is its progressive weakening westwards. Yet Pokhara lying 110-miles west of Kāṭhmāṇḍu receives twice the amount of precipitation than in the latter Vale (Fig.15a). The Vale of Kāṭhmāṇḍu is shut off from the southerly moisture-bearing air masses by the high range of Chandragiri (8,000 feet), while the low Barsāmi ridge (3,600 feet) south of Pokhara does not provide any effective barrier.

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*For location of Nunkhāni, 84°24' East and 28° 24' North, see Fig. 3.

Even allowing for such local peculiarities, it seems to the present writer that to classify the climate of the hill region ('Pahāṛ') of Nepal as microthermal[4] would be overemphasising their temperate aspect. The high-lying Kāṭhmāṇḍu Valley (4,200 feet) has its lowest monthly mean temperature not below 50° F. (Table xii)* The climatic type prevalent hereabout would rather fall under the mesothermal type. Pokhara Valley, within 20-miles of the frigid heights of Annapurṇa, indeed has all the attributes of a humid sub-tropical region, owing to its low altitude. Its mean temperature always above 56° F, summer means exceeding 72° F, and comparatively dry winter place the region's climate under Cwa type of Köppen's formula, and Humid Tropics Aw type of Köppen's modified system. The tropical aspect of Pokhara region is evidenced by the climograph of mean monthly temperature and precipitation (Fig. 15b) and the climatograph (Fig. 19).

b. Weather Elements.

Figure 16b shows the atmospheric pressure condition as well as the most centrally-placed 75 per cent of barometric observations. The summer low pressure is attributed to the advance of the high level 'jet stream' and the more dominant Tropical maritime (mT) monsoon air that thrust deep into interior until confronted by orographic barriers. The large-scale ascending motion during the end of the summer monsoon along the southern side of the Himalaya is thought of as being produced by strong convection, which is supported by the slope

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4. Karan (1960): 26, plate 9, gives the blanket term 'Microthermal Himalayan Climates' for this region.

*The highest and lowest absolute temperatures for Kathmandu recorded for 26 years were 99° F. and 5° F. respectively.

XXV. Morning Fog. The fog in the low valleys lifts after the sunrise and by afternoon strato-cumulus clouds blanket the high ranges. The pre-fabricated buildings from part of a new hospital at Rāmghāṭ. See p.58.

XXVI. Monsoon Thunderstorm. Rainfall is mainly during the summer with copious downpours. Here one hour's thunderstorm has flooded the high street. See p.55.

of the terrain and its action as an elevated heat source.[5] In winter the region is shielded from the polar continental (cP) air by the Annapurṇa Himāl, and the dry cool air masses that bring some winter showers (with snowfall at higher hills) are associated with westerly 'jet streams' that follow the southern edge of the Himalaya. These, however, do not always produce enough subsidence in order to generate typical anticyclonic föhn conditions in spite of their confluent character.[6] The influence of these contrasting air masses on the local weather is elaborated below. Temperature and precipitation, the two chief elements in distinguishing this present region as an isothermal[7] sub-tropical intrusion into a microthermal Himalayan climate, are discussed in detail.

(i) Temperature. (Table iii) Temperature conditions are unusually high for a Himalayan station; with eight months exceeding the 80° F. maxima (Fig. 16a). The annual mean is 71° F. and the range 20° F, with a January minima and July maxima. The following table shows the annual course of temperature.

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5. Flöhn (1958).
6. Reiter and Heuberger (1960): 19.
7. Thornthwaite (1948).

Table iv.

Annual Course of Temperature

Month	Monthly Mean	Deviations from Annual Mean	* (F°. degrees)	Relative * (%)
January	56.3	-14.8	0	0
February	59.5	-11.6	3.2	14
March	66.6	- 4.5	10.3	40
April	73.6	+ 2.5	17.3	79
May	77.2	+ 6.1	20.9	95
June	77.5	+ 6.4	21.2	97
July	78.1	+ 7.0	21.8	100
August	77.8	+ 6.7	21.5	98
September	73.4	+ 2.3	17.1	78
October	71.2	+ 0.1	14.9	68
November	62.5	- 8.6	6.2	28
December	58.2	-12.9	1.9	8
Annual	71.1			

The resultant annual curve of temperature shows that the months preceding July are warmer than the symmetric ones after July (Fig. 16c). But for the minor August excess over June, the rising curve is higher than that during the fall. May is warmer than September, April warmer than October, and so forth. There is a rapid transition from the coldest month to the beginning of the extreme heat. The months May-August have a uniformly high mean, and the lowest mean occurs during December-January. The lowest recorded mean was 43° F. in January 1963 and the highest mean of 91° F. in May 1957. The highest absolute occurred in July 1963 when the present observer recorded temperatures exceeding 99° F. Monthly ranges are highest during the pre-monsoon lull in April, and the lowest during July-August when high humidity and cloudiness retard radiation. Afternoon

* means the difference between the respective monthly average temperature and the average temperature of the coldest month (January).

temperatures are higher than those in the morning and diurnal range contracts during the summer (Figs. 18a, 18b). Nocturnal inversions of temperature occur when down-valley winds reduce the low-level temperatures after sunset. For the conditions during September, it has been proved, "that the air temperature in the foot-hills of the Himalayas is higher than the average free air temperature over Calcutta or New Delhi at the same time."[8]

The Vale is well-protected against severe importations of low temperature from higher latitudes. There is a preponderance of 'summer days',[9] Except in the highland even the coldest month has temperatures within the limit of germination of seed ($> 43^{\circ}$F.). At the other extreme 'summer days' ($> 77^{\circ}$ F.) extend from April to October and 'tropical days' ($> 86^{\circ}$ F.) from May to June (Fig. 16a). Cold spells are exceptional and the growing-season long. The optimal conditions allow for the maturing of subtropical crops and the limiting factor for temperate crops being rather the lack of rain in the early summer than the lack of warmth.[10]

(ii) Precipitation. (Table V). The main precipitation in the region occurs in the form of rainfall. Snowfall associated with the westerly disturbances during winter occur only on the northern highlands and the higher slopes of Panchase Hill (8,250 feet) in the West, but the snow-cover never lasts more

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8. Reiter and Heuberger (1960): 21.

9. The terms used are as defined by Conrad and Pollack (1950): 168.

10. The estimated values of the warmth and coldness index for the humid region of Central Nepal as calculated by Kawakita (1956): 12-13 are:-

	W.I.	C.I.		W.I.	C.I
1,000 metres	151		2,500 metres	69	-5.8
1,500 metres	122		3,000 metres	48	-14
2,000 metres	93	-0.5			

than a few weeks. The annual rainfall averages 141 inches ranging from 123 inches to 157 inches (Table V). The accumulative deviations of rainfall for the six-year period are shown in Fig. 16e and in the following table:

Table vi.
Accumulative Deviations of Rainfall

Year	Average	Deviation	Accumulated Deviation	Percentage Deviation
1957	153.48	+11.98	+11.98	19
1958	132.07	-09.43	+ 2.55	5
1959	128.05	-13.45	-10.90	17
1960	123.08	-18.42	- 7.52	12
1961	154.92	+13.42	+ 5.90	9
1962	157.42	+15.92	+21.82	35

Average Rainfall for 1957-1962 = 141.50 inches.

The variability of rainfall is below 15 per cent. More significant are the annual deviations, and seasonal variations within a year. The following table illustrates the distinct seasonal nature of rainfall:

Table vii. Cumulative Summation of Rainfall

Month	Average	Cumulative	Average %	Average Cumulative %	May to April	Average %
January	49	49	1.3	1.3	May	7.1
February	23	72	0.6	1.9	June	23.2
March	50	122	1.4	3.3	July	47.2
April	45	167	1.2	4.5	August	73.4
May	218	385	7.1	11.6	September	89.4
June	656	1,041	16.1	27.7	October	95.0
July	814	1,855	24.0	51.7	November	95.0
August	905	2,760	26.2	77.9	December	95.5
September	557	3,317	16.0	93.9	January	96.8
October	200	3,519	5.0	99.5	February	97.4
November	2	3,519	0.0	0.0	March	98.8
December	20	3,529	0.5	100.0	April	100.0

In Fig. 16d the January-December curve of cumulative rainfall is steeper than the May-April curve. The greatest accumulation of 82 per cent occurs between mid-May and mid-September, the monsoon season. Pre-monsoon precipitation accounts for 11 per cent and during post-monsoon it is only 6 per cent. The summer rain is 18 times that of the winter rain and the samples graphs show three rainy days in January 1963 (Fig. 18a) and three rainless days in June 1959 (Fig.18b). The same graphs also show the large amount of rain mainly during the night. Nocturnal precipitation is at least three times higher than that during the day-time (Fig. 18c).*

Following recent studies of the upper-air circulation pattern, "it is proposed to attribute only such precipitation to the influence of the summer monsoon which is clearly linked with the equatorial convergence zone, or with the easterly jet stream."[11] The pre-monsoon showers during the Spring[12] and the post-monsoon storms during the autumn are thus non-monsoonal precipitation spells. The Himalayan spring storms are due to the intense insolation during the dry months of March and April, which build up cumulus clouds that discharge violent thunderstorms towards the afternoon. Thunderstorms are often accompanied by hail, even to the lowlands, and thus discourage cultivation during the Spring.

By the end of May the local convectional storms and squalls merge with the invading monsoon from eastern Himalaya. The complex interaction of the easterly 'monsoon lows' and

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*For table to this graph see Gurung (1961): appendix.

11. Reiter and Heuberger (1960): 32. "Any other precipitation will be caused by disturbances in a westerly flow aloft, and is of non-monsoonal character."

12. Contemporary to the 'north-westers' of Bengal, and "mango showers" of Malabar.

westerly extra-tropical troughs are responsible for the pulsatory character of the rains. The westward movement of the monsoon depression is associated with intense rainstorms alternated with brief 'breaks'. Summer droughts are rare and falls of 10-15 inches are recorded within 24 hours (Pl.XXVI). When the retreat of the summer monsoon is belated, protracted periods of bad weather follows, and the late monsoonal precipitation merge gradually with the winter showers. Late summer and early fall in the montane regions are associated with post-monsoon storms caused by strong local convection and weak cyclonic storms, associated with frontal convergence zones. The hurricane rainfall of autumn though provides a maximum late summer rain, proves disastrous to ripening crops. The brief precipitation during the winter is associated with disturbances of the westerly jet stream. The winter cyclonic precipitation averages 3-5 inches only, but contributes much snowfall on the higher grounds. High ablation rates cause rapid melting below 10,000 feet and these in turn swell the streams for irrigation during the Spring.

(iii) Related Phenomena. The relative humidity averages 76 per cent with a range of 38 between April minima and December maxima. (Fig. 15c) Though the dryness during April and May are to be expected, the extreme dampness for the winter during November-December is unexplained (Table VIII). Diurnal range is greater during the winter and the daily march of humidity shows a seasonal variation of parallel to that of the rainfall. Except during early summer, relative humidity is at its maximum during the early hours. (Fig. 17a). High humidity in conjunction with high temperature produce sultry weather conditions during the monsoon. Humidity rises with increasing elevation and in the highlands it is not far below saturation. The dew-point shows a close correlation with the annual march of precipitation (Fig.17d).

The range is 54 with a summer high. The annual value averages 54 per cent, and diurnal range is minor except during December, the month with the lowest absolute record (Table viii).

Evaporation values progress in converse relation to the relative humidity and dew-point. The maxima occurs in March-April and minima during July-October (Fig. 17b). During the Spring, evaporation is aided both by high temperature and active prevailing winds. The summers too have high temperature but the saturated monsoon air discourages rapid evaporation. The diurnal range is greatest during the Spring maxima, and the daylight hours have a constantly higher evaporation rate. The average daily evaporation shows a corresponding decrease with increasing altitude. Closely related to the above recorded evaporation is the problem of potential evapotranspiration, the cumulative loss of moisture directly from the land surface and indirectly by plant transpiration.[13]

Table ix.

Potential Evapotranspiration (in inches)

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Potential Evapotranspiration	1.09	1.32	2.47	3.85	5.26	5.57	5.70	5.76	4.64	3.23	1.62	1.08	41.59
Precipitation	1.93	0.91	2.05	1.81	8.54	25.63	32.01	35.63	21.89	7.87	0.04	0.79	139.10
Precipitation-P.E. (Difference)	0.87	-0.42	-0.42	-2.04	3.28	20.06	26.31	29.87	17.25	4.64	-0.58	-0.29	97.51

13. Thornthwaite (1948).
No attempt was made to calculate the water balance as the water-holding capacity of the soil was unknown.

There is high proportion of water surplus particularly during summer. Even January has a surplus water budget owing to winter showers. December and the spring months, February-April, are the only months during which potential evapotranspiration exceeds precipitation. The outwash plain, however, experiences water deficiency outside the monsoon season due to the low water-table (2,000 feet) peculiar to its gravel stratum.

The wind systems prevalent in the region are the south-westerly monsoon during summer and anticyclonic westerlies in winter, the latter producing high-altitude gales. Insolation also causes varieties of local ascending and descending winds, some of them strong enough to effect the seasonal winds. The most prevalent wind system seems to be the northerly one as evidenced by the north-inhibited and south-elongated branches of the shade trees on the plain. The northerly winds are affected by the katabatic winds funneling down the higher mountain slopes. The down-valley winds are most pronounced during the evening and during March these acquire gale force causing much damage to the buildings. During the dry months March-April, they pick up dust and sand and make the atmosphere hazy (Pl. XXVII). The winds give pleasant ventilation on hot summer nights, but also cause importation of cold air to the lower levels during winter. The prevalent wind direction during January and February point north in the morning, and south-east in the evening (Fig. 17e). During October-November the pronounced direction in the morning is towards south-west. The average wind speed is 2.9 knots and varies from less than 1 knot during the winter to over 4 knots during April (Table viii). The morning breeze is more stable than those in the evening, while the greatest fluctuations in speed occur during the mid-day (Fig. 17c).

The possible daily amount of sunshine exceeds ten hours but cloudiness limits the actual amount of bright sunshine. The percentage of cloudiness is greater during the summer with the monsoon overcast. The advance and the passing of the jet stream clouds in autumn is however marked with clear weather. The day wind carries upwards cumulus and strato-cumulus clouds and the night wind carries the moisture down filling the lower valleys with fog, and mist. The valley mists melt before the morning sun and rise again up the mountain sides (Pl. XXV). The drift of the low-level clouds is controlled mainly by the local breezes and the orientation of the valleys.

c. Seasonal Rhythm.

On average 222 days in a year have air temperature exceeding 68° F. and the remaining days also are fairly warm (Fig. 19).* In spite of the dominance of the warm-hot period on the plain, allowance must be made for the modifying influence of the temperate highlands immediately to the north. Thus the laterized warm-humid lowland zone is juxposed with mossy forest zone of the cool-humid highlands. The seasonal pattern for the whole region may thus be modified as cool-warm-hot-warm cycle. The warm periods are mere transitory phases between the cool ('hyund') and hot ('barkha') seasons. The four seasons are therefore:

I.	Cool	late November to February
II.	Warm (early)	March to early April
III.	Hot	late April to early September
IV.	Warm (late)	late September to early November

Cool season (late November to February) has average temperatures below 64° F. in the lowland and 50° F. in the

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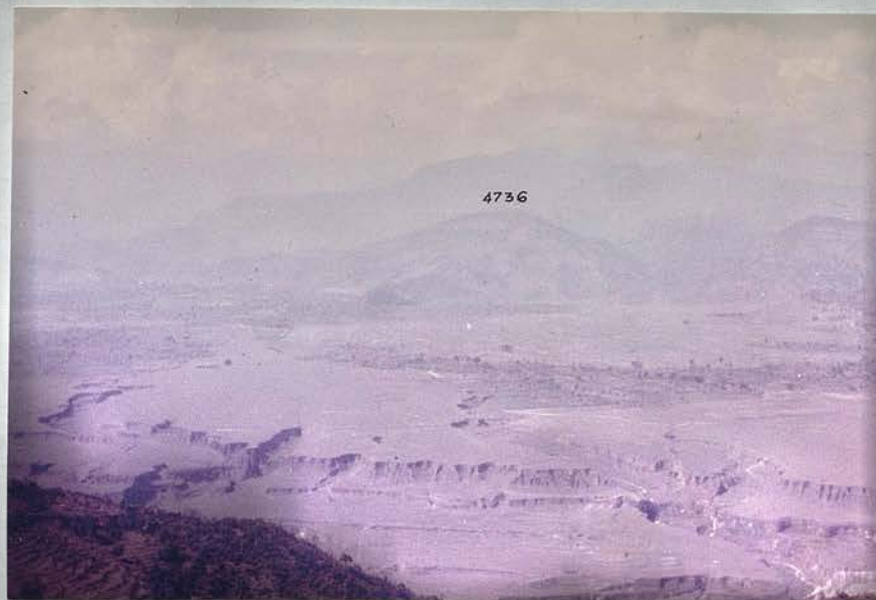
*The climatograph of Pokhara tallies closely to that of Monterey (Mexico), altitude: 1,765 feet; Latitude 25° 12' N. Cf. Hartshorne (1938) p.171, fig. 1.

SEASONAL VARIATION



XXVII. April. During the pre-monsoon months the plain vegetation is parched and smaller streams dry up. Dust-storms occur e in the afternoon and visibility is reduced. The badland topography seen on the plain is typical of the extensive Seti terraces. See p.59, p.182.

XXVIII. August. The dry and bare aspect is transformed into wet and lush by the monsoon. Note the gentle slope of the plain from left to right. Baidam village with ripening paddy beside Phewā Tāl. Meadows mark the open spaces in the middle distance and Kāhun (4,736 ft) and Arbā (4,500 ft) hills in the background. King's residence on the banks of the lake. See p.59, p.72, p.177

highland. Snow falls above 6,000 feet while occasional frost occurs at lower elevations. Severe freezes are associated with the intrusions of northerly airs land frequent importations of tropical air on the front of the advancing cyclone push up the temperature. Westerly disturbances bring some winter rain, and the humidity is closely attuned to the precipitation rhythm (Fig. 18a, Table x).

Warm season (March to early April) before the summer hot season is shorter than the autumn. It marks the retreat of the cyclonic belt and the gradual establishment of the summer solstice. Temperatures are moderately high (64^{o} - 68^{o} F.) and rainfall does not exceed 3 inches. Humidity is at its lowest, evaporation maximum, and winds fairly strong (Table viii).

Hot season (late April to early September) commences with a very dry period followed by the onset of the monsoon frontal belt. Average temperatures exceed 68^{o} F. and July extremes in the 90's are not unusual. Precipitation between mid-May and mid-September account for 82 per cent of the annual total and the landscape presents a lush and green aspect (Pl. XXVIII). Humidity is fairly high and the muggy air makes June, July, and August the hottest months (Fig. 18b). Evaporation is minimal in spite of strong winds. Pressures are low and the late summer hurricanes cause frequent hail storms.

Warm season (late September to early November) of the fall is longer and warmer than that during the Spring. Average temperatures remain in the 60's and there is a sharp break in precipitation. Skies are unusually clear and the visitations of the westerly jet streams are indicated by the pennants (blowing east) and snow plumes on the peaks of Annapurna Himal.

The seasonal rhythm of life attuned to the four seasons follows the following pattern:

1. Mangsir* (mid-November/mid-December) marks the close of the main agricultural season. Harvesting and threshing of paddy. Stacking of paddy straw for winter feed. Sowing of mustard and green vegetables in the lowlands.

2. Pus (mid-December/mid-January). No work in the fields. Sugar-cane pressing in the lowlands. Re-thatching and repair of houses, and collecting firewood.

3. Māgh (mid-January/mid-February). No field work . Sugar-cane pressing, collecting firewood and repairing agricultural implements. In the highlands weaving of bamboo and cane baskets and woollen loom work.

4. Fāgun (mid-February/mid-March). Harvesting of winter crops, and cutting log-wood for fuel in the higher forests.

5. Chait (mid-March/mid-April). Preparing the fields by repairing terraces and application of manure. Maize sowing in the lowland and bringing down of log-wood in the highland villages.

6. Baisākh (mid-April/mid-May). Ploughing of fields and weeding of early maize.

7. Jeṭh (mid-May/mid-June). Sowing of millet and preparing paddy seed-beds. Second weeding of maize crop.

8. Asār (mid-June/mid-July). Sowing of the main paddy crop. The busiest farm season.

9. Sāvan (mid-July/mid-August). Harvesting maize crop, sowing millet, and weeding of paddy.

10. Bhado (mid-August/mid-September). Harvesting of maize and early paddy. Weeding of millet crop, and preparing seedlings for winter crops.

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*Eighth month of the Nepalese calendar.

11. Asoj (mid-September/mid-October). Harvesting the main paddy crop. Ploughing for the winter crops.

12. Kārtik (mid-October/mid-November). Harvesting of paddy. Sowing of vegetables. Beginning of lax agricultural season.

There is much travelling after the close of the main field season in mid-November. At this time of the year rivers are at their lowest ebb and bridges are improvised across them for the next five months.

Chapter Outline

VEGETATION AND SOIL

a. Vegetation

   i. Distribution pattern
   ii. Vegetation types

b. Impact of Man

   i. Forest products
   ii. Deforestation and forest policy

c. Soils

   i. Formation and types
   ii. Erosion problem

VEGETATION AND SOIL*

a. Vegetation

The near-tropical temperature and heavy rainfall experienced in Pokhara provide abundant climatic energy for plants, and the vigorous growth is matched by the richness in floral variety. The abundance of oaks and the rarity of pines in the region indicate the vegetation to be of the East Himalayan type.[1] The major plant communities range from tropical seasonal forests in the south-east to temperate evergreen forests in the north-west. Some of the mixed broadleaf species are deciduous and others evergreen and the trees are of medium height with one or two understoreys. The dominant species are Schima wallichii and Castanopsis indica in the lower hills and Rhododendron arboreum and Quercus spp higher up. Shorea robusta is confined in the south-east and Salmalia malabarica and Acacia catechu proliferate on the riverain tracts.

Variations within the types seem to be related more to topography rather than to geological factors. A remarkable element in the regional landscape is the sharp contrast between the bare southern and the wooded northern slopes of the lower hills. The steeper highlands in the north are extensively forested. As a distinct ecological unit, the

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*Acknowledgement is made here for the kind communications from Professor A. W. Küchler, University of Kansas, 6th June, 1962, and Mr. R. G. M. Willan, Chief Conservator of Forests, U.N.T.A.O. Mission, Kāṭhmāṇḍu, 12th January, 1964, during the field-work. The specific plant names were identified with the help of Bor (1953) and Kitamura (1955). Native terms appended are based on the writer's personal knowledge.

1. Burkill (1910):91-96; fifty years ago found many similarities between Central Nepal and Sikkim forests. A recent map also shows the western boundary of the moister East Himalayan vegetation terminating forty miles west of Pokhara. Schweinfurth (1957): 'Die horizontale und vertikale verb' scale 1:2,000,000.

low-lying plain is a grassland, with exotic species around settlements and along roads.

Much of the character of the natural vegetation has been altered by grazing, burning, and cutting. The chief value of forests in the economy is not commercial but to meet the household needs. Deforestation is much apparent, and traditional forest management by village communities have now been superseded by State regulations which now classify most forests as 'reserved'.

(i) Distribution pattern. The relative rise of the ground, to the order of 7,000 feet, from the south-east to north-west has caused vertical zonation in plant formations from the moist deciduous to Sub-montane and Montane evergreens. The cooler montane levels show increasing humidity and nebulosity. The vertical zonation mapped was arrived at by applying the two systems of classification, the physiognomic[2] and dominant species, in combination (Fig.21b). The recognition of indicator-plants to define three main vegetation zones are qualified by physiognomic descriptions of the vegetation types. Shorea robusta was used to establish the tropical zone of moist deciduous forest up to a level of 3,600 feet.* During its flowering season in April, the Shorea tree becomes distinctly recognizable from a distance, which facilitated rapid mapping (Fig.20). The middle zone of sub-tropical Wet Hill mixed evergreens up to 6,200 feet was indicated by the dominance of Schima wallichii. Quercus spp. define the upper temperate zone of moist montane evergreens. The upper limit of the montane forests terminates just above 10,000 feet.**

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2. Küchler (1956):155-167.

*Shorea robusta was found to occur at 4,400 feet near Nuwākot (10 miles South-west of Pokhara) and at 4,200 feet at Nālmā in Midim valley 18 miles north-east).

**In Bārahpokhari Lekh, Lamjung, also the upper limit of the forest zone was found to be at 10,000 feet.

More intricate are the modifications in the zonal distribution caused by aspect and exposure. Interpretation is complicated by variability in aspect and gradient prevailing in two comparable areas. In contrast to the well-wooded higher slopes (even those with south aspect) the south-facing low hills are devoid of plant-cover, these having been cleared for cultivation. From the distribution of Rhododendron spp. it is assumed that the temperate plants descend lower on a more northernly aspect. Climatically, the tropical type seems fairly emphatic and this has led certain observers to extend tropical vegetation even up to the Rhododendron-coniferous belt, as high as 13,000 feet (4,000 metres).[3] Kawakita also emphasizes the warmth of the temperate zone.[4] Of greater importance to the human geography of the region are the two ecological types; the upper terrace grasslands and the riverain forests. Finally, man in addition to altering the above natural vegetation types has created a sixth type. The plantations of trees for shelter-belt, fence, fodder, and shade has wrought significant changes in the plain landscape.

(ii) Vegetation types (Fig.20). Of the six vegetation types three are altitudinal (moist deciduous, wet hill forest, moist montane evergreen) and three locational (low savannah, riverain, plain plantation). Their nomenclature, distribution, physiognomy, flora, and alteration are discussed below.

I. Tropical Moist Deciduous Forest (1,700-3,600 feet) Pl.LXXIII.

The forests at lower elevations resemble the Wet Hill sal[5] and are confined to the south and eastern section of the region.

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3. Schweinfurth (1957):300-302.

4. Kawakita (1956):1-66.

5. Champion (1936):85. It has been since revised as 'very moist sal-bearing forest'. Champion (1964) Ms. Also called 'the zone of Shorea' by Nakao (1955):280-281; 'sub-tropical Shorea type' by Kawakita (1956)62 and 'Tropischer trocken-winter kahler Fallaubwald (feuchter Salwald)' by Schweinfurth (1957)293-295.

It is the dominant type on the eastern hills and the entire Barsāmi ridge to the south. The low-lying valleys of Phusre Kholā and Mārse Kholā represent its western extension.

These typical monsoon forests have deciduous dominants with evergreen lower storeys. The top canopy 80-100 feet high are fairly dense and the middle storey is deficient where overgrazed. As indicated by its type name, Shorea robusta ('sāl') is the dominant species but the hill sāl is inferior to those found in the Terai. Sāl generally tends towards gregariousness and exclusive forests of sāl occur on the Ānpu Hill and west of Begnās Tāl. The outcropping hillocks Riṭhepāni and Bhanāḍhik carry scattered pockets of sāl. In spite of its proverbial adaptability to wide ranges of habitat, the sāl here occupies exclusively the southern aspect (Fig.20). Common sāl associates are Aegle marmelos, Buchanania latifolia, Lagerstroema parviflora, and Schima wallichii. Where sal is missing other species like Albizzia ('siris'), Dalbergia latifolia ('satsāl'), Duabanga grandiflora, Sloania or Echinocarpus form closed forest, mixed with the medium size species such as Bauhinia variegata ('koirālo'), Castanopsis indica, Cordia dichotoma, Melia azedarach ('ruda'), Phyllanthus emblica ('amlā'), and Terminalia tomentosa ('asan'). The undergrowth is composed of evergreen shrubs Aselepias currasavia ('Khursāni-phul'), Beaumontia grandiflora ('swāri-phul'), Fragaria vesca (strawberry), Crataegus crenulata ('ghangāru'), Ribes, and Rubus. Where burnt the semi-evergreen shrubs are replaced by grasses such as Eulaliopsis binata ('sābe'), Evolvulus alsinoids ('sunkasiḍhār'), Gynura nepalensis ('phuerejhār'). Epiphytic Ficus bengalensis, Dioscorea bulbifera and other climbers infest the trees. Locally tree ferns, the short-stemmed palm Phoenix humilis and Dendrocalanus strictus thrive on the shady slopes, and Bauhinia occur extensively on drier soils, as does Salmalia malabarica along the stream banks.

The undergrowth becomes luxuriant during the rains with the proliferation of weeds and grasses. Above 3,000 feet the sal thins out and ultimately gives precedence to Schima and Castanopsis. The dominance of Schima above 3,500 feet roughly marks the end of the sāl forest.[6]

II. Sub-tropical Wet Hill Forest (3,600-6,200 feet). Pl.IX

The wet hill forest [7] composed largely of broadleaf evergreen species marks the transition belt between the sal and montane forests. Coinciding as it does with the cultivation belt it is interspersed with wide scrub and cropland stretches. Burkill even equates the two, "because all along the Himalayan cultivation is most intense in it (the sub-tropical belt), and more distinctly cuts off the upper forests from the lower forests than any other feature".[8] This forest zone has suffered most from deforestation and even the existing forests clinging on the steeper slopes are of secondary character.

Though Castanopsis indica ('kaṭus') and Schima wallichii ('chilāune') commonly form the co-dominants elsewhere, in Pokhara region the dominance of Schima is very emphatic. This may be due to the fire-resisting character of Schima, which is equipped with a thick bark that can stand fire well. Schima tends to form pure woodlands and most of the low hills around Pokhara are covered with Schima forests. In composition and flora the wet hill forest is less dense than in the lower monsoon forest, and the top canopy rarely exceeds 100 feet.

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6. Near Kāṭhmāndu, on the other hand, the Sāl forest give place to forest of Castanopsis indica. "I think that this change marks a place where the tropical forests may be conveniently considered to end." Burkill (1910):73.

7. 'Wet Hill Forest' of Champion (1964)Ms.; 'mixed evergreen zone' of Nakao (1955):281; 'Schima-Castanopsis forest' of Kawakita (1956):62; and 'Tropischer immergrüner Bergwald' of Schweinfurth (1957):297-298.

8. Burkill (1910):60.

XXIX. Bamboo, varieties range from Dendrocalamus stricticus in the plains to fine Arundinaria in the highlands. The bamboo seen in the clump at right is used for beams and rafters, and the mountain bamboo transported by the men are used for weaving mats and baskets. See p.74.

XXX. Michelia excelsa (chānp) yields durable timber and is valued for building purposes. The large tree occurs on ~~the~~ Barsami ridge. See p.73.

Tropical grasses are replaced by a dense undergrowth of shrubs and herbs and varieties of creepers, aroids, epiphytes, orchids and ferns occur locally. The lower section of the zone includes Schima, Castanopsis, Berberis sp. leontice ('kāphal'), and Polyalthia longifolia ('dār'). Above these the common associates are Alnus nepalensis ('utis'), Fraxinus floribunda ('lāngri'), and Quercus lanuginosa, which ultimately merge into the higher oak forest. Alnus, a light-demanding species, grows fast and is the first plant to colonise old landslips and abandoned fields. Fraxinus also grows moderately fast and replaces tropical ficus species above 5,000 feet as the shade tree.

The medium-size trees Acer oblongum ('pirpire'), Bauhinia variegata, Daphniphyllum himalayense ('setkānlo'), Erythrina suberosa, Pieris ovalifolia, Rhus acuminata ('bhalāyo') are buttressed by a dense undergrowth of shrubs: Arisaema intermedium (cobra plant), Berberis nepalensis ('chutrā'), Fragaria vesca, (strawberry), Cretaegus, crenulata, ('ghangāru'), epiphytic Hymenopogon, fruit-bearing Pyrus pashia, Ribes ('aselu'), Rubus lasiocarpus ('kāliaselu') ~~and~~ Rubus rosifolius ('ghyāmpeaselu'), Solanum indicum ('dhaturā'), stinging nettle, and Zanthoxylum alatum ('ṭimur'). Sometime the mixed forests are enriched by Ilex excelsa, Myrica esculenta, Photinia integrifolia and Symplocos Chinensis. Dendroclamus strictus of numerous varieties occur and Euphorbia royleana is found along the dry slopes. Damp sites are occupied by Begonia spp. as well as ferns - Dryopteris papitio and Polystichum nepalense. Above 4,500 feet the common Schima associates are the warm temperate plants such as Rhododendron arboreum ('gurās'), Litsea lanuginosa and certain evergreen oaks ('phalāṭ').

III. Temperate Moist Montane Evergreen (6,200-9,000ft.) Pl.LXXVII.

The true montane forests[9] occur on the northern highlands, forming the top tier of the regional vegetation profile (Fig.21a). The lower montane forests here correspond to the Ban oak forests of Kumaon-Garhwal though the conifers are rarer. The oak forest belt is extensive, among which Quercus lanuginosa descends as low as 6,000 feet and Quercus semecarpifolia, capable of standing heavy snowfall, ascends higher than most species. The latter is usually found mixed with Acer spp., and Betula utilis and occasionally Pinus roxburghii. The oaks Quercus lanuginosa, Quercus lamelossa, Quercus glauca, Quercus semecarpifolia are all large trees and yield valuable timber, fuel and fodder, resulting in their intense use near the settlements. Hence Rhododendron, fire-resistant and of less use, tends to establish itself progressively at the expense of oaks. Rhododendron arboreum and Rhododendron wrightii with flower shades of white to dark-crimson are found at lower elevations and Rhododendron barbatum with pink flowers occupies the upper level. Rhododendron barbatum is a large spreading shrub while Rhododendron cinnamomeum favours exposed clearings. Other species commonly occurring in the oak forest are Juglans regia ('okhaṛ'), Lithecarpus spicata ('arkhaulo'), Magnolia, and Michelia excelsa ('chānp'). Michelia makes fine building material but is very susceptible to fire (Pl.XXX).

In composition the montane forests have characteristic low bushes on the northern aspect and grasses on the southern aspect. True alpine grassy slopes of Anaphalis nubigena ('buke') are encountered just above 10,000 feet. The hill meadows are primarily of the regressive type owing to

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9. 'Wet temperate forests', Champion (1964)Ms.; 'Evergreen oak zone', Nakao (1955); Kawakita (1956). 'Lower belt of upper montane forest', Schweinfurth (1957).

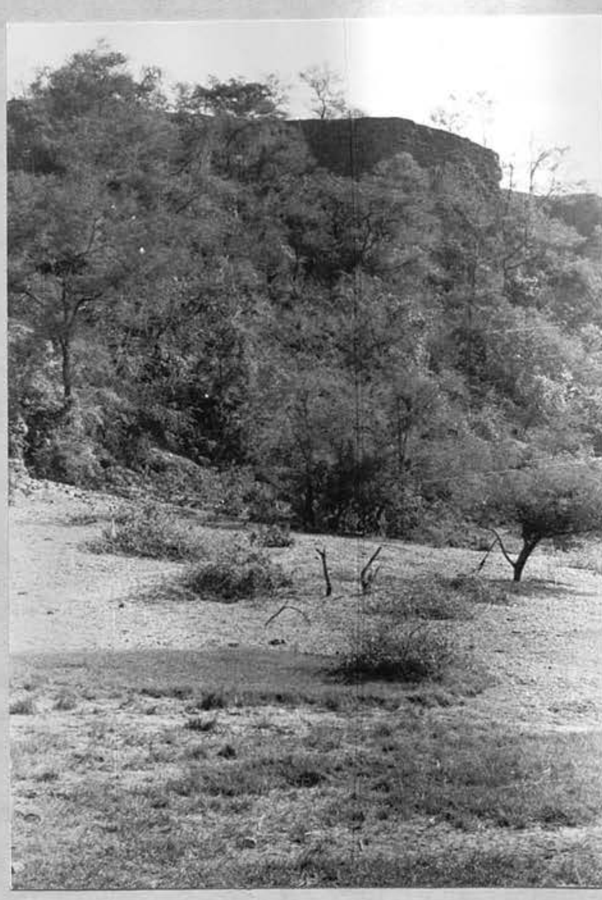
overgrazing, burning and intermittent cultivation. Arundinella nepalensis and Heteropogon are found mixed with Desmodium triflorum and Spiranthus australis. The shrubby undergrowth of Pieris ovalifolia and Lyonia formosa of Rhododendron forests is replaced by Ribes acuminatum in the maple zone. Tree trunks and branches are festooned with parasitic Laranthus scurrula, Polypodium contortium, and filigree of moss and lichen. Old camp sites are overgrown with nettles and wherever humidity allow its development, mountain bamboo Arundinaria ('nigālo') forms clumps of impenetrable jungles sheltering leeches.

IV. Low Savannah. Pl.XCII. On the plain within the tropical zone, the moist vegetation passes into an edaphic formation of open savannah.* The lower terraces where springs with their source in the hills ooze out, swampy conditions with tough, inedible grass, Saccharum spontaneum ('kāns') occurs. The intermediate terraces with lesser moisture have xerophytic plants such as Acacia catechu ('khair') and Zyziphus jujuba ('bair'), and the prevalent grass is Saccharum munja. The well-drained higher terraces are exposed to periodic burning and grazing and the natural grass cover has become a Heteropogon subtype[10] of short turf. Such flats with biotic climax of grasses such as Cynodon dactylon and Poa pratensis ('dubo') recur frequently and are called 'chaur' or 'pāṭan'. As a common practice, Imperata cylindrica ('khar') is fenced and burnt over to maintain regrowth, to provide material for thatching. Where the plain approaches the lakes the savannah vegetation grades into coarse hygrophilous grasses. The stages in the hydrosere

*The grasses are shorter than the climax savannah of the sub-montane 'duns'. Cf. Gee (1959):489.

10. Whyte (1957):91.

XXXI. Riverain vegetation line the streams, and the dry beds are marked by Salmalia malabarica and hardy grasses. See p.71.



XXXII. Dry Deciduous ~~e~~forest of Acacia catechu with undergrowths of Zuzuba zyziphus on the old riverain sites near Gagangauda.
See p.71, p.167.

are composed of Phragmites communis (reed), Carex spp. (sedges), water hyacinth (Eichhormia). The small pond Kamalpokhari is choked with water lilies and similar aquatic plants, and in Maidi Tal Cyperus (papyrus) grows abundantly and is cut for weaving mattresses. Rupā Tāl has ten acres of weed-infested marsh on its southern edge.

V. Riverain Vegetation. (Pl.~~XXI~~ LXIX). is a distinct locational type along the stream courses. On the Seti river terraces they supplant the seral stages of grassland, as dry deciduous forests of Acacia catechu (PlXXXII). Acacia is usually found in pure stands, and the stretches of Acacia forest with Zizyphus jujuba bushes and grasses provide a park savannah character. On older grounds Acacia is superseded by Salmalia malabarica* ('simal'). Salmalia (Pl.III) thrives well on silts and matures rapidly. As pioneer plants on alluvial soils, Acacia and Salmalia create soil conditions suitable for other colonizers. The new alluvial stretches are generally overgrown with an unpalatable weed called 'pāti' which form extensive thickets. The narrow river gorges harbour a rich community of shade-loving plants. The sunshine hardly ever falls direct on the deep tangle of vegetation in these hollows overhung with willows, Terminalia tomentosa, Pandanus furcatus, Strobilanthus, and Symplocos theaefolia.

VI. Lowland Plantations. (Fig.21a). The savannah character of the plain has been much altered by man-made habitats. These are the complex of plantation trees around the plain villages. For example, it is said that eighty years ago Rāmghāṭ below

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*The silk-cotton tree also called Bombax malabaricum. The correct name is Salmalia malabarica since Bombax genus is restricted mainly to plants from Tropical America. Cf. D. Chatterjee and M. B. Raizada: "Correct name of silk-cotton tree (semal)." Indian Forester, LXXVI (1950):154-155.

XXXIII. Aquatic. The small pond Kamalpokhari is choked by water lilies. The plants on the right are overgrazed Schima wallichii. Grazing caravan mules appear as black dots in the background. See p.43, p.71.

XXXIV. Plantation. The settlements on the plain are marked by planted trees for fence, fruit, fodder and shade. For species see profile in Fig. 21a. See p.72, p.163.

Kāhun hill was a mere expanse of 'pati' weed. At present it is a thriving settlement with numerous trees presenting an open woodland from a distance (Pl.XXXIV). The older a plain village, the more woody the settlement site becomes. The introduction of exotic elements helps to transform the soil, microclimate and vegetation of the farmsteads. The first plants that come with the settlers are the fence trees as the thorny Euphorbia royliana, and flowering Euphorbia pulcherrima ('lālpāte'). Salmalia malabarica and Dendrocalamus strictus are valued for their supply of building materials. Varieties of pollard and fence trees also act as shelter-belts enclosed within which are orchards of banana ('kerā') Psidium guayava ('belauti'), Punica granatum ('anār'), Maesa macrophylla ('bhogaṭe'), Mangifera indica (ānp), and oranges. There are some mango groves in Baidam, while on either side of the Seti, Batulechaur and Hyangjabesi vie with each other for the largest orange orchards.

The most important plantations on the plain and on the lower hills are the shade trees along the roads. They shade stone platforms for resting and parking loads. Shade trees are planted by philanthropic individuals to gain religious merit and Ficus religiosa ('pipal') and Ficus bengalensis ('baṛā') make the traditional pair (Pl.LXVII). Some of the shade trees along the main bazar of Pokhara are reputed to be over 200 years old. It is sacrilegious to destroy shade trees, but two of the trees in the town have been felled because of their age and falling branches. The evergreen Ficus benjamina ('swami') makes isolated shade trees on the plain, and sometimes deciduous Sapinus mukorossi ('riṭhā') is also used for the same purpose.

b. Impact of Man

The veneration proferred by the people to the forest deity 'Bandevi' is symbolic of the dominance of forests in the native's life. Villages worship forest gods and the otherwise bare plain is dotted with sacred groves. The economy depends greatly on forest products and the natives of the upper Mardi and Seti valley are still partly hunter-collectors. The proverbial proficiency of the Gurkha in jungle warfare is based on his constant struggle against the forest and its wild denizens. The degree of dependence on forests may decrease nearer the bazars but here the shortage of fuel is greatly felt. Man turns to forests to supplement the produce of the soil, and forests invite destruction by their very usefulness. Thus an ambivalent man-nature relationship is created.

(i) Forest products. Forests yield building materials, timber, fodder, food, and wild game. Fire-wood remains the most demanding item, in the highlands where the coldest months are mostly spent beside the log-fire and on the plain where distance from forests results in exhorbitant price for the fuel (Pl.XXXVI). The great demand for fire-wood alone has caused the rapid depletion of forests. In addition to the household consumption, wood charcoal from sāl and other hardwood species are used as industrial fuel by the smithies.*

The chief timber species are Shorea, Salmalia, Schima, Alnus, and Quercus spp. Shorea has a great demand for its high durability, and Castanopsis and Schima as second-class timbers are widely used because of their availability. Michelia excelsa is much sought-after for its size and straight stem (Pl.XXX). From Polyalthia, wooden jars and bowls are carved, and Alnus nepalensis comes handy as poles for building purposes. The fruit of Juglans regia is useless but its timber is good. Magnolia and Pyrus pashia are used for constructional work and the tough wood of Floribunda and Phyllanthus provide

*Pokhara had thriving smelting works in copper for export during the eighteenth century.

XXXV. Shade Trees. Ficus religiosa and Ficus bengalensis are planted to provide shade to the roadside chautaras. See p.72.

XXXVI. Firewood. Forests provide fuel for household and industrial purposes. Firewood is gathered in winter and stocked for the rainy season. The Seti at its lowest level in January is crossed by a temporary bridge. See p.73, p.149.

most of the agricultural implements. Salmalia malabarica stands well in water ~~under~~ and is used for making dug-out canoes. As a soft-wood it is the chief raw material for the local match factory. Furniture is made from Acacia catechu, Alnus nepalensis, and Michelia excelsa.

The versatile bamboo - at least six species are found - is put to a variety of uses. (Pl. XXIX) The large Dendrocalamus hamiltonii ('tānbe') make handy containers, and its culm-sheaths are used as platters for meals during field-work. The medium-size Dendrocalamus strictus ('dhanu') provides rafters, scaffoldings, and poles. The solid-stemmed bamboos (that provided lance-shafts to the medieval warriors) make good fences, and the high altitude Arundinaria ('nigālo') provides the finest material for basketry as well as for torches on night journeys. The rhizomes of the dwarf bamboos is a culinary delicacy.* The rain-shields ('ghoom') made from bamboo pleats are lined with the bark of Betula utilis. The highlanders also weave coarse cloth from nettle fibres; and juniper is used for incence-burning. Writing papers are made from the pulp of Daphne bark. Forests also yield a variety of medicinal herbs and drugs, such as Phytolaccia acinosa ('jaringo'), nervine tonic Nardostachys rhizome ('jaṭmāsi'), poison from aconite tuber ('bikh') and poison antidote ('nirbisi'). Bulbs of Fritillaria cirrhosa are eaten as a preventive against goitre. In addition numerous species of tubers like Dioscorea sativa ('giṭhā') and Diascoria anguina ('tarul') are much valued as food during periods of food shortage.

*The saying "Lekh ko tusā; Arbā ko besā" (Rhizomes from the highland, barter at Arbā) implies its popularity.

(ii) Deforestation and forest policy. The forests have been, by their very usefulness, over-exploited. It is probable that the natural forests on the slopes of Annapurna and the Mahabharat Lekh once formed a continuous arboreal expanse. But at present they are separated by a forty mile wide belt of arable farming. Expansion of farming has taken toll of much woodland within the altitudinal limits of the habitable cultivation (3,000-6,000 ft.). To illustrate the retreat of forests, one ornithologist's observation at Sarankot is revealing: " Ten years ago before, the hillside was covered with scrub jungle, but now there was nothing left except a small tree or two and a tangle of brush and ferns around a spring".[11] The chief factors responsible for the deterioration and ultimate destruction of forests are periodic fires, shifting cultivation, over-grazing, and lopping of trees.

Fire. The higher forests are burnt-over in the Spring for the improvement of grazing. Fires are also used for driving down wild game such as the Hemitrages jemblaicus ('ghoral') Ovis Hodgsonii ('jhāral'), deer, ~~Vand Lophophorus~~ Sus vittatus ('banel'), Lophophorus impejanus ('dānfe'). The lower scrublands and grasslands are set on fire before the rains to provide fresh growth. Fire by regulating succession becomes an important agency in propagating pyrophytes like rhododendron, Schima and Imperata grass in the region. In addition, by destroying existing stands of trees and arresting regeneration, fire causes exposure of soil and the consequent soil erosion, landslide, and flood.

Shifting Cultivation.[12] Cultivation belt is extended by burning a part of the forest and using it for intermittent

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11. Fleming (1959): 577.

12. Type (8) 'depending mainly on some permanent form of agriculture with some shifting cultivation'. Cf. Watters (1960): 65.

farming. The process is termed 'khoriyo' literally to scourge, it is practised either around grazing camps or by clearing the forests on gentler slopes. In order to gain an economic return and lessen the depredation of wild animals, glearings should not be too small. The clearing is initially cultivated at the interval of four to five years. Where climate and soil conditions are favourable the clearing is used more frequently and periodic extensions are made at the expense of the adjacent forests. The fields are not terraced and suffer from heavy erosion during the fallow period.

Over-grazing. The acute problem of grazing may be illustrated by a custom on the Pokhara plain. The villagers fix a day in November by which time the paddy must be harvested to make it possible for the ill-fed cattle at their stalls to browse the stubble. When the cattle are let loose on the agreed date any tardy farmer's crop is left at the mercy of the onrushing bovine hordes. In the highlands, tribal feuds originate from controversial grazing rights. The shortage of grazing land obviously results in the over-grazing and impoverishment of forests. Grazing causes the destruction of seedlings and grass-cover and loss of soil permeability due to the trampling of the cattle. Over-grazing is particularly serious around the settlements and many dense forests have degenerated into poor scrubland within a short time. Even in the highlands the pastures are no more than poor range country. Such unchecked grazing has caused "retrogressive succession" of plants and the proliferation of thorny and inedible families and species such as Euphorbiaceae, Holarrhena anti-dysentrica, Lagerstroema parvoflora and Zizyphus jujùba.

Lopping of trees. The forest situation is further aggravated by the lopping of larger trees for fodder. Except in the highland villages which practice transhumance, the cattle have to be kept in and stall-fed for a part of the year.

Broad-leaved trees suffer most from indiscriminate lopping. The scrub tree near the settlements are but a collection of pollards (Pl. LXW). The reduction of the crown weakens the tree and reduces soil protection, which leads to deforestation and soil erosion.

Forest Policy. The large-scale destruction of forests becomes understandable on reviewing the forest policy of the country. The lack of a national forest policy till recently was due to the popular fallacy that the country's forest resources were inexhaustible. The official view was expressed by a forester: "There is no doubt that Nepal, with her growing population and with the tendency of her landless surplus manhood to emigrate to India, must adopt and press forward a policy of tree felling in all localities where crops can grow and men live happily."[13] Thus, it is not surprising that the destruction of forests accelerated along with the demand for more land due to population increase. Though the natives believed the planting of a shade tree as a good deed, the concept of afforestation was beyond their ken. A recent forestry report confesses that even on the government level "previous experience on actual afforestation work in the country had been nil."[14]

Most of the forests in the region used to be owned by the villages collectively under 'sanadiyā' system. Under this system the forest was managed by an elected warden ('chitāidār') who apportioned household demands according to the need. The system gave autonomy to the villagers but provided no safeguard where an expanding village was in need of more farm land.

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13. Collier (1928): 252. Underlined by the present writer.

14. Basnet (1963): 2.

Thus some villages were better-provided than others in forest products. The plain villages which lack forests had to make use of others' forest with payment of a fee.* Recently, however, all the forest land has been declared as "reserved forest"[15] and this has created an acute shortage of fuel supply in most of the plain villages and all the bazars.

c. Soils

Immaturity remains the chief characteristic of the soils found in the region. Talus accumulations, screes, slumping, landslips and landslides as agents of progressive wasting provide regular fresh supplies. With frozen ground occuring only above 14,000 feet, the soil conditions within the region are rather suggestive of the wet tropics. Indications of laterization are observable up to 4,000 feet.

According to locational factors, the soils fall under two broad groups: montane soils and alluvial soils. These are liable to further modification subject to the parent material, site, and formation. Though very little is known of their chemical composition and physical properties, sample from similar areas show them to contain sufficient calcium and potassium but lacking in phosphate and nitrogen.[16] A considerable proportion of the montane soils are under forest cover while the plain soils are more often characterized by subhumid grasslands.

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*As an interesting instance, the Gurungs of Kāhunkoṭ have free access to the forest of Armalā village, from whence they originally migrated.

15. Forestry Dept., Nepal Govt. (1961).

16. Knutsson (1953): 1, Samples were taken from Kāṭhmāṇḍu Valley, Trisuli Valley, and Kakani hill at altitudes ranging from 2,000 to 6,000 feet.

(i) Soil Formation and Types. In the absence of scientific soil analysis,* the following general account makes use of purely descriptive terms to distinguish the soil types. The classification is based on general morphology and the physical appearance of the soils are described as they occur in the field. The montane and alluvial soil groups have each been divided in two types, so that four soil types are recognized: (1) Montane brown forest soils, (2) Montane red earths, (3) Recent alluvia of the foot-hills, and (4) gravelly loam of the plain (Fig. 22).

(1) Montane Brown Forest Soils. Climate, vegetation, and soil being parts of a single inter-related ecosystem, there are changes in the soil character with increasing altitude. The Brown Forest Soils woud roughly correspond to the temperate oak forests of the highlands, and the Red Earths to the sub-tropical and tropical belt. The Brown soils develop well particularly under deciduous forests. The humus accumulation enriched by a deep root-system is dark-brown in colour and heavy loam in texture. Derived as they are from sedimentary as well as crystalline rocks the soil is grained with quartz and mica. Under forests the humus is fairly thick but their fertility is offset by their location on steep sites. They ~~do~~ tend to lose top soil rapidly and when exposed to plough-share or mattocks erosion is intense.

(2) Red Earths (Pl. XXXVII). Under warmer conditions at lower elevation the brown forest soils develop reddish-yellow B-horizon The typical Red Earth ('krasnozem')[17] is the predominant type on the surrounding hills. They are derived mainly from gneiss

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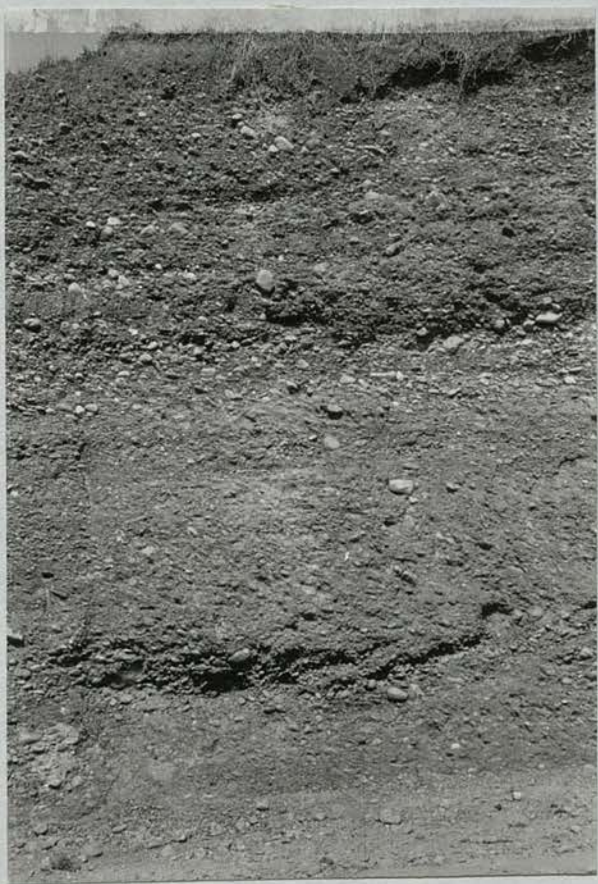
*No edaphological investigation was ever made though agricultural development schemes were introduced in the region as early as 1953. The soil map (Fig. 22) may be consulted with the contoured map (Fig. 7), and slope map (Fig. 50) to supply information about slope and aspect.

17. Rode (1962): 265.

XXXVII. Red Earths. The soils on the lower hills are lateritic and immature. This particular profile is derived from phyllitic rocks. See p.80.



XXXVIII. Coarse Gravel. The soil on the plain is composed of sand, silt, pebbles and gravels with varying dominance. The top soil is thin and the water-table extremely low. See p.22, p.81.

schists and phyllites and the shades in hue ranging from reddish-yellow, grey-brown, and very dark may be due to lithologic or organic factors. Where the soils are derived from quartzites the soil is non-homogenous with plenty of scree. The mull layer is fairly thick under forests and the eluviation horizon less acidic than in the Brown earth. The humus is underlain by a B-horizon of heavy loam or clay with considerable accumulation of iron oxide. The Red clays are adhesive and much used for plastering the mud walls. The low hills, particularly their gentler southern slopes, show a marked degree of laterization. The lateritic soils are usually leached, deep, and contain hydrous oxide clays. Plant nutrients are lacking and profitable farming necessitates application of manures.

(3) <u>Recent Alluvia</u>. The intensity of monsoon thunderstorms causes the removal of soil from the hills and the debris so displaced is deposited along the hill-foot region in small and large alluvial fans. They bound the outwash plain by a series of cones and inter-cones and also overlay the plain in certain sections. The larger streams have low banks of coarse gravel, mixed ferruginous sand and clay. The alluvial deposits tend to grade finer downstream, and the ease with which they can be irrigated tends to make them the preferred sites for cultivation (Pl. XC). The alluvial deposits emanating from Kāhun Kholā fan out two miles radius on the adjacent plain (Pl.XCIV). The soils are sandy loam and have good internal drainage. The poorly-drained soils around the lakes have a dark-coloured surface horizon and when drained these have a high productivity value.

(4) <u>Gravelly Loam</u> (Pl. XXXVIII). The soils on the outwash plain are derived from the underlying gravels. Even a cursory examination reveals that the Pokhara gravels bear no relation to

the 'black earthy manure'[18] (lignite) and statements about "the highly fertile soils of such lateral valleys as Pokhara and Kathmandu"[19] are misleading. The soil texture as shown along the section of a road-cutting is mainly gravel and sand interspiced with pebbles (Pl. XXXVII). The humus layer at the top is very thin, and has a poor water-holding capacity. Elsewhere, the depth of the soil varies from 6 inches in the southern part of the plain to about 3 feet in the north. The poor quality of the plain soil is mainly due to its very low water-table (c. 200 feet).

(ii) Erosion Problem. Each year the hill country is scourged by landslides, and during heavy rains as in 1955, whole chunks of hillside slither down carrying down forests and farmlands. "Erosion is slowly but surely robbing the Mahābhārat Lekh (middle Himalayas) of its habitable land."[20] Natural and human agencies have both contributed to this grim prospect. Before blaming human mis-use of the land,* one must

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18. Masters (1838): 3.

19. Karan (1960): 31.

20. Robbe (1954): 15.

*H. W. Tilman (1952): 126-127; provides a fresh approach; 'Whether it takes little by little or in one swift calamity soil erosion is generally attributed to man's careless greed, his idleness or neglect. It would not, I think, be fair to blame the people of these Himalayan fringe for the present landslips which occur there. In turning the steep slopes into fruitful fields they have been neither lazy nor neglectful .... The task of building must be spread over years and their maintainance calls for constant labour over and above that of routine cropping. One might say that on such hillsides the forest never should have been cleared, in which case the country must be left uninhabited...."
Actually the above remark was prompted by the Tāgring landslide (Pl.XXXIX) which Tilman visited in 1949.

EROSION PROBLEM

XXXIX. Tāgaring Landslide in Marsyāndi valley started during the earthquake of January 15, 1934 and with fresh encroachments each year. The acute problem of arable land may be judged from the villages still clinging near the landslide. Light yellow tone marks the paddy fields and the houses are in light grey dots. See p.82.

appreciate the scale of natural forces active in the area. The steep mountain sides here are made-up of fractured basic rocks and sandrocks liable to disintegration on the slightest exposure. (Pl. XI). When periodic downpours saturate the hill slopes, it results in the slipping of steeply inclined sedimentary bands of soft shales and phyllites. On the higher grounds, deepening of the valleys and consequent increase in instability of the valley walls causes large-scale earth-flows and debris avalanches. The Tagring landslide (Pl. XXXIX) is unconformably sited on the north dipping 'Kathmandu nappe' system. When this landslide started during the great earthquake of 15th January, 1934, the Marsyāndi river was temporarily dammed, silting-up a flourishing salt-brine at Noon-khāni. The landslide has been extending laterally as well as headward ever since.

Man aids the natural processes in his own way. The demand for cultivable land causes large-scale deforestation and the loss of protective cover to the land accelerates the rate of erosion. The enormous downpour (with records of 1-2 feet of precipitation during the first few days) and swelling rivulets with nothing to contain them or slacken their velocity, cause great damage by cutting deep gullies, undercutting the river banks, causing landslides and flooding the plains. A specific instance may be sited to this effect. The village site of Taranche (3,500 feet) in Lamjung is perched on a high terrace 2,000 feet above the present flood-plain, of the Marsyāndi river. Behind the village to the east, rises a steep 8,000 feet high hill. A narrow belt of woodland separated the village from the hill-foot, till its clearing in 1952 for maize cultivation. In the monsoon of 1955 a landslide originating at the base of the hill swept away the village. At the time of the writer's last visit in 1962, the site of the landslide had been colonized by a dense thicket of 'pāti' grass, completely obliterating any sign of past habitation. All over the hill country numerous are such instances but unrecorded. The hill man is not ignorant of the calamities. But with no obvious alternative he has simply turned fatalistic. In his quest for basic food needs he has created precarious and increasingly difficult conditions for himself.

PART TWO: CULTURAL LANDSCAPE

'.... my thoughts return to you who were my comrades, the stubborn and indomitable peasants of Nepal. Once more I hear the laughter with which you greeted every hardship. Once more I see you in your bivouacs or about your fires, on forced march or in the trenches, now shivering with wet and cold, now scorched by a pitiless and burning sun. Uncomplaining you endure hunger and thirst and wounds; and at the last your unwavering lines disappear into the smoke and wrath of battle. Bravest of the brave, most generous of the generous, never had country more faithful friends than you.'

R. L. Turner

(in Nepali Dictionary, London(1931),pix)

Chapter Outline

POPULATION AND EFFICIENCY

a. Demographic Review

i. Density and distribution
ii. Composition
iii. Change and migration

b. Health and Education

i. Diet
ii. Disease
iii. Education

Chapter V.

POPULATION AND EFFICIENCY

This chapter describes the distribution of people by seeking relationships between the patterns of population and physical factors. Population pressure and composition in the region are compared with those of the neighbouring areas. For spatial comparison at the present scale of investigation, the region has been analyzed at the smallest administrative level. Movements of population both within and outside the region are explained in the light of past and present trends. Just as the ratio between total numbers and the total area of an enumeration unit is a crude figure, their statistical treatment provides only an outline of the population structure. To give substance to the demographic figures, the quality of the population concerned is examined on the basis of their health and efficiency.

a. Demographic Review*

The discussion is based on the detailed report of the 1954 census[1] and the preliminary report of the 1961.[2] These have been supplemented by the data collected by the writer for the bazar population, and the records of the Nepal

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*The earliest countrywide enumeration dates back to 1911, and was continued roughly every ten years. The returns concern only larger districts and reveal inaccuracy and under-enumeration. The first census according to modern specifications was carried out in 1952 (East Nepal) and 1954 (West Nepal), and the last census was completed in June 1961.

1. Statistics Dept., 1957.

2. Statistics Dept., 1962. The 1961 Census material is still in the processing stage, and the 1961 data for Kāski district was kindly furnished by the Director of Census, Mr. T. B. Rayamajhi. (Personal Communication 28th June, 1963).

Malaria Eradication Organization for villages lying below 4,000 feet. The areal base for plotting the population data has been confined to that part of the present region which falls under Kāski district: this covers 88 per cent of the Pokhara region. The 33 sub-districts ('thum') incorporating this area (155 square miles) accounts for 68 per cent of the area of Kāski. Of the remaining parts of the region, 10 per cent (18 square miles) fall in Syāngjā district in a narrow belt, and 2 per cent (4 square mile) in South-east Tanhu district, for which no 'thum' data are available[3] (Fig. 3; Fig. 24 inset). Therefore, statistical treatment has been concentrated on the 33 Kāski 'thums' within the Vale region for lack of details elsewhere. The 'thum' boundaries drawn here on the basis of local authorities and topographic features attempts to define an administrative unit above the village level.[4] As the areas are not given, all the 'thums' were measured by a method of squares (hundredths of an inch) for calculating 'thum' areas and thus their density of population.

(i) <u>Density and Distribution</u>. The area, population, and density of Pokhara region has been compared to those of Kāṭhmānḍu Valley, Ganḍaki districts and all Nepal in Fig. 23 and Table XIV. With a density of 172 persons per square mile, Nepal has a fairly high density for a mountain country. The heaviest concentration occurs in Kāṭhmānḍu Valley where the

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3. Statistics Dept. (1957): 41, lists 12 thums in Syāngjā without giving their population.

4. A 'thum', also known as 'mauja' is a revenue sub-division composed of 10 to 200 villages. The map of administrative units as given by Karan (1960): back pocket; shows, in fact, not the administrative thums but the so-called 'census districts' compiled by the Census Department.

dėnsity exceeds 2,000 persons per square mile. The density of the four Gandaki districts, (Kāski, Lamjung, Syāngjā, Tanhu) ranges from 86 to 465 persons per square mile. The 218 mean density of Kāski district exceeds that of the country as a whole. The density of population in Pokhara Valley is 483 persons per square mile, giving a high concentration compared to other hill areas.

Within the region, population density between the 'thums' varies from 125 to 1,235 persons per square mile: the density of Sarānkoṭ is ten times that of Bhumdi (Fig. 25, Table xv). When to low, medium, and high density categories are added lowest and highest, the clustering of lowest densities on the high hills are obvious as mapped in Fig. 25. In the east, the low density of Begnās resembles that of the gravelly plain, and the large 'thums' of Sarānkoṭ, Kāhun-Kunḍahar and Arghoun would have the same low density but for their bazar settlements. The low hills in the east and north have a medium density and the hill 'thums' Kāski, Ribān, and Mājhṭhān have high density. Kāski includes the historic Kāskikoṭ, a settlement well-populated since medieval times. Ribān's highest density is due to its extreme small area; only 1.05 square mile whereas the average 'thum' measures 5.4 square miles. The 'thums' of the upper plain have a higher density than those of the central plain. Ninety per cent of Sarānkoṭ population are concentrated in Pokhara town and Baidām village. The density of the municipal area comprising of Pokhara, Rānipouwā, Kunḍahar bazar neighbourhoods exceeds 3,450 persons per square mile.

In numerical dominance the 'thums' with plain areas lead all others except Kāski (Fig. 24). The larger population of the lowland 'thums' is primarily due to their bazar concentrations. In settlement density, however, the situation is reversed as the distribution pattern shows a higher settlement density on the hills than on the plain (Fig.26). There is sizable concentration of villages on the hills while the extensive central plain is conspicuously bare of large settlements except for the isolated bazars. The basic pattern of the population distribution shows an increase with altitude up to 5,000 feet and a sharp decrease above this level owing to steep and forested areas. The people prize the valley-bottom fields but prefer to live on the hills.

(ii) Composition. There is no systematic vital registration in Nepal. The following notes on the population composition of Kāski district may give some indication of the situation prevailing in Pokhara region.*

All the Gandaki districts have female preponderance in sex ratio (Table xivb). The percentage of females for Pokhara region is 53 and all the 'thums' record more females than males, the range varying between 51 and 58 per cent. The chief reasons for the disparity in sex ration being the emigration of males for work and immigration of females through polygamy. In all hill areas the number of males away from home for more than six months is considerable and in Kāski the absent population accounts for 11 per cent of the total (Table xxib). Males constitute 81 per cent of the away population, and 82 per cent of those outside the country (Table xxia). Increase in females results by polygamy too, practised, chiefly by the Brahmans, for aquiring additional agricultural hands.** Also, Gandaki region being a preferred

*Pokhara region accounts for 68% of Kāski area, and 88% of the Pokhara region falls under Kāski district.

**Polygamy has been made illegal since 1962.

Gurkha recruiting source, a considerable number of the male population was drained away during the 1914-18 and 1939-45 wars.[5] In marital status, 56 per cent of the married and 85 per cent of the widowed are females. In the 5-14 age group, the 'married' females out-number the males by five times (Table xvia).

The age structure is 'expansive' with a broad base to the pyramid and high proportion of children and suggesting a rapid rate of population growth (Fig. 23b). The youngest age-group (0-4) show less than the next age-group which may be due to high infantile mortality as well as under-enumeration.[6] The largest percentage (13) fall in the 5-9 age-group (Table xvib). As births are not officially recorded, 0.4 per cent belong to a doubtful age-group. The proportion of children below 15 years is 37 per cent, that of working-age group (15-59) above 55 per cent, and the old-age group only 6 per cent. The 'median age' falls below 20 years or half the population is below 20 years. Though more children means 'heavy youth dependency', the children here start work earlier than at 15 years and even the school-going children get work-leave during the rice harvesting season.

Occupationally, 55 per cent of Kāski's total population are independent and 45 per cent dependents:

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5. The situation was personally observed in the autumn of 1962 when many able-bodied men left their villages to enlist in the Indian Army during the Sino-Indian border conflict. (Pl. XLIII) During the Great War of 1914-1918 West Nepal contributed 132,530 Gurkhas, over 83 per cent of total Gurkha soldiers.

6. Thakur (1936): 7.

Table xvii.

Occupational structure, Kāski district, 1954*

Occupation	Independent				Dependent			
	Male	Female	Total		Male	Female	Total	
1. Agriculture	27,953	29,262	57,215	92.3	18,952	26,579	45,531	91.4
2. Other Industries	1,026	591	1,617	2.6	606	855	1,461	2.9
3. Commerce and Trade	746	568	1,314	2.1	598	999	1,497	3.0
4. Services	1,267	228	1,495	2.3	192	308	500	1.0
5. Construction	176	33	209	0.3	128	157	285	0.6
6. Communication	42	32	74	0.1	30	31	61	0.1
7. Occupation Unknown	12	13	25	0.03	225	238	463	0.9
TOTAL	31,222	30,727	61,949	100	45,531	18,952	49,798	100

In economic status 88 per cent are predominantly self-employed, 9 per cent employees and only 0.2 per cent are employers. More than 90 per cent of the population are engaged in agriculture, livestock keeping, fishing and forestry (Fig. 27). About three-quarters of those engaged in subsidiary occupations are also hired as agricultural labourers. Femalee make 54 per cent of the farm workers. The proportion of those engaged in services, commerce and trade are concentrated in Pokhara town.

In spite of its being an important commercial centre in West Nepal, no mention of Pokhara's <u>urban</u> character has been made in the Census reports.[7] From field evidence it is clear that a sizable proportion of Pokhara town population subsist on commerce, services, and ancillary urban industries. The Newars possess little agricultural

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*Statistics Dept. (1957): 2-9-211.

7. The urban criteria suggested by the Census reports seem to be a population concentration of over 5,000 persons. Both the 1954 Census Report (1957): 53, and 1961 Preliminary Report (1962): 10, however excludes Pokhara Town from among the settlements with 5,000 population.

land and the Thakālis none at all. Apart from these two exclusive business communities, many locals also engage in trade as their primary occupation. The functional analysis (chapter X) and high population density establish the urban character of Pokhara town[8] beyond doubt. The population of the central part of the town alone was 3,295.[9] Quite distinct from the rural village populations, the centraltown has an urban population structure with 56 per cent males and 78 per cent all adults (Table xviiia). The establishment of Pokhara as a municipal area four years ago recognizes the reality. The municipal area incorporates Pokhara, Rānipouwā, Kuṇḍahar bazārs and their neighbourhoods* (Fig. 28). The total municipal population is 14,624 with a density of 3,450 persons per square mile. The aggregate population of the municipality conforms well with the voters' list of 8,549 over 21 years of age.[10] Other smaller bazārs east of the town also have some urban population. The approximate population of the bazārs together make 18 per cent of the region's total population (Table xviiib).

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8. Thirty years ago Landon (1928) vol. II, p.18, estimated the population of Pokhara town at 10,000 persons. This, of course, was an over-estimation. Kawakita (1957): 44, quotes 13,000 persons in 1953 on the authority of the local Barā Hākim (Governor). The District Officer (T. B. Thapa, personal communication 2nd May, 1961) put the urban population of Pokhara around 10,000 in 1961.

9. Nepal Malaria Eradication Organization; Records, 5th November, 1959.

*The settlement composition of the municipality is 26 urban localities ('ṭol') and 42 rural villages ('gāon').

10. Pokhara Municipality Office, Voters' List 1962.

(iii) Change and Migration. The earliest available census figure for the four Gandaki districts is 405,142 in 1920 and progresses as follows:

Table xix.

Total Population, 1911-1961

	1911	1920	1930	1941	1952/54	1961
Nepal	5,638,749	5,573,788	5,532,574	6,283,649	8,473,478	9,753,378
Gandaki Region	N.A.	405,142	N.A.	531,720	722,602	807,909
Kāski	N.A.)	139,565	N.A.	94,358	133,627	141,175
Lamjung	N.A.)		N.A.	107,543	121,601	141,211
Syāngjā	N.A.	183,417	N.A.	256,941	346,100	387,476
Tanhu	N.A.	82,160	N.A.	72,878	121,274	138,047
Pokhara Region	N.A.	N.A.	N.A.	N.A.	78,408	86,859

For 1911, only the number of houses are available.[11] To estimate a rough population, the 68,274 houses may be multiplied by 4.7, the average number of persons per family.[12] This gives an approximate population of 320,887 for 1911 as against 722,602 in 1961. It suggests that the population of the Gandaki districts has more than doubled in the last half century. District level data are available only after 1941 and the decennial progress of the areas compared are graphed in Fig. 29.

The population growth for Pokhara region can be ascertained only after 1954 for which 'thum' data are available. (Table xx). The 1954-1961 change shows an increase of 5.8 per cent for Kāski and 10.7 per cent for Pokhara region. The regional differences in percentile change contrast from a decrease of 17 per cent in Bhumdi to a decrease of 73 per cent in Pachbhaiya (Fig. 30a). The hill areas register less change than the plain where all the plain occupying 'thums' have made considerable gains. A compact

11. Statistics Dept., (1957): 23.

12. Statistics Dept., (1957). Pt. 2, p.2.

block of 5 per cent increase includes the 'thums' of Bāṭulechaur, Sarānkoṭ, Kāhun-Kunḍahar and Arghoun. The 'decrease' 'thums' are localised on the surrounding hills. Population change in absolute terms show maximum numerical gain in the 'thums' with bazār settlements (Fig. 30 b). This indicates the trend in urbanisation, and the bazār immigrants are drawn from areas both inside and outside the region.

The migration of Nepalese population is directed mainly outside the country. Of the 2.3 per cent migrants in 1954, those abroad constituted 91.4 per cent (Table xxia). The migrants reported abroad were residing or working in India (79%), Malaya (3%), Burma (0.93%), Tibet (0.21%), Pakistan (0.08%), and elsewhere (16%).[13] In 1951, there were 278,972 migrant Nepalese spread all over the states of India including Andaman and Nicobar Islands.[14] The Ganḍaki districts contributed the highest percentage of external migrants: 87 per cent in 1941 and 67 per cent in 1954. From Kāski district 97 per cent of the emigrants in 1954 had left Nepal. The emigrant percentage for the district fell to 87 per cent in 1961 (Table xxib). Although there has been an increase of 41 per cent among the emigrants between 1954 and 1961 the gain has been in internal migration: an increase of 10 per cent. An important factor in the internal movement of population has been the opening of rehabilitation areas in the 'duns' and Terai. The exodus of surplus hill population to Rāpti Dun especially has been regular since the inception of Rapti Valley Development Project in 1955. And with the increase of employment opportunities in the country, it is expected that the last decade's trend of decrease in emigration abroad will accelerate.

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13. Op. cit. (Part 2): 85.

14. Census of India (1951), Vol. I, Pt. II.A., p.248, Table D-IV.

b. Health and Efficiency*

This section tries to explain the people's food habits and the region's health situation. One important factor in improving the habitibility of the low-lying valleys has been the eradication of malaria. And just as health affects the work-effort, educational facilities provide new avenues of opportunity to the people.

(i) Diet. The food habits of the people here vary between different ethnic and caste groups. The social sanctions in food taboos present a more complicated picture than the religious practices.that generate them. The dominance of Hindu religion makes cow-killing a capital offence and only the Bhoṭeas of the northern border lands are still beef-eaters. The Tamāngs who have no aversion to beef, depend on carcasses due to accidental death as cow-slaughtering is illegal. Beef is also eaten by the leather-worker caste, Sārki. Pork, avoided both by the high-caste Hindus and the Muslims, is eaten by the Magars and all the menial castes. Buffalo-meat is relished by the Gurung and Newārs, and the latter decorate the Hindu shrines with the sacrificial buffalo heads. High-caste Hindus also sacrifice buffalo during October for the bigh 'Dasāin' festival but the meat is spared to the low-castes. The high-caste Khasas are not supposed to eat chicken though mutton and goat's meat are permissible. The local Brahmans are not strict vegetarians compared to their brethren in India.

The confusing list of food taboos are mentioned here not because they reflect the totality of a group's beliefs or its social status, but as influences in their dietary habits. The

*Acknowledgement is made here to the kind assistance of Dr. Gerald M. A. Turner, with whom I had discussions both in Edinburgh and Pokhara, where he has been working.

Brahmans consume little meat; instead milk plays an important part in their diet. They also practise occasional f astings for religious purposes. Animal food is more important among the tribal people. The tribal highlanders eat sheep, goat, and chicken, and organise hunting in groups ('ayer') for wild animals during the slack farm season. The hillman is well-known for his expertise in snaring smaller animals and birds. Another source of supplementary diet is the fresh-water fish from the numerous streams and lakes. The potato is largely consumed in the highlands and green vegetable and fruits are available seasonally. The staple diet of the people constitutes of maize, rice, and lentils, and the monotonous nutrition results in chronic deficiency of vitamin B complex.

The use or prohibition of alcoholic drinks makes a clear distinction between the high-caste Hindus and other social groups. The tribal people who use beer ('chāng') and spirits ('raksi') are called 'Matwālā' (literally, Bacchanals). Beer is normally drunk during the summer hot days and spirits are used during festivals and the cold winter season. Beer and spirits are made exclusively from food-grains which increases the shortage of grains in the tribal highlands. Smoking is very popular with all groups of population.

(ii) Disease. Two modern hospitals, one dispensary, one leprosorium, and numerous apothecary shops* in Pokhara provide the limited medical services for the rest of Central

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*Nepal Evangelistic Band Missionary Hospital at Purano Tundikhel established in 1953.
District Soldiers' Board Hospital at Ramghat started in 1958.
The Government dispensary dates back to 1935 but the first qualified doctor to be appointed was only in 1960.
The leprosorium at Dhungasangu was revived by the Missionaries in 1957, at the site of the old government leprosorium.
The local 'hakim' practice in'ayurvedic' medicine.

Nepal. The dispensary attendance data cover a wide area and suffer from such limiting factors as the practice of self-diagnosis and self-medication, prevalence of private practitioners, use of medical services by a limited group, and limitation of beds and out-patient facilities.
Table xxiia shows that the people are turning to medical services in increasing numbers in spite of their traditional attitude: 'weakness is regarded with scorn, sickness is regarded with callousness, and mental illness with amusement.'[15] The biggest influx of patients occurs during the pre-monsoon season, March-May (Table xxiib) Hospitals are less-frequented during the busy summer months. A second high peak in attendance is reached in December-January with the influx of the Gurkha pensioners to collect their annual pension and avail the opportunities of visiting the hospital. For this reason, the common complaint of the highlands, goitre, is registered higher during the winter.

Of those who avail themselves of the medical services, 82 per cent are adults, of which 60 per cent are males. The large percentage of adult male patients is due to their greater mobility to travel as well as contact with outside areas. Among the children twice as many male children frequent hospitals as the female children. This is because the school-going children from the hill areas attending Pokhara schools are predominantly male.

The so-called 'eminently healthful'[16] Himalayas does not seem a perfectly salubrious habitat after all. Whether it is due to the increase in morbidity since Hodgson's days or

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15. Williams (1950): 161.

16. Hodgson (1874): 83-89, "On the colonization of the Himalaya by Europeans."

improvement in disease diagnosis, Central Nepal suffers from innumerable diseases (Table xxiii). Importation of 'civilized diseases' has been going on for over a century through the traffic of Gurkha soldiers and seasonal labourers to India. The hill people seem to have less resistance to alien pathogens such as malaria, tuberculosis, and bronchitis. An investigation of Europeans, Gurkhas, Malays, and Sinhalese in Malaya showed that the Gurkhas had the highest incidence of bronchitis.[17]

Making allowance for uneven standard of diagnosis, the numerical frequency of diseases in Table xxiii give some idea of the common diseases prevalent in Central Nepal. Diseases of the digestive system are the commonest, followed by respiratory and abdominal diseases. Goitre occupies sixth place and malaria tenth place. Rheumatism, nervous diseases and skin diseases are fairly common. Tuberculosis, leprosy, small-pox, cancer, and beriberi together account for less than one per cent.

The gastro-intestinal diseases like amebiasis, ascites, liver abscess, cirrhosis liver, diabetes, diarrhoea, dysentry and ulcers become especially dominant during the Rains. The main cause of higher incidence of protozoal infections is poor sanitary conditions and contamination of drinking water. The night soil is not used for manuring as in Kathmandu and the 'fecal peril' is all the more evident in the promiscuous defecation along stream banks, ponds and around the villages. These open-air latrines pollute drinking water and provide conditions for flies and rodents. The "factor that tends to

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17. Morley (1950): 186.

keep the infections low is no doubt the food habits of the people."[18] Practically everything is cooked for a long time, served directly from the pot and eaten hot.

Among the pulmonary and respiratory diseases, asthma prevails in the lower valleys. Some unusually potent allergen is presumed to be prevalent in these localities and this form of asthma is caused by inhalation of mites found in grass and grains.[19] Virus infection fevers and bacterial infection enteric fevers are unimportant. Eye infection, cataract, tissue, and nose diseases constitute the local diseases. In the highlands periodontal diseases occur and the gingival tissues are reddened, swollen and spongy[20] probably due to the use of ice-cold water. Negligence of skin hygiene causes skin diseases, ringworm and scabies, and working bare-footed in the fields aids to the spread of hookworm.

Leprosy* is a widespread granulomatous disease and the patients are segregated from the community. The Leprosorium at Ḍhungesāngu maintains 80-beds and rehabilitation of the cured patients into their family is met with difficulty. Surgical diseases include dislocation, bladder stone, glaucoma, hernia, hydrocele, piles, and tumour. Diseases of the locomotor system such as gout, rheumatism, arthritis are usually found among those who carry heavy loads on the steep mountain trails. Only five cases of cancer were reported during 1958-1961.

Endemic goitre is fairly common among the highland population.[21] Two villages visited by the writer in Lamjung (Tārāchok and Ṭhulibensi, see Fig. 31) with hyper-endemic goitre

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18. Svensson (1956): 166. 19. Taylor (1951): 434.

20. Dunn (1962): 137.

*Its Nepali name 'mahāerog' (great disease) indicates the dread with which leprosy is viewed.

21. Dunn's survey of three Bhotea villages showed high goitre incidence of 45% (at Sāndā), 62% (Tirigāon), 54% (Dangarjong) and exceeded 80% among the adults. Cf. Dunn (1962): 125-148.

had at least 40 per cent of the children suffering from deaf-mutism. Lack of iodine in drinking water may cause thyroid enlargement, but the determinant factor of goitre causation in the Himalayas is suggested to be the bacteriological impurity in water.[22] Tārāchok (4,550 feet) is perched on a limestone ridge and the high calcium content in the drinking water perhaps intensifies this effect.

The term 'awal' (malarial fever) "hums an undertone of death throughout the chronicles of Nepal".[23] It is not only the Terai 'low road'[24] the hillmen dread but the low-lying interior valleys are also avoided.[25] The plain of Pokhara was one such 'awal' area where a few years ago no one dared to spend a night, and the bazars of Arghounpouwa, Sisuwa, and Khudi had been ravaged by the scourge of Anopheles fluviatiles. In the lower hills the chief vector is Anopheles minimus which breed in jungle streams, still pools and ditches. The survey by the Nepal Malaria Eradication Organization[26] puts 4,000 feet as the upper limit of malaria transmission (Fig.31). Most of the present region fall under the zone of high transmission. Spraying the houses twice a year since 1959 has made some progress in controlling malaria as shown in the following table:

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22. Kelly and Snedden (1960): 159.

23. Landon (1928): Vol. I, p.173.

24. Strickland (1936): 70-77.

25. Geddes (1952): 21. "If their rice paddies lie low in the malarial zone, they descend daily to plow, sow, water and transplant during the monsoon, men and women climbing back to their homes, often 3,000 feet higher, every evening with light free step and laughter."

26. The work of N.M.E.O. under W.H.O. is described by Wayne Mineau in The Fever Peaks, London, 1962.

Table xxiv.

Malariometric Indices, Central Zone*

Year	Infant Parasite Rate	Child Parasite Rate	Remark
1959-60	7.50	11.60	Before spraying
1960-61	3.70	6.70	One year) after
1961-62	2.00	2.30	Two years) spraying
1962-63	1.30	3.30	Three years)

The result of eradication measures is seen in the progressive decrease in malaria cases as registered in the following two dispensaries:

Table xxv.

Malaria Cases Reported

a. D.S.B. Hospital

	J	F	M	A	M	J	J	A	S	O	N	D	Total
1958	N.D.	27	86	119	137	106	84	101	137	90	152	63	1,102
1959	57	51	98	127	-	80	89	79	70	117	92	109	969
1960	65	39	14	22	29	38	24	60	59	123	71	40	584
1961	61	26	36	83	47	45	33	27	40	26	35	30	489
Total	83	143	234	351	193	269	230	177	306	356	250	242	3,144

b. Government Dispensary

	A Baisakh	M Jeth	J Asar	J Savan	A Bhadra	S Asoj	O Kartik	N Mangsir	D Push	J Magh	F Falgun	M Chait	April Year
1961-62	5	17	3	2	6	3	8	7	3	8	8	7	77
1962-63	1	12	5	11	15	3	12	7	5	15	N.A.	N.D.	143
	6	19	8	13	11	6	10	7	8	13	12	7	120

With the gradual elimination of malaria pestilence, more and more people are settling in the lowland areas.

*Nepal Malaria Eradication Organization (1961/62): 15.

(iii) Education. While surveying the situation of education in the region, one should note one observer's comment less than a century ago: "The subject of schools and colleges in Nepal may be treated as briefly as that of snakes in Ireland. There are none."[27] Even as late as 1949, the only schools in Kāski district were the Sanskrit schools ('pāṭhsālā') which imparted scriptural instructions to the Brahman students. The Sanskrit schools were in keeping with the conservative attitude of the government then in power. In spite of the lack of educational facilities, the Census survey of 1954 showed that Kāski district had a higher literacy percentage than other Gandaki districts and twice that of the national percentage of 4.

Table xxvi

Literacy: Gandaki Region*

	Kāski			Lamjung			Syāngjā			Tanhu			Total		
Age Group	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
5-9	127	10	137	130	17	147	337	31	368	161	24	185	755	82	837
10-14	807	54	861	634	48	682	963	103	1066	558	54	612	2962	259	3221
15-24	2058	74	2132	1361	55	1416	1340	56	1396	1372	71	1443	6131	256	6387
25-44	2646	90	2736	2189	45	2234	1504	163	1667	2110	69	2179	8449	337	8786
over 45	1365	29	1394	1239	12	1251	847	31	878	1305	14	1319	4756	86	4842
Age Unknown	11	1	12	11	2	13	5	1	6	15	1	16	42	5	47
Total	7014	258	7272	5564	179	5743	4996	385	5381	5521	233	5754	23295	1025	24150
Percentage	15.6	0.5	8.0	10.7	0.3	5.5	10.7	0.2	5.5	12.2	0.4	6.3			

	M	F	T
Nepal =	8.3	0.7	4.0
Kāṭhmāṇḍu Valley	27.2	6.0	16.6

*Statistics (1957): 149-150.

In fact Kāski district registered the highest literacy rate outside Kāṭhmāṇḍu Valley.[28] The above literacy rate may be due to the urban influence of Pokhara town and the army-educated Gurkhas. By 1957 the district had two high schools,

27. Wright (1877): 18.

28. Joshi (1957): 51.

three middle schools, and 52 primary schools with a student population of 3,000. Still, the situation presented was "one high school for 188,352 persons, one middle school for 94,176 and one primary school for every 74,059 persons".[29]

At present there is one degree college, four high schools 12 middle schools, and 70 primary schools[30] within Pokhara Valley (Fig. 32, Table xxvii). A survey of four villages shows a considerable increase in literacy percentage.

Table xxvii

Percentage of Literacy*

Village	Male	Female	Total
Bāṭulechaur	55.0	9.8	33.5
Arghoun	38.9	3.7	21.3
Bhalam	49.1	1.2	28.6
Armalā	39.9	2.3	21.8
All villages	45.3	4.7	25.8

Over a quarter of the population in the above villages were literate. Over 52 per cent of the literate are of the child age-group indicating the spread of education as a recent phenomena.

29. Shrestha et al (1957): 74.

30. The Inspector of Schools records 4,522 children attending primary schools in 1962.

*Shrestha (1963): 3-4, Tables 5 and 6.

Chapter Outline

PEOPLE AND CULTURE

ma. Social Groups

i. Tribes and Castes
ii. Language
iii. Religion

b. Culture Areas

i. Tribal
ii. Pahari

c. Culture Contact

i. Diffusion
ii. Assimilation

Chapter VI.

PEOPLE AND CULTURE

The environmental conditions in the region range from the humid plain to the temperate highlands. The differential cultural development between the Mongoloid highlanders and the Europoid lowlanders is also a legacy of the fluctuations of their dominance in the past.* The languages and legends of the highlanders indicate their ancestral homes to be beyond the Himalayas in the north,[1] and antedate the Europoid influx from the south. The Europoid migration to the south slopes of the Himalayas became particularly pronounced following the 12th century Muslim persecution in the plains, and their expansion was mainly eastwards along the corridor of Mahābhart Lekh.[2] In this chapter the tribal and Pahāṛi** culture areas are defined on the basis of race, language, and religion. The evolution of a multi-ethnic society in the region is seen as a product of the interaction between these two societies.

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*The most notable expansive phases were the 7th century 'golden age' of when Srong-btsan-sgam-po extended his empire to the Nepal foothills, and the 12th century domination of West Tibet by the Khasa ruler Prithvimalla of Jumlā. (Tucci, 1956).

1. The Tibetan geography classic Dzam-gling-rgyas-bsad devotes its first regional chapter to Nepal and describes the Ma-kra (Magar) and Gyu-rin (Gurung) tribes. (Wylie, 1962; Nebesky-Wojkotwitz, 1956).

2. According to the Indian Census of 1931, the sub-Himalayan districts Kumāon-Gaṛhwāl coterminous with Nepal has the highest ratio of Brahman population.

**Derived from 'Pahāṛ' - the hill country.

a. Social Groups

In order to avoid the danger of using philological terms in an ethnical sense, the basic culture elements - race, language, religion - that make up a society are discussed separately.

(i) Tribes and Castes. Pokhara region lies in a zone where two ethnic groups impinge. The juxtaposition of the tribal Mongoloids and the caste-stratified Europoids here present a methodological problem in comparison. A suggested solution is to postulate a continuum, "at the one end of which is a society whose political system is entirely of segmentary egalitarian type and which contains no dependents whatsoever; and at the other end of which is a society in which segmentary political relations exist only between a very small proportion of the total society, and most people act in the system in the role of dependents."[3] According to the scheme the people of Pokhara would present the following tribe-caste gradation.

NORTH

Racial Type	Tribe and Caste	Societal Structure
Mongoloid	Bhoṭea	Tibetan
Mongoloid	Thakāli	Tribe
Mongoloid	Tamāng, Gurung, Magar	Tribe
Mongoloid	Newār	Caste
?Europoid	Occupational Castes	Caste
?Europoid	Thakuri	Caste
Europoid	Gharti, Khatri, Chhetri	Caste
Europoid	Brahman	Caste
Europoid	Churāṭe	Mohammedan

SOUTH

3. Bailey (1960):264.

The above scheme, cutting across the status scale, arranges the ethnic/caste groups into the northern Mongoloids and southern Europoids. The racial differences become sharper as one proceeds on either direction of the Occupational Castes. The Bhoṭeas from the extreme northern borderlands are culturally Tibetan while at the southern base, the Churāṭes remain social outcastes as Muslims. The ethnic/caste distribution map (Fig.33) portrays the situation in 1962-63 and in spite of the apparent diffusion it must be emphasized that ethnic solidarity outweighs caste barriers and religious differences.

Mongoloids. The Mongoloids are short to medium in stature, brown in complexion, and thick-set. They are brachycephalic with high cheek-bones, low-bridged nose, and straight black hair. They are represented by the older ethnic groups, Tamāng, Gurung and Magar, occupying contiguous regions in the highlands. The Thakali and Newār are strictly speaking outsiders who have settled in the bazars as traders and craftsmen.

The Gurungs ('Tamon') are the largest tribal group in the region and occupy exclusive areas in the northern highlands. They extend farther west and east joining the Magar and Tamāng tribal areas. They have a long-standing tradition in sheep farming and woollen weaving, and there is also an increasing emphasis towards wet-farming from dry farming. They share the common epithet of beau ideal Gurkhas with the Magars and their martial tradition has led to their wide diffusion.*

*It is suggested that the first Rānā premier, Jang Bahādur, assumed the title of Mahārājā of Kāski and Lamjung "to identify the office with that of a famous fighting people". Cf. Landon (1928), vol.II, p.343.

The Tamāngs ('Murmi') living east of the Gurungs, form the largest tribe in Nepal but occur in minority in the present region. They are usually found living in Gurung villages, withwhom they have close affinities. They are also known as Lāmā* due to the greater influence of Lamaism in their religious practices. The Tamāngs are dry crop cultivators and are skilled in cane-and-bamboo works which they barter for rice. They are less valued as soldiers and instead they contribute the bulk of the hired porters.

The Magars show a greater degree of Hindu influence than other hill tribes owing to the fact that their medieval principalities (Bāra Magarānt) lay on the direct route of the Khasa expansion. In economy also they are more agricultural than other indigenous tribes and have spread in the lowlands. In Pokhara they are found mixed in both Gurung and Khasa villages. The Magars are valued for their military service both in the native and foreign armies.

The Thākālis come from the upper Kāligaṇḍaki valley and show a greater tribal cohesion than their Bhoṭea neighbours. The location of their homeland (Thāk-khola) on a trans-Himalayan trade route has exposed them to outside influences and their religion presents a rapid transition from tribal to Lamaism and to Hinduism. During the winter months, while their men engage in brokerage trade between Tibet and India, the Thakāli women tend inns ('bhaṭṭi') along the main trails of Central Nepal. Their proficiency in the local dialects give the Thakalis an advantage over the Newār traders and being minority new settlers in Pokhara they have a high degree of solidarity.**

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*The term 'Lāmā' is associated with Tibetan contacts even in a secular sense.

**The first Thakāli to settle in Pokhara bazar was one from Tshero in 1846, and in 1962 there were 32 families well-established in town.

The Newārs of Pokhara originally came from Kāṭhmāṇḍu Valley in mid-eighteenth century as craftsmen and traders.* In their own heartland, their early contact with India and Tibet has contributed to their high level of culture with a distinct style in art and architecture. The Newārs have imported their urban tradition in Pokhara where they live in brick-and-tile houses to be found exclusively in the bazārs. They engage in petty trade and monopolise in metal and wood craftsmanship.

Europoids. The Europoids are dolichocephalic and medium to tall in stature. The high nose-bridge, open dark eyes, wavy hair (plentiful on the face), clearly distinguish them from their Mongoloid neighbours. They have no specific area of their own and have spread all over the low hills. Those living in the lower valleys are called the 'Awaliyās' and have a darker complexion. They are socially stratified into a dominant Brahman-Khasa class and a depressed class of artisan castes. It is not known whether the helot castes are derived from an autochthonous people or merely Hindu outcast elements.[4]

The Brahmans are accorded their traditional ritual primacy regardless of whether or not individuals follow a priestly occupation. The immigrant Brahmans must have found ready converts among the tribal barbarians as they were well-established in Central Nepal by the 15th century. Some of them secured royal patronage by inventing Rajput genealogies for the native chiefs and on whom they conferred 'Kshatriyahood.' However, environmental and economic

*Their descendants still hold grant ('Birtā') lands at Kunḍahar and Arghounponwā, awarded by the then Kāski ruler.

4. Berreman (1963):15, remains non-committal following his detailed study of the Khasa and Ḍoms in Gaṛhwāl: "These were probably groups of different ethnic affinities, but they could have been status groups originating from a common source."

exigencies in their country of adoption forced many of them into proletarian farmers. In Pokhara the Brahmans are found on the plain and lower hills in dispersed villages.

The Khasas are a complex caste group with varying degrees of hybridization. They include the progeny of the misalliance between the Europoid immigrants and the native tribal women, as well as tribal people who have adopted Brahmanic ways of life. Their contact with the more numerous tribal groups and their supremacy in political power have tended to generate a feeling of homogeneity and solidarity among these mixed people. At the apex of the Khasa complex are the Ṭhakuris who claim a royal descent. The other Khasa castes are Chhetri, Rānā, Bhanḍāri, Bhaṭṭ, Buṛāthoki and Adhikāri. The Khasas tend to live in dispersed villages in the lowlands, occasionally mixed with Brahmans.

The Churāṭes as Muslims still remain outside the "normal" Pahāṛi society and maintain constant contact with their co-believers in the plains.[5] Their name is derived from their specialization in the trade of bangles ('churā') which they sell as itinerant peddlers. They are centred at Kunḍahar bazar where they have a mosque.

In the Brahmanic caste-system, the service castes are given the lowest status and considered untouchable. The service castes found in the region are Āgri (smelters), Damāi (tailors), Gāine (minstrels), Kāmi (smiths), Kasāin (butchers), Kumāl (potters), Mājhi (boatmen), Poṛe (scavengers), and Sārki (leather-workers). They are endogamous castes having little connection with land. They

5. The Muslims of the western hills of Nepal originally came from Bettiya (in Bihar) at the invitation of an 18th century Tanhu ruler to trade in bangles.

are economically vulnerable to the whims of the higher castes. Their specialization in occupation and competition for patronage tend to scatter them in high-caste villages. The most widely distributed are the Kāmis who make agricultural implements and the Damāis who are employed as tailors and musicians. The potters are found only in one locality south of Arghoupouwā where clay is easily available. The concentration of the minstrel Gāines at Bāṭulechaur may be due to the past royal patronage when Bāṭulechaur was the seat of the Kāski ruler.

(ii) Language. Two linguistic families, Sino-Tibetan and Indo-Aryan, confront in the present region. The striking features are the multiplication of Sino-Tibetan Bodic dialects due to geographic isolation and the dominance of Indo-Aryan Nepāli language due to the political influence of its speakers.

The Bodic group is represented by Thakāli, Gurung, Tamāng, Magar, and Newār dialects of which the last alone has its own script. The Thakāli dialect is closely related to the language spoken in Western Tibet, which in itself shows a progressive phonetic degeneration of classical Tibetan westwards. Gurung and Tamāng dialects also preserve certain archaic aspects of the old Tibetan language. Magar dialect being more exposed to the southern influences has been greatly corrupted by Nepāli, as for example in the use of suffixes.[6] Newāri with a literary tradition since 14th century is similarly profuse with Sanskritic loan-words.

The Bodic dialects are monosyllabic in structure, and make use of word-order and tones to distinguish meanings. Because of their monosyllabic basis, they are peculiarly liable to change. In addition to this fundamental variability,

6. Beames (1870):188.

the comparative isolation of the montane tribal areas tend to encourage formation of local dialects from tribe to tribe and even within a single tribe speaking the same mother-tongue but living apart.

'Nepāli' is a recent nationalistic label given to a language long known as Pahāṛi or Parbatiyā (hill speech), Khaskurā (language of the Khasas), and Gurkhāli (language of the Gorkha rulers). As an eastern extension of the Pahāṛi language group it is closely related to the Kumāon dialects.[7] It is believed that Pahāṛi language had reached Nepal even before the 6th century though its active development followed the expansion of the Hindu rulers of Nepal after the mid-18th century.

Nepali is derived from the Indo-Aryan family and many details of its grammatical structure and much of its vocabulary is identical with that of Sanskrit. The alphabet employed is Nāgari with variations in nasalization, which perhaps came from the south-west between 12th and 15th centuries.

The words are simple and the vocabulary has been enriched by the incorporation of loan-words both from Hindustāni and Bodic sources. Originally a court language of the Khasa rulers, it now forms the <u>lingua franca</u> of the Nepalese at home and abroad. It is the State language and all official transactions are carried out in it.

Compared to the fissiparity of the Bodic dialects, Nepāli is a homogenous speech strengthened by political patronage. The tribal people with their own Bodic mother-tongue also have to speak Nepāli in order to communicate with those outside their linguistic group. The appeal of Nepāli is both of practice and of prestige which a cultivated language

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7. Turner (1931):xiii.

confers. In effect, Nepāli as a medium of communication between diverse people has helped in unifying the country as a nation.

(iii) Religion. Lamaism in the tribal highlands and Brahmanism in the lowlands represent two converging religious realms. However, Brahmanistic Hinduism as practised here is as divorced from Sanskritic stipulations as is Lamaism from classical Buddhism, since the orthodox doctrines have been adapted to local conditions. The distinctions in denomination are not with reference to their creedal context but according to the priesthood criteria.

If religion is defined as a set of beliefs and practices regarding the supernatural, one finds ancestor-worship for patronage, spirit-worship motivated by fear, fetishism in after-life, overt reliance on shamans, etc., common to believers of both faiths. Lamaism or Brahmanism* may claim their ulterior allegiances but "the old, anonymous gods of animist-shamanist era have remained alive in the minds of the common people".[8]

The influence of higher religions rests even lighter in the tribal areas because raw nature perpetuates occult beliefs and also Lamaism is dying of atrophy. Lamas do perform religious functions in tribal areas but it is the sorcerer/medium ('Jhānkris') who regulate the life of the laity. Incantations based on oral traditions, animal

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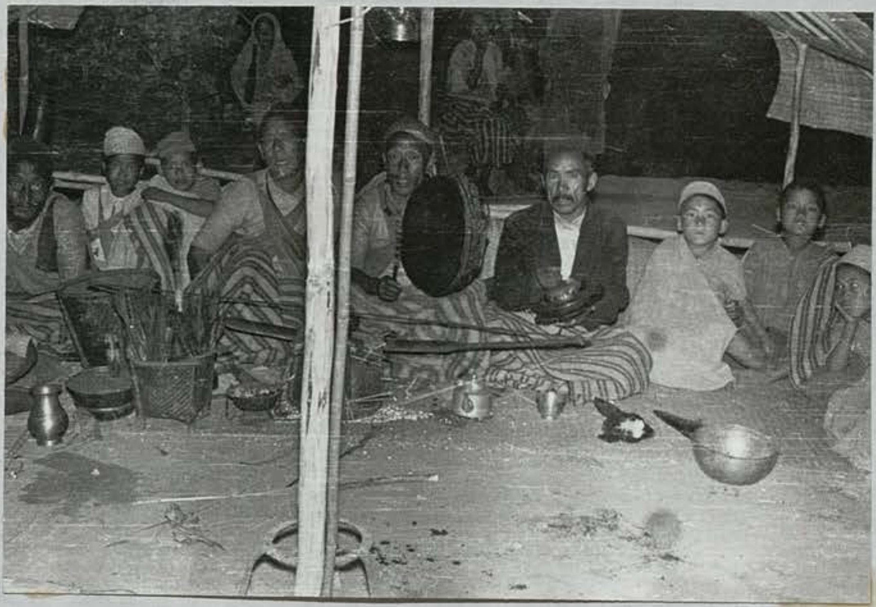
*If the majority claim to be Hindus, it is because Hinduism happens to be the State religion.

8. Hoffman (1961):101.



XL. Tribal Ritual. At the new year in April, the Gurungs have a ceremony (dev-lava) when a bow and arrows are consecrated by the 'Jhānkri' shamans. This probably marks their old tradition as a hunter community. See p.113.

XLI. Hindu Festival in Pokhara Bazar when ropes of grass decorated with flowers are strung across the streams to guide the spirits. See p.115, p.145.

sacrifices, elaborate death rites, sanctity of juniper, all suggest shamanistic elements in the tribal rituals.[9] (Pl.XL)

Underlying the shallow veneer of Lamaism and Brahmânism, the following features "produce direct effects in the landscape, and indirectly essential for deeper understanding of the religious development of the higher religions as a whole and many of their individual aspects.[10] The cult of mountain veneration is marked here by the unapproachability of the deity. Among the many peaks of Annapurṇa ('the giver of food') the pyramidal Māchhāpuchhre ('Fish's Tail') is greatly revered. Stones of distinctive shape are propitiated with the blood of sacrificial animals. The impressive size of an isolated boulder perched on the plain north of Pokhara town, is also an object of worship as 'Bhim-ḍhungā'.* In the highlands large rocks are associated with the spirit of the Tsen, and passes and summits are marked with cairns of stones.

Springs are sacred places. The seasonal springs of Dhor (south of Pokhara) and the hot spring of Tatopani (north-west of Pokhara) draw pilgrims from afar. Similarly, lakes are sacred and to take scientific soundings is sacrilegious! Bathing in Seti river during fairs is washing ones sins. To the Lamaists lakes and rivers are the domain of 'klu' spirits. Hindus cultivate 'tulsi' (Ocimum var.) as sacred plants and the Lamaists use juniper smoke to drive away evil spirits. Planting of shade trees, particularly pipal and banyan, is an act to gain merit. Sacred ropes

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9. Kawakita (1963):38 calls this indigenous religion 'Jhānkrism' and suggests its relation with the Bon-po religion of ancient Tibet.

10. Fickeler (1962):95.

*Associated with the Indian Hercules, Bhima of the Mahābhārat epic.

made of grass and bamboo strips are hung over streams to guide the benevelent spirits. (Pl.XLI) Forests are abodes of the wild shaman ('banjhānkri') and 'Dui' spirits.

The red colour is the symbol of sun and gold, and the lowland houses are plastered with red laterites. The Hindu shrines fly red pennants and Brahman women prefer scarlet dresses. In the highlands above the lateritic zone, white supersedes red in sacredness and the houses are white-washed with clay. White is the symbol of supermundane and celestial, the absolute and pure. The deceased are carried to the grave-yard wrapped in a white sheet. Among the ceremonial sounds, conch-blowing is primarily Hinduistic associated with the sea and the plain. The rhythmic sound of 'dhyāngro' (one-faced drum) and the weird wail of 'mirkāng' (thigh bone) symbolise the Jhākri and Lama realms.

Elaborate temples are more numerous on the plain lacking in topographic salients (Fig. 34). On the hills each hill top has a modest shrine. Some of these, known as 'koṭs', are marked for animal sacrifices during April and October. The Hindu temples house images of worship, the chortens of tribal areas are reliquaries to protect the village from evil spirits.

The comparative late origin of the Hindu temples contrasted with the antiquity of native shrines however crude, point to the later development of Hinduism in the region. There is also a Muslim mosque at Kunḍahar built by the Churāṭes living there (Fig. 34). The mosque has no relevance outside the churate minority. The latest new intrusion is Christianity, brought in by the missionaries, with their church at Rāmghāṭ. The local attitude towards the Muslim Churāṭes and the Christian converts is not of antagonism but one of indifference.

b. Culture Areas

The evaluation of relative correspondences of the basic culture* elements provide here two culture areas (Fig.34). The ethnic, linguistic, and Lamaistic features align the tribal highlands with the Tibetan sphere of influence, and the sub-montane Kachhāṛ fall within the Hindu realm. The boundary-line between the two 'culture worlds' does not coincide with the crest-line of the High Himal but descends on the south slope with recessions along the trans-Himalayan gorges. In low-lying Pokhara Valley where Hinduistic Pahāṛi culture has made a deep northerly intrusion the tribal-Pahāṛi contact line runs at the altitudinal level of 5,000 feet.

Apart from terrain and social contrasts, the two culture areas also differ in the extent of forests, to the preservation and destruction of which native attitudes greatly contribute. Forests are more extensive in the tribal highlands where people live in symbiotic relationship with the forests. On the other hand, the dread of forests among the Hindu Pahāṛis and the primacy of agriculture has led to large-scale deforestation in the lowlands.

(i) Tribal Culture. The highlands of Pokhara form a part of the Gurung tribal area extending from Modi valley to Buṛigaṇḍaki valley (Fig.3), and the regional validity of this tribal area is substantiated by Gurung place-names (Table XXVIII).

*Culture is defined here as "the way of life of a group of people, the configuration of all the more or less stereotyped patterns of learned behaviour which are handed down from one generation to the next through means of language or imitation". Barnouw (1963):5.

The Gurung region exemplifies a cultural drift from the Tibetan culture world as the traditions, language, and pastoralism of the Gurungs point to their Tibetan origin. In spite of physical isolation with the Bhotea (Tibetan) region, Gurung villages have Lamaistic symbols such as chörten (reliquary), 'kāni' (village gateway), 'tarchho' (religious flag), and some link maintained through the Lamas and Jhankris who graduate from Manangbhot.

The influence of the Himalaya in differentiating one ethnic group into culture variants is seen among the Gurungs.[11] The Gurungs living north of the Himalaya lead a Bhotea way of life* while those settled south of their tribal area evince Brahmanic overtones and compete for paddy land with their Khasa-Bāhun** neighbours. The southward migration of the Gurungs, mainly through Marsyāndi valley, must have been fairly early as their tribal economy is well-adapted to the new habitat. They practice transhumance (in sheep) up to the snow-line, grow dry crops near nucleated villages and wet crops in the valley bottom. The hardy environment

11. Kawakita (1957):215, quotes a Gurung from Bragā (Manāngbhoṭ): "Long ago the people in our northern valley were being harassed by robbers [invaders] who came from the southern mountain [Annapurna Himal]. At the time there was a Lama in our northern valley, who by some device made it impossible for the robbers [invaders] to cross the mountains. By the same token, we were unable to get out. Hence, though we are all Gurungs, our customs differ on opposite side of the mountains."

*Prototype of the Bhotea Magars north of Dhaulāgiri (Snellgrove, 1961 p.36; Tucci, 1956, p.37) and Bhotea Tamāngs of East Nepal (Fürer-Haimendorf, 1956).

**Khasa-Bāhun is the collective term used by the Mongoloids to describe the Khasas and Brahmans.

and the cohesive social system provides a background to their martial exploits. Their long-standing mercenary tradition has helped to maintain a fairly high standard of living.

(ii) <u>Pahāṛi Culture</u>. Pahāṛi culture is an ecological adaptation of Hindu culture to a hilly environment.[12] Unlike the tribal groups arranged in exogamous patrilineal clans, the Pahari population is a complex of diverse castes derived from different sources - functional, hybridization, incorporation of broken tribes, etc. The dominant Khas-Bāhun, depressed service castes, and Hinduised tribal elements live in occupational interdependence.

The average altitude of Khas-Bāhun settlement in Pokhara is at 3,500 feet and absolute limits rarely exceed the 5,000 feet level.* The settlement pattern is dispersed on the plain and partly nucleated on the hills, with red-plastered houses as the distinctive feature of the Pahāṛi culture area. The service castes live in segregated quarters near the main villages.

Forest resources are lacking and agriculture with some livestock is the principal occupation. The emphasis is on paddy growing. The Khasa alone follow military profession and dominate the native army as officers though they constitute only 10 per cent serving outside the country in the Gurkha regiments.

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12. Berreman (1963):344-351.

*The highest Brahman village occurs at Taprāng in Mādi valley at an altitude of 5,200 feet.

c. Culture Contact.

In recognizing the relativity of cultures for comparison, the contending tribal and Pahāṛi cultures reveal varying degrees of diffusion and assimilation.

(i) Diffusion. If the comparatively lenient attitude of the Pahāṛi Hindus "seems to conform to a moral climate prevalent among most of the Tibeto-Burman speaking populations",[13] the tribal people themselves have not been immune to the Brahmanic concept of social stratification. The portentious status differentiations among the otherwise egalitarian tribal society were inspired mainly by the State advocacy of Hinduism.* Even whole tribes were incorporated as castes within the hierarchical Hindu society: the Mongoloids categorized as 'Unclean Castes'. This also encouraged the imitation of Brahmanic ways of life in order to gain status favour in the eyes of the Hindu rulers.

The process of transition from tribe to caste has led to the gradual erosion of the indigenous tribal culture to which the physical isolation of its montane habitat provides the last prop. But Pahāṛi culture has made inroads even in the tribal culture areas through the agency of the Gurkha** soldiers who lead a stereotyped life in the army. The influence of the Gurkhas that has long provided the only source of external contact is best observed in the

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13. Fürer-Haimendorf (1960):18.

*The Newārs early exposed to Brahmanism, for example, adopted a caste-system so elaborate that even land surveyors (Kshetrakāra') were given a separate caste status. Cf. Petech, 1958, p.180.

**The term 'Gurkha' is not limited to any particular caste or tribe. Originally it referred to the soldiers in the service of the rulers of Gorkha, and now may be defined as Nepalese mercenary soldiers.

XLII. Gurkha Recruits. Medical examination of new recruits at Pokhara during the Sino-Indian conflict in November 1962. A retired Gurkha (on the right) acts as an agent on commission for bringing young men from remote areas.
See p.107, p.120.

XLIIIL. Gurkha Pensioners. Two pension camps at Pokhara distribute pensions to the Gurkhas living in four districts surrounding Pokhara. During the slack season in winter the influx of pensioners boosts the business in town.
See p.120, p.144.

progressive 'Sanskritization' of the fold traditions.* In the sphere of language, Nepāli the mother-tongue of the ruling castes, has tended to oust all the various disjunct Bodic dialects.

(ii) Assimilation. The evolution of the Nepalese society is the outcome of the mixing of diverse peoples within a geographic confinement enclosed by the High Himal and the Mahābhārat Lekh. The over-all expansion of the Pahāṛi culture is a story of the last two centuries, but much more older and potent process has been the synthesis of a native Nepalese culture imbued with certain attributes of both Indian and Tibetan cultures.[14] The emergence of the martial Gurkhas, who once over-ran the Himalayas from the Sutlej to the Teesta was a product of this multi-ethnic society. The Gurkha would not be a by-word for gallantry** if he had not a bit of the primitive and intelligence in him. (Pl.XLII)

Acculturation is most intense in the intermediate low hills where the downward tribal and upward Hindu population movements impinge. Another point of assimilation are the commercial settlements ('bazārs') which act as a melting-pot for the different ethnic and caste groups. It is in the bazārs that the settlers loose the 'schism of the soul' for their native habitats and are being turned into an urban milieu.

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*Cf. Baké (1959).

14. Kaufmann (1962):112, "Nepalese folk songs, just like the people who sing them, represent a fusion of styles of the two bordering cultures; India contributes its complex scales, its melodic and rhythmic patterns, and Tibet, its pentatonic scales, the sustained notes, and the strict duple (or common) meter of its folk music".

**Sir Ian Hamilton, Gallipoli Diary, 1915, London, 1930, p.33: ".... each little Gurkha might be worth his full weight in gold at Gallipoli."

Chapter Outline

SETTLEMENT PATTERN

a. Location Factors

i. Physical
ii. Cultural

b. Settlement Types

i. Loosely-clustered
ii. Nucleated
iii. Bazar

c. House Types

i. Rural Variation
ii. Bazar style and sequence
iii. The 'Kot'

d. Pokhara Town

i. Situation and site
ii. Historical growth
iii. Morphology
iv. Centrality

Chapter VII

SETTLEMENT PATTERN

The areal distinction between the physiographic units and culture areas may be examined by a comparative study of settlements. The frequency of houses and villages are noted along with their locations. Settlement types are classified at two levels; dispersal and concentration as well as rural and urban. House types are described as rural variations in space, and urban sequence in time. 'Koṭs' are treated as the dominant cultural features in the landscape. The final section on Pokhara town defines the site, growth and morphology of the most important town in Central Nepal.

a. Location Factors

The density of villages in the region is 2 per square mile and that of houses 91 per square mile (Table xxix). The average within each thum is 10 for villages and 500 for houses. Among the determinants of settlement, topographic and water supply are more discernible than either climatic or cultural factors.

(i) Physical Factors. The site of 366 villages including bazars are summarized in the profile diagram (Fig. 36), along with some highland villages inserted on the right-hand margin for comparison. About 80 per cent of the villages are located on the hills and 71 per cent of the total face south. The predominance of the 'adret' (sunny aspect) settlements is due both to the preference for sunny sites and the areal extensiveness of the south-facing gentle slopes. Some 8 per cent of the villages are perched on hill-tops and straddled along the ridges. The plain which covers 27 per cent of the region area, supports only 15 per cent of the settlements. This clearly implies that for habitation the hills are preferred to the plains. The settlement net is particularly high above 3,000 feet and below 5,000 feet. The lower levels are avoided for their debilitating climate, malarial scourge, and the need to keep them for paddy. The higher level is limited by steep slopes, dense forests and colder climate.[1] The intermediate level has a favourable weather condition and provides optimal conditions for agriculture.

Most villages face the problem of water supply and during the dry season women-folk traverse long distances to collect drinking water. Water supply problem ceases in the hills during the monsoon when springs become plentiful. But on the outwash plain the water shortage is a permanent feature except where piped water is available. The original pipe system of 1921 providing 24 water taps in Pokhara town has been used to its optimum by later extensions to the neighbouring villages (Fig. 38b). A new scheme proposes to tap the waters of Bhoṭe Kholā four miles north of Pokhara to supplement the needs of the growing settlement on the plain. Provision of piped-water and the construction of canals has led to the growth of settlements on the plain.

(ii) Cultural Factors. The preference of higher ground for habitation by the tribal Mongoloids has been an important influence in raising the settlement level. Whatever the ethnic traditions, the basic principle in a subsistence economy demands that villages be so sited as to exploit the natural resources more advantageously. Thus the highest villages show a combination of pastoral and farming economy. Hill villages situated above the arable land and below the pastures, and close to forests are better endowed than the

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1. The upper limit of permanent settlement is 7,200 feet on the south slopes of Annapurṇa Himāl; much lower than those in the Everest region, (14,000 feet) and north of Dhaulāgiri (15,000 feet).

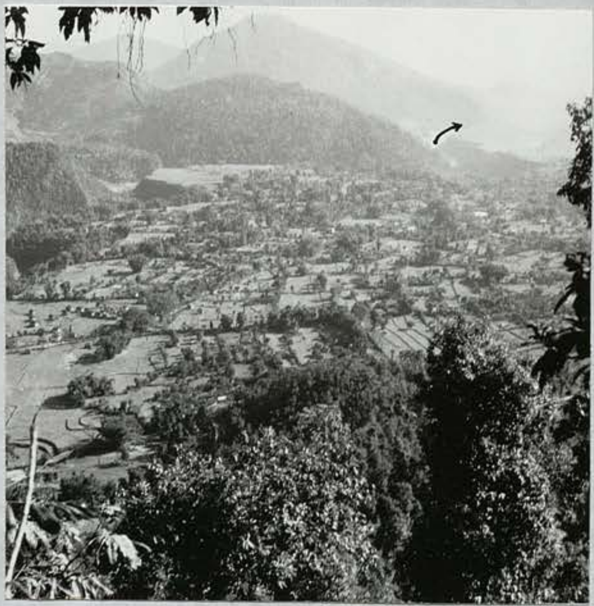
plain villages. But the habitability of the plain with recent malaria control as well as the increase in exchange economy has led to the shift of emphasis for settlement to the lower valleys. In the evolutionary stages of 'settlement series', the descent to the low-lying fields has been succeeded by the development of bazars. Many roadside 'chautārās' (rest-places) shaded with trees have become the nuclei of new bazars and already existant bazars have grown in size with increasing diversity in functions.

b. Settlement Types

The physical distance between settlements increases with altitude as the rugged topography of the hills tends to disperse settlements. But the highland houses are more close-packed than on the plain. The chief settlement types are the loosely clustered, the nucleated, and the linear bazars. Isolated hamlets found both on the plain and hills are too few to rank a separate type.

(i) Loosely clustered settlements. (Pl.XLIV) The average distance between plain villages is less than one mile but the houses are detached, each enclosed by fields. The farm units are tied to their work-place and have less,communal restraint. The only link between houses are narrow defiles lined by boulder fences, leading to the nearest 'chautārā' where village councils and schools meet (Fig.37b). This is typical of the plain Brahmin and Khas villages.

The loose clustering also occurs on lower hills where the slopes are gentler. Increasing clustering induced by topographic situation is exemplified by Begnās and Pachbhaũyā (Fig.37d). On the higher but gentler sloped Begnās ridge the groups of houses are spread widely. The steep north slope has been left forested. On the lower but steeper Pachbhaũyā ridge the settlements are perched separately on the branching spurs. The largest nucleas occurs in the centre with a 'koṭ', and the radiating spurs each



XLIV. Loosely-clustered. The plain villages are loosely-clustered with each house attached to its fenced fields. Bāṭulechaur in the picture is mainly a Brahman village with an emphasis on orange growing. See p.124, p.133.

XLV. Clustered. Clustering of houses increases on the hills. The houses include both rectangular and elliptical types. Some stacks of paddy-straw on stilts can also be seen. An annual fair is held at the point marked by a shade tree and a temple on the valley bottom. See p.124, p.128.

have a hamlet based on ethnic/caste grouping. Clockwise, (1) Upallogāon has Gurung and Kāmi; (2) Simledānṛā has Gurung, Kāmi, and Sārki; (3) Thāḍikhoriyā has Brahman only; (4) Khanālthumkā has Brahman and Kāmi; (5) Pallo Thapāthar has Brahman, Chhetri and Gharti; and the central (6) Thapāthar village is primarily of Chhetri and Brahman. One notes that occupational castes Kāmi and Sārki occur both in Gurung (Mongoloid) and Brahman-Chhetri (Europoid) villages. Physical distance here expresses social difference. With the increase in altitude physical limitations increase and social differences decrease, and one finds original tribal units preserved in the highlands.

(ii) Nucleated settlements. (Pl. XLVI) The increase of nucleation with altitude can be seen on Kāhun hill (Fig. 37a). The loosely clustered settlement ascends up to 4,200 feet and above this the houses are clustered below Kāhunkoṭ (4,736 feet). The original settlement of the locality dates back to the time when some Gurungs of Armalākoṭ were settled here for the defence of the 'koṭ'. The settlers have succeeded in imposing their traditional nucleated form and to this other castes have subsequently joined.

Nucleated settlements are typical of the tribal highlands, particularly among the Gurungs, who 'live in sizable villages, the biggest in the whole of Nepal'.[2] The nucleated villages are separated by steep slopes, deep ravines, and extensive forests, but within each nucleas there is greater cultural cohesion. They are patri-clan settlements, a manifestation of a people's tendency to live in familial and kinship

2. Hagen (1961): 68.

XLVI. Nucleated Settlement. Siklis, a Gurung village in Madi valley has about 500 houses administered by nine headmen. The village is sited on a convex slope between two streams which run 25 water mills.
See p.126, p.128.

XLVII. Bamboo Baskets and mats of various shapes and sizes are made from fine bamboo splits. The one on the left(incomplete) is used as a rucksack by the shepherds.
See p.74, p.165.

XLVIII. Wooden Utensils. Water-powered lathes are used to make household utensils from wood. The bamboo cylinder on the right is for churning milk.
See p.73, 165.

groups.* The antiquity of these settlements can be gauged from the extensive burial-grounds near the villages.

The nucleated villages are located on hill-tops commanding a view over the fields, on saddles where tracks meet, and above the convexity of the slope. The tendency of building on steeper slopes for sparing the gentler slopes for tillage, is fraught with danger of landslides, and the villages erect 'chörtens' (cairns) supposed to safeguard from this danger. The shape of the settlement is compact with intricate lanes, approaching the Tyrolian saying, "here hens have to walk on crampons and the cocks use Alpine poles."[3] There is no apparent plan in the arrangement of buildings though many houses lie parallel to the contour for valley ventilation or sunshine (Pl. XLVI). The back gardens are small or absent, but small courtyards provide space for drying grains and setting the loom (Pl. LXXXI). The building space is put to optimal use in the main village, with barn-houses in the valley-bottom and herdsman's chalet on the alps. On the ridge-tops, the houses follow the ridge alignment and assume a linear pattern (Fig. 37e).

(iii) <u>Bazār Settlements</u>. Settlement types must be distinguished both in form and function. If the highland villages represent the primary nucleation of tribal settlements and the plain hamlets represent secondary dispersal with an agricultural base, the growth of bazars with exchange economy represent the tertiary development. There is no

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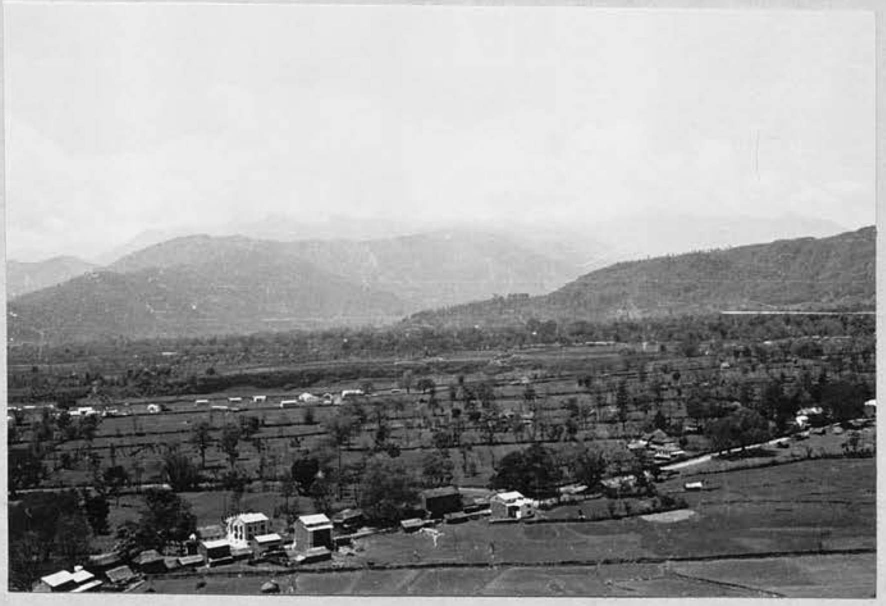
F. v. *Richtofen remarks on the loess country villages of China: ".... they are groups of families united by common descent, or at least having rites in common, who cleave to one another because of the necessity - or advantage - for cooperating in the cultivation of the same crop." <u>China</u>, Vol. II (1882): 680.

3. Peattie (1936): 163.



XLIX. Bazār Settlement. The bazārs are aligned along the roads and the well-built houses are primarily of recent origin. See p.127.

L. Site of Pokhara Town, as seen west from Kāhun Hill. The northern end of the town is marked by clump of trees on the highest terrace. Sarānkoṭ Ridge continues westward to the dominating summit of Kāskikoṭ (5,867 ft), north of which Yāngdi Kholā joins the Seti river. See p.132½

universally clear distinction between villages and bazārs. Size is no indicator as most bazārs are insignificant compared to some rural villages. Shape too does not distinguish them as the predominant linear pattern of the bazārs is found in spur-orientated villages. If population were made the criteria many villages such as Bāṭulechaur with 3,380 persons and Armalā with 5,650 persons would pass off as 'agro-towns'. Conversely, the continuation of agricultural pursuits in the bazārs make them 'urban villages'. Even central Pokhara town has 1,668 cattle to 3,295 persons, a ratio of 1:2. The urban index used in this study is the predominance of retail shops. Rural affiliations may still exert an influence in the bazārs, but they all provide commercial services absent in rural villages.

All the bazārs are confined to the roads, on the plain. There is no well-developed "hubbed" form, the rallying point being the shaded 'chautārā s'. The houses with street-level shops line the roads and subsequent growth takes place not laterally but in the spaces between old houses (Pl. XLIX). The bazārs range from small-size (less than 10 shops) to medium-size (10-50 shops) and large-size such as Pokhara town. Their hierarchical ranking decreases with the increase of distance from metropolitan Pokhara (Fig. 35). The space relationship of the bazārs rests lightly on their immediate neighbourhood. The volume of pedestrian traffic influence their frequency: all but one align the busier Pokhara-Kāṭhmāṇḍu route. The bazārs nearer to the metropolitan town have grown rapidly because of the cheaper and faster distribution of goods, Pokhara being the main source of retail items.

c. <u>House Types</u>.

Differences in dwelling forms occur locally due to the ethnic principles of imitation, and regionally due to the accessibility of materials. Local affluence and waves of innovation cut across these limitations, causing incongruity by diffusion. For example, some well-ordered house arrangements found in hill villages were explained as some ex-soldiers' attempt to emulate the lay-out of regimental quarters. House types differ in rural areas from the lowland to the highland. In the bazars the differentiation is less from locality to locality but there is successive developments within a particular locality. The bazar houses present multiplicity of architectural styles.

(i) Rural Variations. The rural houses are predominantly of stone with wooden and bamboo framework. In ground plan the simple rectilinear form is the most common (Fig. 41b). An interesting variant is the elliptical house with a rough circular ground-plan and semicircular verandah (Fig. 41a). One such house in Chhinedānṛā, built 35 years ago, had a 100-feet base circumference and 20-feet height to the crest. They have a primitive appearance, being confined to poorer or orthodox residents, and were commoner in the past.

The stone walls are made of boulders on the plain and quarried slabs in the hills. The stone-work is plastered with mud and clay the exterior colour depending on the locality. There is an obvious contrast between the red-ochre of houses in the lowlands and the white-washed of those in the highlands (Plates LI, LII). The altitudinal level of the red-coloured houses corresponds roughly with the level of laterization and settlements of the Hinduistic people to whom red colour has a sacred significance.

The roof material is exclusively thatch in the lowland villages (Pl. LII). In the highlands both thatch and slate are used and the dominance of slate-roofed houses suggest either their proximity to quarries or their owner's affluence for acquiring slates from afar (Pl. XLVI). The thatch is held by split-bamboo lathings and are replenished with fresh thatch-grass every three or four years. The slates do not require such periodic maintenance and also are less exposed to fire. To

LI. Highland House. The Gurung houses in the highlands are two-storied usually roofed with slate. It is white-washed with clay and the brass jars in the verandah exhibit the affluence of the owner. See p.129.

LII. Lowland House. Rural houses in the lowlands are thatched and have two stories. It is invariably plastered with red earths. In front is the vegetable garden with orange trees. The baby-cradle is hung in the verandah. See p.115, p.128.

maintain rapid run-off the thatch roofs are steeper than those of slate.

All houses, except those of the poorest, are double-storied with projecting eaves at the top and a verandah raised two feet above the ground-level. The verandah fronts south both for summer ventilation and winter sunshine and it acts as an outer sitting room where rectangular ('gundri') and circular ('chakaṭi') mats of paddy and maize straw are provided. The mats are superseded by woollen blankets in the highlands. The hearth is placed on the ground-floor living room. The first-floor is reached by a wooden stair-case made of beams with notched steps. This floor is used for storing food-grains in circular mattings ('bhakāri') and household goods in wooden chests. The smoke from below keeps the grains dry and discourages termites from destroying the wood structure. The highland houses have trellised windows, and balustrades, door-frames, and pillars are carved (Pl. LI).

Agricultural implements are stored in the first-floor of the out-house ('dhansār'), the lower of which is used for keeping the stall-fed bullocks and milking buffalo. Except for the brass and copper wares from the towns, most of the household utilities are locally made. There is little use of earthen pots in the highlands, instead most utility goods are of wood, bamboo trunk and wooven bamboo (Plates XLVII, XLVIII).

(ii) Bazar Styles and Sequence. Bazar houses range from make-shift wattle huts to most ornate brick structures. A detailed analysis of 480 houses of Pokhara town give the following characteristics. The predominant building material is brick (57%), and stone buildings account for 34 per cent. About 2 per cent have stone base and brick-finished walls. The rest are made of wattle, wood, bamboo, and tin sheets (Fig. 42a).

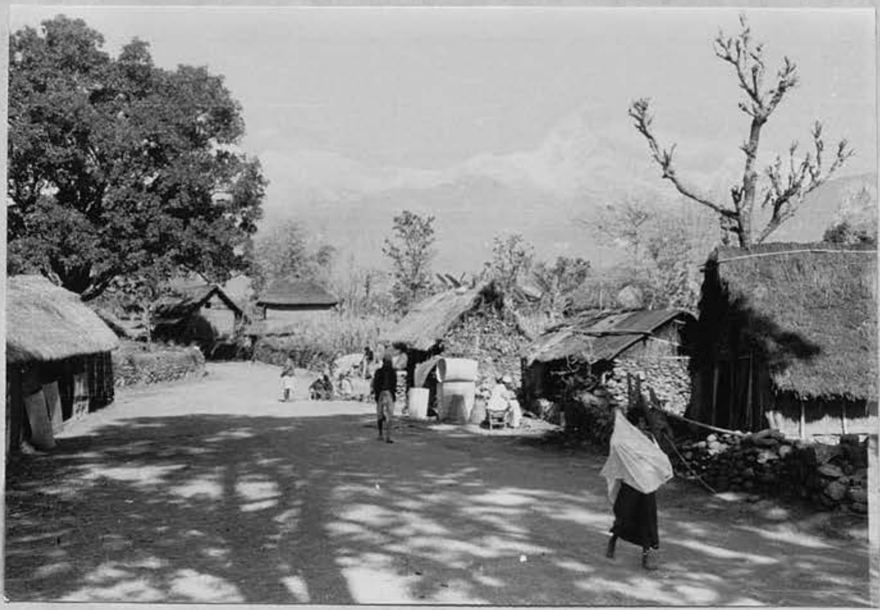
The biggest group of houses (37%) have corrugated tin roofs, and 24 per cent have slate roofs. The slate is imported from 12 miles north of the town and tin-sheets from India. A quarter of the houses are thatched. Six per cent have combinations of tin, slate, and thatch, the most common being tin and slate, (Fig. 42b).

Eighteen per cent of the houses are four-storied, 33 per cent three-storied, 25 per cent two-storied, and less than a quarter are single-storey huts. (Fig 42c). The tallest building in town is five-storied and stands 33 feet high above the street level (Pl. LVIII).

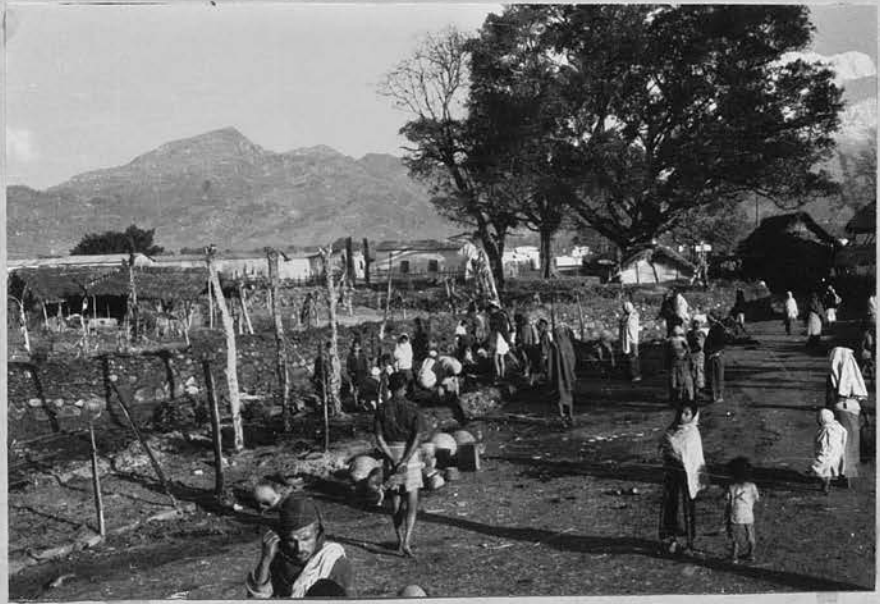
The typical bazar house is a three-storied brick structure with tin roof. In sequence the oldest are the brick-and-tile houses associated with the first immigrant Newars. Their architectural style with trellised windows and over-hanging eaves is reminiscent of the Kathmandu houses. The temples likewise have pagoda style tiered roofs (Pl. LIX). Tile roofing is preserved only in the oldest buildings. These have been replaced partly or wholly by slate or tin.

Occasional fires in the bazārs has led to the greater emphasis being given to the more durable tin for roofing instead of the incendiary thatch and the heavy slate. The evolution of roof-types from thatch to tile or slate and thence tin applies only to the 'pucca' houses with solid foundations. The sequence is different in the case of the rudimentary huts. Plate LIII shows some thatched huts at Rāmghāṭ. The nearest four huts were built in 1959 as small shops. Plate LIV shows the left-hand section of the previous place after fire. The stark wooden poles are the only indicators left of the shop. Only a week later the burnt down houses rose like a phoenix (Pl. LV). However, the thatch roof has been replaced by mats of split bamboo. The mats are easier to put up, and mark the simplest and latest houses in the bazars.

BUILDING SEQUENCE



LIII. Before the Fire.
A newly-established bazar at Ramghat composed mainly of thatched huts.
See p.77, p.130.



LIV. Destroyed by Fire.
A fire in April 1963 destroyed the hut on the left and three on the right. See p.130.

LV. After the Fire, the huts were rebuilt but instead of thatch 'chitra' (bamboo mats) were used. 'Chitra' comes handy for improvising shelters and are later replaced by thatch. See p.130.

(iii) The 'Kots'. Most of the hill-tops have some stone structures locally known as 'koṭ'. (Fig. 34) Some are mere stone edifices now overgrown with vegetation (Pl. LVI). The 'koṭ' on Nuwākoṭ ridge has a well laid out quadrate-cross plan (Fig. 41d), and the one at Sarānkoṭ has a four feet high stone enclosure, thirty feet wide and fifty feet long. Usually the old site is marked by a primitive shrine encircled by dry ditches. Some of them still preserve archaic artefacts such as rotary-querns and stone benches (Pl. LXVI). The 'koṭs' probably represent the earliest form of surviving settlement. They are well-sighted for their defensive situation and point to the turmoil of the past when tribal warfares were frequent. The liquidation of small chiefships with the rise to power of the Gorkha kings in the 16th century led to the decline of these medieval fortresses.

But they still retain their importance as the seat of local deities. The 'koṭs' now have a central square (kaṭāngini') where animals are sacrificed during 'Chaite Dasāin' in April and the big 'Dasāin' in October. In many cases the 'koṭ' sites are now chosen for schools thus imparting the 'koṭs' central functions which they once held (Pl. LVII).

d. Pokhara Town

Pokhara bazar has been indiscriminately described as a village,[4] a town, and even a city.[5] Kawakita visiting it in 1953 was non-committal but more geographical in referring to it as a "large-size commercial settlement."[6] Since 'city' seems

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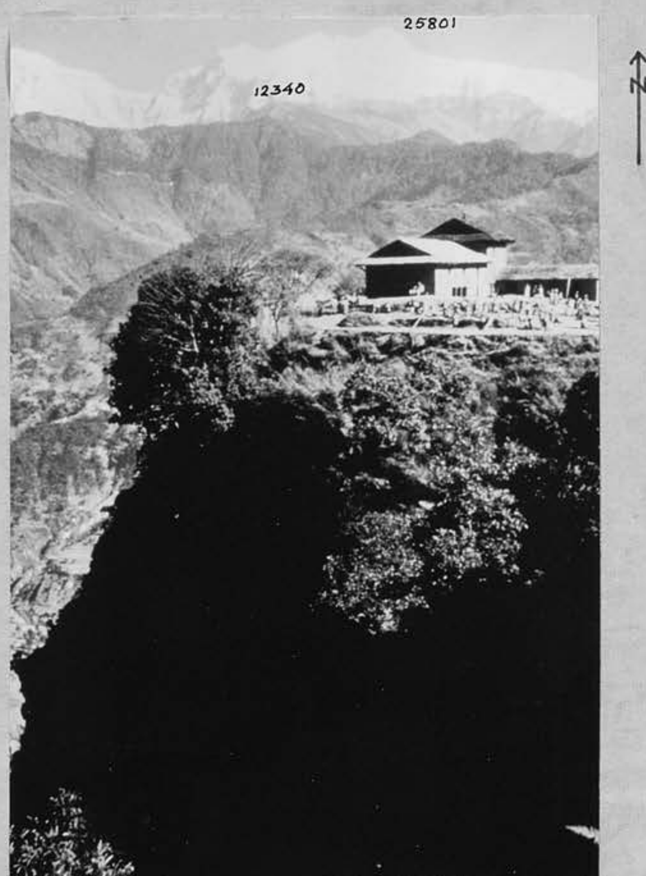
4. Noyce (1958): 38, found it "a big village of characteristic brick and mortar".

5. Oldfield (1880) Vol. I: 160 called it a "large, well-inhabited capital city."

6. Kawakita (1957): 46.

LVI. Nuwākoṭ. The old fortress of Nuwākoṭ (5,034 ft) now is in ruins overgrown with vegetation. The ground-plan is shown in Fig. 41d. It was from here that the Shāh rulers of Nepal swept eastwards to Gorkhā and Kāṭhmāṇḍu. See p.131.



LVII. Lamjung-durbār 'koṭ' in Marsyāndi valley is in a better shape and now houses a high school. The snow range is Himālchuli (25,801 ft) and Pls. LXXVIII and ~~LXXVIII~~ LXXIX were taken on the highlands in the middle distance. see p.131.

too ambitious an appellation, the present study defines Pokhara as a town befitting a principal settlement with pronounced population concentration and long-established urban character.

(i) Situation and Site. The trans-Himalayan trade route linking Buṭwal in the plains and Ṭukche in upper Kāligaṇḍaki valley passes through Pokhara town (Fig. 2). Pokhara is also an important staging-point on the main east-west route connecting Kāṭhmāṇḍu with the outlying western districts.[7] The intersection of these two arterial routes at Pokhara, contributes nodality to the town.

The town itself is situated at a narrow gap between the hills of Sarānkoṭ and Kāhun (Pl. L and Fig. 38a). North of the town, the narrow plain is dominated by the tribal highlands. The plain widens southwards and finally merges into the hill complex of the Mahābhārat Lekh. Pokhara acts as a contact point between the highland and lowland tracts and subsists on the exchange between the products of these two ecological regions.

Sited on a gently sloping high terrace the town commands a bridge-point on one of the primary routes. The old bridge-point over the Seti between Pokhara bazār and Rānipouwā bazar is advantageously placed, and connects the main bazār with other settlements on the central plain.

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7. The earliest foreign reference is that made by Kirkpatrick, the first British visitor to Nepal (1793), while describing the route from Kāṭhmāṇḍu to Beni: "to Poakhra; cross by a wooden bridge the river Saite, very deep, but narrow; belongs to Kaski." Kirkpatrick (1811): 290.

(ii) Historical Growth. The making of the town with route convergence is substantiated by its geographic location. The historical origin of the town had less fertile grounds. During medieval times when innumerable 'koṭ' settlements studded the surrounding hills, Pokhara was unprotected. In the 12th century when Prithvimalla dominated western Nepal as far as Kāskikoṭ,[8] nearby Pokhara was insignificant. Later, during the reign of Kulamandan Shāh (16th century) over Kāski principality, Bāṭulechaur village was selected as the winter capital. Although the royal route between the winter capital and summer capital (Kāskikoṭ) passed through the site of Pokhara, there is no evidence that Pokhara formed a political centre. It was only after the conquest of the 46 principalities of West Nepal by the Gorkha rulers in the 18th century that Pokhara became a seat of local governors.

Presumably, some form of indigenous settlement existed at the bridge-head and the road junction. In 1752 the Kāski ruler brought the first batch of Newār settlers from Bhādgāon* as metal-workers and builders. The urban architecture of the town was due entirely to the Newār settlers. The houses of their descendants still form the nuclea of the town and Bhimsen, patron deity of Bhādgāon, occupies the most central temple in Pokhara. The immigrant Newārs may have also carried on their avowed profession of trading owing to their special tradition**

8. Tucci (1956): 112.

*Bhādgāon is one of the chief towns of Kāṭhmāṇḍu Valley. The original Newār settlers probably numbered 26 families, as their descendants are known as 'Chhabis Kuriyā' or 'Twenty-six Houses'.

**The Newārs are the principal business community in Nepal.

and location. By early 19th century Pokhara had become a "considerable town .... a mart frequented by merchants from Nepal [Kathmandu] Palpa, Malebum, etc., and afforded duties that in so poor a country were reckoned considerable."[9] A later reference describes it as a large city, "well-inhabited and contains plenty of supplies and grain of all sorts. Famous for its copper manufacturers."[10]

Recent growth is well examplified by two photographs taken more than thirty years apart. The earlier picture (Pl. LIX) was published in 1928 and the later picture (Pl. LVIII) was taken by the present writer in April 1963. The plates show the central part of the town with the Bhimsen temple, where roads from the south and east converge to form the 'high street' leading north. The houses in the earlier photo look so primitive that even Landon who called Pokhara 'the second city in Nepal'[11] in the text, captions this illustration as the 'Pokhara Village Bazar'.[12] In the last photograph the two-storied tile and thatch houses are replaced by four-storied buildings. The slate-roofing earlier confined to the communal temple, has become common with increasing affluence. The 'pipal' tree seen in the old photograph though still there, is not visible in the later due to degeneration. The loss of foliage and branches with old age is seen in the middle-distance tree in Pl. LVIII. The past persists only in the temple and the cobbled street. Similar evolution has been going on in other parts of the town as well as other smaller bazārs.

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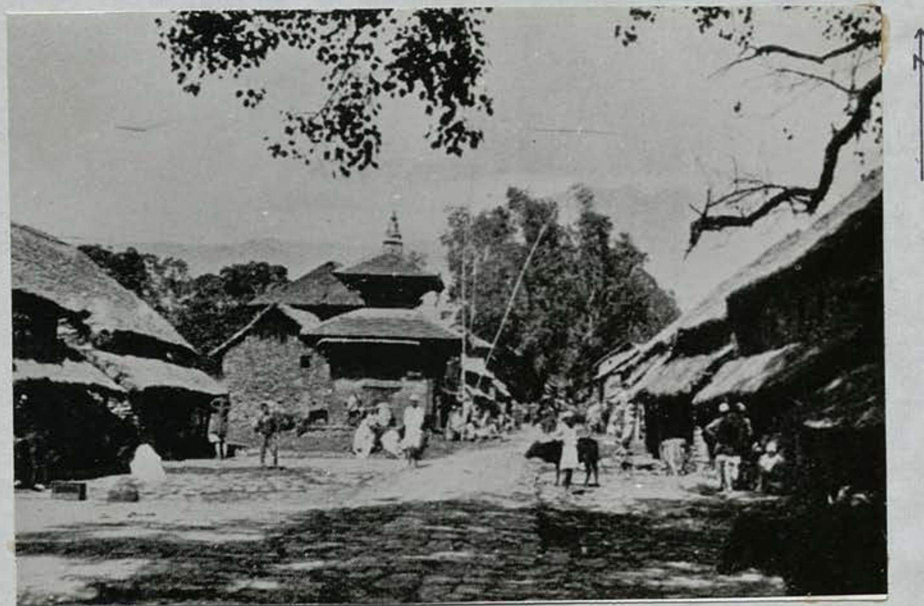
9. Hamilton (1819): 242.
10. Oldfield (1880) Vol. I: 160.
11. Landon (1928) Vol. II: 18.
12. Op. cit. p.19.



LVIII. Pokhara pre-1928. The main street of Pokhara leading north. The temple is dedicated to Bhimsen, the patron deity of Bhātgaon, from where the first Newar settlers came to Pokhara. See p.133, p.134.

LIX. Pokhara 1963. The same site after 35 years. The growth of the bazar houses in size and change in style is obvious. There has been depletion in the foliage of the shade trees. Loads of cotton manufactures being brought by women porters from the nearby air-field. See p.134, p.142.

Morphology.

(iii) The alignment of the buildings along the three converging roads has led to the ribbon development of the town (Fig. 39). The total length of the bazārs along the roads is almost three miles. The nearest to the central 'hub' occurs at the point where the eastern road joins the north-south road. Here also occur the largest concentration of old houses as well as the bigger business establishments. One might assume this locality, Bhimsen-Ṭol to be the primary core and it was here that the first Newārs settled too. The secondary cores constituting of other old houses are found just above it at Bhairab-Ṭol, southwards at Rāmkrishna-Ṭol, and eastwards at Sangumukh. Each neighbourhood ('ṭol') has its own temple and many of the neighbourhood names are derived from the name of the local deity. The exceptions being Sāngumukh ('bridge-head') in the east, Nālāmukh ('water-tap') in the town centre, and Kasāin-Ṭol (Butchers' colony) in the north-east.

There are no secondary lanes connecting the neighbourhoods (except the one between Rāmkrishna-Ṭol and Sangumukh) as communication is maintained between them through the main streets. Instead the roads are joined by country-lanes, and within the bazar limits the roads are liberally endowed with chautārās. The meeting point of the three roads is marked not by a temple but by an old chautārā. It can be assumed that the chautārās being the part of the highway tradition were built before the temples and their neighbourhoods. The architecture and the deities of the temples suggest their importations from Kāṭhmāṇḍu after the Newār immigration in the mid-eighteenth century. On the other hand, the chautārās and their shade trees exhibit a rust of antiquity and probably symbolise the indigenous culture.

Over 22 per cent of the buildings were put-up within the last three years. The new buildings are usually built between the interstices of the old buildings or link the old core areas, and there is no significant outward expansion of the town. Moreover, the intransient nature of the buildings due to recurrent fires* causes new buildings to be supplanted over the foundations of the old ones. Thus, the over-riding process in determining the morphology of the town has been not outward expansion but instead gradual filling-up of the intervening spaces and therefore leading to compactness.

(iv) Centrality. Pokhara town as an institutional centre influences areas far beyond its immediate environ. It has been a depot for the trans-Himalayan trade and staging-point for travellers. Its many temples and shrines give sustenance to the Hindu pilgrims bound north to Muktināth and to Buddhists travelling south to Sarnāth. During the fairs, the town is thronged with the sight-seeing and shopping villagers. It is primarily a commercial centre with an extensive market.

It is also important as an administrative and service centre. Pokhara provides all sorts of public and private services, and for Central Nepal it is "a meeting place and melting pot, both a refuge for people and ideas and also a reservoir of new ideas and venturesome populations."[13] Pokhara has been the headquarters of Kāski district, and since 1962 it has been made the regional capital of Gaṇḍaki zone. All the important government departments are represented here, and developmental agencies range from malaria eradication to fish-breeding, and sheep improvement to horticultural research (Fig. 40).

*Pokhara town experienced widespread fires in 1915, 1935, 1941, and 1949, the last one was reported to have swept three-quarters of the town.

13. Wagner (1960): 153.

One degree college caters to the needs of the entire Central Nepal, and five high schools and numerous primary schools serve the area within the present region. Three hospitals provide the only sophisticated medical services in entire West Nepal, and two banks deal with finance and insurance. Two pension distribution camps draw Gurkha pensioners from all over the surrounding districts.

The town provides specialized services such as radio and watch repairs, photographic work, cinema, and a newspaper.

Pokhara is also becoming a popular tourist centre, second only to Kāṭhmānḍu.

PART THREE: ECONOMIC SURVEY

'.... the Central Nepal Himalaya is over-populated by Nepalese farmers. Every patch of ground which can render a reward for labor is sought. Slanted mountain sides which can support terraced fields are all under cultivation. The narrow basin of the lower terraces of the river or the small detritus fan where water can be supplied is all cultivated. The scene on the high hillside with many levels of terraced paddy fields is the monument to the generations of Nepalese to make arable lands for their livelihood.'

— Sasuke Nakao

(in Land and Crops of Nepal Himalaya edited by H. Kihara, Kyoto (1956), p.96)

Chapter Outline

TRADE AND COMMUNICATION

a. Trade and Fairs

i. Trans-Himalayan trade
ii. Annual Fairs

b. Circulation Pattern

i. Tracks and transport
ii. Innovations

Chapter VIII.

TRADE AND COMMUNICATION

Pokhara lies on one of the main trans-Himalayan trade routes. It is also an important regional centre by virtue of its central location within Nepal. The fairs provide opportunities for the exchange of goods produced in diverse regions and promote contact between peoples. Conservatism associated with isolation is still found in the remoter highlands, but recent developments in roads and transport techniques have eased the circulation of ideas and commodities.

a. Trade and Fairs

The routes and seasons for the transmission of trade goods through Pokhara are described here along with some remarks on local commerce.* The fairs even if not all of them involve commodity exchange, give credence to the centrality of the region.

(i) Trans-Himalayan Trade. The location of Pokhara at the junction of arterial routes have made it both a staging, depot for long-distance trade and a storehouse. Two trans-Himalayan routes, one through the Mustāng Pass (14,900 feet) in Kāligaṇḍaki valley and another across Gyā Pass (18,379 feet) east of Marsyāndi valley converge at Pokhara and bifurcate southwards to the foothill markets of Buṭwal (840 feet) and Narāyanghāṭ (900 feet) (Fig.2). The Kāligaṇḍaki route is reputed to have been a favourite passage

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*The Pokhara Municipality income for 1962 gave a return of 43 per cent on cigarettes, 26 per cent on other Trade goods, 21 per cent on Road Cess and the rest teashops.

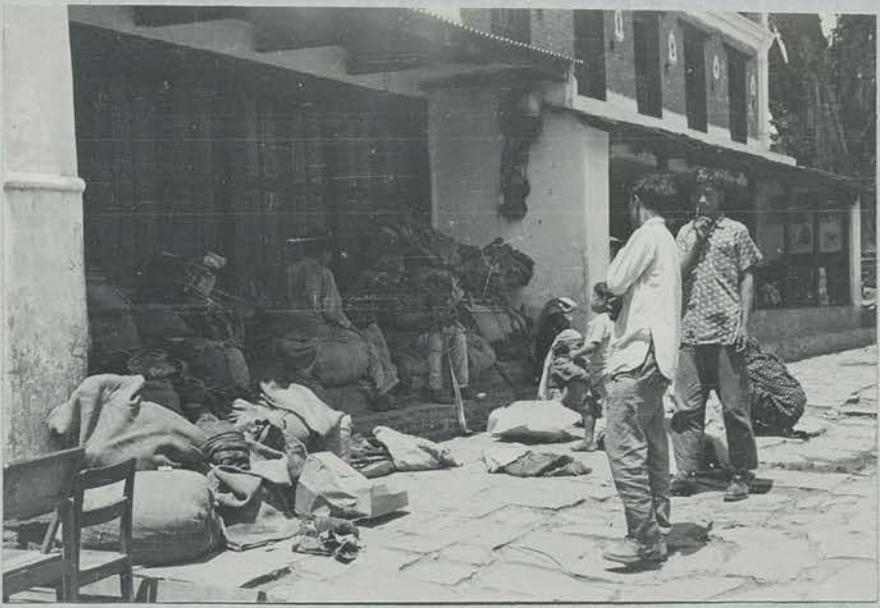
for armies and opium smugglers in the past. On this route also lies another important entrepot Ṭukche* where Tibetan goods are brought down during May-October when the high passes are free from snow. The goods stored here and forwarded south at the end of the monsoon season either through Bāglung or Pokhara (Fig. 3).

During the winter months, from October to March, the Ṭukche-Pokhara route is regularly used by animal caravans and porters. The chief pack animals are sheep, goats, and mules and sometimes as in December 1962 even hybrid yaks ('zopkio') descend down to Pokhara. The early arrival of the carrier sheep and goats in October coincides with the 'Dasāin' festival and many are bought by the hillmen for sacrificial purposes. The mules however are retained by the Bhotea muleteers for carrying the goods to the Indian border and for the return trip with Indian and Nepalese merchandise. The muleteers make more than a dozen trips between Ṭukche and Buṭwal via Pokhara, in five months. As middlemen they convey mainly Tibetan wool to India, Indian cotton manufactures to the Nepalese hills, and hill food-grains to the Bhoṭ region and Tibet beyond.

During the trade season, innumerable tea-stalls ('bhaṭi') sprout along the chief roads and Pokhara is overwhelmed by the Tibetans,**Bhoteas, hillmen as far west as Jumlā and as far east as Gorkhā, and by some Indians. The verandah of the bazar houses are overcrowded with transit goods and the pavements are encumbered with merchandise. (Pl. LX) Business is transacted at various levels and there is increasing use of cash instead along with some bartering. The traditional

*Prof. Christoph von Fürer-Haimendorf who was in Thākkhola during 1962-63, kindly supplied information on the salt trade of Ṭukche. Personal communication 29th January, 1964.

**Only those coming from Political Tibet are referred as 'Tibetans'. Here 'Bhoteas' refer to the people of the northern borderland politically within Nepal.



LX. Bhotea Muleteers. Bhotea and Thakāli muleteers transport Tibetan merchandise from the Kāli-gaṇḍaki valley to Pokhara from whence it is forwarded to India. On the return trip the caravans carry back food-grains from Pokhara. See p.108, p.141.

LXI. Salt-carriers, bringing salt from Buṭwal to Pokhara on a back-breaking journey of seven days. The porters are poor farmers from Gorkha who make several such trips during the winter. The house in the background is elliptical in ground-plan, and the one in the foreground is rectangular. See p.142, p.150.

practice of 'ceremonial friends' ('mit') between the local merchants and the Bhotea traders still plays an important role.

The chief commodities of Tibetan origin are raw wool, blankets, furs, yak-tails, herbs, salt, borax, gold-dust and sheep and goats. Indian items are primarily cotton yarn and piece-goods, cigarette, and sundry manufactures. Central Nepal exports food-grains to the Bhotea region, and grain, ghee, oilseeds, fruits, handloom blankets, herbs, hides and skins, honey and wax, live animals and birds to India. Large quantities of rice and maize are exported from Pokhara to Ṭukche. The great demand for salt results in excessive export of food-grains at the peril of food-shortage locally during the Spring. While most of the Tibetan wool that enters Nepal is exported direct to India,[1] all the imported salt is consumed within Nepal. The main depots of Tibetan salt are at Bimtākoṭhi in upper Marsyāndi valley and at Ṭukche (Fig. 3). Before the improvement of the track through Marsyāndi valley, the highlanders north-east of Pokhara used to cross over the Annapurṇa Himāl at Nāmunbhanjyāng (18,976 feet) to reach Bimtākoṭhi for salt. The volume of salt trade at Ṭukche may be assessed from a report that the contract price for one particular year reached Rs. 140,000. The exchange rate between salt and grain varies in ratio to the relative supply of either commodity, and the distance from the Tibetan border. With the disruption of regular salt supply from Tibet following political developments there, the hillmen have been turning increasingly to the

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1. In 1962 over 1,500 maunds of wool worth Rs. 3 lakhs was exported through Pokhara. Rupees used in the text are in Indian currency.

Indian sources at Buṭwal and Narāyanghāṭ.

There are no retail facilities for procuring salt, so each family must supply their needs by direct trading. A large proportion of the hill population make annual 'salt-trips' sometime involving weeks. (Pl. LXI) Another partial movement of population originates from food-deficit areas to buy grains; such an expedition is known as 'besā'. In winter where there is little to do in the fields, hillmen and Bhoteas descend to the plains to work as porters, for shopping and also for warmth ('eating sunshine'). The only people to move in opposite direction to this southward movement are the peddler Churāṭes who visit outlying villages selling glass-bangles, hair ribbons and fancy goods. They are based at Kunḍahar near Pokhara and also in Bandipur, where they make the ribbons; but the bangles are imported from Uttar Pradesh in India.

The traditional trade pattern has been influenced by two recent factors. Since 1952 air transport has intensified business, and the start of pension distribution camps in Pokhara has provided men with ready cash. Goods which would have taken a week from Bhairawā on a porter's back can now be delivered by air in 28-minutes. It is true however that the import of goods by air has greatly raised the price-level and contrary to its earlier image[2] Pokhara has a higher price index than most other Nepalese towns.

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2. In 1899, monk Ekai Kawaguchi remarked of Pokhara; "Another thing notable about that place was that it was the cheapest spot in Nepal for all kinds of commodities." Kawaguchi (1909): 41. He found rice in Pokhara twice as cheap as in most other places.

Perpetuating the price increase in consumer goods, there has been an extra flow of cash in the bazars since the establishment of pension camps by India (in 1952) and Britain (in 1961) in Pokhara. Previously the Gurkha pensioners collected their pension either at Kāṭhmāṇḍu or Gorakhpur (U.P.) and there they spent part of their money. The pension distribution in Pokhara now provides local merchants with hard currency to import goods. The pension amount paid by India alone has soared from Rs. 18,000 in 1954-55 to Rs. 36 lakhs* in 1961-62.[3] The two banks in town handled over Rs. 99 lakhs during 1961-63[4] even though a still larger amount of foreign currency goes directly into the hands of the business community. The growth of the town has been boosted by the added purchasing power of the pensioners.

(ii) Annual Fairs. In olden times when free contact was scarce and regular commerce lacking, economic exchange was closely linked to religious gatherings. Periodic festivals brought communal participation irrespective of religious denominations. After the commemorative visit to the deity or ablution in a stream or lake, business and social activities would dominate the fair. On fair ('jātrā')** days no one may touch a plough or work and so people are drawn to the fair-grounds. Pokhara town observes about half a dozen festivals each year and these

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*1 Lakh = 100,000.

3. Military Attache, Indian Embassy, Kathmandu; personal communication. The Rupees are in Indian currency.

4. Lohani (1963), personal communication 23rd July, 1963.

**The Nepali word 'jātrā' for fair is a derivation from the Sanskrit term 'yātrā' which means travel.

may suggest that the town was once a neutral ground where different peoples gathered under the sanction of a deity for peaceful barter and commerce. The Janma-ashṭami festival in August for example attracts people from the neighbouring areas including the tribal highlands though it is a Hindu festival. The four fairs mentioned here are sited on the plain at some distance from the bazars. Their locations indicates a fair concentration in the regional context and all are annual events.

Two fairs are held in April during the Chaite-dasain festival, one near Rupā Tāl and the other at Sunpaneli, east of Kunḍahar (Fig. 34). The Rupa Tal fair is held on an extensive fallow land where cattle from surrounding villages are grazed. A crude shrine marks the fair site. There is very little trade involved, the chief social interest being a shot-put competition. The Sunpaneli fair is also centred round a temple beside Bijaypur Kholā. The temple is encircled by stalls for glass-bangles and refreshments. Shot-putting here brings inter-village rivalry and the champion is hoisted on the shoulders of his fellow villagers and carried in triumph round the gathering. The third, Varāh fair is held during Dasāin in October on the banks of Phewā Tāl. The fair is consecrated to the Varah temple on an island and devotees are ferried to the shrine by dug-out canoes. The fair is chiefly religious with very little trade or social activity.

The largest fair Māghesankrāti* Jātrā marks the beginning of the summer solstice in mid-January and is held near the

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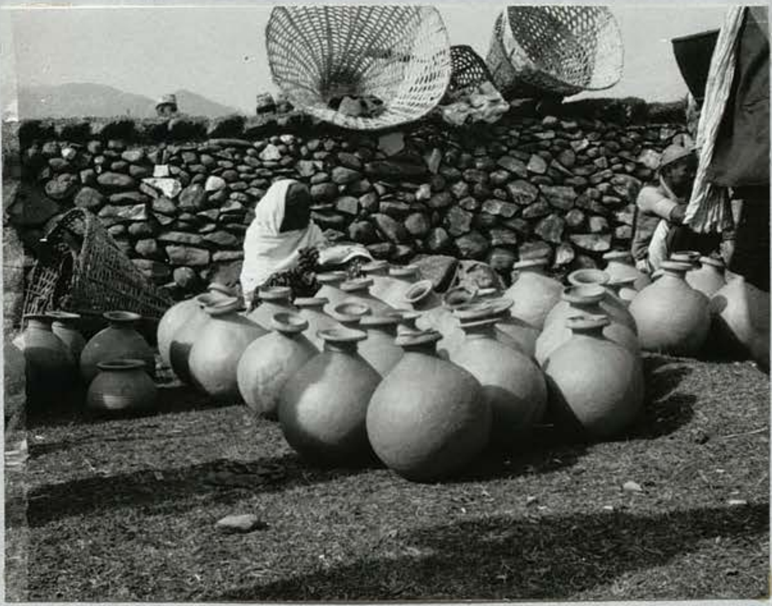
*It coincides with the Bāgeswari fair of Kumāon (Pant, 1936, p. 195-198), and approaches the Huari fair of the Central Andes both in size and the diversity of goods displayed (Wrigley, 1919, p.69-70).

LXII. Dhungāsāngu Jātrā, is held in January, three miles south of the town. Goods of diverse regions are brought to the fair for sale and exchange.
See p.74, p.146.



LXIII. Exchange Commodities, include bamboo baskets and mats from the highlands, earthen pots from Kumālgāon, glass bangles from Kundahar, and farm implements from Nuwākoṭ. See p.146.

Seti-Phusre Kholā confluence at Ḍhungēsāngu (Pl. LXII). It has been early described as one, at which copper manufactures "as well as supplies of grains and all productions of the district are sold."[5] The Ḍhungēsāngu fair site on a high open terrace borders the medieval principalities of Kāski and Nuwākoṭ and has no religious edifice. Long-distance visitors start gathering an evening before the fair day and set-up separate village camps for the song-and-dance night. On the fair day people bathe in the river and the rest of the day is spent in trade-bargaining. No booths are provided except for tea-stalls and the goods are displayed in the open air, each kind being arranged alongside. The common items for sale are agricultural implements of iron from Nuwākoṭ and Ḍhor, earthen pots from Kumālgāon, bamboo baskets and mats from the highlands, and glass bangles from Kunḍahar (Pl. LXIII) Other local items such as oranges from Bāṭulechaur and sugarcane from Baidām and Khudi are to be had in plenty. No grains are brought or sold now though they formed an important commodity in the past.

Approximately 14,000 people attended the Ḍhungēsāngu fair in 1963, but the natives speak of this fair as immensely reduced from its former magnitude. The fair visitors now make a point of going to the town where they have better choice of manufactured articles. It appears that the growth of bazars has divorced the fairs of their early functions and led to their decline.

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5. Oldfield (1880): 45.

b. Circulation Pattern

Although the town of Pokhara influences most of Central Nepal, yet accessibility varies within short distances owing to differences in topography and route-making. It takes more than an hour to climb the hills of Sarānkoṭ and Kāhunkoṭ but times diminish on the level plain (Fig. 44b). Milk is brought to the town from four miles in the hills (at Phoksing) but seven miles over the plain (at Sisuwā). Topography is also reflected in the people's ways. The highland villagers disapprove of visitors during the millet ripening season in April.* Their belief that strangers are harbingers of hailstorm is one of many expressions of their mountain conservatism.

(i) Tracks and Transport. Pokhara is connected by arterial routes with Kāṭhmāṇḍu (110 miles), Lamjung-durbār (30 miles), Ṭukche (50 miles), Beṇi (36 miles), Nawākoṭ (18 miles), and Narāyāṇghāṭ (56 miles). Lamjung and Ṭukche routes lead to the Tibetan mart of Ṭraḍom, and the last two routes descend to the Indian plain (Fig. 2). The main routes draw together innumerable trails, paths, and tracks from which they differ only by slight improvements in width, stone steps, and ~~the~~ in the permanence of the bridges. Such well-established main roads ('mulbāṭo') are marked by rest-houses and with milestones (Pl. LXIV).

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*For instance in 1953 a Japanese expedition was not allowed to trespass Siklis village. The villagers relented later after accepting a fine with which to propitiate the local deities.

LXIV. Milestone, in the town centre is inscribed "Hanumān-ḍhokā dekhi kos 47". Hanumān-ḍhokā lies in the centre of the old city of Kāṭhmāṇḍu and one 'kos' is 3.2 kilometres. See p.147.

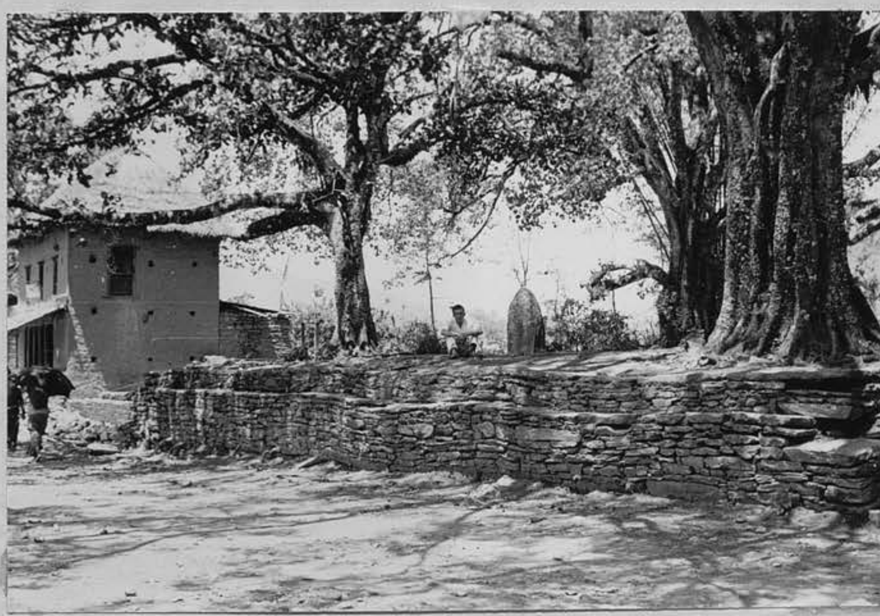
LXV. Hill Track. Steep tracks on the lateritic hills are paved with stone-stairs as they become slippery during the rainy season. See p.150.

In the humid lowlands wooden platforms ('ṭhānṭi') are raised on stilts to provide freshening breeze at a halt. More common are the stone-built rest-platforms ('chautārā') shaded with planted trees. Some chautārās are provided with pots for drinking water and many are favoured sites for tea-houses, so that the chautārās beckon the toiling porters and travellers. They occur at road bifurcations and junctions, on the passes and vantage sites. The chautārās occur irregularly both because they were due to individual benefactors and because uphill climbs entail more rest-places than with descents. They however congregate closer in bazārs and may ante-date the houses around them. In the middle of Pokhara town, Lāmochautārā (the long chautārā) is 80 feet long, 24 feet broad and 3 feet high and reputedly over 200 years old. Other old chautaras similarly suggest their highway tradition.

The main roads are served by numerous inter-village tracks some seasonal and some permanent. The total length of the roads and tracks in the region measured by opisometer is approximately 320 miles. Over 52 per cent of the road-lengths are located on the hills. But the density of roads is higher on the plain and valley-bottoms. The network of tracks shown in Fig. 43 is valid only during a part of the year. The monsoon floods and landslides disrupt the communication lines and they are fully usable only during the dry winter season.

Bridges ('sāngu') are expensive to build, and difficult to maintain, thus most streams have to be forded. The Seti has six fords during low water and eight bridges. Only one of these bridges is jeepable. The main bridge at Rānipouwā with the heaviest foot and pack traffic is crudely made of bamboo shafts 18 feet across and 4 feet wide, but 150 feet

LXVI. Medieval Platform at Nuwākoṭ. The stone slabs are hewn from massive rocks and the platforms mark the site of the seat of medieval rulers. See p.131.



LXVII. Highway Chautārā. Chautārās with shade trees are strung along the roads to provide rest-places. The stone slab between the trees commemorates the donor. The chautārās are also provided with shelves for resting the load. See p.148.

above the river-bed.(Pl.LXIX)* The suspension iron bridge over the Mardi Kholā was erected by iron-workers from Sallyān in West Nepal, and was paid for by 24 neighbouring villages. Most bridges are made of trunks of sal or cotton tree simply laid directly across the stream and only a few are provided with hand-holds (Pl. LXVIII). When the bridges of log thrown across the river in autumn are swept away during the monsoon, many villages remain cut-off till the next autumn's bridging. Even a crude log-bridge appears safe compared to a native swing-bridge ('jhulongo') that span a highland stream. Swing-bridges are made of three rope-lines of lianas, one providing a narrow foot-hold with two for supporting hand-holds. During the monsoon they remain the only link across mountain rivers. The streams are too fast for boats, which are thus confined to the three large lakes. Dug-outs which are made from the cotton tree (Salmalia malabarica) can carry up to six persons. The boats are used for transporting fire wood and fodder from the nearby forests.

The break-down of communication during the Rains does not necessarily disrupt rural life. Communications in mountain regions are not merely a function of topography and relief but an expression of the economic and mental needs of the people. The monsoon is the busiest work season when people are tied to their fields. This is chiefly why the tracks are almost deserted and the tea-stalls are dismantled and taken for the paddy fields. There is indeed a sharp contrast between this seasonal blockade of routes and the winter influx when all roads lead to the lowland bazars, fairs and festivals.

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*It is now being replaced by a jeepable bridge.

The communication line between two points does not remain constant. The ridge-top pathways are preferred during the Rains, while in winter the dried river-beds determine the line of movement. Even on the plain the level roads are interrupted by abrupt gullies leading to the next terrace level. Near Khudi, two terrace levels are connected by a hundred yards long tunnel, Dulegauṇḍā, said to have involved 50 men over 6 months to cut through. The hill pathways are even more intricate most of the time ascending or descending the steeps by stair-cases (Pl.LXV). As a result the mountain tracks are too precarious for pack animals. The only mule-track connecting Pokhara town with outside areas is that to Ṭukche and Buṭwal. Horses are few and riding is confined to the gentry.

Man is the essential beast of burden* Loads are carried by both sexes, men claiming the heavier share. The load averaging 80lbs. is carried on the back supported from the forehead with a strap (Pl. C). On long travels the head-band is supplemented by two arm slings. The head-band limits the movement of the head and oblige the bearer to concentrate on his direct path, so indispensable in dangerous trails. The rough nature of the tracks calls for high endurance so that necessity and habit seem to have modified the physique of the natives, for the hillmen have thickset torsos and strong legs. Yet salt-trips lasting

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*"Since economic and topographical circumstances make animals and vehicles impossible, the inhabitants have literally taken the matter on their own shoulders, and human transport, laborious and wasteful as it is, has become one of the bases of the social structure." Lionel Terray, Conquistadors of the Useless: From the Alps to Annapurna, London (1963): 251.

THE BRIDGES

LXVIII. Seasonal. Tree trunks are laid across the streams during their low winter level. Where no suitable boulders are available the beams are perched on reconstructed supports. The beam itself is notched to provide improvised hand-holds. See p.149.

LXIX. Permanent, bridge between Pokhara town and Rānipouwā bazār. It is made-up of bamboo shafts laid 150-feet above the Seti, and carries constant traffic in men and animals. This is now being replaced by a jeepable bridge. The ropes above the bridge were put up during the Hindu festival, 'Ekādasi'. see p.115, p.132.

two to three weeks over harsh terrain can be a severe strain and in age the porters suffer from serious trouble in the joints. Carrying paddy up from the valley bottom 2,000 feet to the village level by steep climbs is a hard and tedious task. To some Sahibs the difficult Himalayan terrain may represent a 'pedestrian's pa adise',[6] but to the natives who bear the brunt of the load, it is an eternal toil.

(ii) Innovations. Till recently wheeled vehicles were entirely lacking in the region, in spite of the extensive level plain. Transport on the plain has developed in an inverted sequence: the aeroplane in 1952, the jeep in 1959, and the bullock-cart in 1961. By the close of 1962 there were in all 3 jeeps, 22 bullock carts, and 136 bicycles. The bullock carts, introduced curiously late, have proved very useful in transporting building materials and heavy loads. During the dry season, jeeps can drive 12-miles eastwards up to Deorāli, and farther 20-miles south to Khairenitar without much construction problem. A 128-mile motorable road projected between Pokhara and Sunauli (near Bhairawā) in Terai had progressed only 7 miles from the airport in the last three years. Its making has recently received a fresh impetus from the Indian Government and is to be completed by the end of December 1968. The opening of this direct surface link with the important trading post of Bhairawa* close to the Indian markets should have far-reaching consequences on the region's development.

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6. Mason (1936): 16.

*Incomes from Custom collection at Bhairawā made heavy returns of Rs. 1,305,790 in 1959, Rs. 1,526,803 in 1960, and Rs. 1,649,180 in 1961.

In Pokhara the rudimentary tracks end up at an all-weather air-strip (Pl. C). Since the first commercial flights were introduced in 1952, air traffic has increased progressively. It may even be said that air service has slowed down road development by diverting the potential surface traffic. People from job-seekers to pilgrims have become accustomed to air travel and prefer to pay Rs. 40 for the half-hour flight to Bhairawā rather than trudge a week over the rough track. During the leave-season of the Gurkha soldiers the Pokhara-Bhairawā air service shuttles six trips a day. Similarly connection with Kāṭhmāṇḍu is regular, and further extensions include weekly flights to Bharatpur, Gorkhā and Nepālganj (Fig.44). Unscheduled flights also connect Pokhara with Simrā, Jomosom, and Ḍhorpāṭan. Among the internal services run by the Royal Nepal Airlines Corporation, the Pokhara-Bhairawā and the Pokhara-Kāṭhmāṇḍu routes accrue the largest income, by handling 25 per cent passengers and 14 per cent freight of the total volume (Table xxx, Fig, 45a). The volume of air traffic both in men and materials is shown in a sample diagram (Fig. 45b). At present the Bhairawa run-away is being pitched for all-weather use, and with its completion the air traffic between Bhairawā and Pokhara is bound to increase considerably.

The town is also connected with Kāṭhmāṇḍu and Nuwākoṭ by telephone lines. The establishment of wireless telecommunication in 1962 has further facilitated the region's contact with the outside world.

Chapter Outline

LAND USE - PROCESS

a. Land System

   i. Tenure
   ii. Assessment

b. Agricultural Practice

   i. Some observations
   ii. Crops
   iii. Livestock

c. Industries

   i. Seasonal
   ii. Whole-time
   iii. Tourism

Chapter IX

LAND USE - PROCESS

The economy of the region is very much the reflection of the local environmental conditions. Physical limitations impose a subsistence economy: if the plain soil is poor, the hilly terrain demands high labour input. Land polity also affect use-intensity on different land grades. The social and commercial value of rice* has relegated other crops to lesser importance in spite of the heavier taxation on paddy-land. Crop farming remains the most important occupation and rearing livestock is mainly to provide manure and draft animal for the field. Pastoralism becomes more important in the highlands, where woollen weaving is a traditional industry. The growth of new industries near the bazars reflects the economics of location and distribution. Tourism is the latest phase of development in the economic life of the region.

a. <u>Land System</u>

Land remains the primary source of income and most of the capital investment made are for procuring arable land. Farm demands are great and rents high. The size of the holdings are normally small.[1] Those with outside employment** are better-off as their earnings and pensions supplement the farm income as

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*The word for 'food' is the same as the word for 'cooked rice' ('bhāt').

1. A survey of Kāski and Lamjung districts showed that only 9 per cent of the holdings exceeded 3.2 acres and 34 per cent fell short of 1.6 acres. About 16 per cent of the farmers were landless. Shrestha et al (1957): 34.

**The employment sources in order of preference are the Singapore State Police, British Gurkha Regiments, Indian Army, and lastly the Royal Nepalese Army.

FIELD TYPES

LXX. Plain Fields. At Kuṇḍahar the unirrigated higher ground is surrounded by canal-irrigated paddy fields. The hillocks have been left forested.
See p.71, p.157.

LXXI. Hill Fields at Kāhun. Above the paddy fields on the flat floor, the hill fields cannot be irrigated and are given to dry crops like maize and millet. See p.159.

LXXII. Highland Fields. Paddy fields in the highlands are of limited extent occupying terraced alluvial cones.
See p.159.

as well as provide extra cash for buying land.[2] The increasing pressure of population on the one hand, and the archaic forms of land tenure and assessment on the other demand changes in the land system.

(i) Tenure. The three forms of land tenure were Birtā, Guṭhi, Raikar, and of these 'Birtā' has now been abolished. 'Birtā' lands were the grant of land ownership to private individuals by the State as rewards for services. Such grant lands were mainly on the plain and Brahmans were the chief beneficiaries. The first Newār settlers from Bhātgāon also received some paddy lands in grant at Kuṇḍahar and Arghoun. The most extensive of these grant lands were at Rāmghāṭ, Lāmpāṭan, and north of the town at Bhimpāṭan (Pl. XCVII). These lands were either used as paddy seed-beds or mostly left fallow since the owner's privileges insulated these against more intensive use by others. By legislation passed in 1959, however, all 'Birtā' lands have reverted from private ownership to the State, with compensation to be paid only on cultivated land.[3]

The 'Guṭhi' land are those traditionally held under trust assigned for religious, charitable or philanthropic functions. As a contrast to the criticism against high rents under 'Birtā' ownership, the high rents on 'Guṭhi' land enjoy social sanction. Even the Land Reform Commission concedes that the abolition of the 'Guṭhi' system would be anti-social and anti-religious.[4]

Most of the land falls under the 'Raikar' system, "a form of state landlordism which originally involved a direct relationship between the State and the cultivator."[5] The cultivators pay

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2. Hitchcock (1961) exemplifies the economic ascendency of Indian employment in a Central Nepal village.

3. Law Ministry (1959).

4. Nepal Govt. (1953): 25.

5. Regmi (1963): 20.

taxes either directly to the local revenue office ('Māl Aḍḍā') or a tax-collector ('Tāluqdār').* There is security of tenure on 'Raikar' land as long as tax is regularly paid, and in cases of default, eviction is made only from the land and not from the house.[6] Transactions between tillers involve transfers in occupancy rights only and not land itself. The abolition of the 'Birtā' system has brought more land under the 'Raikar' system.

(ii) Assessment. Pasture land, rural homesite, urban land, and agricultural land are the major categories of taxable land. The assessment on pasture ground is based on a rough estimate and the tax is minimal whether based on areal estimate, number of cattle grazed, or number of graziers using it. In all cases they are unimproved pasture, and the State policy for larger revenue seems to be not by raising taxes but by encouraging cultivation of grazing land.

The rural homesite are taxed a household assessment ('Sāune Fāgu') with a surcharge ('Megjin') while urban land enjoys a considerable immunity from taxation, perhaps to encourage urban settlements.**

Two criteria for taxation on agricultural land are the emphasis on increasing arable land and the assessment on potential use. New land could be reclaimed without permit and tax-exemption was granted for four years after the land had been brought under cultivation. Land left uncultivated for one year is not treated as waste since "the apparent intention of

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*The Tāluqdārs are categorized as 'jimwals' where most rent is from paddy land, and 'mukhiyā' where it is mainly from dry cropland.

6. Nepal Govt. (1955): 119.

**But when "every homestead in the hill districts.... is liable to pay Saune Fagu and other taxes .... there is hardly any justification for exempting residential sites, assessed at less than Rs. 50,000 in value, from taxation in urban areas." Regmi (1963): 51.

MARGINAL CROPLAND

LXXIII. Long Fallow. Some fields at the margin of forests are left fallow for three to four years. These may be used more intensively and further extended in due course. See p.76.

LXXIV. Abandoned Fields on Kāhun Hill. Crude field terraces now infested with ferns and thistles are found on the hills, associated with shifts in settlement. Note the wallowing pond for buffaloes. Two thousand feet below, the Seti enters an intricate gorge. See p.159.

the government is to make non-utilization of the land a burden on the owner."[7] Arable land thus includes waste land once under cultivation, gardens of non-fruit-bearing trees, thickets, minor forests, and waste lands adjacent to cultivated area.[8]

The arable land of Kāski district was classified as irrigated ('Khet') and unirrigated ('Pākho') during the assessment of 1933. The ratio between irrigated and unirrigated land for the 27 thums* are shown in Fig. 47 (Table xxxi). It is to be noted that out of the 10 thums with more irrigated land than unirrigated, 7 thums lie on the hill and also the thum with the lowest ratio of irrigated land (Bijaypur) lie on the plain. The pattern indicates the dominance of traditional use of irrigated hill terraces, and the lack of large-scale irrigation works on the plain, at the time of assessment.

The primary arable land classes, irrigated and unirrigated, are each sub-divided according to the availability of water, soil type, and productivity. The four grades of irrigated land are: Abal, Doyām, Sim, and Chahār.

Grade I (Abal), where irrigation saturates the entire plot for three to four days when water is once applied. The soil is porous and two crops can be grown with a minimum yield of 450 lbs. per acre. Grade II (Doyām), where three-quarters of the plot can be saturated by irrigation for two to three days. Soil is good enough to support one crop of paddy or two of others, with a yield range between 250 lbs. to 450 lbs. per acre. Grade III (Sim), where only half the plot can be irrigated advantageously and water stays for one day. The soil is sandy but it is possible to grow two crops with productivity varying from 21 lbs. to 250 lbs. per acre. Grade IV (Chahār), where the plot is sandy and stony, and has poor water-holding capacity. Only one crop can be grown in a year and yield does not exceed 21 lbs. per acre.

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7. Regmi (1963): 35. 8. Survey Dept. (1961): 15.

*Detailed data are available only for these thums within Pokhara Valley.

The percentages of the four grades, based on the 27 thums, increases with devaluation: abal 4, doyām 17, sim 38, Chahār 41, (Table xxxii).* The sub-division is, however, relative, and taxation varies from place to place.**

Unirrigated land involved less precise measurement owing to its lesser value as well as greater physical difficulties. The size of a unit of holding was estimated according to whether it could be ploughed by a pair of bullocks in one day ('Hale') or whether it involved one man one day to dig with a spade.[9] The assessment in this system was based on the unit of productive power used per area, not the productivity of the holding. The system was replaced in 1935 by one which taxes on unirrigated land were assessed on the basis of the seed expected to be needed for sowing ('Bijan'). A holding of one acre was estimated to need 80 lbs. of maize seed. All these commonsense but subjective assessments have since been superseded by cadastral survey, and unirrigated land are also being categorized into four grades. Fig. 46 clearly brings out the contrasts in land classes between a hill and plain location.

b. <u>Agricultural Practice</u>.

The farming practice is characterised by high labour input but little capital investment. Methods of work are well-adapted to the plentiful and cheap labour supply. Yields however do not correspond to the labour involved and farmers take up secondary occupations during the slack season. Almost 98 per cent of the total arable land is given to growing food crops.

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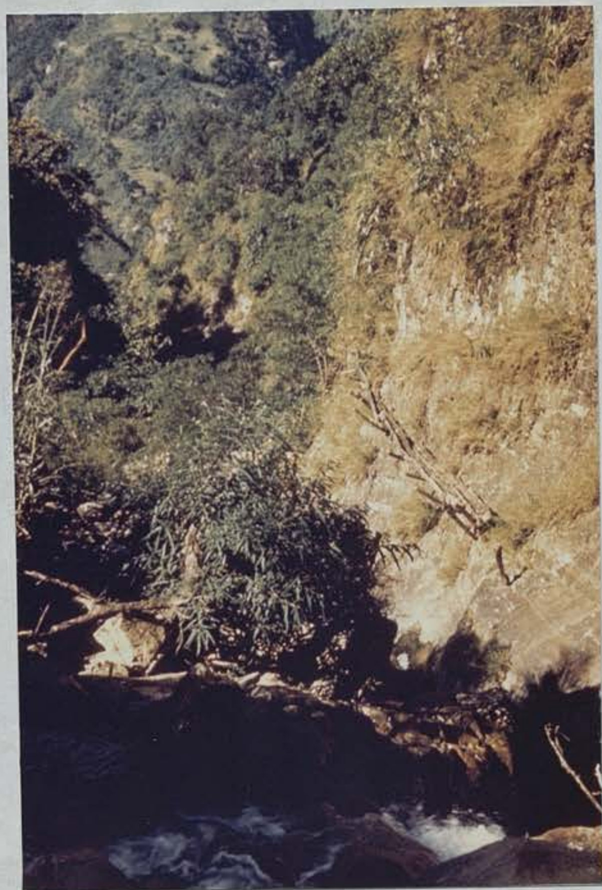
*In Kathmandu Valley on the other hand 'abal' grade is 22 per cent, and 'chahār' grade only 10 per cent.

**Rents for irrigated land of similar grade are twice as high in Gorkha district as in Pokhara and ten times as high in Kathmandu Valley.

9. Harilal (1951): 187.



LXXV. Irrigation Channel. Water for irrigation is carried through bamboo pipes supported by pegs fixed into solid rock. These need repairs before the paddy season. See p.182.

LXXVI. Two Slopes, Two Crops. In paddy fields, the near-vertical intervening slopes are also utilised for growing soybeans. Thulibensi village in Marsyāndi valley is one of the most northerly paddy-growing areas. See p.159.

(i) Some observations. Draft animals are used for ploughing the fields on gentler slopes. On steeper slopes and narrow terraces, the plough is replaced by mattock and hoe. In case of shifting cultivation only hoe is used. Weeding is done two to four times depending on the value of the crop. The paddy fields are generally left fallow in winter even though warmth and rain is sufficient for winter-cropping. The limitation in growing season in the highland is met by pseudo-rotation and double-cropping during the warmer months (Pl. LXXVI). The main agricultural activity is focused upon holdings near the settlements with less intensive utilization of further tracts.

Crop yield depends on the amount of manure applied and great importance is given to cattle dung. Manure is applied either by dumping and spreading it on the fields or by tethering the cattle on fallow fields in turn for the dung they drop. Farmers without cattle may either buy dung manure by loads or hire other's cattle to be tiedd on their field. Pests, poor soil, and poor seed may limit productivity but the methods of threshing, winnowing and storing are also primitive and wasteful (Pl. LXXII).

These general observations may be focussed on two villages of contrasted location. Kāhun village* is perched on a hill (5,736 feet) with fields and houses facing south (Pl. LXXI). The north slope of the hill is entirely forested. The arable land are of poor quality (Fig. 46a). The chief crops are maize in early summer and millet in late summer. Wheat is a secondary crop to millet and the altitude is too cold for pulses. There are no wet paddy lands near the village but some mountain rice ('ghaiyā') that thrives in dry areas are grown. The poorer lands are given to grass for thatch. A farmer of average means has 6½ acres of land in the village and 2 acres of paddy land at Bhalam and Rayelchaur, one hour's journey from the village. His total yield

*See also Chapter X, section ci. and Fig. 52.

in 1962 consisted of 3,000 lbs. of millet, 1,100 lbs. of maize, 500 lbs. of mountain rice, and 2,000 lbs of paddy. In a year a family may import on the average 600 lbs. of rice and 400 lbs. of maize. The village forest suffers from over-grazing and for half the year the cattle have to be stall-fed. A man-load (80 lbs.) of paddy-straw for feeding the stock costs about Rs. 5 and the annual investment of Rs. 60 for the straw yields 20-30 loads of manure. Out of the 25 families in the villages, five Gurung houses derive outside income as Gurkha pensioners.

Baidām (2,700 feet)* is a large Brahman village on the plain beside Phewā Tāl. (Pl. XXVIII) The village has no forest of its own, and fuel and fodder are brought from the other side of the lake. Thatch grass is brought from over three miles south. The topography is gently-sloping and land grades are superior to those at Kāhun (Fig. 46b). The yield of paddy close to the lake amounts to 2,600 lbs. per acre, and the maize and millet yields are estimated at 1,100 lbs. and 1,200 lbs per acre respectively.** Buckwheat, pulses, mustard and sugar-cane are also grown. More than half of the garden vegetables grown in the village are sold in the town. Out of the 200 acres of dry land in the village, three acres are set aside as 'guṭhi'land to support a temple. One well-to-do farmer owns 2 acres of dry cropland and 10 acres of paddy land. For manure he bought 200 loads of compost manure and invested 100 loads of paddy-straw to feed his 15 cattle. Manuring gave him almost a 50 per cent increase in yield. His income in 1962 was made-up of 4,000 lbs. of paddy, 828 lbs. of maize and 900 lbs. of millet. Another

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*See also Chapter X, section c.i. and Fig. 53.

**Statistics (1963): 16, estimates 1,767 lbs. per acre for paddy, and 1,550 lbs. per acre for maize as average yield in Kaski district.

farmer with eight cattle, had a net return of 2,200 lbs. of paddy, 850 lbs. of millet. They also made some cash income from sugar-cane and potato for buying cloth.

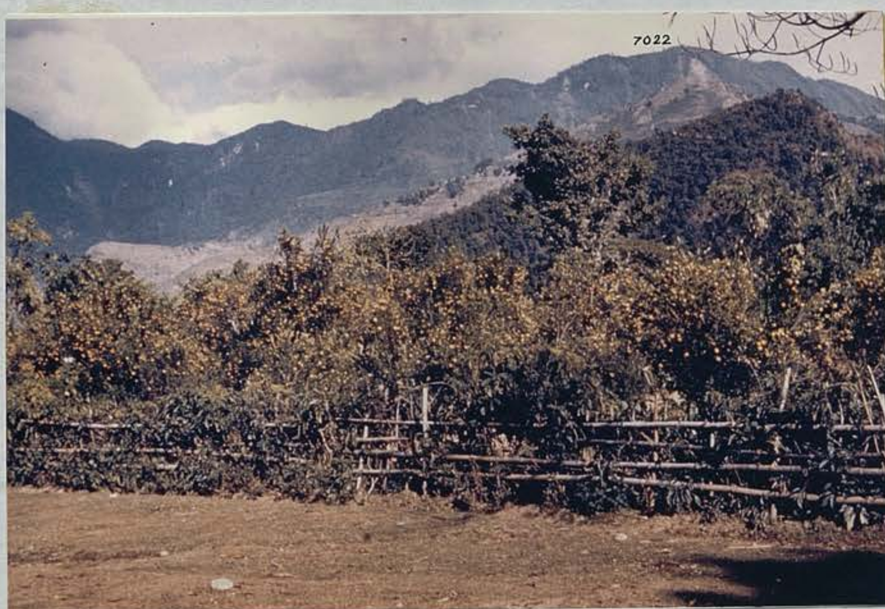
(ii) Crops* In conformity with the three climatic plant associations there are three crop zones. The low-lying zone of paddy, maize, sugar-cane, tobacco, oilseeds and tropical fruits is succeeded by the intermediate zone above 3,000 feet proliferating in diverse crops. Above 6,000 feet the chief crops are millet, barley and potato. Maize as a versatile crop occurs in all zones and forms the staple diet of the people.

But the relative prosperity of the farmer depends greatly on his paddy outturn. Paddy (Oryza sativa) though best-suited to warm humid valleys has a much extended area owing to its great demand. The flats not served by canal and depending entirely on rain-water for paddy are known as 'tārs'. The paddy areas on the plain are irrigated by canals. On the alluvial fans and the hill-side terraces the water source are springs, streams, and minor channels. The main paddy season begins in June and the harvesting during October-November coincides roughly with the biggest annual festival of 'Dasāin'.

Maize (Zea mays) thrives best under conditions of relatively high summer temperature with warm nights. It is preferred to wheat for its short growing season and covers at least three-quarters of the unirrigated cropland. On irrigated fields, maize precedes paddy so that the uprooting of maize stocks and ploughing for paddy goes together. Where no paddy is grown, maize is sown in April and harvested in September. In the highlands, maize is followed by millet and occasionally the two are cross-cultured.

*There are no statistical data available on crop acreages. A sample survey of Kāski district puts 77 and 20 per cent for paddy and maize respectively. Statistics (1963): 13.

COMMERCIAL CROP



LXXVII. Oranges. Bāṭulechaur, two miles north of the town is famous for oranges. Large quantities are sold into the town from where it is exported outside. The forested hill in the background is Sabje Choyān (7,022 ft).

See p.163, p.174.

Beans and peas are also grown with maize, the maize stocks acting as their supports.

Another common dry crop is millet (Eleusine coracana) grown in autumn. It requires a fair amount of moisture in the early stages but once established it resists drought well. Barley (intermedium) suffers from heavy clays and high temperature but thrives well on poorer soils of the colder highlands. It is planted in autumn and harvested in Spring before the maize season. Wheat (Triticum vulgare) is a winter crop grown in irrigated fields. It demands fertile soil, good drainage and subhumid conditions with a moderate temperature. Spring wheat occurs only above 6,000 feet. Buckwheat (Fagopyrum tataricum) as a summer crop in rotation with winter barley is planted in June and harvested in October. Among oilseeds, mustard is grown in winter and sesamum in summer in wind-sheltered warmer valleys.

In the highlands shrubs and forests on south-facing slopes are burnt-over and used for potato (Solanum tuberosum) cultivation. It is cultivated in winter and maturing takes about seven months. Digging is completed in July and enjoys good value in the exchange market. Pindālu (Calladium arumaciae) is another common tuber plant popular with the natives. Good varieties of soya bean (Glycine hispida) are exported from the highlands. Pulses and lentils are widely grown, and soya beans are grown either along the banks of paddy fields or on the out-facing slopes (Pl. LXXVI).

Sugar-cane grown in the warmer valleys is the most important cash crop. It is cultivated in early spring and cutting and crushing are done about the same season in the following year. Baidam, Khudi and Serbensi are favoured localities for sugar-cane. Cotton (Gosypuim herbaceum) on the stony soils of humid valleys once supported a flourishing weaving industry. It s importance has greatly declined since 1946 owing to the import of cotton manufactures. Tobacco thrives best in humid valleys, but is grown only in small plots to meet the local needs.

Vegetables grown in the back-garden include radish (Raphanus sativus), spinach (var. oleracea), cucumber (C. sativas), chillies, onion, garlic, turmeric, pumpkin, asparagus, anise seed and fenugreek plant. The needs of the town are sometimes supplied by cabbages and radishes brought from Kāṭhmāṇḍu, by air. The encouragement given by the local developmental agencies has led to the increase in truck-gardening in recent years.

The homesite usually carries few stands of fruit trees such as orange, guava, lemon, banana, pomegranate, pineapple, and jack fruit. The orange groves at Bāṭulechaur, Lāmāchaur, and Hyāngjāchaur are fairly extensive (Pl. LXXVII). The oranges grown are of good quality and during the ripening season, large quantities are exported by air to Kāṭhmāṇḍu and Bhairawā.

(iii) Livestock. Stock-rearing is an integral part of crop farming as cattle provide valuable manure, draft power, and dairy produce. Of the total livestock population in the region 15 per cent are draft bullocks and 11 per cent milch cows and buffaloes.* As far as their utility for manure is concerned, the people prefer number to quality and greater expense on maintaining livestock is not considered worthwhile. Thus milk yields are poor and it is only in the highlands, where grazing land is extensive, that dairy products occur in surplus for sale.

Cattle and buffaloes that predominate in the lower regions are of the short-statured indigenous type. Bullocks alone are used as draft animals, and she-buffaloes are preferred to cows for milk. During summer some villages send their cattle to the higher slopes, while others graze their cattle on the grasslands along the Seti river. The gorge-enclosed pastures on the lower Seti terraces

*In 1957, the local Village Development Office estimated 40,167 cows and buffaloes, 13,416 sheep and goats, and 16,882 poultry birds in Pokhara Valley. In Kāski district there are four cattle per household; 46 per cent of the cattle are buffaloes, 28 per cent cows, and 26 per cent oxen. Cf. Statistics (1963): 20.

LXXVIII. Shepherd's Camp with part of the flock on the Bārapokhari Lekh in Lamjung. The camp is moved every week or so along established routes. Marsyāndi valley behind the middle distance ridge. See p.164.

LXXIX. The Shepherds with their camping equipment. The two with clean dresses have come from the village for the autumn shearing. The dogs are kept as guards against wild animals. Note the overgrazed shrubs and grasses. See p.164.

provide natural enclosures that confine the cattle against depredations on the higher terrace crops (Pl. XCII). In autumn the cattle are let loose on the plain to graze over the harvested fields. (Pl. LXXXVII) For instance, at Mālmulphānṭ alone more than 400 cattle sheds gather from surrounding hill villages during the winter. The concentration of cattle on the plain makes the raising and protection of winter crops almost impossible. When the field stubbles are exhausted, the cattle range wider into the nearby forests and such unchecked foraging causes much destruction of natural vegetation (Pl. LXXXVIII). Small flocks of goats ('Sināl') and sheep ('Kāge'), mainly for meat are also found in the lowlands. In summer they are entirely stall-fed.

The flocks of sheep increase in size in the highlands. The alpine grazing grounds ('kharḳ') are communally owned by the tribes, and the movement of stock from high summer pastures to the low elevations in winter are along traditional routes. The altitudinal range so covered is between the village about 4,000 feet and the snow-line at 17,000 feet. The form of mountain pastoralism* as practised here however involves regular organic connection between the village and the shepherd accompanying the herd.

The upward movement, known as 'ūnbhauli', of the flock begins after the lambing in March; then the snows start melting and lowland fields must be ploughed. The descent ('ūndhauli') in September commences before the time of possible snowstorms. The flock is composed mainly of 'baruāl' sheep with some goats (Pl. LXXVIII) and are guarded against wild predators by dogs (Pl. LXXIX). The sheep graze on meadowsgrasses and clovers and the goats subsist on shrubberies. During the movement the flocks

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*Cf. Arbos (1923): 559, and Hofmeister (1961): 37.

Sometimes contact infectious diseases and parasites. One expert,[10] who maintained that such movement of sheep was deleterious to improvement, was responsible for setting-up a sheep farm on the Pokhara plain at Lāmpāṭan. However, the experimental farm has proved a failure as the sheep brought to this low level (2,500 feet) die of excessive heat in summer. The superior quality of the wool sheared in spring to that of the autumn also prove that lowland Pokhara is unsuited for sheep-breeding.

The average ewe or wether yields about three pounds of wool at each clipping and the wool is short and coarse. The sheep also provide mutton and milk for cheese-making.

c. Industries.

Local industries can be categorized as whole-time or seasonal according to the time devoted. Whole-time or primary industries may be traditional as well as modern introductions. (Fig. 48) The plentiful supply of labour and the small inadequate holdings also make subsidiary employment essential.

(i) Seasonal Industries. The slack season following the autumn harvest is given to various types of secondary and tertiary industries. Porter-work is accepted by the hillmen as freely as petty trading by the Tibetans;* and porters must exceed the numbers in any other occupation during the winter. Collection of forest products in the highlands and the pressing of sugar-cane in the plain are examples of local industries. The highland villages have proprietory rights over well-established wild bee-hives and honey is extracted during autumn and spring. The highlanders are adept at weaving mats, baskets of cane and bamboo (Pl. XLVII) and also make wooden containers by employing water-driven lathe (Pl. XLVIII). Some engage in paper-making from the pulp of native plants such as Daphne species.

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10. Bennett (1959): 8.

*Carrasco (1959): 213, "All segments of the Tibetan population engage in trade: government, monasteries, individual officials, monks, and peasants."

LXXX. Sheep Shearing. The average ewe or wether yields about three pounds of coarse wool. The natural wool colours black, white, and grey provide the traditional patterns. See p.165.

LXXXI. Weaving Woollens. The loom used is the through-shuttle type and the materials produced are blankets, jackets and scarfs. See p.165.

Sheep-breeding has established a long tradition of weaving woollens among the tribal people, especially the Gurungs. The wool is used undyed and the natural colours white, brown and black are provided the traditional patterns. Men do the soaking, beating and washing of wool, and the women yarn with hand-spindles and weave in a through-shuttle loom (Pl. LXXXI). The woven material is made close-textured by men by fluffing and dipping in hot water and treading. The materials for export are blankets ('rāḍi') and jackets ('bakkhu'), and for fine mufflers fleece is imported from Tibet. In the town, Thakali women weave multi-coloured carpets which fetch high price. The making of rough, durable garments from the fibre of wild nettle is no longer popular. Pokhara was once famous for the making of chintz varieties but this Newar handicraft has greatly declined with the increasing import of milled cotton goods.[11]

(ii) Whole-time industries. Metal-work, leather-work, tailoring, pottery and fishing are done by separate occupational castes. Pokhara was once a producer of copper in considerable quantity.[12] Mining has since declined owing to outside competition and the smithies now depend entirely on imported raw materials. Sārkis specialize in leather-work and the hides are processed with barks and leaves. There seems to be a lot of scope for tanning if the large quantity of raw hides and skins now being exported to India were utilised locally by improved methods.

The potters live exclusively in a village south of Arghounpouwa, where clay is easily available. The earthen vessels they make are unglazed and their use decreases in the highlands. The potters also engage in brick-making and the kilns are operated between October and May. (Pl. LXXXII). Fishing is traditionally carried out by the ferry-man Mājhis. The streams are moderately

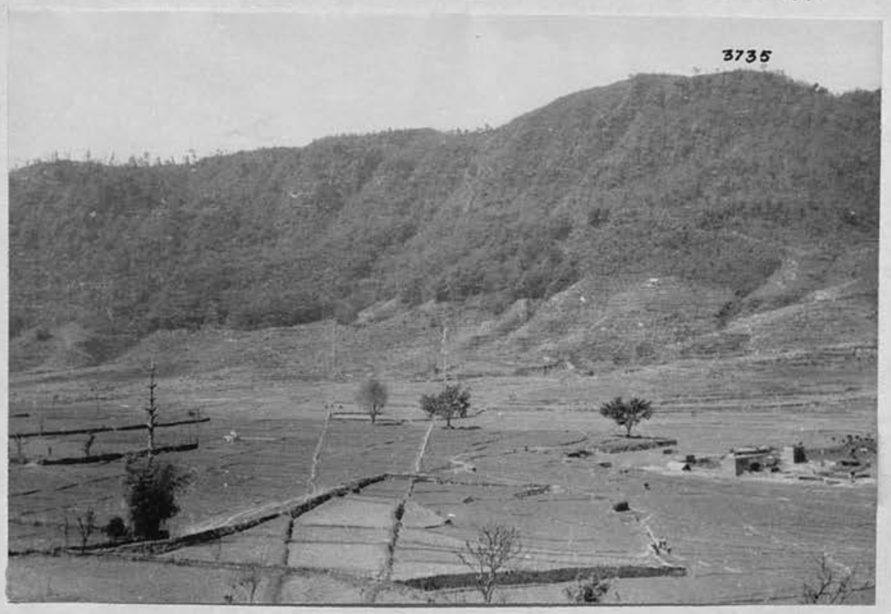
11. Campbell (1836): 220.

12. Oldfield (1880) vol. I: 160.

rich in carp, murrel, eel, trout and mahseer, with the lakes as their favourite spawning grounds. Fishing in streams employs cast nets, wicker traps, and even explosives. In small ponds the fish are stunned and caught by using alkaloid extracts of certain plants. Recently, breeding tanks for foreign carp have been established near Phewā Tāl and nylon nets and hook-and-line have been introduced for fishing in the lakes.

The traditional method of milling food-grain is by the use of hand-querns ('jānto') and water-mills ('ghaṭṭā'). The foot-pestle ('ḍhiki') is used both for husking paddy and for making parboiled rice ('chyurā'). Near the bazars, these old techniques are being replaced by mills run on diesel power. At present there are six rice mills with an average capacity of 10-horse power. Another important industry is the quarrying of building stones which is increasing in importance with the growth of the bazārs (Pl. LXXXIII) Other new industries include a match factory which depends on Salmalia malabarica for soft wood, and two furniture factories that use Acacia catechu from the south and Alnus nepalensis floated down the Seti from the northern forests.

(iii) Tourism. Pokhara Valley endowed with scenic views provides great opportunities for tourist development. Though within 26-miles of the main Himalayan range, it enjoys a mild winter. Māchhāpuchhre (22,958 feet) the southern outlier of the Annapurṇa Himāl approaches the town within 16-miles and dominates the Vale (Pl. I). From the southern ridge of Barsāmi (3,630 feet) one can have an uninterrupted view of the Himalayan panorama extending 114-miles from Puthā Hinchuli in the west to Gaṇesh Himāl in the east (Fig. 2). The forested highlands provide good conditions for field sport and the surrounding hills offer trekking and hiking facilities. The lakes add beauty to the landscape as well as being natural sites for angling and boating. The town is also an important staging-point for the climbing expeditions to the mountains of Central and Western Nepal.



LXXXII. Brick-making. The brick-kilns at Parsyāng are worked during the winter. The two parallel lines in the centre are pipes for drinking-water for the town. See p.166

LXXXIII. Stone-quarrying. Stones for the bazar houses are quarried in the nearby hills. Slates for roofing are brought from Bhārbhure in the north and Bandipur in the south-east. The bullock-cart was introduced only recently. See p.167.

Nepal remained a sequestered kingdom till 1950 and Pokhara was even more forbidden as an interior part of the country.* Within a decade of opening the country to climbers and tourists the annual tourist traffic had exceeded the 4,000 mark. In 1962 alone, more than 6,000 foreigners visited Nepal[13] and of these 8 per cent visited Pokhara Valley. Recently, Pokhara had 681 visitors from 24 countries within a brief period of twenty-one months (Table xxiii). It remains the most popular tourist centre, second only to Kāṭhmāṇḍu, and with increase in accommodation facilities there is every possibility of tourism as a modern recreation affecting the economy of the region.

*Of the total 153 Europeans who visited Nepal over a period of forty-four years (1881-1925) none had been to Pokhara. Cf. Landon (1928) vol. II; p.298-305.

13. Tourism (1963): 2.

Chapter Outline

LAND USE - PATTERN

a. Slope Problem

i. Slope zones
ii. Terracing

b. Land Use Survey

i. Scale and method
ii. Categories of Land use

c. Sample Studies

i. Rural land use
ii. Urban land use

d. Changes in Land Use

i. Irrigation extension
ii. Present trends.

Chapter X

LAND USE - PATTERN

The study of the ways in which man's economy utilises its natural environment provides a background to the understanding of the land use pattern. The problem of slope is emphasised as terracing represents an attempt to overcome the physical handicap of sloping ground. The major land-use categories of the region are mapped on the basis of field survey. The regional picture of land use is supplemented by selected local studies with an analysis of land-use by specific categories. The rural surveys show field lay-out and crop distribution, and the town survey concentrates on urban land-use. The changes in land-use make a case for both past and present trends. Extension of agriculture results directly from the making of modern weirs and canals for irrigation. Canals and piped water-supply have also led to the growth of settlements on the plain. New development projects are all located on the meadow land sites on the plain.

a. Slope Problem

An appreciation of the slope problem gives some indication of the region's use capability. The pattern of land-use is a reflection of the initial slope of the ground, and the degree of slope puts an obvious limit to the amount of productive land. The maximum degree of slope on which fields occur does not exceed 32 degrees.*

(i) Slope Zones. The slope zone map (Fig. 50), prepared from contour maps and field examination by Abney level, attempts to demarcate slopes of similar degrees. Only three broad zones are shown and consequently the range within each zone is large. The slope zones are:

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*Hagen (1959) b: 17, "On the average, the cultivated slopes are much steeper in Nepal than in the Swiss Alps."

LXXXIV. On Steep Slopes. Where water is available for irrigation, steep slopes are terraced for paddy. The Harvested paddy are kept in stacks before thrashing. See p.170.

LXXXV. River Terraces in the hill-foot make good cropland where irrigated by hill streams. See p.171.

LXXXVI. On the Plain. Mālmulphānṭ is irrigated from the waters of the eastern lakes. The stubbles are grazed over by cattle after harvest and paddy straw is stored on stilts above the reach of the cattle. In the centre can be seen a telegraph pole. The gap between the two distant hills marks the outlet of the Seti. See p. 183.

1. Very steep - 25 degrees or more;

2. Steep to fairly steep - 5-24 degrees;

3. Moderate to gently steep - less than 5 degrees.

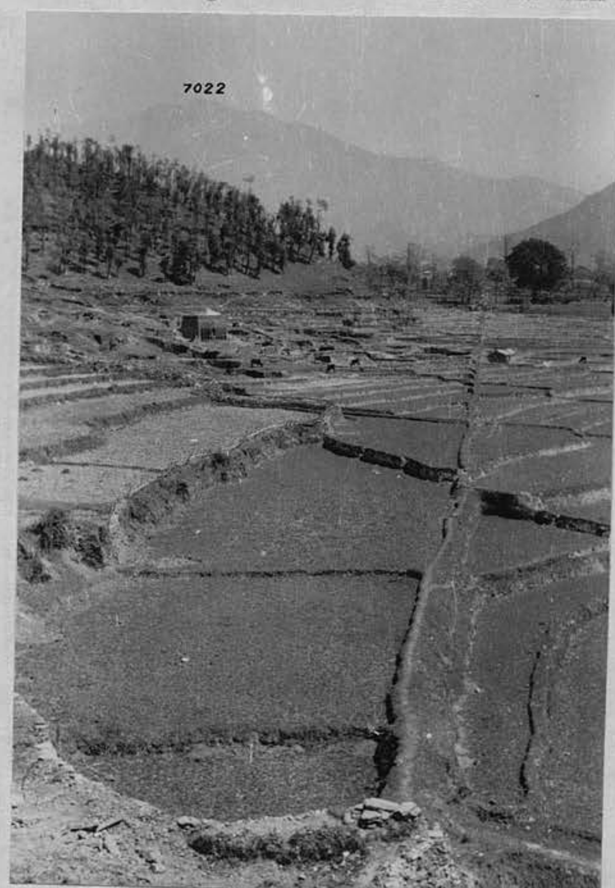
1. Very steep slopes with a gradient of ½ and less are characteristic of the northern highlands and the north-facing scarp slopes of the lower hills. The average slope of these ridge-scarps is 29 degrees. Free-faces with scree falls and land-slips are widely distributed (Pl. XI). The lands under this slope zone are mostly forested and landslides occur where the vegetation cover has been removed. Soils are shallow and liable to erosion on exposure.

2. Steep to fairly steep slopes with gradients less than 1/10 include all hill areas except those included in the first zone. The range of slope is wide and the average angle of slope is 18 degrees. Soils are moderately stabilised but require terracing for better utilisation. Unterraced and abandoned fields within this zone are susceptible to gullying. Most of the fields are limited to slopes of less than 20 degrees or ⅓ gradient, but some cultivated patches may be encountered on declivities of 31 degrees (Pl. LXXXIV).

3. Moderate to gently sloping zone incorporates land surfaces with a slope less than 5 degrees and gradients exceeding 1/12. The outwash plain slopes gently south-west with an average fall of 100 feet in a mile. The low-lying side-valleys joining the Pokhara plain also have a gently sloping gradient. The alluvial fans debouching over the plain constitute areas of moderate slope (Pl. LXXXIX). The latter experience flooding during the rainy season. The soils on the moderate to gentle slope zone are fairly well-stabilised with veneers of silt and sand.

b. Terracing. The technique of utilising slope land by terracing is a traditional practice and terrace-fields occur over varying degrees of slope. The terraces may range from crudely built small patches to intricate tiers extending over an entire hillside. The terraces

LXXXVII. Enclosed Fields. Near the settlements, the paddy fields in the depressions are enclosed. They are left fallow in winter. See p.164.



LXXXVIII. Hill-foot Fields. At the base of the hills the fields are fertile with hill-wash. The forest on the hill has no undergrowth due to overgrazing. The straight line along the fields is the pipe line for the town water-supply. See p.164.

are made by walls of rock or structures of logs behind which fields are levelled by back-slope digging and fore-slope filling. In places of copious regolith, excavation of terraces does not involve stone-masonry for embankments. Over convex slopes the fields follow the initial outward curve of the slope and in smaller concave retreats the field width is extended by putting a bund across the ravine. The width of the field is in inverse proportion to the height of the embankment. Where fields are too narrow for operating the bullock-team, mattocks are used for working. The embankments are vertical when made of stones, and steeply sloping downward when they are made of earth. The latter are used for planting soybeans (Pl. LXXVI).

The terrace-fields are of two types: flat-surface fields for irrigated crops and gently-sloping fields for dry crops. The sloping field terraces[1] depend for moisture entirely on natural precipitation with gravity flow. The fields do not necessarily follow the hill contour and the pairing of field ends on successive levels make a zigzag pattern. The sloping field terraces are typical of newly-acquired lands and fields on steeper slopes. Where labour can be expanded for irrigation work, such sloping terraces are in due course levelled for growing paddy. The second type, flat-surface terraces,[2] have a low retaining mud-wall along its outer edge for impounding water. The water supply from the upper fields is regulated by means of a series of spill-ways. The main channel is diverted during heavy rains to avoid flooding and excessive silting. Terracing is a laborious task and requires constant care. The cost of maintaining existing fields puts a certain limit to the acquisition of new fields.

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1. 'Linear sloping, field terraces', type 3 of Spencer and Hale (1961): 8-9.
2. 'Wet field terrace', type 8 of Spencer and Hale (1961): 11-12.

b. Land Use Survey

The land use survey and mapping accomplished on a topographic scale purports to be the first of its kind as far as Nepal is concerned. Karan's reconnaissance land-use map of entire Nepal with only three categories (Cultivated Land, Forest and Mountain Pasture, and Wasteland) bears no comparison with the present study, either in technique or in scale of investigation.[3]

(i) Scale and Method. The survey technique adopted to determine the actual land use in the region was formulated on the basis of the writer's reconnaissance work in January 1960.[4] The method may be simply described as a comprehensive regional survey. The entire Pokhara region was covered on foot with extensive traverses for direct observation. The ground survey was complemented by the interpretation of vertical air photographs at a scale of 1:40,000. In addition to these terrestrial and aerial observations, a large collection of low-oblique colour-slides from aeroplanes and panaromic views from vantage-points were taken. These photographic evidences helped to supplement the field-notes in the preparation of the map. The final map (1:63,360) was reduced to half its original scale without modifications in detail. The categories of land use and their respective colour-scheme tries to follow the World Land Use Survey Classification[5] with adaptations to suit local scale and conditions (Fig. 51).

(ii) Categories of Land Use. The seven major land use categories in the present region are: (1) Settlements and Associated Non-agricultural Land; (2) Tree Fruits; (3) Cropland - 40%
(4) Unimproved Grazing Land - 6%; (5) Woodlands - 45%; (6) Lakes and Marshes - 2%; and (7) Unproductive Land - 4%.

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3. Karan and Jenkins (1960a); plate 12; Karan [illegible] (1960b): 172-187.

4. Gurung (1961).

5. Valkenburg (1950).

Improved Permanent Pasture (class 5 of World Land Utilization Survey Classification) is entirely lacking in the area, and Horticulture (class 2 of World Land Use Survey Classification) as 'garden cultivation' of villages occur not as block areas but as points of limited extent. A number of sub-categories have been distinguished to bring out the intricate patterns.[6]

1. Settlements and Associated Non-agricultural Land (red) include two sub-categories; (1a) Urban and rural settlements, and (1b) Recreational and Development sites. No area was computed for this category because of their diffused character. The rural villages shown by closed circles also mark the points of horticulture. Other non-agricultural used are distinguished from the bazars by the use of light red colour. It must be emphasized that farming however, is not excluded from the occupations of the urban community. The largest expanse of non-agricultural land is the experimental sheep farm at Lāmpāṭan covering 300 acres. While the villages are sited on cropland category, the bazars lie along the roads.

2. Tree Fruits (purple) include the orange orchards at Hyāngjāchaur and Bāṭulechaur (Pl. LXXVII). Even though the fruit trees stand on dry cropland, the trees dominate the grain in value. Fruit trees in isolated stands also occur in other settlement sites but cannot be represented at the present scale

3. Cropland (yellow) is shown in yellow colour[7] to symbolise the dominance of paddy. Land given to grain crops covers 78 square miles or 40 per cent of the total area.* Two sub-categories of cropland are: (3a) Alluvial flat, and (3b) Terrace slope. Terraced fields accounting for 23 per cent of the total area are indicated by the interpolation of 500-feet contours in dotted lines.

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6. Fox (1956): 12-26, provides a logical and coherent classification of land use into ordinal, generic, specific, and varietal categories. However the present discussion turns to the World Land Use Survey Classification for the sake of wider comparison.

7. Brown colour in the W.L.U.S. Classification.

*The percentage of cultivated area in Kathmandu Valley is estimated at 60-75 per cent (150-175 square miles).

ALLUVIAL FANS

LXXXIX. In the Hills the alluvial fans provide pockets of rich land but these are liable to occasional floods. See p.175.

XC. On the Plain. The best paddy land on the plain occur where the outwash plain is overlain by alluvium. Kāhun Kholā in the foreground and Bijaypur Kholā in the background irrigate large areas of the plain. See p.175.

The alluvial flats on the periphery of the outwash plain constitute the best arable land both for their deep rich alluvium as well as convenience for irrigation (Pl. XC). Croplands dovetail with woodlands and most of the hill croplands have a southern aspect. The wooded hills in the north and east enclose some tilled clearings beyond the area of continuous agricultural area.

4. Unimproved Grazing Land (grey) is confined to the extensive grassland along the Seti river terraces. These natural grasslands clearly fit the definition of the World Land Utilisation Survey. The vegetation has undergone much modification with "very intensive"[8] grazing. The pastures are held in large blocks with each terrace level forming a natural enclosure. The pastures are not deliberately manured, though they are periodically burnt over. Scrub forest pastures where much of the livestock browse are not included in this category. Montane meadows for summer pasture also do not occur within the present region. The area under unimproved grazing land is 11 square miles, only 6 per cent of the total area.

5. Woodlands* (green) accounting for 87 square miles or 45 per cent of the total area forms the largest category. The woodlands are grouped into (5a) dense forests and (5b) scrub woodland. Dense forests are found mainly on steeper slopes and on the higher grounds. Scrub woodlands mark the transition zone between dense forests and the cropland. They are heavily grazed owing to their proximity to the fields and settlements. Plantations managed as shelter-belts or hedge-rows in the plain villages are not included in the woodland category. Deforestation is widespread and the depletion of woodland is changing the landscape.

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8. Davies defines "very intensive" when there are more than 80 'cattle units' per 100 acres. Cf. W. Davies 'Pastoral systems in relation to world food supplies', The Advancement of Science, XVII (1960): 272-280.

*For types of trees see Chapter IV.

XCI. Upper Terrace. All plain settlements and most fields are on the upper terrace. The fields close to the hamlets are unirrigated. The air-field is across the Rāmghāṭ amphitheatre in the middle distance. The gorge of the Seti can be followed below Rāmghāṭ by a line of riverain vegetation. Nuwākoṭ hill in the far distance. See p.31.

XCII. Lower Terraces are mainly used for grazing cattle when the upper terrace is under crop. The bounding hills in the south rise 1,000 feet above the plain level. See p.175.

6. Lakes and Marshes (blue) occupy 2 per cent of total area (5 square miles), most of it under permanent water body. Except for Phewa Tal, all other lakes have deltaic marshy areas. The smaller lakes are being choked by swamps and marshes. The marshlands ('dhab') are unfit for cultivation and are used for rough g razing during the winter.

7. Unproductive Land (white) includes the reaches of sands and boulders along the rivers. They are covered by monsoon floods but lie bare and waste during the drier months. Sites of recurrent land-slides and exhausted stone-quarries also fall under this category. The area of Unproductive Land is approximately 4 per cent of the total area.

c. Sample Studies.

The land use map (Fig. 51) presents an over-all regional pattern. Local variations occur within each land-use category as well as slope zone. The ridge slopes being more exposed and less conducive to water-control, are of lesser importance for cultivation than the lateral slopes. On the plain, soil characteristics are influenced by the time factor over successive terraces: the older upper terraces evince better humus formation. Conversely, the occurrence of springs on the lower terraces may off-set the disadvantages of their gravelly soil. The following specific examples of local land use include one hill village, one plain village, three small bazar villages and one large bazar. These have been mapped on a scale large enough to distinguish the land use categories at varietal level.

(i) Rural Land Use. The villages of Kāhun and Baidām are entirely rural. A brief reference was made in chapter nine as to their land classes (Fig. 46) and farming practices. They exemplify here the contrasts in land use between a hill and plain locale.

The pattern of land use on Kāhun hill (Fig. 52) is the reflection of the poor land classes represented there. Slope plays an important role though maize fields occur on slopes as steep as 24 degrees. A considerable part of steep land is given to growing thatch-grass. The moderate slopes are terraced for dry crops mainly maize. Soil is stony to coarse-textured, less than a foot in depth. Gully-erosion is severe and there are no irrigation facilities. The crops depend entirely on rain-water, and drinking water is brought from a forest spring north of the village. The plot attached to the houses grow kitchen vegetables and some fruits. On the poorest of cropland one-year cropping is followed by two to three years of fallow period.

Baidām, (Fig. 53) on the north-eastern bank of Phewā Tāl is better-placed than most plain villages. The land slopes gently south-eastwards and a small stream provides irrigation during the monsoon. The soil is medium textured with a depth of up to two feet. The good quality land are given to paddy and the medium-quality land to maize. The detached strip of land across the stream grows pulses at fallow-intervals of three years. The road passing east-west south of the village has stands of mango trees as also in the temple enclosure. There are no fields given specifically for growing thatch-grass. The meadow on the south-west corner is now a site for a modern bungalow.

Arghoun, Sisuwā, and Pārdi, are plain villages that have adopted some commercial functions because of their location along the main roads. Apart from the high density of chautārās and some shops, they are rural in character. Arghoun (Fig. 54) lies between an east-west road and a canal. The topography gently slopes south-eastwards and the soil is medium-textured. Irrigation is provided by the lower Bijaypur canal. All lands adjacent to the canal are given to paddy. Still 40 per cent of the fields grow maize and farm houses are attached to this latter category of fields.

Two miles below Arghoupouwa the same canal and road enclose Sisuwā (Fig. 55) which is also a junction of three roads. The land is gently-sloping south of the road with an undulating surface to

XCIII. Selective Cultivation. In areas where spring source occurs, the lower terraces are selectively cultivated. The white scar across the Seti is a recent landslip. See p.176.

XCIV. Local Details. On the upper terrace irrigation follows local contours, as seen from the orientation of the embankments in the foreground fields. See p.175.

the north. The higher grounds are given to maize growing. The canal irrigates a narrow belt and the paddy fields in the north-west are served by another canal from Gaṛuwā Kholā. Pārdi (Fig. 56) marks the site of a canal-crossing. The canal from Phewā Tāl serves a large tract south of Pārdi. The lands close to the village are unirrigated and there is a large share of fallow land. The poor quality of the land in the vicinity is also proved by the fields growing thatch grass. Maize is raised closest to the settlements and farther down, the dry fields grow buckwheat. Nearby is the Pārdi dam, below which Pārdi Kholā demarcates the contact zone between the plain in the east and Kālābang ridge in the west.

(ii) Urban Land Use. A detailed survey of land use within Pokhara town provides the best indication of its urban character. The classified features of 480 houses were mapped on a scale of one inch to a hundered feet, and the reduced map (Fig. 57; Table. XXXIV) summarises the dominant characteristics of each individual building. A sample profile of 62 houses in the central part of the town underlines the third dimension in the townscape. Note was also made of the adjacent lands and their crops. These constitute transverse strips of farmland stretching away from the arterial roads. It is only in the rural section between the fork of the two southern roads that this transverse pattern does not occur.

Typical of a commercial locality, various combinations of use are found on the same piece of land and often in the same building. There is a vertical stratification of functions, the most common being residential buildings with a business establishment on the ground floor. The functions performed include distribution, exchange, processing and production of goods and a variety of services for the people of a wide area.

The most important function is commercial, accounting for 60 per cent of the total establishments as follows: shops 200, tea stalls 47, services 27, godown 16, and banks 2. The main shopping centre is in Bhimsen-Bhairab Ṭol with a secondary cluster at Sāngumukh. All the shops are on the ground floor, facing the main street. The retail shops in order of importance are hardware (26 per cent), metalware (24 per cent), cloth (14 per cent), spices (4 per cent), medicine (3 per cent), grain (2 percent), and cigarrettes (1 per cent). Some shops specialize in bangles, furniture, kerosene, earthenware, stationary, and shoes. The paucity of grain shops suggest that most of the residents grow their own farm produce.

Services contribute 5.6 per cent of the commercial functions, Tailor, shoe-maker, blacksmith, washerman, butcher and barber provide professional services and two watch-repairers and one photographer provide specialized services. There is also a press which publishes a magazine, and the two banks manage finance, insurance, and real estate. Except the two segregated localities (Kasāinṭol) for the butchers, there is no evidence of similar services clustering together. It was observed though that the tailors were generally attached to some large cloth stores.

There are 16 godowns on the ground floor for storing bulk goods. The goods are mainly cotton cloth pieces and raw wool in transit for the trans-Himalayan trade. Commodities for local consumption are normally stored on the upper floors.

The concentration of refreshment shops at Bhimsen-Bhairab Ṭal and Sangumukh give further proof of the thriving business of these two neighbourhoods. Small tea-houses are numerous but there are only three hotels with accommodation.

There are 17 <u>administrative offices</u>, half of which are local and the other half central government offices. The concentration of offices at Sāngumukh include the Survey Department, Regional Transport office, Education Department, Panchāyat Department, Police Headquarters, Malaria Eradication Office, and the Airlines Office. The other locality for offices is the adjacent Terchhāpaṭi with the Municipality, Post Office, Publicity Office, & a Bank.

The chief industrial establishment of the town is of metalwork at Terchhāpaṭi and Rāmkrishṇa Ṭol. At Sāngumukh six Newār families specialize in preparing parboiled rice for sale. The latest industries are two furniture works and a soda factory at Terchhāpaṭi.

Educational buildings include three public libraries and one school. Nine Hindu temples and one Buddhist shrine, strung along the main roads are the chief cultural features. Commercialised recreation is made-up by one cinema hall in the town centre. A theatre at Terchhāpaṭi was destroyed by a fire a few years ago.

Transport function is represented by four rest houses and ten chautārās. With the exception of 26 houses (5.4 per cent) left vacant, the town houses put to other functions are used for residence as well. A quarter of the town houses are entirely residential. West of Sāngumukh, a group of modern bungalows establishes it as a new high-class residential area.

In brief, there is no separation of places of work from places of residence. Functional differentiation occurs instead within the storeys of the structures. The plot of land attached to the buildings all grow maize and market gardening is still unimportant. There is the ascendency of newcomers who had no land but derived their wealth from commerce, against old residents who owned land.

d. Changes in Land Use.

Field-terraces new overgrown with ferns, new clearings close to forests, reclamation of overgrazed pastures for cultivation and growth of new bazars all indicate changes in land use through time. Changes are most apparent in the transition zone between arable farming and grazing, and between farms and forests, which has resulted in the contraction of grazing land for farming and in turn the overgrazing of woodlands. Another feature of land use evolution has been in the clearing of woodland for dry crops, and the subsequent conversion of dry cropland into irrigated fields for paddy. There has been an increase of 7.6 per cent in irrigated land between 1933 and 1962 among the 27 thums of Pokhara Valley for which data are available. (Table xxxv).[9] The increase in irrigated land has been greatest in the thums on the plain with new irrigation projects, and least in the montane areas (Fig. 58b). Thus the improvements in irrigation facilities has greatly altered the pattern of land use. Urbanisation is also evident along the main roads in the central plain.

(I) <u>Irrigation extention</u>. Agriculture on drier slope fields depends on irrigation and it is even more so on the outwash plain where the water-table is 200-300 feet below the surface. And the high value attached to rice puts a premium on irrigated land for paddy. The density of population per irrigated acre varies from less than three in the plain thums with large irrigation works to over six persons in some montane thums (Fig. 58a) the average for the 27 thums being 4 persons per acre. In detail, however, this density pattern does not necessarily c conform to the respective topography of the thums. The critical criteria remains the availability of irrigation, be it small enterprizes in the hills to large projects in the plains.

Irrigated fields are greatly prized and immense labour is devoted to procure water for the fields. Small paddy fields are found wherever there are spring sources for irrigation. Given the limited technical knowledge and resources, the diversion of small streams is common and intermittent streams are also utilised. Usually a low dam is raised across the streams to divert the water to the fields through channels. Sometimes the channels ('kulo') may be over two miles long and may involve

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9. Revenue Records, Kāski District, 1933 and 1962 reveal that the district has experienced an increase of 6.5 per cent in irrigated land and 9.7 per cent in unirrigated land over the last 30 years.

tunneling through solid rock or the use of bamboo aqueducts and wooden flumes over steep rock-face (Pl. LXXV). Such native ingenuity in water-control has helped to irrigate many fields otherwise dry.

The irrigation schemes for the plain by their very scale demand greater resource and modern techniques. The need for irrigating the extensive plain had long been recognized but the local techniques were unable to overcome the challenge. In the last century the then Prime Minister (Jang Bahādur) "calculated that if, by power of steam in working pumps, the water of the lakes were made available for general irrigation and the whole valley were brought under cultivation, it would yield income of five or six lakhs of rupees."[10] The project was never undertaken as it would have involved engaging foreign engineers in forbidden Nepal! Local attempts at providing irrigation to the plain land were, however, not lacking. Over a hundred years ago Phewā Tāl had been dammed by a crude stone and mud bund by professional builders from Pālpā and the plain thus irrigated was named Pālpāphānṭ (Fig. 59b). Kāhunkholā, which previously joined the Bijaypur Kholā was also diverted south on the Kāhunphānt by a local engineer in the last century. Many streams debouching unto the plain were similarly utilized to irrigate plain fields at Hyāngjābesi, Kunḍahar, and Arghoun and each were maintained by canal wardens ('chitāidār').

Since over a decade ago technological improvements have helped to extend old attempts and government has instituted new irrigation projects. The Bijaypur Project started in 1948 proposed to bring under irrigation over 1,600 acres on either side of the Bijaypur Kholā. The project envisaged two canal systems, the Upper Bijaypur Canal for the Kāhunphānṭ to the west

10. Oldfield (1880) I: 46.

XCV. Minor Irrigation of local scale utilizing the lake waters irrigate the plain in patches at Khudi. See p.183.

XCVI. Major Irrigation. On the Pālpā-phāṇt, the large-scale damming of Phewā Tāl has brought an extensive area under canal irrigation. A power-house is projected at the right-hand edge of the plain. See p.183.

and the lower Bijaypur Canal to serve the eastern plain (Fig.59a). The Upper Bijaypur Canal project was later abandoned because of the wrong estimate in the irrigation potential of the canal water supply. The initial estimate was based on experiences in Kāṭhmāṇḍu Valley where 1 cusec water irrigates 80 acres, and in U.P. and Bihar where it is 60 acres per cusec water. On the gravelly Pokhara plain the irrigation capacity of 1 cusec water is only 25 to 30 acres. Thus, work was later concentrated on the Lower Bijaypur Canal with a carrying capacity of 90 cusecs during the rainy season. The original 9 mile canal has since been successively extended below Khudi. The canal now irrigates land worth about 20,000 bushels of paddy.

The plain east of Khudi is served by the waters drained from the eastern lakes. The waters of Khālṭe and Dipāng Tāl are re-charged from the stream draining Begnās Tāl and the combined lake waters irrigate the south-eastern plain. The old Pārdi dam has been replaced by a modern 46-feet high barrage which will also produce 1,000 kilowatts of hydroelectricity. The 8-mile long canal from Pārdi dam irrigates 1,200 acres of Pālpāphānṭ (Plate XCVI; Fig. 59b). In addition a viaduct over the Pārdi Kholā, carries 15 cusecs of water from the main canal irrigating 400 acres of the western flat, Chhorepāṭan.North of town, at Hyāngjāchaur, a small canal has a capacity of 40 cusecs and irrigates about 1,000 acres.

(ii) Present Trends. Two trends in land occupance are evident at present, (1) intensification in the use of existing land categories, and (2) extension of certain categories at the expense of others. Under the first group falls the practice of double-cropping along with improvements in farm practices, and increase in marketing facilities. Winter fallowing as a general practice meant that most of the agricultural lands were left idle for a part of the year. Agriculture extension by means of introducing winter crops and green vegetables has been active since the first arrival of the Village Development workers in 1952. One agricultural trial farm and one horticultural farm for experiment,

PLAIN LAND

XCVII. <u>Fallow Land</u>, once under 'Birtā' ownership at Bhimpāṭan north of the town. Old embankments are seen on the large enclosed field in the foreground. The college is located at the left-hand edge. The Seti flows through a gorge in the centre foreground. See p.155.

XCVIII. <u>Meadow Land</u>. The extensive meadow lands have become the favourite sites for new projects. The one in the picture is the Refugee Camp for Tibetans below Hyāngjābesi. Note the wooded north slope of Kāhun Hill in the centre background. See p.184.

demonstration, distribution of seeds, insecticides, fertilizers and periodic exhibitions since 1959 have made some repercussions near the bazārs. The grant ('birtā') lands which were being used less-intensively have now reverted to public ownership and these now form the nucleas of development (Pl. XCVII).

Population pressure admittedly accounts for the present shift towards more intensive use of the plain. There has been considerable flow of hill population unto the plain, once a negative area for settlement. The old dread of the plain for habitation has been dispelled by the progress in malaria eradication.* Improvements in communication and transport had encouraged growth of bazārs both in size and number. Ghāripāṭan, an expense of thicket dreaded for highway robbers before its clearance in 1943, is now an all-weather airfield. All the new development projects are located on such virgin lands and the meadows on the plain** within five mile radius of the town (Fig. 51).

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*Near the plain localities of Tinpipole, Susuwā, Bhanāḍhik, and Gagangauḍā new settlement areas were created between 1956 and 1959.

**The important new establishments are the Tibetan Refugee Camp at Hyāngjābesi; National High School, Mission Hospital, P.N. College, and British Pension Camp near Bhimpāṭan; Agriculture Farm, Horticulture Farm, and Cottage Industries Centre at Mālepāṭan; Village Development Centre, D.S.B. Hospital, D.S.B. Hospital, D.S.B. High School, and Indian Pension Camp at Rāmghāṭ, and Sheep Breeding Station at Lāmpāṭan.

CONCLUSION

a. Systematic Analysis

b. Geographic Synthesis

CONCLUSION

"Man has modified the face of the mountains by stupendous labor, but the great earth masses that all but blot out the stars of night, and by day limit the sunshine which may penetrate to the fields in the canyons, condition, and always will condition, man's activities."

- Roderick Peattie (1936, p.235)

a. Systematic Analysis

The preceding topical chapters examine the specific phenomenal content of the region. Before attempting a regional synthesis, the basic findings are recapitulated below.

1. Location. The study area is an intermont valley in the middle stretch of Seti river in Central Nepal. It falls in the hill country ('Pahāṛ') bounded by the Great Himalaya in the north and the Mahābhārat Lekh in the south. Altitudinally, the region rises from below 2,000 feet in the south-east to 8,900 feet in the north. The significant levels encountered are low valleys ('Bensi'), sub-montane hills ('Kachhāṛ'), and montane highlands ('Lekh').

2. Orogeny and Glaciation. Lying within the Himalayan mobile welt and close proximity of the glaciated highlands the region has been exposed to the physical processes of uplift and glaciation. Intermittent uplift is indicated by the river terraces and the stream profiles. There are three main terrace levels and the stream profiles are irregular. The region may not have experienced direct glaciation but the outwash deposits of the plain suggest a strong peri-glacial regime in the past.

3. Structure. The regional geology is derived from two main nappe systems superimposed over a para-autocthonous zone. The structural axis of the nappes are north-west to south-east and that of the para-autochthonous 'Pokhara zone' south-west to north-east. The erosion of nappe sheets has exposed the

LANDSCAPE PATTERN

XCIX. Hills and Plain, reveal contrasts in their physical and livelihood characteristics. Kāhun (4,736 ft) village in the foreground and an extensive irrigated area on the plain. Bijaypur Kholā flows from the left-hand centre to join the Seti at the base of Barsāmi Ridge in the background. Kunḍahar bazar on the unirrigated fields of the plain at right.

'Pokhara zone' as a tectonic window.

In addition 48 square miles of the main valley is covered by superficial gravel deposits. The average thickness of the strata decreases downstream: 400 feet to 200 feet. The bedding is large-scale and gently dipping south. The diversity in content and the morphology both suggest a rapid deposition under abnormal conditions.

4. Geomorphology. The physiographic components are an extensive plain enclosed by a maze of hills; and the terrain types range from nearly flat plain to slopes of varying declivity. The plain slopes gently southwards and its gradient also decreases in the same direction. On the average the plain falls 100 feet in a mile and comparision of its morphology with other mountain areas indicate it to be a valley train in origin. An anticlinal axis running east-west just above the town demarcate two landscape zones. The hills south of the anticlinal axis form parallel strike-ridges with their gentler slopes facing south. The northern highlands are more rugged with pronounced spur-development and steep slopes.

5. Hydrography. Structural control is seen in the rectangular pattern of the larger streams and parallel pattern of the tributary streams. The plain has low stream density but higher stream order. The stream profiles, hyperbolic with steep upper reaches, indicate their extreme youth, and the irregularities prove their descent over an uplifted land surface. Discharge of the streams vary greatly between the winter trickle and the monsoon deluge.

The lakes are all located on the edge of the plain and were formed by the damming-up of the tributary streams by a valley train of the main Seti valley. The smaller lakes are diminishing in size by silting. Phewā Tāl has been enlarged by damming for irrigation and for generating hydro-electricity. The water-table on the plain is very low due to the porous gravel.

6. Climate. The climate is humid sub-tropical. Mean temperature on the plain is always above 56°F. and summer means exceed 72°F. The annual range is 71°F. with a range of 20°F; the January minima being 56°F. and July maxima 78°F. Snow falls above 6,000 feet during the winter with frosts lower down. mean [Table iii]

The annual rainfall averages 141 inches, and 82 per cent of precipitation occurs during the summer monsoon. Local convection hailstorms in autumn and strong winds during the dry Spring are the limiting factors to certain crops. The seasonal cycle is gool-warm-hot-warm. The agricultural activity conforms to the seasonal rhythm and the vagaries of monsoon affect the farmer's poverty or prosperity.

7. Vegetation. Plant associations of great variety are zonally distributed from the tropical to temperate levels. Shorea robusta occur in the tropical belt and Schima wallichii-Castanopsis indica predominate on the sub-tropical hills. Forests of oak and rhododendron cover continuous blocks in the northern highlands. Natural grasslands are extensive on the Seti river terraces and sometime overlap with riverain Acacia catechu and Salmalia malabaricum. Plantations for shade, shelter, fodder, and fuel has also much changed the vegetation on the plain.

Shifting cultivation, overgrazing, fire and lopping have resulted in the depletion of forests. In the sub-tropical belt forests are most vulnerable to destruction by the farmers and forests have been left only on the steep slopes.

8. Soils. The method of soil evaluation employed is of a purely comparative character. Immaturity is the chief characteristic of the soils. The brown forest soil is heavy loam in texture and fairly fertile. The red earths with varying degree of laterization necessitates manuring for profitable

farming. The preferred soils for cultivation are the recent alluvia of sandy loam with good internal drainage. The soil on the plain derived from the underlying gravels has a thin humus layer and water-holding capacity is poor. What with steep slopes, occasional thunderstorms, and deforestation, the soil erosion is an acute problem.

9. Population. The density of population is 483 persons per square mile for the region and 3,450 persons per square mile within the municipal area. About 18 per cent of the total population live in the bazars, and there is a sharp fall in density above the 5,000 feet contour level. There is a pre-ponderance of females and the age structure is one of rapid rate of population growth. There has been a population increase of 10 per cent during the period 1954-1961. The greatest gain has been in the bazars indicating a trend towards urbanisation. The exodus from the hills is directed both towards the bazars as well as new settlement areas in the Terai.

10. Health and Education. Diseases of the digestive system are the most prevalent. Endemic goitre is common in the highlands. The eradication of malaria in the lower valleys has been making a satisfactory progress. Dissemination of health services is of recent origin and three hospitals serve a large area.

Even in 1954 when there were only a few schools, Kaski district registered the highest literacy rate outside Kāṭhmāṇḍu. At present over a quarter of the population in Pokhara region are considered literate. The fact that 52 per cent of the literate fall under the child age group indicate the increasing impact of education as a new phenomena. The conversion of old hill fortresses ('koṭs') into schools is symbolic of the dominance of this modern innovation.

11. Culture. The highlands are inhabited by Mongoloid tribes, using Bodic dialects and subscribing to shamanistic Lamaism. The sub-montane area is peopled mainly by the caste-stratified Europoids, who use the Indo-Aryan Nepāli language and profess Hinduism. The contact zone of the two culture areas lie about the 5,000-feet level.

The tribal area is pronounced for the localization of culture patterns and in their interaction with the Pahāṛi (Hindu) culture, the political advantage of the latter wields a greater influence. The returning Gurkha soldiers have been a potent medium for the spread of Hinduistic traditions in their tribal areas. The process of transition from tribe to caste has led to the gradual erosion of the indigenous tribal culture to which the physical isolation of its montane habitat alone provides the last prop.

The formation of multi-ethnic Nepalese society is seen as a process of mixing of diverse peoples within the geographic confinement provided by the Great Himalaya and the Mahābhārat Lekh. Acculturation is most intense in the low hills where the downward tribal and upward Pahāṛi population movements coalesce. Bazars are points of assimilation where an urban milieu is in the making.

12. Settlement. The density of villages is 2 per square mile and that of houses 91 per square mile. On average there are 10 villages and 500 houses in each thum. Over 84 per cent of the settlements are sited on the hills, and the plain covering 27 per cent of the total area supports only 15 per cent settlements. The settlement net is highest between 3,000-5,000 feet. Settlements are distributed by site as follows: sunny aspect hill 55%, shady aspect hill 21%, ridge-top 8%, and valley bottom 15%. Nucleation increases with altitude and the distance between settlements also increase in the highlands.

Bazārs with retail shops are all confined to the plain along the main roads. Their size decreases with increase of distance from metropolitan Pokhara. The town of Pokhara is primarily a commercial centre aligned $2\frac{3}{4}$ miles along three converging roads. Its neighbourhoods are centred around roadside shrines and chautārās. It has since grown in importance as a service as well as an administrative centre.

The typical rural house is rectangular in plan and two-storied. The lowland houses are invariably thatched and plastered with lateritic earth. In the highlands, thatch and slate are both used and white-washing is preferred to red plaster. The bazar house is usually a three-storied brick building with slate or tin roof. The emphasis is on tin roof because of the recurrent fires in the bazars. The 'koṭs' probably represent an old settlement form, and occupy defensive sites.

13. <u>Circulation</u>. The town of Pokhara is a trans-Himalayan trade depot, as well as an important staging-point for the east-west communication within Nepal. The main roads are served by local tracks. The total mileage of roads and tracks is 320, hills claiming 52 per cent. Most roads are however seasonal and there is a sharp contrast between the deserted roads in summer and the winter influx when all roads lead to the bazars and fairs. The growth of bazars has divorced the fairs of their earlier functions and led to their decline.

Man is still the essential beast of burden. The introduction of modern transport has been in an inverted sequence: first aeroplane, then jeep, and finally bullock cart. Air transport by diverting the potential surface traffic, has arrested road development.

14. <u>Agriculture and Livestock</u>. The primitive agrarian structure is the heritage of an archaic land system. The burden of taxation is heavier on the paddy lands and this has led to the

extension of dry cropland at the expense of forests. The farming is characterized by high labour input, little capital investment, and low productivity. Food crops account for 90 per cent of the total arable land. In spite of heavier taxation, paddy enjoys premium over other crops both in acreage and value. Maize is the most important dry crop. Oranges for the market are grown in two plain villages. Truck gardening in the bazars has been introduced only recently.

Livestock rearing is an integral part of crop farming as animals provide manure and draft power. Pasturage remains an acute problem in the lowlands. In the highlands sheeps are raised which yield surplus dairy products and wool.

15. Industry. The plentiful supply of labour and small inadequate holdings make subsidiary employment essential. Porter-work is widely accepted and mercenary service remains the most valued profession. Native industries differ between the highlands and the lowlands according to the availability of raw materials. Apart from the weaving industry of the Gurungs, the highlanders also engage in basket-making and extracting forest products. Occupational castes specialize in certain primary industries. Brick making is confined to the plain. Newly introduced industries include, furniture-making, rice mills, and a match factory. Tourism is the latest modern industry.

16. Land Use. The degree of slope puts an obvious limit to the amount of productive land and in spite of the adverse slope, most suitable lands are already being utilized. The maximum degree of slope on which fields occur do not exceed 32 degrees. Terracing has extended cropland on steep slopes. Terraces are of two types: flat-surface for irrigation crops and sloping-surface for dry crops.

The seven major categories of land use are according to areal dominance: Woodland (46%), Cropland (41%), Pasture (5.8%) Unproductive Land (3.7%), Lakes and Marshes (2.6%), Settlement (1%), and Tree Fruits (1%). One-third of the Woodland is overgrazed scrub forest. About 57 per cent of the cropland is terraced, and the Pasture grasslands are all confined along the Seti river terraces. Lakes cover a total of 4 square miles, the largest being Phewa Tal with 1.85 square miles. Unproductive Land includes the reaches of sand and boulders, and Associated Non-Agricultural Land all occupy the meadows on the plain.

The land use in Pokhara bazar by houses reveal 60% commercial, 25% residential, 5% vacant, 4% administrative, 4% industry, 1% cultural and educational, and 1% transport. The bazar houses have vertical stratification of functions with shops on the ground floor and residence on the upper floors.

Change in land use is most intense in the zone between arable farming and grazing, and between farms and forests. The extension of cropland creates a chain reaction of contraction in pastureland and the overgrazing of woodlands. The land utilization evolution is clearing of cropland for dry crops and the subsequent conversion of unirrigated land into irrigated land. There has been an increase of 7.6 per cent irrigated land over the last 30 years. Recent developments in large-scale irrigation works on the plain has upgraded the value of the plain for cultivation, and settlement. The new trends in land occupance are the intensification in operation and the extension in cropland by reclamation. The growth of bazars with market economy has further laid emphasis on the rapid development of the plain.

b. Geographic Synthesis

Intermont plains, like monadnocks are conspicuous by their location. The Vale of Pokhara in Central Nepal is one such topographic variant in the Himalayan complex. The analysis of its physical and cultural phenomena yield certain site-complexes in their areal interrelationship (Fig. 60). The subdued topography and tropical climate of the sub-montane Pahāṛ zone differs markedly from the rugged relief of the temperate montane Lekh. They reveal corresponding differences in human ecology and economy. In the Lekh zone, nature is more dominant and man tries to adjust within the limit set by the physical environment.[1] It may even be asked if the orientation of the Mongoloid tribes to the mountain fastness is not due to their instinctive choice for familiar habitats.[2] On the other hand, man-land relationship in the Pahāṛ zone is one of man's conscious adaptation of nature for his own needs. The impact of tradition in the spoliation of ecological setting may be seen in the extensive deforestation of the Pahāṛ zone. In socio-economic parlance, the intrusive Pahāṛis represent a stage of feudally organized agrarian society while the indigenous tribes represent a stage of clan-peasantry with some pastoralism.

With this environmental background, one might proceed to examine the processes of functional relationship between the two ecological zones. If the rearing of large flocks of

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1. Thomas (1957): 117-43, recognizes five categories of man-land relationship: (1) Physical Environmental Dominance, (2) Man's adaptation to Nature, (3) The Idea of Landscape Harmony, (4) Man's Action in Changing His Habitat, and (5) Cultural Dominance.

2. P. H. Stevenson offers this conjecture on the Lolo, Ch'iang and Chiarong tribes in "Notes on the human geography of the Chinese-Tibetan borderland," <u>Geographical Review</u>, XXII (1932), 599-616.

CHANGING PROCESS

C. <u>Porters and Plane</u>. The rapid change in the life of the region is symbolised by the intrusion of aeroplane over a decade ago. Man is still the beast of burden, but opportunities have widened.

animals was profitable in the montane zone, the sub-montane zone capitalized on the best agricultural land as the local saying goes:

Arbā ko ghāri
Baidām ko bāri
Mājhṭhān ko ṭāri.[3]

The differences in human operations is evident in the exchange of agricultural and pastoral-forest products as an important aspect of trade. In the past when the raiding of paddy harvest by the highlanders was not unknown, periodic fairs marked peaceful exchange of goods. But with the stability of political organization and administration, the mere circulation of goods was followed by demographic mobility from one zone to another.

The evolution of human occupance in the present region was primarily one of descent to the lower elevations.[4] The upward movement of the extreme limits of cultivation and settlement signifying expansion of the 'oikoumene' is much less evident than the downward drift. In fact, the highland villages are primary nucleations of greater antiquity compared to the lowland villages which represent a secondary dispersal with agricultural extension. The tertiary development in settlement, growth of bazārs, was the result of increase in circulation (Pl. C). Humid and malarial conditions conspired to make the lowest elevations ('bensi')

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3. The place-names Arbā, Baidām, and Mājhṭhān can be located in Fig. 7. 'Ghāri' is an irrigated field at hill-foot much enriched by alluvial soils. 'Bāri' refers to well-manured fields close to the settlements, and 'Ṭāri is terraced irrigated fields.

4. The process described here is reverse to that envisaged by Peattie (1936): 159, "Mountain regions are difficult to farm. Economically they are the last places which are chosen. They are overflow areas of the plains, and the number of people that they are compelled to maintain depends upon the economic condition and pressure of population of the adjacent plain."

less favourable for permanent occupation. The movement of population to the 'bensi' level was forced by the deterioration in man/land ratio with increase of population in the hills and the trend has been accelerated recently by malaria eradication. The plain, once a negative zone of occupance is now the focus of settlement. The shift from small-scale irrigation farming to large-scale irrigation farming aided by government directed projects has been a significant factor in the development of the plain. Technological innovations and central function of the town has further enhanced the importance of the plain for habitability.

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TABLES

TABLE I - POKHARA PLAIN GRADIENTS

	Location/Altitude		Feet in miles	Gradient
	Bhārbhure	4,251	157 in 4 miles	1:1,584
	Ghāchok	4,094		
	Ghāchok to Hyāngjā	3,413	681 in 4 miles	1:372
	Hyāngjā to Pokhara	2,997	413 in 3 miles	1:450
	Pokhara to Ḍaḍuwākholā	2,625	375 in 4 miles	1:640
	Ḍaḍuwākholā to Khudi	2,191	434 in 5 miles	1:728
	Khudi to Mālmul	2,051	140 in 2 miles	1:905
	Mālmul to Dobhān	1,655	396 in 8 miles	1:1,349
Plain				
Upper:	Bhārbhure - Pokhara		1,251 in 11 miles	1:556
Central:	Pokhara - Mālmul		949 in 11 miles	1:736
Lower:	Mālmul - Dobhān		396 in 8 miles	1:1,349
Average:	Bhārbhure to Dobhān		2,826 in 30 miles	1:652

TABLE II - FLODD-LEVEL RECORDS OF BIJAYPUR KHOLĀ AT TIN-PIPALE

Bed Level = 98.50 (assumed)

From 8 to 12 hrs.

July 1962		August 1962		September 1962	
Date	F.L.	Date	F.L.	Date	F.L.
16	101.00	1	102.30	1	102.10
17	101.00	2	101.80	2	101.60
18	101.80	3	101.50	3	101.50
19	101.50	4	101.40	4	101.30
20	101.00	5	101.10	5	101.60
21	100.98	6	101.20	6	101.10
22	100.98	7	101.70	7	101.00
23	100.97	8	101.30	8	101.00
24	101.00	9	101.60	9	101.00
25	100.98	10	101.30	10	101.00
26	100.98	11	102.10	11	101.00
27	101.00	12	102.70	12	102.00
28	100.00	13	101.70		
29	101.00	14	102.10		
30	101.00	15	102.40		
31	101.20	16	103.90		
		17	102.30		
		18	102.70		
		19	102.10		
		20	101.90		
		21	101.90		
		22	101.70		
		23	101.50		
		24	101.60		
		25	101.70		
		26	101.90		
		27	102.30		
		28	102.40		
		29	102.10		
		30	101.40		
		31	101.50		
Average	2.21	Average	3.53	Average	2.35

II

Date	F.L.	08.00 a.m.	12.00	16.00 p.m.	20.00 p.m.
16.7.62	101.00	101.00	101.00	101.00	101.00
17	101.00	101.00	101.00	102.00	101.80
18	101.80	101.00	101.00	101.00	101.50
19	101.50	101.00	101.00	101.00	101.00
20	101.00	101.00	100.98	100.98	100.98
21	100.98	100.98	100.98	100.98	100.98
22	100.98	100.97	100.97	100.97	100.97
23	100.97	101.20	101.20	100.20	101.00
24	101.00	100.98	100.98	101.98	100.98
25	100.98	100.98	100.98	101.98	100.98
26	100.98	101.20	101.00	101.00	101.00
27	101.00	101.00	101.00	101.30	100.00
28	100.00	100.99	100.98	101.50	101.00
29	101.00	101.00	101.00	101.00	101.00
30	101.00	101.20	101.20	101.20	101.20
31	101.20	101.00	101.00	101.00	101.00
Average	2.35	2.53	2.51	2.69	2.52

TABLE III - TEMPERATURE (in F°)

Monthly Means

	1957	1958	1959	1960	1961	1962
Jan.	56.1	58.6	56.3	5818	57.4	54.1
Feb.	59.0	59.7	58.5	63.5	57.9	58.6
Mar.	65.7	68.4	67.8	64.4	65.8	66.0
Apr.	74.5	75.9	75.2	73.9	75.2	74.1
May	79.9	76.6	77.2	78.8	77.4	73.4
June	77.4	79.2	77.0	78.3	77.9	76.6
July	77.7	77.4	78.3	78.3	78.6	83.7
Aug.	77.7	77.0	78.1	79.5	78.1	77.0
Sept.	76.6	78.4	76.6	76.3	77.4	75.9
Oct.	70.9	73.4	70.9	70.7	61.9	70.5
Nov.	74.5	66.0	63.7	63.3	59.7	62.0
Dec.	59.0	58.8	58.8	59.2	54.3	57.2
Range	21.6	20.6	22.0	20.7	21.2	29.6

Temperature Summary 1957-1962

	Maximum	Extreme Maximum	Mean ~~Median~~	Minimum	Extreme Minimum	Range	%
Jan.	66.6	68.5	56.3	46.0	43.5	20.6	7.6
Feb.	69.6	74.5	59.5	49.5	47.7	20.1	8.1
Mar.	77.7	80.4	66.6	55.6	53.8	22.1	9.1
Apr.	86.7	87.6	73.6	60.6	60.1	26.1	10.1
May	88.0	91.8	77.2	66.4	63.7	21.6	10.4
June	85.5	89.2	77.5	69.6	69.3	15.9	10.6
July	85.1	86.0	78.1	71.2	70.7	13.9	10.6
Aug.	84.6	86.9	77.8	71.1	70.3	17.1	10.8
Sept.	81.1	84.7	73.4	65.7	46.6	15.4	10.0
Oct.	80.4	82.6	71.2	62.1	61.0	18.3	9.6
Nov.	73.9	76.8	62.5	53.2	50.9	20.7	8.4
Dec.	68.2	70.5	58.2	48.2	43.7	20.0	7.9
Annual	78.9	81.3	71.1	60.9	56.7	20.4	100

TABLE V - RAINFALL (in inches)

	1956	1957	1958	1959	1960	1961	1962	1963	Average
Jan.		3.92	0.69	2.95	0	2.13	2.20	0.16	1.93
Feb.	No	0.26	0.59	0.48	1.06	2.64	2.87	0.91	0.91
Mar.		0.37	1.94	0.88	3.43	1.65	1.57	3.98	2.05
Apr.	Data	1.39	8.15	2.35	1.10	2.24	2.95	4.84	1.81
May		3.85	7.14	10.90	9.45	5.55	12.91	9.61	8.54
June	24.22	18.33	17.05	29.40	21.26	30.87	39.06	26.38	25.63
July	27.05	9.51	36.37	23.92	31.96	41.18	31.97		32.01
Aug.	25.78	50.00	48.00	19.39	18.98	40.39	40.39	No	35.63
Sept.	25.54	17.59	22.99	26.35	27.05	18.43	18.46		21.89
Oct.	8.48	3.30	10.12	11.43	9.09	8.82	4.25		7.87
Nov.	0.31	0.08	0.12	0	0.20	0.04	0.04	Data	0.04
Dec.	0.76	1.47	1.44	0	0	1.06	0.75		0.79
Total		153.48	132.07	128.05	123.08	154.92	157.42		141.50

TABLE VIII - WEATHER RECORDS, POKHARA, 1956-1963

Altitude, 2,700 feet (917 m.). Long. 84^{0}E; Lat. 28^{0} 15' N.

	*Barometric Pressure (in Millibars).			Temperature F^{0}						Relative Humidity %			Dew Point (Pressure 30.0 In) %			Piche Evaporimeter (Mm.)			Wind Speed* (in knots)		
	08.30	17.30	Mean	08.30 Dry	08.30 Wet	08.30 Depression	17.30 Dry	17.30 Wet	17.30 Depression	08.30	17.30	Mean	08.30	17.30	Mean	Day	Night	24 hrs.	08.30	11.30	17.30
Jan.	923.9	920.6	922.2	52.5	49.1	3.4	58.3	53.6	4.7	81	75	78	43	45	44	1.8	0.8	2.7	3.1	4.2	1.5
Feb.	922.2	919.6	920.9	56.8	52.0	4.8	63.0	55.2	7.8	76	59	67	44	41	42	2.3	1.0	3.6	1.9	3.7	3.8
Mar.	920.2	917.6	918.9	65.5	59.5	6.0	65.5	59.2	6.3	70	66	68	50	48	49	3.5	2.4	7.5	2.0	4.7	3.9
Apr.	917.4	915.5	916.4	74.1	62.4	11.7	75.6	63.9	11.7	54	45	49	40	41	40	4.4	3.5	7.5	1.9	1.9	4.4
May	914.7	911.8	913.2	77.5	66.9	10.6	76.5	67.6	8.9	59	61	60	48	53	50	3.7	2.6	6.4	1.9	4.8	4.0
June	913.7	910.9	912.3	77.0	71.8	5.2	78.4	74.5	3.9	78	86	72	63	70	66	1.9	0.9	3.0	2.6	3.7	3.7
July	913.0	911.2	912.1	76.8	73.6	3.2	79.5	75.0	4.5	87	82	84	69	69	69	1.5	0.6	2.2	2.7	4.6	4.8
Aug.	914.1	911.2	912.6	76.5	72.9	3.6	78.8	74.3	4.5	87	82	84	68	68	68	1.5	0.6	2.1	2.0	4.1	3.5
Sept.	916.2	912.9	914.5	75.6	71.8	3.8	76.6	73.4	3.2	86	86	86	66	69	67	1.5	0.5	2.2	1.9	4.6	2.3
Oct.	920.5	918.3	919.4	70.7	65.3	5.4	70.9	67.3	3.6	77	85	79	57	62	59	1.9	0.8	2.7	2.1	4.6	1.6
Nov.	923.8	920.9	922.3	61.9	57.6	4.3	62.1	60.6	1.5	78	94	86	50	55	52	2.1	0.8	2.9	2.2	6.5	0.8
Dec.	921.4	921.3	921.3	55.0	51.6	3.4	54.1	54.9	0.2	82	94	88	38	50	42	1.8	0.7	2.6	2.3	4.0	1.1
Annual	918.4	915.1	916.7	68.2	63.0	5.4	69.9	64.9	5.0	78	74	76	53	55	54	25.9	15.2	45.4	2.2	4.3	2.9
Reference to Graphs	Fig. 16b.			--------						Fig. 17a			Fig. 17d			--------			Fig. 17c		

* Readings only for 1960-1963

TABLE X - JANUARY, 1963 (See Fig. 18a)

	Rainfall (inches)			Temperature F°					Relative Humidity %	
	08.30	17.30	Total	08.30 Max.	08.30 Min.	17.30 Max.	17.30 Min.	Daily Mean	08.30	17.30
1				64.9	41.3	64.8	47.5	59.6	78	65
2				64.8	41.2	65.1	48.0	54.2	73	64
3				65.1	40.3	65.3	48.0	54.5	70	69
4				64.9	43.3	65.1	52.9	62.3	71	63
5		NO		64.9	43.9	66.7	49.1	57.6	70	61
6				66.7	43.7	66.2	48.9	62.3	71	62
7				66.2	41.0	67.8	45.3	59.7	72	57
8				66.7	43.2	68.0	48.9	62.2	73	64
9					N O	R	E C O	R D S		
10				68.6	41.5	67.8	48.6	56.8	74	67
11				67.8	38.7	68.5	49.5	55.6	69	53
12		RAIN		68.5	42.4	66.6	48.2	56.4	68	52
13				66.6	41.9	64.9	47.7	50.2	72	51
14				64.9	42.1	63.3	45.9	54.4	78	60
15		0.05	0.05	63.3	49.5	61.7	50.9	56.2	78	89
16	3.1	2.0	5.1	61.7	45.9	62.6	48.0	54.6	95	61
17	1.0		1.0	62.6	41.9	64.6	46.8	53.9	77	58
18				64.6	42.8	64.2	49.5	55.2	75	60
19				64.2	41.9	65.5	47.7	54.8	75	47
20				65.5	43.0	67.8	48.7	56.2	68	39
21		NO		67.8	43.3	68.4	49.5	58.6	68	35
22				68.4	42.6	70.3	50.5	58.6	59	45
23				70.3	45.1	68.9	51.1	58.8	68	49
24				68.9	45.1	69.3	50.5	58.4	74	54
25				69.3	46.0	70.0	51.3	59.5	59	47
26				70.0	45.5	68.7	52.3	59.0	68	49
27				68.7	47.7	69.6	52.9	59.6	82	59
28		RAIN		69.6	46.4	69.4	53.1	59.5	73	43
29				69.4	46.4	69.3	52.0	59.7	66	54
30				69.3	45.1	70.3	52.5	55.6	59	37
31				70.3	44.2	70.0	51.1	59.2	59	39
Monthly	4.1	2.05+	6.15	66.7	43.5	65.5	52.1	54.1	72	55

TABLE XI - JUNE, 1959 (see Fig. 18b)

	Rainfall (inches)			Temperature F^{o}					Relative Humidity %	
	08.30	12.30	Total	08.30		12.30		Daily	08.30	12.30
				Max.	Min.	Max.	Min.	Mean		
1	0.48	-	0.48	83.5	64.7	83.9	74.1	71.5	71	74
2	0.76	-	0.76	83.9	68.5	84.9	74.1	77.8	86	72
3	0.31	-	0.31	84.9	70.7	85.4	72.7	78.4	96	72
4	1.38	-	1.38	85.4	69.8	86.5	77.1	79.6	87	82
5	2.24	0.78	3.02	86.5	69.5	83.3	69.8	76.7	99	91
6	0.82	0.20	1.02	73.3	61.8	83.4	66.4	71.2	95	79
7	-	-	-	84.4	66.2	87.4	75.6	78.1	76	61
8	0.06	0.70	0.76	87.4	70.7	83.7	74.3	79.0	79.	90
9	0.60	0.04	0.64	83.7	69.7	84.9	69.7	76.6	90	79
10	1.23	0.64	1.87	84.9	69.4	80.4	71.4	78.7	89	93
11	0.40	-	0.40	80.4	68.6	83.8	74.1	76.7	93	85
12	-	1.87	1.87	70.5	59.4	84.9	71.7	71.4	79	93
13	3.55	0.13	4.85	84.9	70.5	84.9	75.7	79.5	92	96
14	0.04	0.36	0.40	84.9	72.7	87.1	72.8	79.3	90	98
15	0.23	0.13	0.36	87.1	71.8	86.8	73.0	79.1	85	90
16	0.33	0.30	0.63	86.8	71.0	88.4	73.8	80.4	82	95
17	0.32	0.11	0.43	88.4	70.8	88.9	73.2	80.1	71	91
18	0.20	0.50	0.52	88.9	69.8	82.5	73.2	78.2	80	92
19	0.60	1.02	1.08	87.4	71.8	87.7	72.4	79.7	81	95
20	0.29	-	0.29	87.7	67.6	87.4	69.8	77.8	74	91
21	-	-	-	87.4	67.8	85.6	67.5	76.9	74	90
22	0.19	0.78	0.97	85.6	68.6	79.8	69.6	75.4	95	78
23	0.03	-	0.03	79.9	69.7	84.0	74.0	76.9	84	79
24	1.21	-	1.21	84.0	68.6	83.8	70.0	76.6	99	77
25	2.95	-	2.95	83.8	68.6	85.1	75.7	78.3	82	81
26	1.81	0.10	1.91	85.1	68.7	83.8	71.0	77.1	97	74
27	0.24	-	0.24	83.8	68.6	86.9	75.8	78.7	88	73
28	2.07	-	2.07	86.9	67.8	84.8	74.0	88.2	85	73
29	0.02	-	0.02	84.8	70.4	80.9	77.7	77.9	67	76
30	-	-	-	80.9	73.4	86.8	78.0	79.7	78	77
Total	21.74	7.66	28.05	84.2	66.1	84.4	73.0	77.0	80	80

TABLE XII - WEATHER DATA, KATHMANDU, 1901-1940*

Altitude: 4,300 feet; Long. 85° 18' East; Lat. 27° 43' North.

	Temperature F°				Rainfall (inches)
	Maximum	Minimum	Mean	Range	
Jan.	64.6	36.2	50.4	28.4	0.38
Feb.	68.2	39.9	54.0	28.3	1.67
March	77.4	45.4	61.4	32.0	0.59
Apr.	83.9	52.5	78.2	31.4	1.01
May	85.3	60.4	74.8	24.9	5.10
June	84.8	66.7	75.7	18.1	9.68
July	83.7	68.7	76.2	11.0	14.69
Aug.	83.4	68.3	75.3	11.1	13.68
Sept.	82.6	65.7	74.1	16.9	7.16
Oct.	80.4	56.4	68.0	23.7	1.44
Nov.	72.8	45.7	69.0	27.1	0.06
Dec.	65.9	37.7	51.8	28.2	0.33
Annual	79.4	52.8	66.1	59.1	55.79

* Data recorded at the previous British Legation in Kathmandu.

TABLE XIII[*] - WEATHER RECORD, NUNKHĀNI, LAMJUNG, 1943-1946

Altitude 3,400; Longitude, 84° 24' East; Latitude, 28° 24' North

	Rainfall (Inches)	Temperature F°		
		Dry	Wet	Depression
Baisākh (mid-April/mid-May)	6.6	76.3	67.0	9.3
Jeṭh (mid-May/mid-June)	6.8	81.0	72.0	9.0
Asār (mid-June/mid-July)	15.5	80.3	74.6	5.7
Sāvan (mid-July/mid-August)	23.7	79.6	74.6	5.0
Bhado (mid-August/mid-September)	24.9	77.3	73.3	4.0
Asoj (mid-September/mid-October)	7.7	77.3	71.6	5.7
Kārtik (mid-October/mid-November)	1.5	71.6	63.6	8.0
Mangsir (mid-November/mid-December)	0.05	66.6	58.6	8.0
Push (mid-December/mid-January)	2.0	60.6	54.0	6.6
Māgh (mid-January/mid-February)	1.6	64.3	56.0	8.3
Fālgun (mid-February/mid-March)	2.4	68.6	59.0	9.6
Chait (mid-March/mid-April)	7.1	73.0	62.3	10.7
Annual	99.8	73.2	65.5	7.7

[*] Data source: Industrial Survey Report, West Nos. 2 and 3, by T.B. Raymajhi et al Kathmandu, 1946, p.4

TABLE XIV - COMPARATIVE DATA, POPULATION *

a. Area, Population, Density, 1961.

Administrative Status	Name of Unit	Area sq. mile	Population	Density
Country	Nepal	54,362	9,387,661	172.6
Capital	Kāṭhmāṇḍu V.	218	456,804	2,095.4
District	Kāski	567	127,231	217.7
"	Lamjung	1,525	130,650	85.6
"	Syāngjā	1,446	341,157	464.7
"	Tanhu	525	127,862	243.5
Region	Pokhara Region	180	86,859	482.5

b. Sex Ratio, 1961

Administrative Status	Name of Unit	Total Population	Male	Female	Female Sex % Ratio
Country	Nepal	9,387,661	4,619,973	4,767,688	50.7
Capital	Kāṭhmāṇḍu V.	456,804	230,291	226,513	49.5
District	Kāski	127,331	58,881	68,350	53.7
"	Lamjung	130,650	62,134	68,010	52.3
"	Syāngjā	341,157	158,878	182,279	53.4
"	Tanhu	127,862	59,852	68,010	53.1
Region	Pokhara Region	86,859	40,278	45,798	52.7

* **Source:** Statistics Dept: Preliminary Report, 1962.

TABLE XV - POKHARA REGION

Area, Population, Sex Ratio, Density *

S.N.	Thum	Area sq. mile	Population			Female % Sex Ratio	Density
			Male	Female	Total		
1.	Arbā	4.45	736	936	1,672	55.9	375.7
2.	Arghoun	16.53	3,802	4,448	8,350	53.9	505.1
3.	Armalā	4.10	1,060	1,096	2,156	50.8	525.8
4.	Astām	1.90	428	464	892	52.0	469.4
5.	Bāṭulechaur	2.42	1,857	2,137	3,994	53.5	1,650.4
6.	Begnās	7.64	775	1,010	1,785	56.5	233.6
7.	Bhalam	2.53	337	434	771	56.2	284.9
8.	Bhirchok	1.71	450	567	1,017	55.7	594.1
9.	Bhumdi	5.49	291	396	687	57.6	125.1
10.	Bhurjungkholā	3.55	247	277	524	52.7	147.8
11.	Bijaypur	3.45	516	603	1,119	53.8	324.3
12.	Chisāpāni	1.00	230	322	552	58.3	552.0
13.	Deorāli	3.67	1,143	1,374	2,517	54.5	685.8
14.	Ghāchok	3.10	1,127	1,246	2,373	52.5	1,098.6
15.	Ghārmi	1.60	321	450	771	58.3	481.8
16.	Hyāngjākoṭ	1.53	345	397	742	53.5	484.9
17.	Hyāngjbesi	2.31	1,399	1,779	3,178	55.6	1,375.7
18.	Jhuprāng	5.33	266	273	1,731	50.6	324.7
19.	Kāhun-Kuṇdahar	11.24	3,814	4.232	8,086	52.5	719.3
20.	Kalābang	2.61	278	367	645	56.7	247.1
21.	Kāski	9.22	3,799	4,410	8,209	53.7	889.2
22.	Khādarjung	2.27	511	549	1,060	51.8	466.9
23.	Lahcok	4.50	1,059	1,212	2,271	53.3	504.6
24.	Mājhṭhān	2.56	1,585	1,896	3,481	54.4	883.4
25.	Maujā	9.43	829	989	1,818	54.4	192.7
26.	Pachbhaiyā	3.29	438	451	889	50.7	270.2
27.	Paundi	8.79	1,071	1,308	2,379	54.9	282.0
28.	Ribān	1.05	571	641	1,212	52.8	1,154.2
29.	Rupākoṭ	7.95	1,035	1,199	2,234	53.6	284.6
30.	Sarānkoṭ	12.11	6,961	7,993	14,954	53.4	1,234.6
31.	Syāglung	2.63	753	931	1,684	55.2	640.3
32.	Tallākoṭ	3.14	1,123	1,330	2,453	54.2	781.2
33.	Ulleri	1.40	132	141	273	51.6	195.0
	Total	177.71	40,278	45,798	86,859		
	Average					52.7	482.5

			Percentage
A.	Part of Tanhu District	3.89	2
B.	Part of Syāngjā District	18.55	10
	Total Area of the Region	180.15	100

* Census Director, personal communication, 28th June, 1965.

TABLE XVI - a. - MARITAL STATUS, KASKI, 1954 *

Age Group	Unmarried		Married		Widowed		Divorced		Relation Unknown		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
5 - 9	7,161	6,751	34	150	-	1	-	-	-	-	7,195	6,902
10 - 14	6,219	4,810	350	1,558	6	34	-	2	3	1	6,578	6,405
15 - 24	6,208	2,141	3,981	8,852	67	383	31	64	87	71	10,374	11,511
25 - 44	879	338	10,632	13,055	328	2,783	87	166	41	28	11,967	16,370
45 - 64	122	95	5,995	4,347	666	4,204	42	56	11	15	6,836	8,717
Over 65	34	19	1,253	547	615	1,919	21	10	5	5	1,928	2,500
Age Unknown	72	79	76	188	6	78	2	7	14	24	170	376
Total	20,695	14,233	22,321	28,697	1,688	9,402	183	305	161	144	45,048	52,781
%	45.9	26.9	43.8	56.2	15.3	84.7	0.4	0.5	0.3	0.2	48.0	52.0

TABLE XVI - b. - AGE STRUCTURE, KASKI DISTRICT, 1954 *

Age Group	Male	%	Female	%	Total	Percentage of Total Population
0 - 4 yrs.	6,905	6.17	7,013	6.27	13,918	12.44
5 - 9	7,195	6.43	6,902	6.17	14,097	12.60
10 - 14	6,578	5.89	6,405	5.73	12,983	11.62
15 - 19	5,878	5.19	6,082	5.44	11,891	10.63
20 - 24	4,565	4.08	5,429	4.85	9,994	8.93
25 - 29	3,747	3.35	5,415	4.84	9,162	8.19
30 - 34	3,053	2.73	4,214	3.77	7,267	6.50
35 - 39	2,649	2.37	3,425	3.06	6,074	5.43
40 - 44	2,518	2.25	3,316	2.07	5,834	5.20
45 - 49	2,281	2.04	2,763	2.47	5,044	4.51
50 - 54	1,933	1.72	2,518	2.25	4,451	3.97
55 - 59	1,514	1.35	1,742	1.55	3,256	2.90
60 - 64	1,108	0.99	1,694	1.51	2,802	2.40
65 - 69	734	0.65	997	0.89	1,731	1.54
Over 70	1,194	1.06	1,503	1.34	2,697	2.40
Age Unknown	170	0.10	376	0.30	546	0.40
Total	51,953	(46.4)	59,794	(53.6)	111,747	100

* Source: Statistics Dept. (1957): 118-119, 72.

TABLE XVIII - URBAN POPULATION

a. Population, Pokhara Bazār, 1959 *

	'Ṭol' or Locality	Adult		Children		Infant		Total		Total
		M	F	M	F	M	F	M	F	
1.	Sāngu-mukh	200	108	8	18	16	6	224	132	356
2.	Terchāpaṭi	478	278	23	54	25	17	526	349	875
3.	Nālāmukh	183	150	29	29	12	6	224	185	409
4.	Bhairab-ṭol	133	148	57	34	15	5	205	187	392
5.	Mohariyā-ṭol	185	179	89	68	23	11	297	258	555
6.	Singnāth-ṭol	60	65	28	17	2	-	90	82	172
7.	Bagar-bazār	117	119	28	25	5	-	150	144	294
8.	Nadipur-Pāṭan	119	80	15	18	3	4	137	102	239
	Total	145	1,127	277	263	104	49	1,856	1,439	3,295

* Source: Nepal Malaria Eradication Organisation, Pokhara.

b. Bazār Population **

	Bazār	Thum	Population
1.	Pokhara town	Sarankot	9,650
2.	Kuṇḍahar	Kāhun-Kuṇḍahar	2,520
3.	Arghounponwā	Arghoun	2,293
4.	Rānipouwā	Kāhun-Kuṇḍahar	997
5.	Sisuwā	Arghoun	639
6.	Khudi	Begnās	485
7.	Pārdi	Sarānkoṭ	474
8.	Sātmuhāne	Rupākoṭ	131
	Total		16,189

** Field Survey, 1962

TABLE XX - POPULATION CHANGE, POKHARA REGION.

S.No.	Unit	1954	Rank	1961	Rank	Change	
						Absolute	Percentile
1.	Arbā	1,719	XIX	1,672	XVIII	- 47	- 2.9
2.	Arghoun	6,697	III	8,350	II	+ 1,653	+ 24.6
3.	Armalā	2,248	VIII	2,156	XIV	- 92	- 4.0
4.	Astām	904	XXIV	892	XXIV	- 12	- 1.3
5.	Bāṭulechaur	3,732	V	3,994	V	+ 262	+ 6.9
6.	Begnās	1,903	XIV	1,785	XVI	- 118	- 6.3
7.	Bhalām	761	XXV	771	XXVI	+ 10	+ 1.3
8.	Bhirchok	1,050	XXII	1,017	XXIII	- 33	- 3.3
9.	Bhumdi	709	XXVIII	687	XXVIII	- 122	- 16.9
10.	Bhurjungkholā	492	XXXII	524	XXXI	+ 32	+ 6.1
11.	Bijaypur	1,229	XXI	1,119	XXI	- 110	- 8.9
12.	Chisāpāni	607	XXIX	552	XXX	- 55	- 9.0
13.	Deorāli	2,092	XIII	2,517	VIII	+ 425	+ 2.3
14.	Ghāchok	2,214	XI	2,373	XI	+ 159	+ 7.2
15.	Ghārmi	756	XXVI	771	XXVI	+ 15	+ 2.6
16.	Hyāngjākoṭ	754	XXVII	742	XXVII	- 12	- 12.6
17.	Hyāngjābesi	3,178	VII	3,178	VII	0	0
18.	Jhuprāng	1,793	XVI	1,731	XVII	- 62	- 3.3
19.	Kāhun-Kunḍahar	6,637	IV	8,086	IV	+ 1,449	+ 21.8
20.	Kālābang	603	XXX	645	XXIX	+ 42	+ 6.9
21.	Kāski	7,913	II	8,209	III	+ 296	+ 3.7
22.	Khādarjung	1,047	XXIII	1,060	XXII	+ 13	+ 1.4
23.	Lāhchok	2,238	IX	2,271	XII	+ 33	+ 1.5
24.	Mājhthān	3,552	VI	3,481	VI	- 71	- 1.9
25.	Maujā	1,817	XV	1,818	XV	+ 1	+ 0.5
26.	Pachbhaiyā	513	XXXI	889	XXV	+ 376	+ 73.2
27.	Paundi	2,139	XII	2,379	X	+ 240	+ 11.2
28.	Ribān	1,187	XX	1,212	XX	+ 25	+ 1.4
29.	Rupākoṭ	1,770	XVII	2,234	XIII	+ 454	+ 25.6
30.	Sarānkoṭ	13,053	I	14,954	I	+ 1,901	+ 14.5
31.	Syāklung	1,726	XVIII	1,684	XIX	- 42	- 2.3
32.	Tallākoṭ	2,192	X	2,453	IX	+ 261	+ 11.8
33.	Ulleri	283	XXXIII	273	XXXII	- 10	- 3.5
	Pokhara Region	78,408		86,859		+ 8,451	+ 10.7
	Kāski	133,627		141,175		+ 7,548	+ 5.8
	Ganḍaki Districts	722,602		807,909		+ 85,307	+ 11.8
	Nepal	8,473,478		9,753,378		+ 42,387,490	+ 15.1

TABLE XXI - ABSENT POPULATION

a. Population Reported Away over Six months, 1954 *

	Internal			External			Total			
	M	F	Total	M	F	Total	M	F	Total	% of Total Pop.
Nepal	15,069	3,664	18,733	173,619	24,501	198,120	188,688	28,165	216,853	2.3
%			8.6			91.4			100	
Kāṭhmāṇḍu V.	1,258	597	1,855	2,342	569	2,911	3,600	1,166	4,766	1.1
%			39			61				
Kāski	253	105	358	7,821	1,675	9,496	8,074	1,780	9,854	8.1
%	70	30	3	82	18	97	81	19	100	
Lamjung	552	144	696	6,700	902	7,602	7,252	1,046	8,298	6.2
%			8			92				
Syāngjā	294	68	362	23,107	4,846	27,953	23,401	4,914	28,315	8.1
%			1			99			100	
Tanhu	580	149	709	5,858	1,030	6,888	6,418	1,179	7,597	6.2
%			9			91			100	
Gandaki Region	1,659	466	2,125	43,486	8,453	51,639	45,145	8,919	54,064	7.4
%	78	22	3	84	16	97	83	17	100	

b. Population Reported Away over Six months, 1961 **

	Internal	External	Total	% of Total
Nepal	52,217 14	313,500 86	365,717 100	3.9
Kāṭhmāṇḍu V.	7,642 52	7,001 48	14,643 100	3.2
Kāski	1,863 13	12,081 87	13,944 100	10.9
Lamjung	2,135 20	8,426 80	10,561 100	8.0
Syāngjā	2,414 5	43,609 95	46,023 100	13.4
Tanhu	1,359 13	8,826 87	10,385 100	8.1
Gandaki Region	7,771 9	72,942 91	80,713 100	11.1

* Source: Statistics (1957): 257

** Source: Statistics (1961): 14

TABLE XXII - a. Outpatient attendances.

Year	Mission Hospital	D.S.B. Hospital	Govt. Dispensary
1953	16,568		
1954	16,492		
1955	18,477		
1956	18,156		
1957	18,489		
1958	17,326	24,158	
1959	24,804	23,010	
1960	25,883	26,365	
1961	28,093	25,297	8,628
1962	30,642		20,197

b. Patient Attendance - H.M.G. Dispensary, Pokhara

B.S. 2018-2019 (mid-April 1961 to mid-April 1963)

Group		Baisākh	Jeth	Asār	Sāvan	Bhado	Aswin	Kārtik	Mansir	Paukh	Māgh	Fālgun	Chait	Total
Adult Male 60%	2,018	377	422	231	347	388	311	214	348	389	551	567	1,130	4,275
	2,019	1,076	1,155	856	1,138	954	1,022	977	926	1,197	1,276	1,468	N.D.	13,208
Adult) Female) 22%	2,018	74	113	113	115	116	120	58	43	105	187	385	867	2,296
	2,019	692	572	429	363	343	272	184	236	360	394	452	N.D.	4,297
Child) Male) 12%	2,018	74	67	60	76	42	44	30	45	55	70	185	266	1,014
	2,019	319	306	252	274	173	164	145	176	149	211	177	N.D.	2,846
Child) Female) 6%	2,018	24	47	46	52	51	19	22	10	55	47	113	203	689
	2,019	178	140	197	171	142	116	119	110	96	111	109	N.D.	1,489
Total	2,018	549	649	432	590	597	494	324	446	580	855	1,250	2,462	8,628
	2,019	2,265	2,173	1,734	1,946	1,612	1,574	1,445	1,448	1,802	1,992	2,206	N.D.	20,197
Monthly Total		2,814	2,822	2,166	2,536	2,209	2,068	1,769	1,894	2,382	2,847	3,456	2,462	

Table xxiii

Principal Diseases*

1.	Disease	Cases	Percentile
1.	Digestive	27,918	28
2.	Respiratory	13,125	13
3.	Eyes	7,560	7
4.	Ulcerative	6,684	6
5.	Tissue	5,444	5
6.	Goitre	4,112	4
7.	Nervous diseases	3,660	3
8.	Other Rheumatism	3,558	3
9.	Skin diseases	3,453	3
10.	Malaria	3,144	3
11.	Ear diseases	3,095	3
12.	Scabies	2,573	2
13.	Injuries	2,275	2
14.	Worms	2,217	2
15.	Rheumatism	1,384	1.3
16.	Dysentary 'A'	1,093	1
17.	Dysentary 'B'	947	0.9
18.	Anaemia	816	0.8
19.	Locomotion	645	0.6
20.	Cataract	630	0.6
21.	Asthma	607	0.6
22.	Nose	560	0.5
23.	Pneumonia	378	0.3
24.	Generative Female	291	0.2
25.	Diarrhoea	279	0.2
26.	Intestinal	246	0.2
27.	Hookworms	211	0.2
28.	Stomach Troubles	189	0.1
29.	Other T.B.	189	0.1
30.	Generative male	178	0.1
31.	T.B. Lung	159	0.1
32.	Glaucoma	146	0.1
33.	Leprosy	118	0.1
34.	Gonorrhea	89	
35.	Urinary	87	
36.	Ringworm	70	
37.	Syphilis	52	
38.	Gland	41	
39.	Tumour Simple	38	

	Disease	Cases	Percentile
40.	Enteric fever	37	
41.	Piles	33	
42.	Dislocation	30	
43.	Circulatory	21	
44.	Small-pox	17	
45.	Liver abscess	16	
46.	Heart disease	12	
47.	Ascites	10	
48.	Sting-bite	8	
49.	Cirrhosis liver	8	
50.	Diabetes	6	
51.	Hernia	6	
52.	Chronic dysentery	5	
53.	Cancer	5	
54.	Snake-bite	5	
55.	Ber-beri	4	
56.	Maggots	4	
57.	Hydrocele	3	
58.	Foreign body	3	
59.	Jaundice	2	
60.	Pleurisy	2	
61.	Abhasia	1	
62.	Gout	1	
63.	Mumps	1	
64.	Necrosis Locomotion	1	
65.	Dog-bite	1	
	Four Years' Total *	98,830	

*Source: D.S.B. Hospital, Rāmghāṭ, Outpatients Register, (1958-1961)

TABLE XXVIII - SOME GURUNG PLACE-NAMES WITH NEPALI EQUIVALENTS *

	Nepali	Gurung	Area
1.	Añtighar	Āthghari	Kāski
2.	Armatā	Nwāl	"
3.	Bāgluñpāni	Syāru	Lamjung
4.	Bhāchok	Pājo	Kāski
5.	Bhirpustun	Paiñthi	Lamjung
6.	Bhoñje	pHoñje	"
7.	Bhujung	pHajoñ	"
8.	Bijaypur	Bijku	Kāski
9.	Chārāgāoñ	Chārā	Lamjung
10.	Chaur	Chor	"
11.	Chhachok	Chhaju	Kāski
12.	Ḍaḍuwā	tHadwā	Lamjung
13.	Ḍahre	Pāje	"
14.	Gahte	Gade	"
15.	Ghalegāoñ	Poñju	"
16.	Ghāmrāng	Komroñ	"
17.	Ghāndruk	Konḍa	Parbat
18.	Ghanpokharā	Poñju	Lamjung
19.	Gilung	Klihnu	"
20.	Jahreboṭ	Konās	"
21.	Kapurgāoñ	Kone	Kāski
22.	Khāsur	Khasu	Lamjung
23.	Khilāng	Khiluñ	Kāski
24.	Kupreḍhungā	Nāuru	Lamjung
25.	Kurāgaon	Kohne	Kāski
26.	Labsibot	Hoñje	Lamjung
27.	Lāmḍāñḍā	Lamdān	Kāski
28.	Ludi	Ṭohre	Lamjung
29.	Māling	Mhili	"
30.	Manjān	Mhāñjā	"
31.	Mapyāng	Mabyoñ	"
32.	Maujā	Mhujā	Kāski
33.	Nāgidhār	Neda	Lamjung
34.	Nālmā	Ngāda	"
35.	Nauthar	Kalje	"
36.	Nawalḍāñḍā	Naul	Kāski
37.	Nayāñgāoñ	Nhayoñ	"
38.	Niuregāoñ	Kaisduñ	Lamjung
39.	Pākhriboṭ	Parwe	Kāski
40.	Pākhurikhor	Parkhu	"
41.	Pārje	Pāje	"
42.	Pasgāoñ	Paigoñ	Lamjung
43.	Rāginās	Rayunāsā	"
44.	Rawaiḍāñḍā	Rawaikoñ	"
45.	Sābet	Sabe	Parbat
46.	Sanjābā	Soñbu	Lamjung
47.	Sibrāñ	Sere	"
48.	Siklis	Chili	Kāski
49.	Siñdi	Sidi	Lamjung
50.	Ṭaksār	Ṭasā	"
51.	Tāñdiñ	Toñde	"
52.	Tāñklichok	Tojo	"
53.	Tārāchok	Ṭahjo	"
54.	Tarāñche	Ngadi	"

TABLE XXVIII (Cont.)

	Nepali	Gurung	Area
55.	Thāk	Thoñsu	Kāski
56.	Ustā	Siñgu	Lamjung
57.	Wārchok	Whājo	Kāski
58.	Yāñjakoṭ	Yojgaiñ	Lamjung

* Compiled by the present writer in the field.

TABLE XXIX - POKHARA VALLEY

Density of Villages, No. of Houses, by Thum, 1961

	Thum	Location (mainly)	Area	Villages	Density	Houses	Density
1.	Arbā	Hill	4.45	20	4	324	81
2.	Arghoun	Hill and Plain	16.53	49	3	1,797	111
3.	Armalā	Hill	4.10	5	1	437	109
4.	Astām	Hill	1.90	6	3	170	85
5.	Bāṭulechaur	Plain	2.42	16	6	765	355
6.	Begnās	Hill and Plain	7.64	15	2	427	56
7.	Bhalam	Plain	2.53	3	1	154	61
8.	Bhirchok	Hill	1.71	3	2	207	121
9.	Bhumdi	Hill	5.49	5	1	142	56
10.	Bhurjungkholā	Hill and Plain	3.55	1	0.3	116	32
11.	Bijaypur	Hill	3.45	5	1	225	65
12.	Chisāpāni	Hill	1.00	1	1	101	101
13.	Deorāli	Hill	2.16	13	6	531	245
14.	Ghāchok	Plain	3.10	3	1	481	161
15.	Ghārmi	Hill	1.60	1	1	164	102
16.	Hyāngjākoṭ	Hill	1.53	3	2	143	93
17.	Hyāngjābesi	Plain	2.31	5	2	645	279
18.	Jhuprāng	Hill	5.33	9	2	376	70
19.	Kāhun-Kunḍahar	Hill and Plain	7.43	31	4	1,616	217
20.	Kālābang	Hill	2.61	4	2	128	49
21.	Kāski	Hill	9.22	51	5	1,694	183
22.	Khādarjung	Hill	2.27	1	0.4	209	92
23.	Lāhchok	Plain	4.50	3	0.7	445	98
24.	Mājhṭhān	Hill	2.56	29	11	764	298
25.	Maujā	Hill	9.43	5	0.5	353	37
26.	Pachbhaiyā	Hill	3.29	6	2	219	66
27.	Paundi	Hill	7.20	38	5	542	75
28.	Ribān	Hill	1.05	4	4	241	229
29.	Rupākoṭ	Hill and Plain	7.53	13	2	538	71
30.	Sarānkoṭ	Hill and Plain	12.11	62	5	2,755	227
31.	Syāklung	Hill	2.05	3	1.4	353	172
32.	Tallākoṭ	Hill and Plain	3.14	15	5	487	162
33.	Ulleṛi	Hill	1.40	4	2.8	48	34
For all Thums			177.71	332	22	16,197	91

TABLE XXX - MONTHLY STATISTICAL RETURNS, 1960 ✱

Route: Kāṭhmāṇḍu - Pokhara - Bhairawā
Bhairawā - Pokhara - Kāṭhmāṇḍu

Month	Passenger			Freight in lbs.		
	KTM/BHW	BHW/KTM	Total	KTM/BHW	BHW/KTM	Total
January	789	993	1,782	32,366	4,809	37,175
February	893	1,023	1,916	37,100	7,809	44,909
March	160	179	339	3,855	332	7,187
April	713	849	1,562	18,668	9,293	27,961
May	714	714	1,428	19,195	3,832	23,027
June	529	721	1,350	28,493	14,431	43,924
July	224	386	610	20,714	1,898	22,612
August	448	662	1,110	30,560	28,177	58,737
September	514	562	1,076	13,640	962	14,602
October	776	642	1,418	11,213	5,276	16,489
November	817	820	1,637	14,014	2,888	16,902
December	740	696	1,436	11,880	5,220	17,100
Total	7,317	8,247	15,654	241,698	84,927	330,625
Percentages	47.4	52.6	25.0	74.4	25.6	14.0
Nepal			61,955			2,382,558

✱ Source: Royal Nepal Airlines Corporation, Kathmandu.

TABLE XXXI - CLASSIFICATION OF CROPLAND (1933) *

(1 Māṭomuri = 0.031427 Acre)

	Thum	Irrigated (Māṭomuri)	% of Total	Unirrigated (Māṭomuri)	% of Total	Total (Māṭomuri)
1.	Arbā	13,620	(54)	11,204	(46)	24,820
2.	Arghoun	97,135	(57)	72,545	(43)	169,680
3.	Armalā	15,520	(41)	23,084	(59)	38,604
4.	Astām	N. A.				
5.	Bāṭulechaur	18,070	(16)	92,892	(84)	111,962
6.	Begnās	15,598	(40)	22,944)	(60)	38,542
7.	Bhalām	6,169	(43)	8,071	(57)	14,240
8.	Bhirchok	N. A.				
9.	Bhumdi	3,848	(50)	3,747	(50)	7,595
10.	Bhurjungkholā	1,078	(30)	2,482	(70)	3,560
11.	Bijaypur	9,270	(52)	8,268	(48)	17,638
12.	Chisāpāni	N. A.				
13.	Deorāli	N. A				
14.	Ghāchok	12,675	(34)	23,891	(66)	36,566
15.	Ghārmi	4,033	(30)	9,010	(70)	13,043
16.	Hyāngjākoṭ	N. A.				
17.	Hyāngjābesi	25,053	(36)	44,390	(64)	69,443
18.	Jhuprāng	1,572	(43)	2,061	(57)	3,633
19.	Kāhun-Kunḍahar	43,087	(23)	141,871	(77)	184,958
20.	Kālābang	4,837	(67)	2,332	(33)	7,169
21.	Kāski	70,693	(53)	62,374	(47)	133,067
22.	Khādarjung	4,970	(32)	10,533	(68)	15,503
23.	Lāhchok	15,208	(36)	26,996	(64)	42,204
24.	Mājhṭhān	9,397	(37)	15,507	(63)	24,904
25.	Manjā	13,292	(64)	7,334	(36)	20,626
26.	Pachbhanjā	12,089	(67)	5,738	(33)	17,827
27.	Paundi	21,210	(46)	24,189	(54)	45,399
28.	Ribān	N. A				
29.	Rupākoṭ	30,954	(51)	28,966	(49)	59,920
30.	Sarānkoṭ	51,180	(32)	107,075	(68)	159,255
31.	Syāklung	5,276	(41)	7,558	(59)	12,834
32.	Tallākoṭ	19,401	(37)	33,018	(63)	52,419
33.	Ulleri	2,332	(63)	1,333	(37)	3,665
	For 27 Thums	527,567	(43)	779,423	(57)	1,306,990

* Kaski District, Assessment Register, 1933.

TABLE XXXII - CLASSIFICATION OF IRRIGATED LAND (1933)

(1 Māṭomuri = 0.031427 Acre). Percentage within brackets

	Thum	Abal		Doyām		Sim		Chahār	
1.	Arbā	228	(1.6)	1,617	(11)	6,014	(44)	5,706	(42)
2.	Arghoun	2,357	(2)	12,964	(13)	38,626	(39)	42,987	(46)
3.	Armalā	39	(1)	2,293	(14)	4,703	(30)	8,484	(54)
4.	Astām								
5.	Bāṭulechaur	55	(1)	1,907	(10)	9,107	(50)	7,008	(39)
6.	Begnās	2,459	(15)	4,412	(30)	6,244	(40)	2,481	(15)
7.	Bhalam	408	(8)	1,260	(20)	2,933	(47)	1,567	(25)
8.	Bhirchok								
9.	Bhumdi	176	(4)	745	(19)	1,674	(43)	1,352	(34)
10.	Bhurjungkholā	-	-	556	(51)	509	(48)	12	(1)
11.	Bijaypur	271	(3)	754	(8)	4,067	(43)	4,176	(46)
12.	Chisāpāni								
13.	Deorāli								
14.	Ghāchok	80	(17)	88	(64)	2,385	(19)	91	(0.7)
15.	Ghārmi	460	(11)	147	(4)	931	(23)	2,493	(62)
16.	Hyāngjākoṭ								
17.	Hyāngjābesi	216	(0.8)	403	(1.6)	3,105	(12)	22,028	(87)
18.	Jhuprāng	15	(1.0)	127	(9)	215	(14)	1,181	(75)
19.	Kāhun-Kunḍahar	5,769	(10)	15,141	(33)	9,004	(27)	13,172	(30)
20.	Kālābang	249	(7)	1,064	(26)	1,952	(43)	571	(14)
21.	Kāski	2,526	(3)	9,368	(14)	31,704	(45)	27,093	(38)
22.	Khādarjung	162	(3)	878	(18)	2,161	(44)	1,767	(35)
23.	Lahchok	1,359	(9)	3,991	(26)	4,520	(40)	5,336	(35)
24.	Mājhṭhān	562	(6)	1,279	(13)	4,542	(49)	3,109	(32)
25.	Maujā	43	(0.3)	787	(5)	5,591	(42)	6,870	(51)
26.	Pachbhaiyā	3,475	(30)	3,518	(31)	3,168	(27)	1,726	(12)
27.	Paundi	6	(0)	151	(0.7)	9,744	(54)	11,307	(43)
28.	Ribān								
29.	Rupākoṭ	1,611	(9)	6,444	(33)	13,149	(47)	1,748	(11)
30.	Sarānkoṭ	986	(1)	3,909	(8)	18,699	(37)	27,584	(54)
31.	Syāklung	414	(8)	1,953	(38)	1,246	(23)	1,662	(31)
32.	Tallākoṭ	3,148	(17)	2,687	(13)	4,867	(26)	8,496	(44)
33.	Ulleri	85	(4)	277	(11)	733	(31)	1,236	(54)
Total of 27 Thums 510,648		22,186	(4.3)	86,720	(16.9)	192,603	(37.7)	211,139	(41.3)

TABLE XXXIII - TOURIST TRAFFIC, POKHARA

15 November 1961 to 16 August 1963

Month	Year	1. Argentina	2. Australia	3. Canada	4. Ceylon	5. Denmark	6. Ethiopia	7. France	8. Germany	9. Holland	10. India	11. Israel	12. Italy	13. Japan	14. Netherland	15. New Zealand	16. Norway	17. Pakistan	18. Spain	19. Sweden	20. Switzerland	21. U.K.	22. U.S.A.	23. U.S.S.R.	24. Yugoslavia	TOTAL
2018																										
Mangsir (mid Nov-mid Dec)	1961																				6	6	2			14
Push (m. Dec-m. Jan)	1961/62							1		1	10			3							6	4	3			28
Māgh (m. Jan-m. Feb)	1962		1								1									1		3	3			9
Fāgun (m. Feb-m. Mar)	"		1					4			4									1		3	3			16
Chait (m. Mar-m. Apr)	"							2			8									1		6			1	18
2019																										
Baisākh (m. Apr-m. May)	"		12					3	4	1	23			1							3	6	9			62
Jeṭh (m. May-m. June)	"		7								2											7	6			22
Asār (m.June-m.July)	"										5											4	1			10
Sāvan (m.July-m. Aug)	"		1								18		5							2			2	3		31
Bhado (m.Aug -m.Sept)	"									3	23									1	3	2	1	6		39
Asoj (m.Sept-m. Oct)	"	1	3					3	7		13		1		1							3	6			38
Kātik (m. Oct-m. Nov)	"		3			2	1		6		10		1				2			3	3	10	7			49

TABLE XXXIII (Cont)

Month		Year	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	TOTAL
Mangsir	(m. Nov-m. Dec)	1962		6					4	3	6	13			7							7	9	1			56
Push	(m. Dec-m. Jan)	1962/63		3	1						5	12			4							5	4	7		4	45
Māgh	(m. Jan-m. Feb)	1963		1			10			3		10	6					1			2	9	4	6			52
Fāgun	(m. Feb.-m.Mar)	"		1								9										7	4	7			28
Chait	(m.Mar-m. Apr)	"		1		1						9		2	7		4					5	10	11			50
2020 Baisākh	(m. Apr-m. May)	"		5					2	4	1	5	4		1							5	3	14			44
Jeṭh	(m. May-m.June)	"									1	8			8				2			1		8			28
Asār	(m.June-m.July)	"		8								8			2							4	7	1			30
Sāvan	(m.July-m. Aug)	"					2		2											1		3	2	2			12
			1	53	2	1	14	1	21	27	18	191	10	9	33	1	4	3	2	1	11	66	97	100	9	5	681

TABLE XXXIV - LAND USE, POKHARA TOWN, 1963 *

(Number of establishments and percentages)

	Specific Category	Varietal Category	Structures	Percentages
1.	Commercial		286	59.4
		Shops	200	
		Tea Stalls	41	
		Services	27	
		Godown	16	
		Banks	2	
2.	Administrative		17	3.5
		Central Government offices	7	
		Provincial " "	5	
		Local Offices	5	
3.	Industrial		17	3.5
		Metal Works	9	
		Rice-parching works	6	
		Woodworks	1	
		Soda factory	1	
4.	Education and Cultural		13	1.4
		School	1	
		Library	3	
		Temples	9	
5.	Recreational		2	-
		Cinema	1	
		Theatre	1	
6.	Transport		14	1.4
		Chautārā	10	
		Rest house	4	
7.	Residential		122	25.4
8.	Vacant		26	5.4

* Survey of 480 houses by the writer in March 1963

TABLE XXXV - CHANGE IN IRRIGATED CROPLAND (1933-62)

(31.8198 Muris = 1 acre)

	Thum	1933 (Māṭomuri)	1962 (Māṭomuri)	Change	
				Absolute	%
1.	Arbā	13,620	14,385	+ 765	5
2.	Arghoun	97,135	101,399	+ 4,264	4
3.	Armalā	15,520	15,692	+ 172	1
4.	Astām	N.A.			
5.	Bāṭulechaur	18,070	19,967	+ 1,897	10
6.	Begnās	15,598	16,632	+ 1,034	6
7.	Bhalam	6,169	6,285	+ 116	2
8.	Bhirchok	N.A.			
9.	Bhumdi	3,848	4,633	+ 785	20
10.	Bhurjungkholā	1,078	1,078	-	-
11.	Bijaypur	9,270	9,347	+ 77	0.7
12.	Chisāpāni				
13.	Deorāli				
14.	Ghāchok	12,675	13,213	+ 538	4
15.	Ghārmi	4,033	4,242	+ 209	5
16.	Hyāngjākoṭ				
17.	Hyāngjābesi	25,053	26,381	+ 1,328	5
18.	Jhuprāng	1,572	1,638	+ 66	4
19.	Kāhun-Kunḍahar	43,087	45,328	+ 2,241	5
20.	Kālābang	4,837	5,259	+ 422	8
21.	Kāski	70,693	83,662	+ 12,969	18
22.	Khādarjung	4,970	5,125	+ 155	3
23.	Lahchok	15,208	16,632	+ 1,424	9
24.	Mājhṭhān	9,397	9,984	+ 587	6
25.	Maujā	13,292	14,114	+ 822	6
26.	Pachbhaiyā	12,089	12,199	+ 110	0.9
27.	Paundi	21,210	24,005	+ 2,795	13
28.	Ribān				
29.	Rupākoṭ	30,954	31,627	+ 673	2
30.	Sarānkoṭ	51,180	54,174	+ 2,954	5
31.	Syāklung	5,276	6,378	+ 1,102	20
32.	Tallākoṭ	19,401	20,911	+ 1,510	7
33.	Ulleri	2,332	3,069	+ 737	31
	For 27 Thums	527,567	567,359	+ 39,752	7.6

TABLE XXXVI - DENSITY OF POPULATION PER ACRE OF IRRIGATED CROPLAND 1961 *

	Thum	Population	Irrigated Cropland (acres)	Density per acre
1.	Arbā	1,672	452	3.7
2.	Arghoun	8,350	3,123	2.6
3.	Armalā	2,156	493	4.3
4.	Astam	892	-	-$\frac{3}{4}$
5.	Bāṭulechaur	3,994	626	6.3
6.	Begnās	1,785	622	2.8
7.	Bhalam	771	197	3.9
8.	Bhirchok	1,017	-	-
9.	Bhumdi	687	146	4.6
10.	Bhurjungkholā	524	33	17.0
11.	Bijaypur	1,119	293	3.8
12.	Chisāpāni	552	-	-
13.	Deorāli	2,517	-	-
14.	Ghāchok	2,373	415	5.7
15.	Ghārmi	771	133	5.7
16.	Hyāngjākoṭ	742	-	-
17.	Hyāngjābesi	3,178	828	3.8
18.	Jhuprāng	1,731	51	33.0
19.	Kāhun-Kuṇḍahar	8,086	1,424	5.6
20.	Kālābang	645	165	3.9
21.	Kāski	8,209	2,627	3.1
22.	Khādarjung	1,060	160	6.6
23.	Lahchok	2,271	522	4.3
24.	Mājhṭhān	3,481	313	11.0
25.	Maujā	1,818	443	4.1
26.	Pachbhaiyā	889	385	2.3
27.	Paundi	2,379	754	3.1
28.	Ribān	1,212	-	-
29.	Rupākoṭ	2,234	997	2.2
30.	Sarānkoṭ	14,954	1,701	8.7
31.	Syāklung	1,684	172	9.8
32.	Tallākoṭ	2,453	655	3.7
33.	Ulleṛi	273	96	2.8
	For 27 Thums	79,527	17,830	4.4

*

PLACE NAME DERIVATIVES IN NEPALI

PLACE NAME DERIVATIVES IN NEPALI

Descriptive terms in Nepali place-names are derived from topographic saliants, water bodies, time and space dimensions, directions and distances, relative and specific locations, tribes and castes, and cultural features. Some incorporate foreign terms such as 'jong' (fortress) from Tibetan, 'di' (stream) from Māgari, and 'tiñ' (house) from Gurungkurā. In the following list, mainly from Central Nepal, generic terms are indicated 'p' for prefix, 's' for suffix and 'x' when applicable either way.

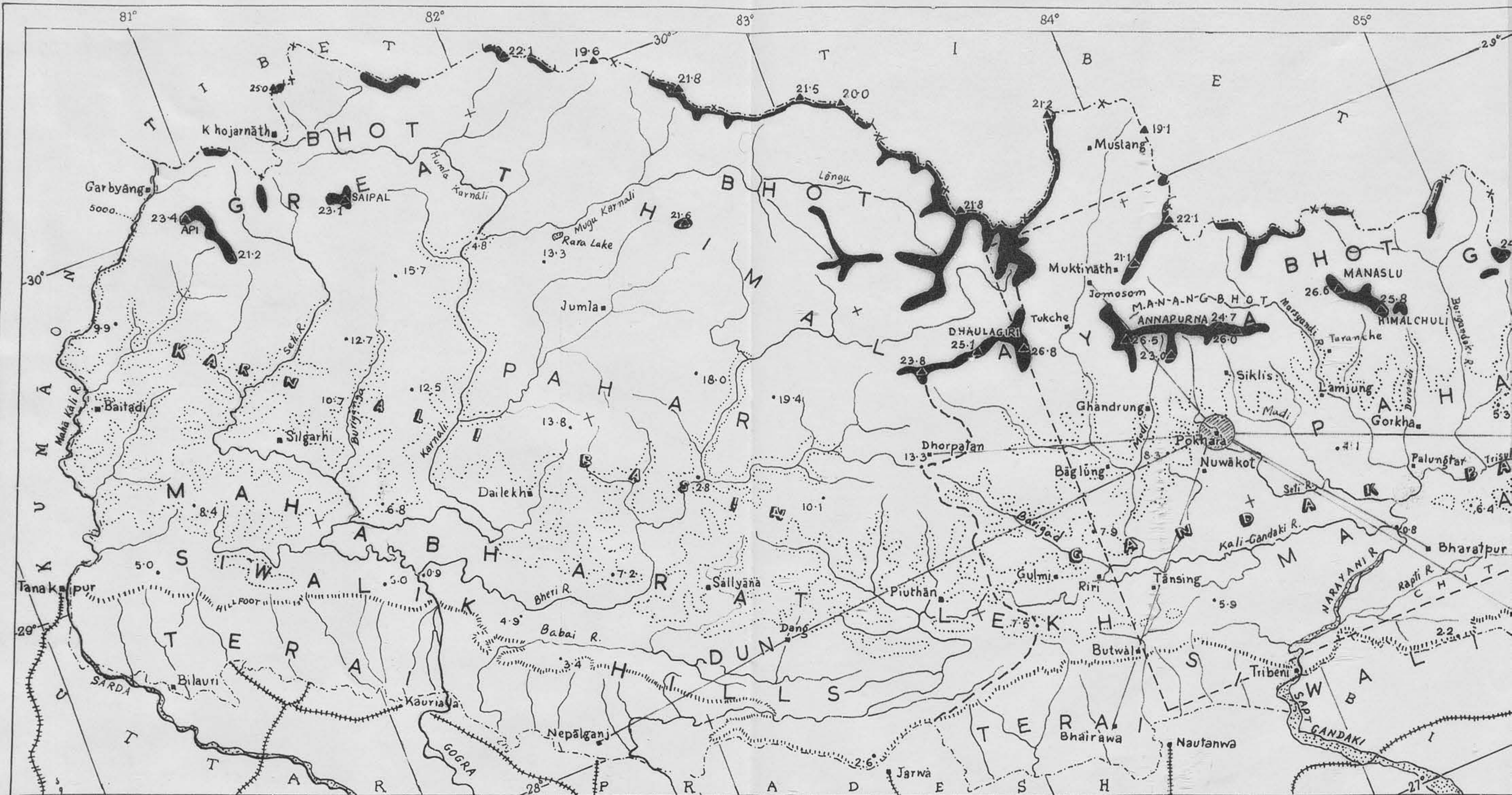
Ayera	p	hunting-ground
Awaliya		malarial
Ban	s	woodland
Bānge	p	angular or bent
Bāri	s	enclosed field
Bāṭo	s	road
Bāṭule	p	circular
Bazār	s	market
Besi	x	valley bottom
Bhanjyāng	s	pass, gap
Bhir	p	precipice
Bhitri	p	inner
Bhoṭ		trans-Himalaya, Tibetan region
Boṭ	s	tree
Chaur	s	flat ground
Chautārā		rest-platform
Chiso	p	cold
Chok	s	courtyard
Chorbāṭo		short-cut
Ḍahar	s	entrenched lane

Ḍānrā	x	hill, range
Deorāli	p	pass or hill with shrine
Ḍhāb	s	swamp
Dhār		crest
Dhārā	p	spring
Ḍhik	s	low hill
Ḍhungā	x	rock
Ḍil	s	edge
Dobāṭo		road junction
Dobhān		stream confluence
Ekle	p	isolated
Gad		stream
Gairi	s	recess, re-entrant
Gāon	s	village
Ganḍaki	s	large river
Gauchar		grazing ground
Gaunḍā	s	narrow defile
Ghar	s	house
Ghāri	x	thicket
Ghaṭṭe	p	water-mill
Giri	s	mountain
Goreṭo	p	trail
Goṭh	s	corral, cowshed
Haṭia		small market
Himāl	s	snowy mountains
Jong	s	hill-top
Kachhaṛ		sub-montane
Kāli	p	black or dark
Kamero		chalk or lime
Karāns		lane
Khān or Khāni	x	quarry or mine

Kharg		alpine pasture
Khel	s	meadow
Khet	s	cultivated land (irrigated)
Kholā		stream
Khor	s	enclosure
Khoriyo		forest clearing for shifting cultivation
Kosi	s	large river
Koṭ	x	hill-top shrine, old fortress
Kulo		irrigation channel
Kuna	s	corner, nook
Kuriyo		household
Lāmo	p	long, extended
Lekh		montane level with winter snow
Madhesh		Plains
Mājh	p	central
Māṭo	x	soil
Mukh	s	facing
Muṛhā	s	stump
Muni	s	below
Nayā or Nuwā	p	new
Oḍhār	x	care
Pahār		hill
Pākho		cultivated land (unirrigated)
Pallo	x	thither
Pāni	s	spring
Pāri	x	far side
Parti		fallow cropland
Pātāl		dense forest
Pāṭan	s	flat land
Pāṭi	s	rest-platform
Phedi	x	bottom
Pokhari	x	pond
Pouwā	s	resthouse

Pur	s	large settlement
Purāno	p	old
Rāte or Rohte	p	red
Sāngu	x	bridge
Serā	x	at the head
Seti	p	white
Sirām	p	on top
Sim	x	marsh
Syāno	p	small
Swānrā	s	terraced slope (unirrigated)
Ṭākurā	p	summit
Tāl	s	lake
Tallo	x	lower
Ṭār	s	dry flats along river banks
Ṭāri	s	terrace slope (rain-irrigated)
Terchhā	p	oblique, slanting
Thān	x	shrine
Ṭhānṭi	s	rest-place with roofed structure
Thar	s	caste neighbourhood
Ṭhulo	p	large
Thumko	s	hillock
Ṭol	s	urban neighbourhood
Ṭundikhel		parade-ground
Upallo	x	upper
Wallo	x	hither
Wāri	x	near side

MAPS AND DIAGRAMS



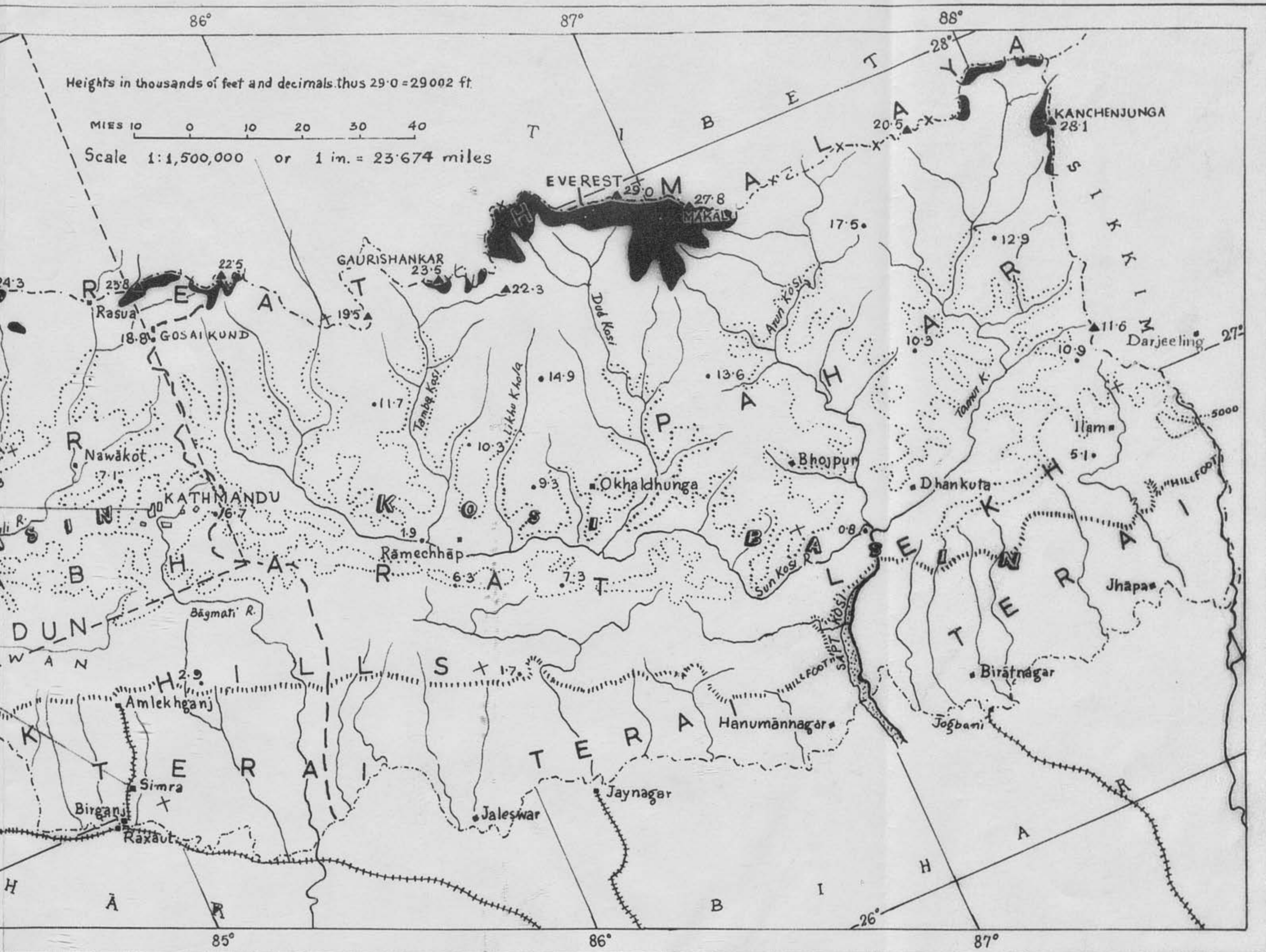
2. ORIENTATION MAP — NEPAL

.... 5,000-ft. CONTOUR

LAND

NOTE THE CENTRAL LOCATION OF POKHARA.

N.B. NORTHERN BORDER ACCORDING TO THE SINO-NEPAL TRE



OVER 20,000 Feet

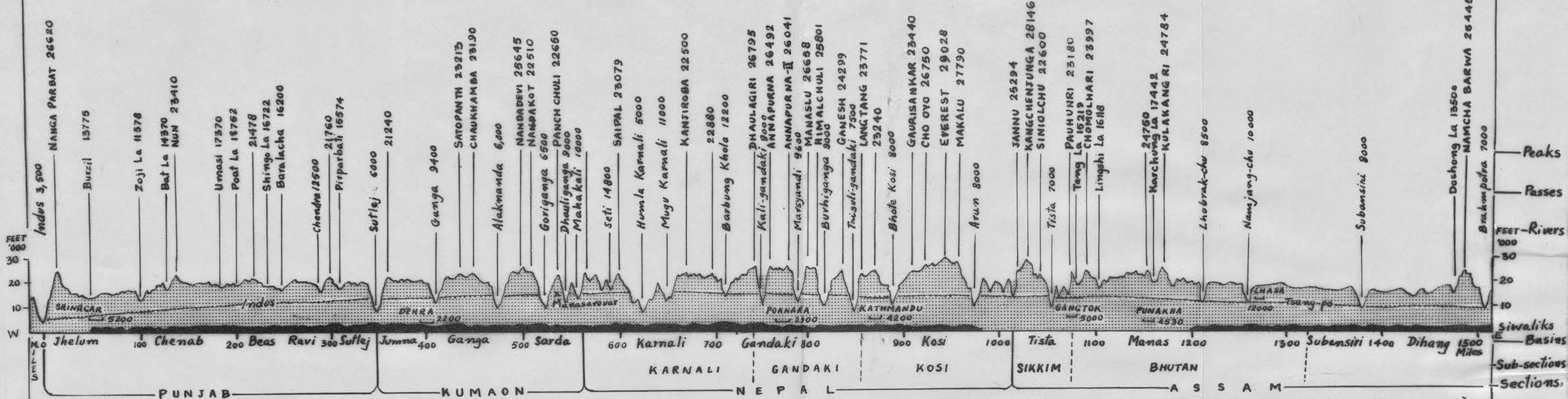
MAP NO. 3 REFERS TO THE INSET WITHIN PECKED LINES.

EATY OF 1960.


3. REGIONAL LOCATION
SHADED AREA: below 3,000 feet
SOLID LINE: Ranges above 15,000 ft.
STUDY AREA: Within the Inset.
WRITER'S ROUTES
MILES
0
32
83°30'E
84°
84°30'
85°
85°30'
28°30'
28°N
TIBET
MUSTANG BHOT
THAK
MANANG BHOT
LARKYA BHOT
PARBAT
KASKI
LAMJUNG
GORKHA
NAWAKOT
SYANGJA
TANHU
PALPA
NAWALPUR
CHITAWAN
BUTWAL
CHISAPANI GARHI
BAGLUNG
MYAGDI
DHAULAGIRI
ANNAPURNA HIMAL
DAMODAR HIMAL
PERI HIMAL
GORKHA HIMAL
LAMJUNG HIMAL
MANASLU
HIMALCHULI
KUTANG HIMAL
THAPLE HIMAL
GANESH HIMAL
LANGTANG
BARAHPOKHARI LEKH
MAHABHARAT
CHURIA
CHANDRAGIRI
SOUTH PEAK
NILGIRI
Muktinath
Jomosom
Tukche
Kali-Gandaki
Manang
Marsyandi
Dana
Modi Khola
Seti Khola
Madi Khola
Ghandrung
Beni
Baglung
Kusma 8250
PANCHASE
Dhampus
Kaski
Phewa Tal
POKHARA
Bharbhure
Siklis
Taprang
Thonje
Dudh K.
Naur Khola
Bimtakothi
Larkya
Gya La
Namun Bhanjyang
SUNDAR
Nunkhani
Naiche
Ghanpokhara
Taranche
Khudi
Lamjung
Kunchha
Deorali
NUWAKOT
Andhi K.
Tanhu
Bandipur
Marsyandi
PALUNGTAR
GORKHA
Chepe K.
Daraudi K.
Nyadi K.
Dordi K.
Rupina La
Buriganda Ki
Ankhu
Trisuli
Dhading
NAWAKOT
Tadi K.
Kalphu K.
KATMANDU
PATAN
BHADGAON
Bagmati R.
KYERONG DZONG
Shiar K.
Chilime
Thaple
Salbula
Langtang K.
Gosainthan
Gosainkund
TANSEN
BUTWAL
Binai
Kali Gandaki
SAPT-GANDAKI
Narayanghat
Bharatpur
Rapti R.
1952
1955
21549
20334
21572
22212
22058
20250
21742
23380
18379
26795
23068
23452
22997
17283
16537
26492
24858
26041
24688
23545
20992
26658
12757
23607
22958
22921
18976
14291
21195
12682
8245
25801
15532
24299
23299
10543
10105
6690
19451
14003
15949
23750
4760
6948
6534
10648
11338
12639
18837
7227
4266
4230
6550
9700
11768
11897
16799
5974
5616
7327
7223
4408
5719
4788
4805
6315
7176
6337
5949
6247
1027
6803
6070
4799
6350
3873
7208
4271
6370
8560
3890
9050
1318

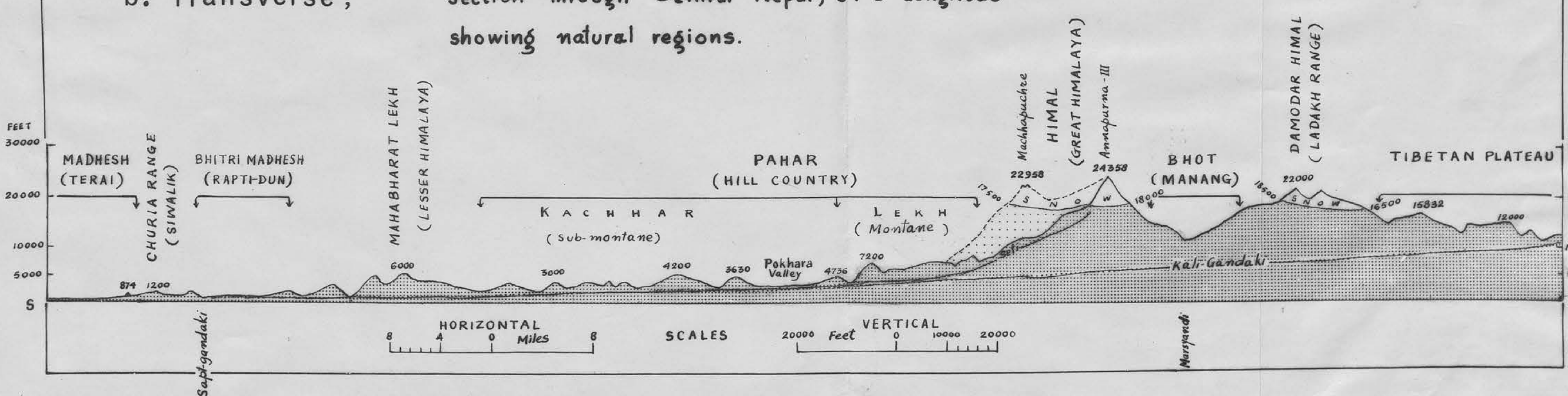
4. HIMALAYAN PROFILES

a. Longitudinal, showing east-west sections, and important valleys.



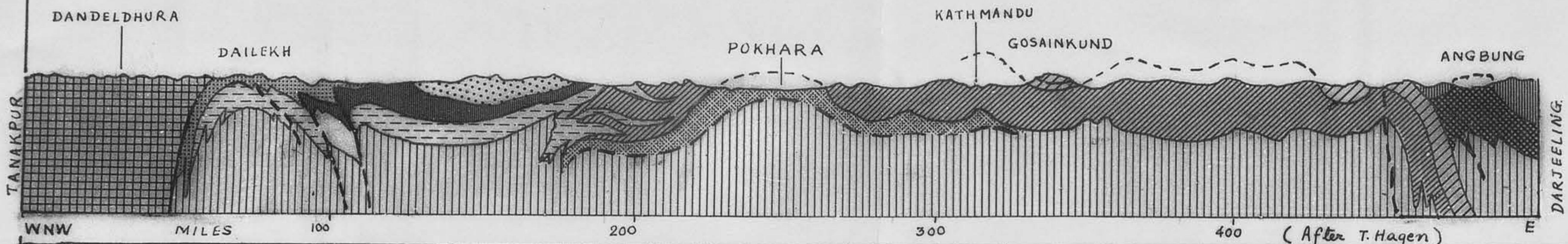
(After MASON, 1955)

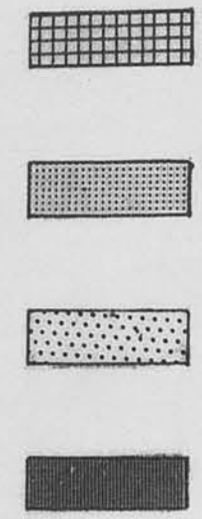
b. Transverse, section through Central Nepal, 84° E Longitude showing natural regions.



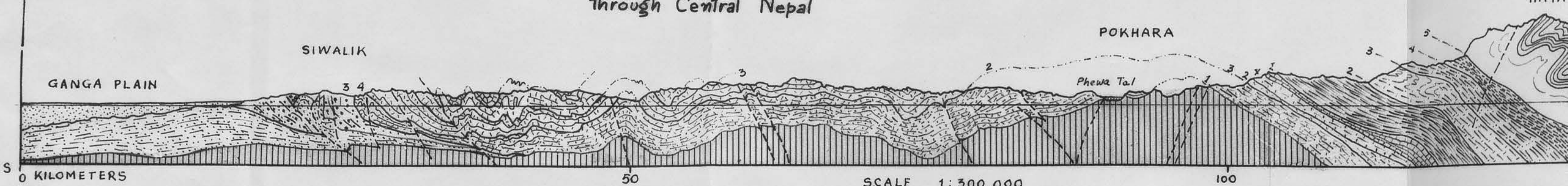
5. GEOTECTONIC PROFILES

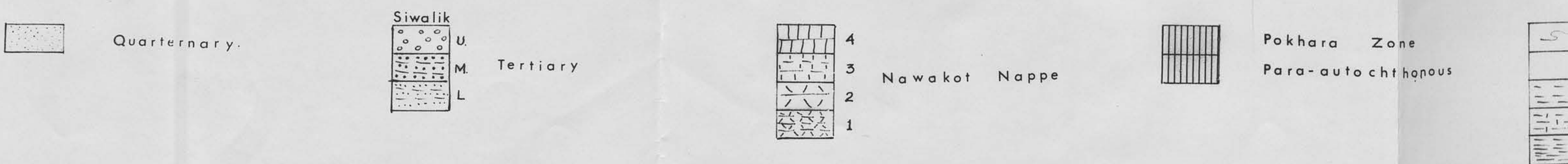
a. Longitudinal,
along the Pahar region across the length of Nepal





b. Transverse
through Central Nepal





Piuthan Z.

Angbung Zone

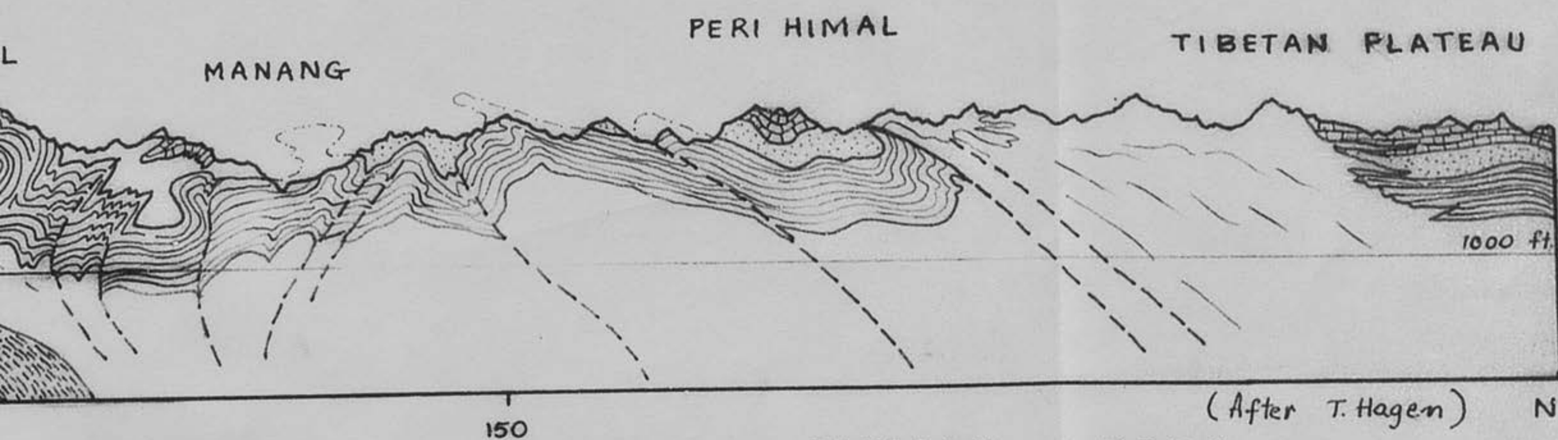
Nawakot Nappe

Pokhara Zone

Kathmandu N.

Autochthonous Z.

Khumbu N.



TIBETAN ZONE

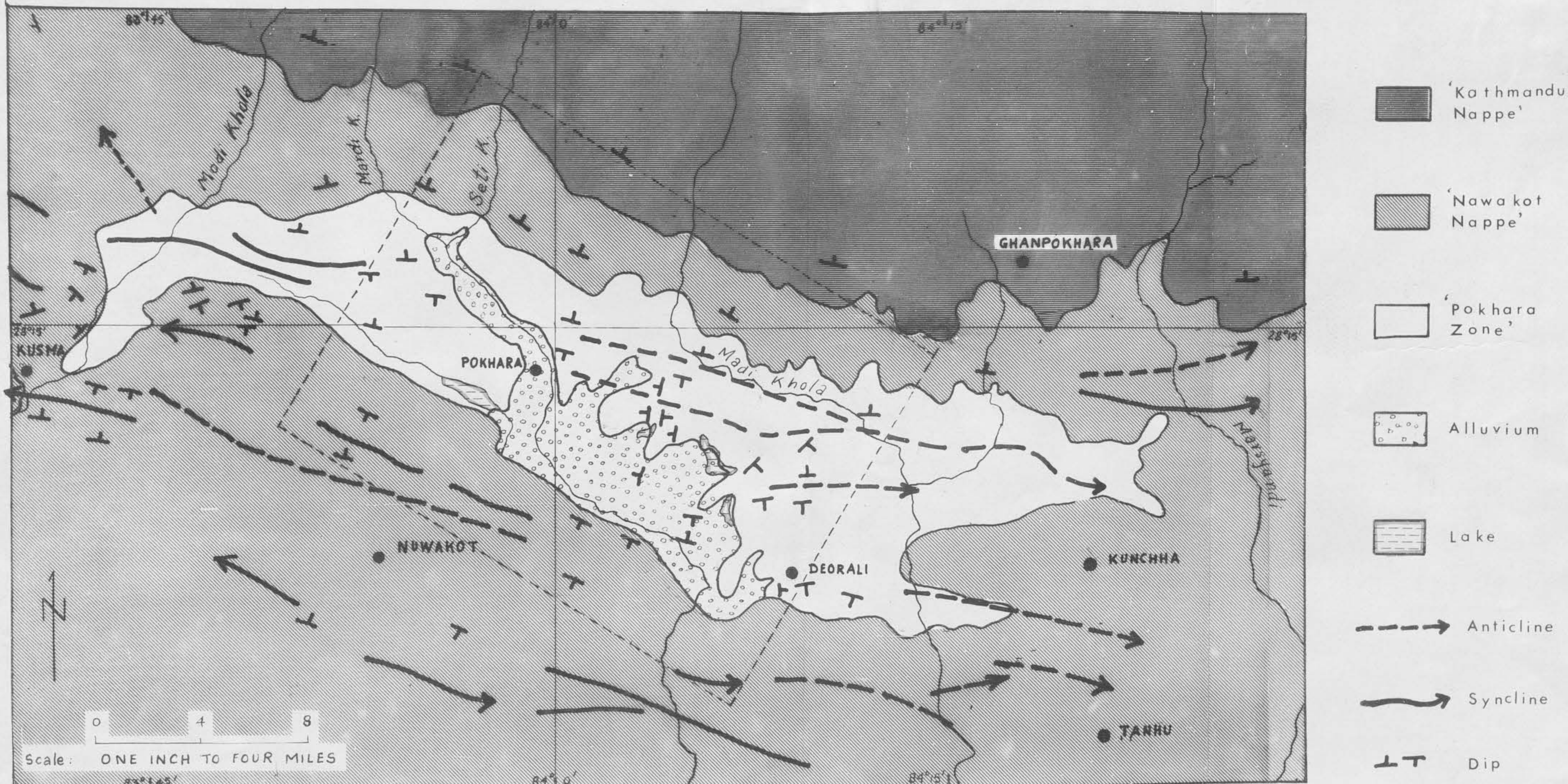
5
4
3
2
1

Kathmandu Nappe

Mesozoic
Permo-Carboniferous
Devonian-Silurian

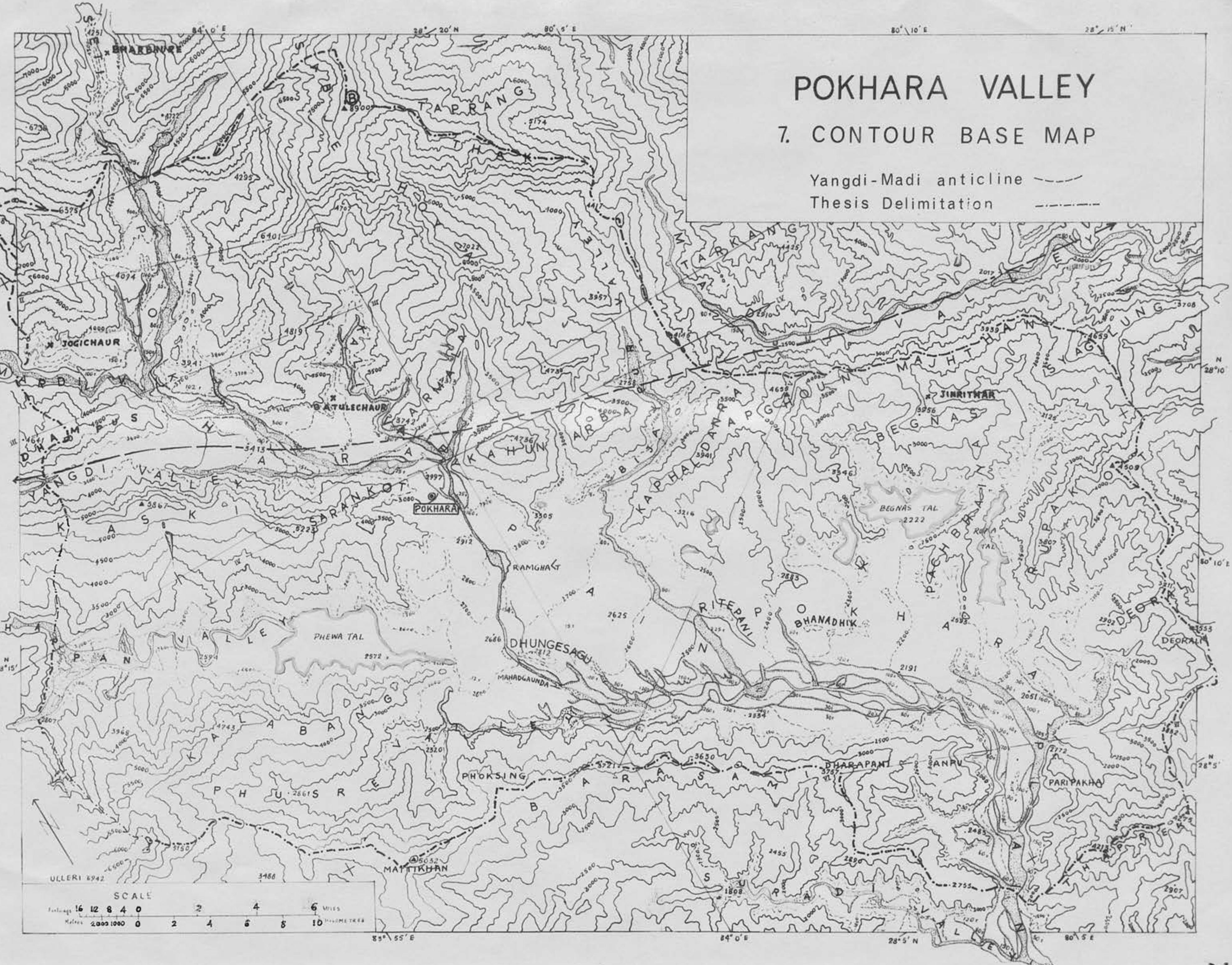
Thrust Fault
Thrust Plane

6. TECTONIC MAP OF 'POKHARA ZONE'



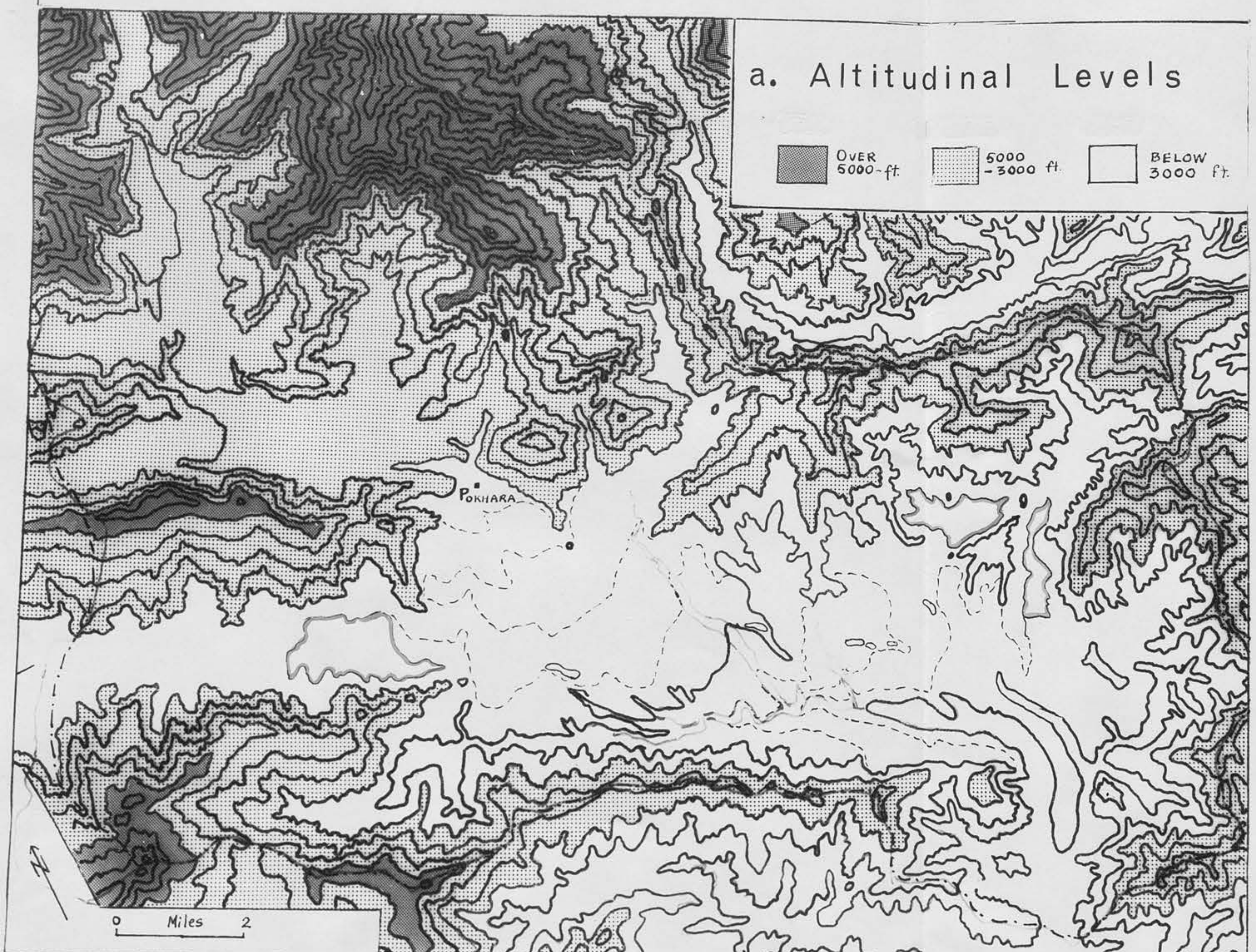
(After T. Hagen)

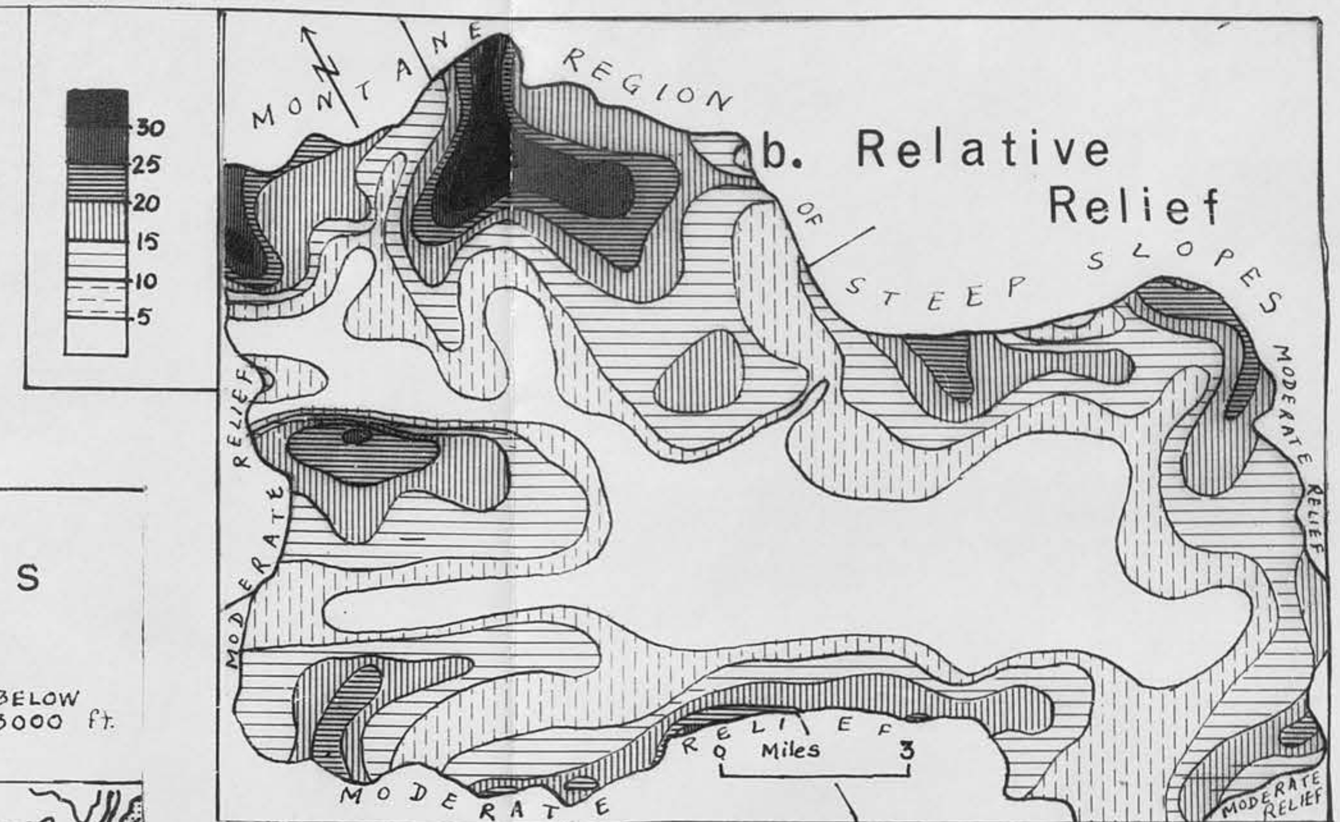
Note: Thesis area within inset.



POKHARA VALLEY
7. CONTOUR BASE MAP
Yangdi-Madi anticline
Thesis Delimitation
TAPRANG
THAK
JOGICHAUR
ATULECHAUR
SARANKOT
POKHARA
RAMGHAT
PHEWA TAL
BEGNAS TAL
RUPA TAL
JIRRITHAR
DHUNGESAGU
MAHADGAUNDA
RITEPANI
BHANADHIK
PHOKSING
DHARAPANI
PARIPAKHA
DEORALI
MATTIKHAN
ULLERI 6942
SCALE
Miles
Kilometres

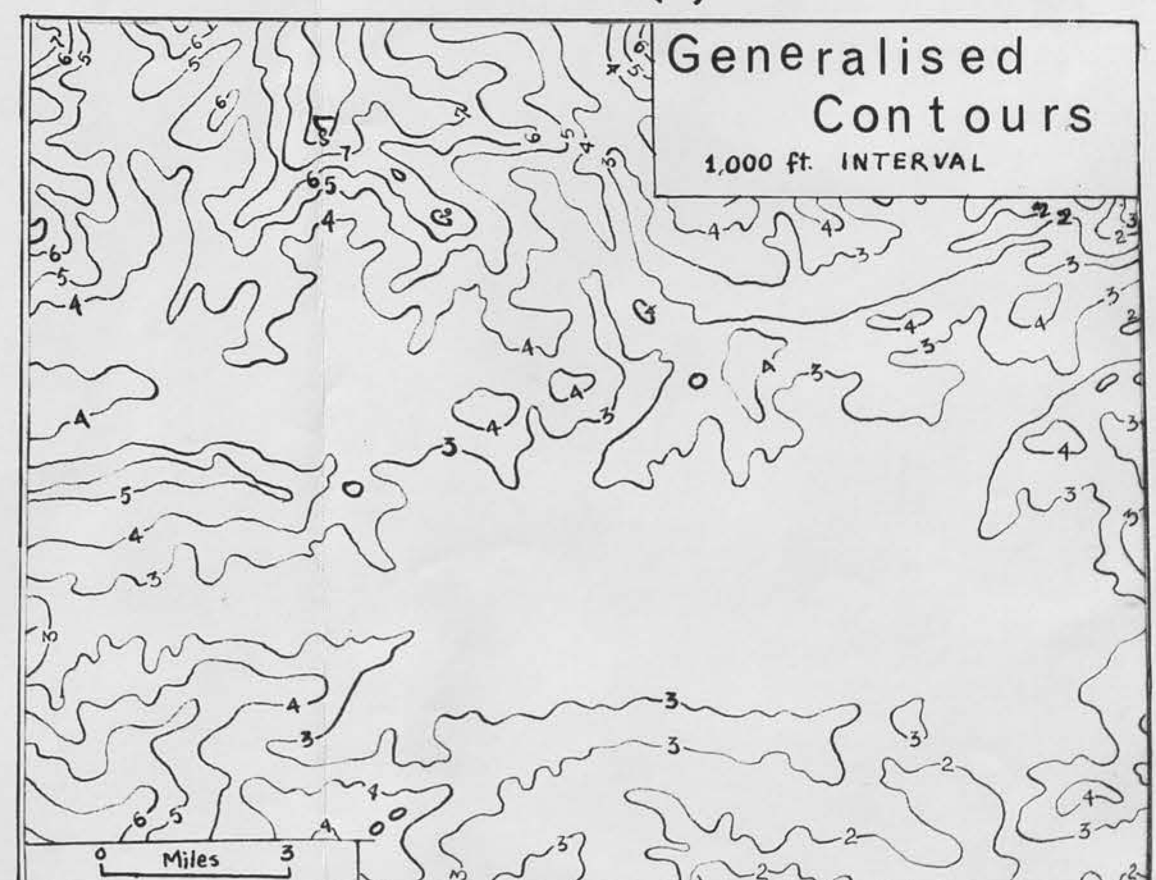
8. RELIEF FORMS





Note: Only the thesis area is analyzed in the above.

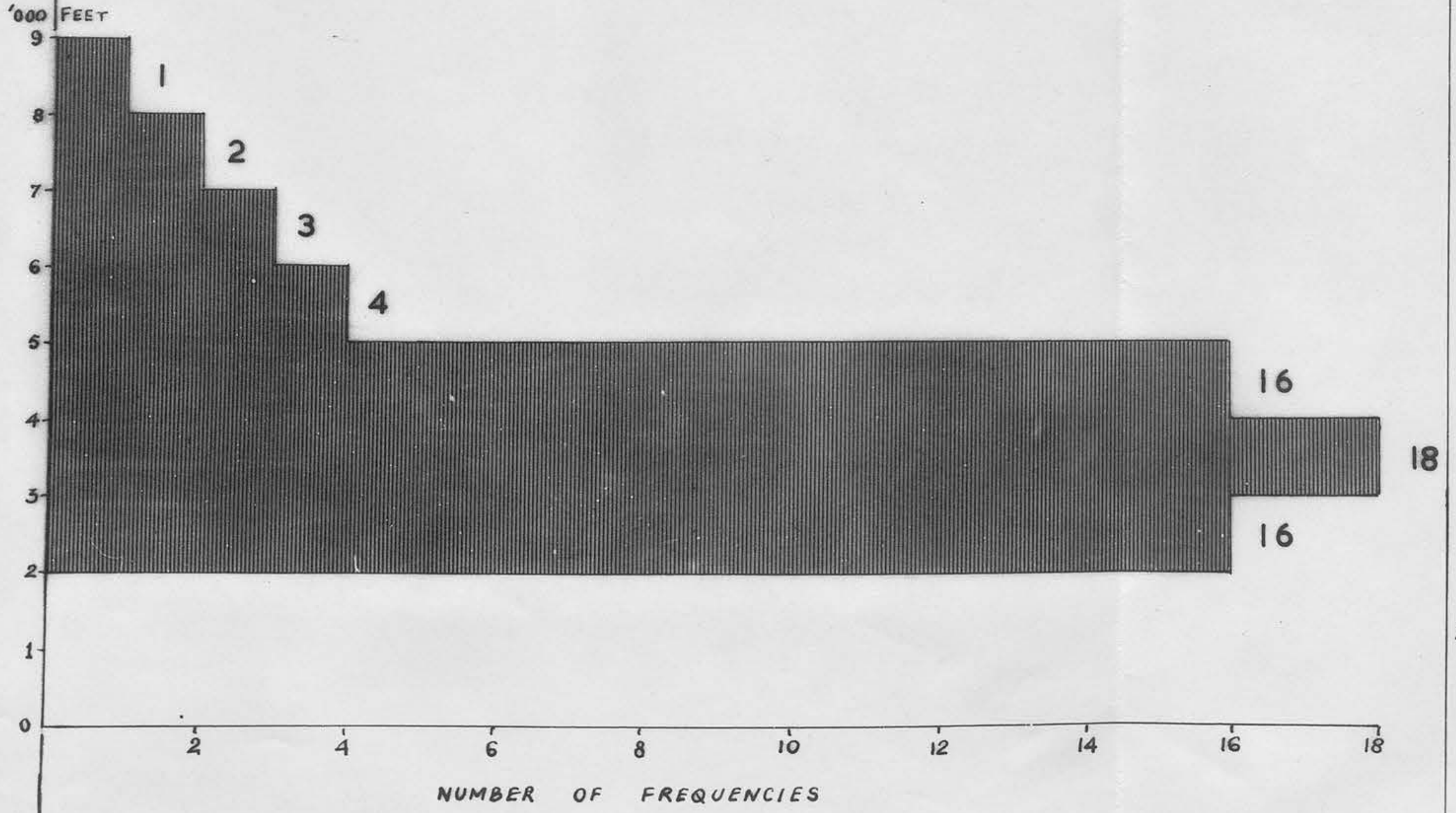
(c)



9. MORPHOMETRIC ANALYSIS

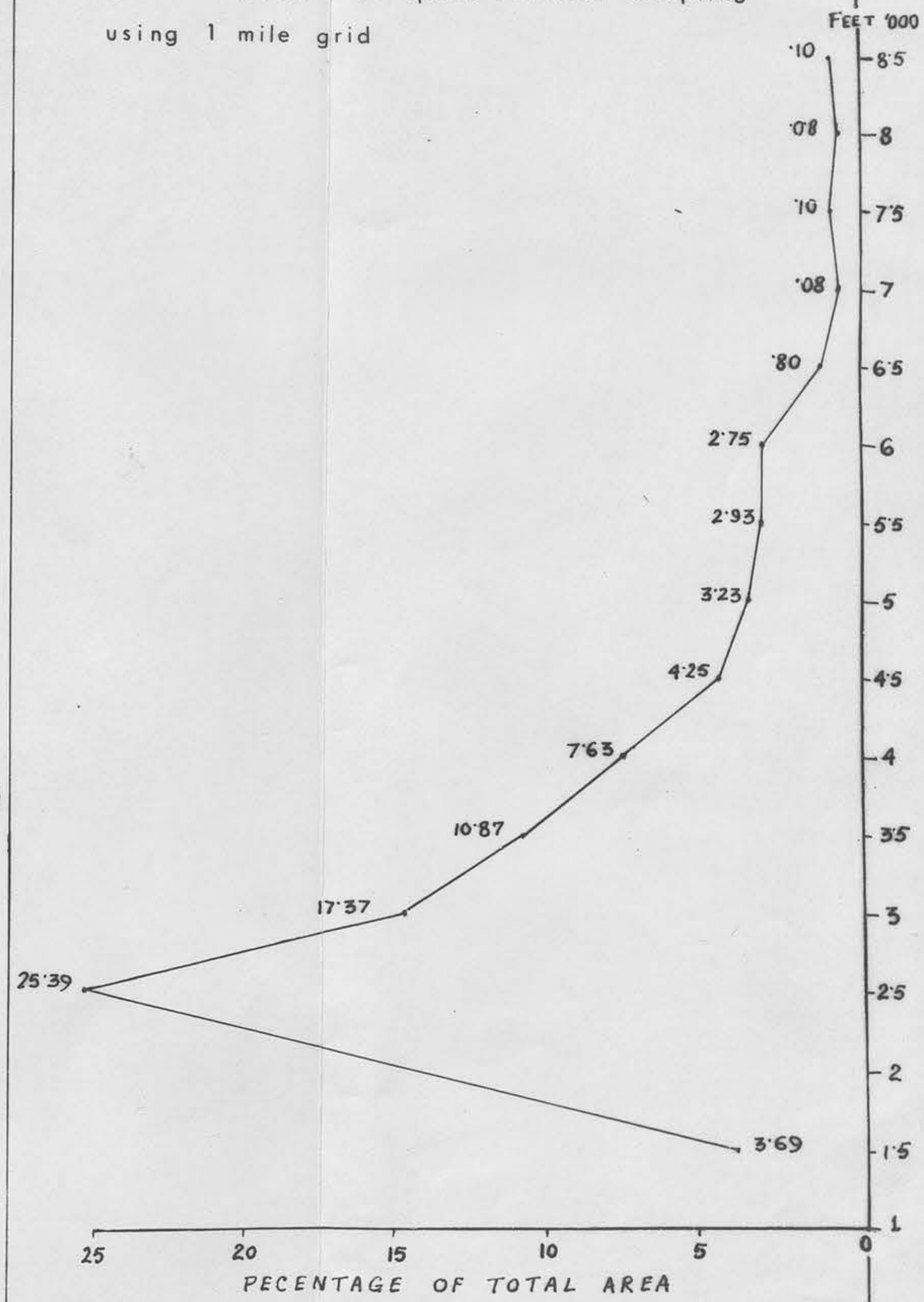
a. Altimetric Frequency

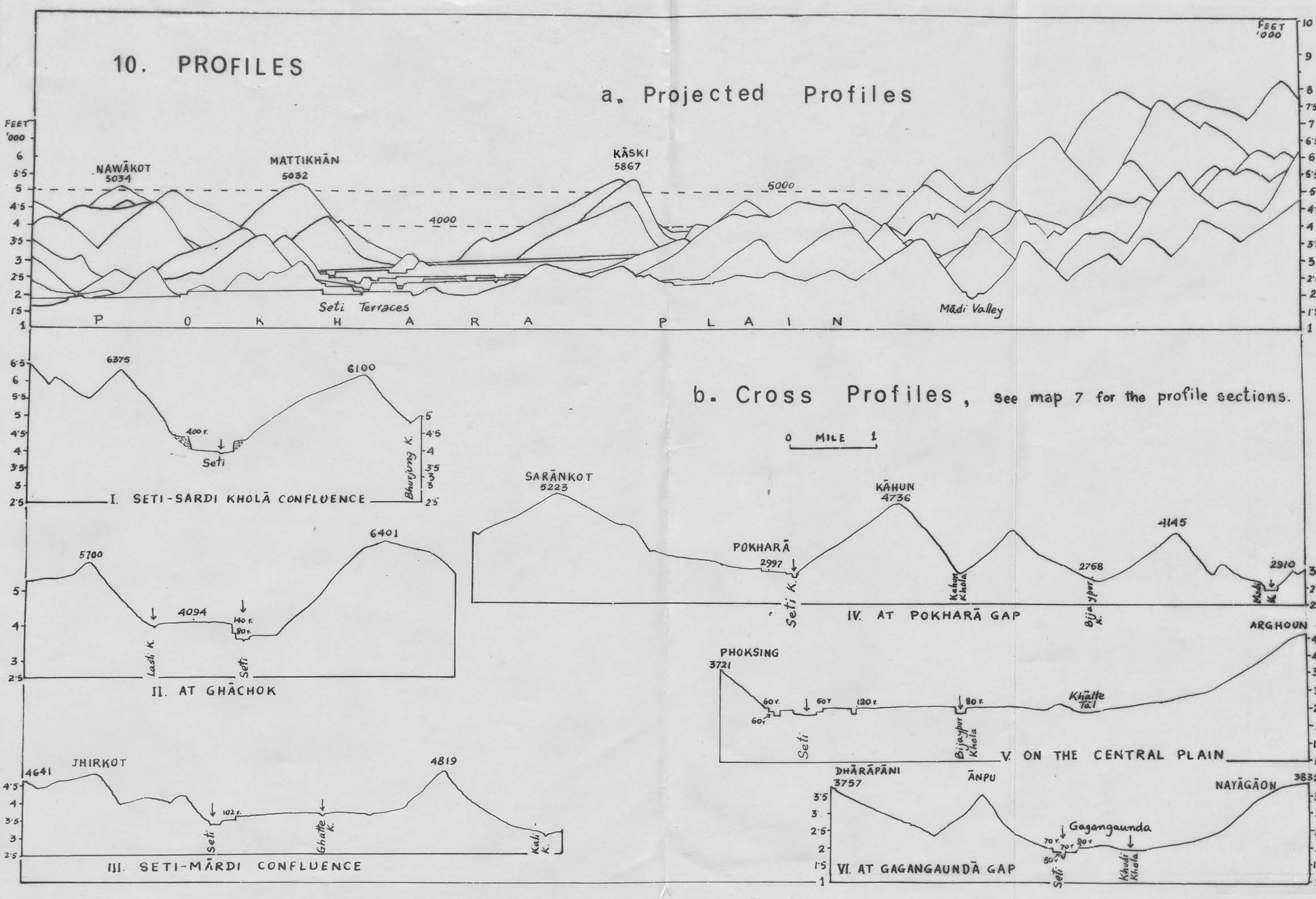
On the basis of 60 spot-heights



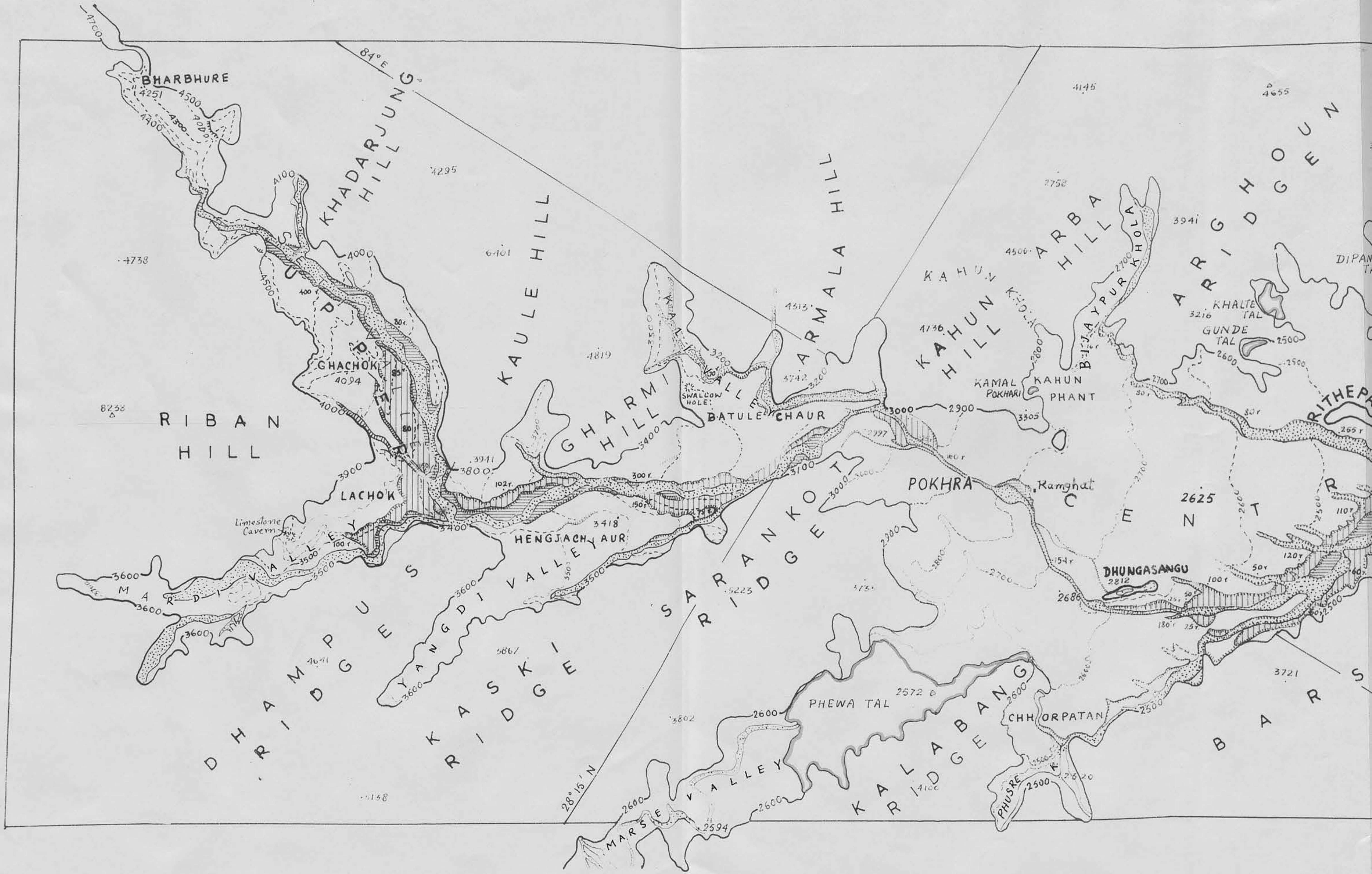
b. Area-Height Curve

On the basis of quasi-random sampling using 1 mile grid

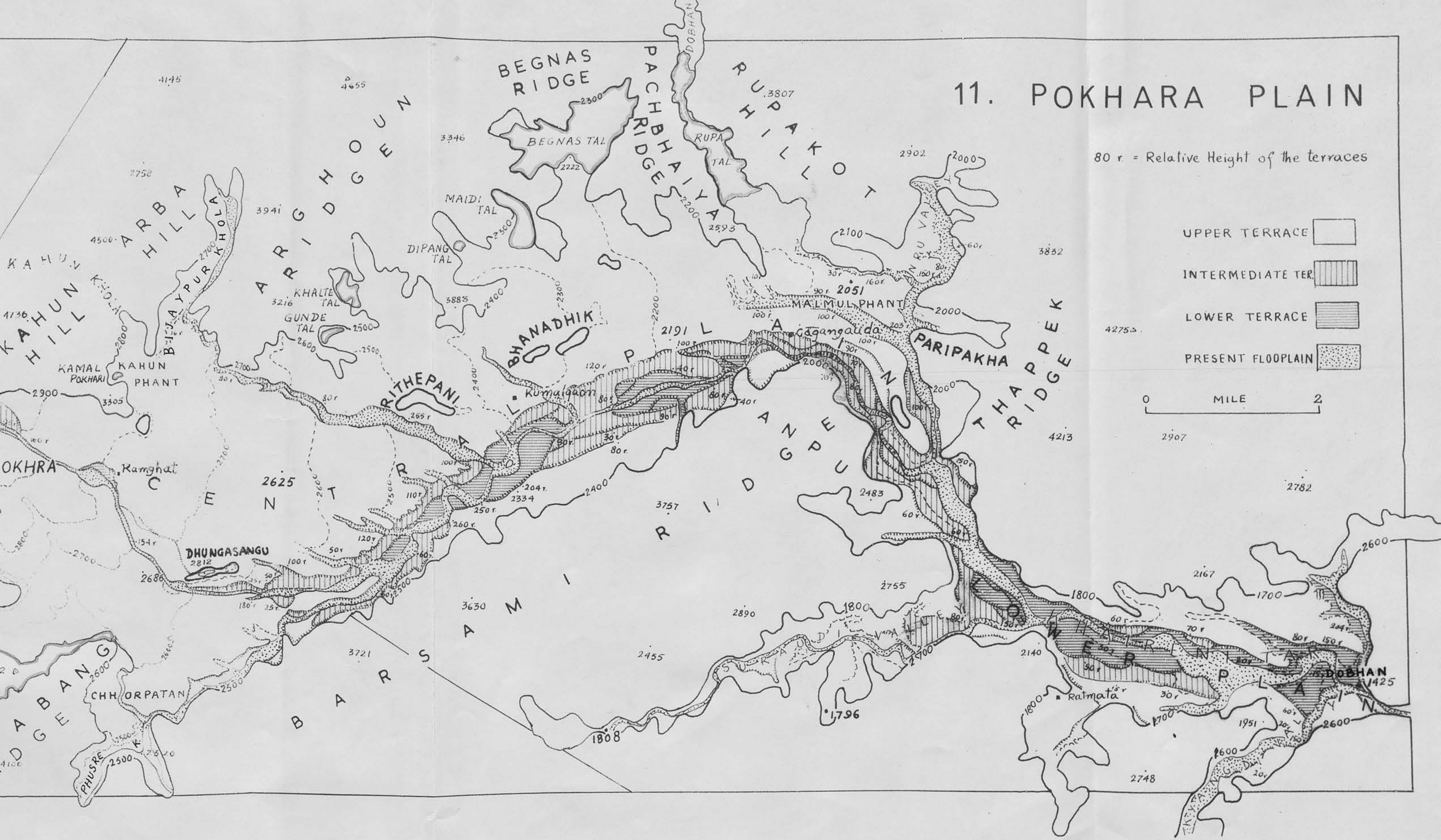




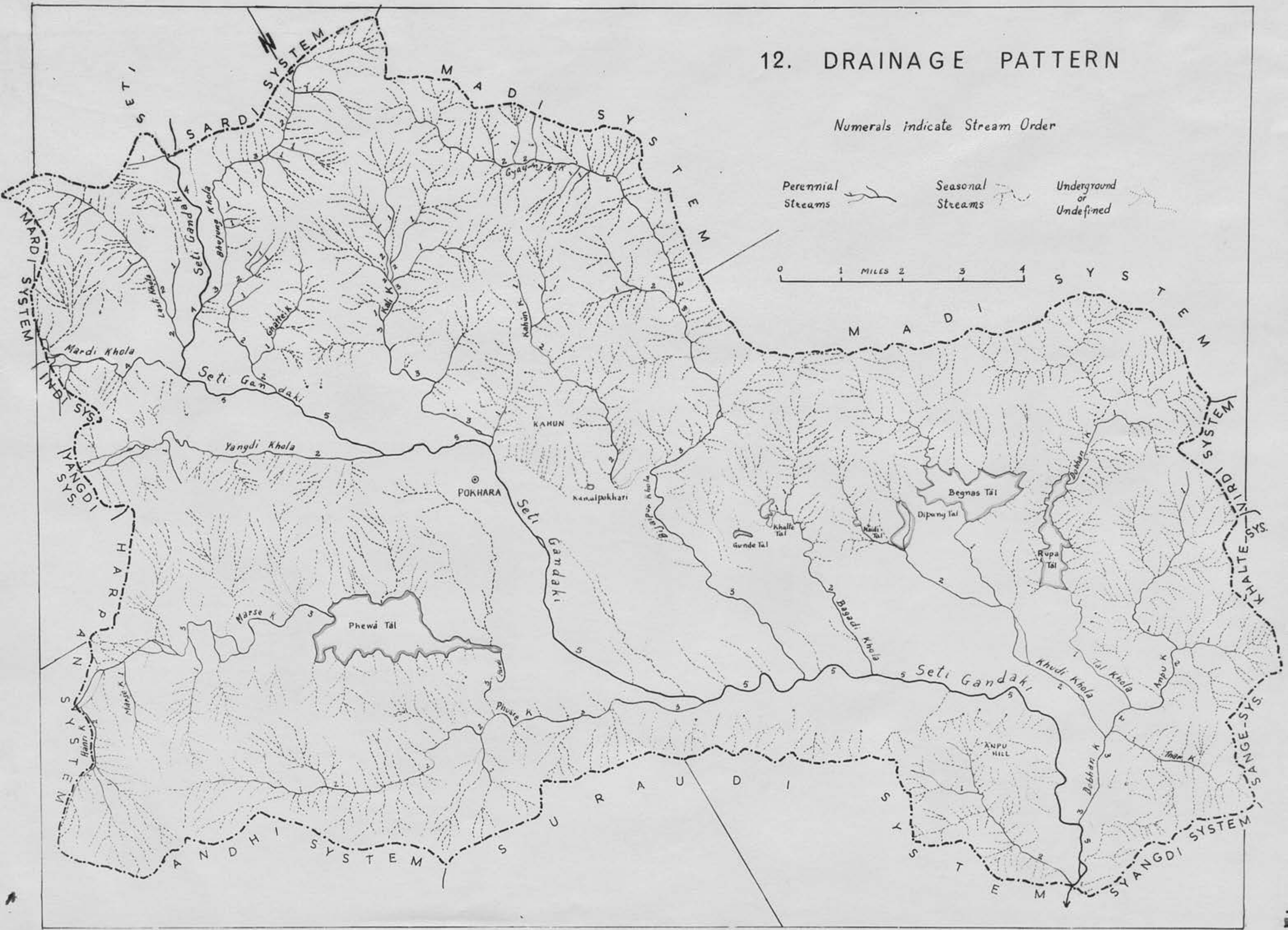
10. PROFILES
a. Projected Profiles
FEET '000
NAWĀKOT 5034
MATTIKHĀN 5032
KĀSKI 5867
5000
4000
Seti Terraces
Mādi Valley
P O K H A R A P L A I N
b. Cross Profiles, see map 7 for the profile sections.
0 MILE 1
6375
6100
400 r.
Seti
Bhujung K.
I. SETI-SARDI KHOLĀ CONFLUENCE
5700
6401
4094
140 r.
80 r.
Lasti K.
Seti
II. AT GHĀCHOK
JHIRKOT
4641
4819
102 r.
Seti
Ghatte K.
Kali K.
III. SETI-MĀRDI CONFLUENCE
SARĀNKOT 5223
KĀHUN 4736
4145
POKHARĀ
2997
2768
2910
Seti K.
Kahun Khola
Bijaypur K.
Mādi K.
IV. AT POKHARĀ GAP
ARGHOUN 4655
PHOKSING 3721
60 r.
60 r.
50 r.
120 r.
80 r.
Khalte Tal
Seti
Bijaypur Khola
V. ON THE CENTRAL PLAIN
DHĀRĀPĀNI 3757
ĀNPU
NAYĀGAON 3832
Gagangaunda
70 r.
70 r.
90 r.
80 r.
Seti
Khudi Khola
VI. AT GAGANGAUNDĀ GAP



BHARBHURE
KHADARJUNG HILL
KAULE HILL
ARMALA HILL
GHARMI HILL
KAHUN HILL
ARBA HILL
RIBAN HILL
GHACHOK
LACHOK
Limestone Cavern
MARDI VALLEY
DHAMPUS RIDGE
YANGDI VALLEY
KASKI RIDGE
SARANKOT RIDGE
HENGJACHAUR
BATULE CHAUR
SWALLOW HOLE
KAMAL POKHARI
KAHUN PHANT
KAHUN KHOLA
BIJAYPUR KHOLA
POKHRA
Ramghat
DHUNGASANGU
KHALTE TAL
GUNDE TAL
RITHEPANI
DIPANG TAL
PHEWA TAL
CHHORPATAN
PHUSRE KHOLA
MARSE VALLEY
KALABANG RIDGE
84° E
28° 15' N



11. POKHARA PLAIN
80 r = Relative Height of the terraces
UPPER TERRACE
INTERMEDIATE TER
LOWER TERRACE
PRESENT FLOOPLAIN
0 MILE 2
BEGNAS RIDGE
BEGNAS TAL
PACHBHAIYA RIDGE
RUPAKOT HILL
RUPA TAL
DOBHAN
MAIDI TAL
DIPANG TAL
KHALTE TAL
GUNDE TAL
ARGHOUN RIDGE
ARBA HILL
KAHUN HILL
KAHUN KHOLA
BIJAYPUR KHOLA
KAMAL POKHARI
KAHUN PHANT
BHANADHIK
RITHEPANI
Kumalgaon
CENTRAL PLAIN
MALMUL PHANT
Cagangaida
PARIPAKHA
THAPPEK RIDGE
ANPU RIDGE
DHUNGASANGU
Ramghat
BARSAMI RIDGE
SURAUDI VALLEY
LOWER HALAN PLAIN
Ratmata
DOBHAN
1425
CHHORPATAN
PHUSRE
2625
2191
2051
2334
2483
1808
1796

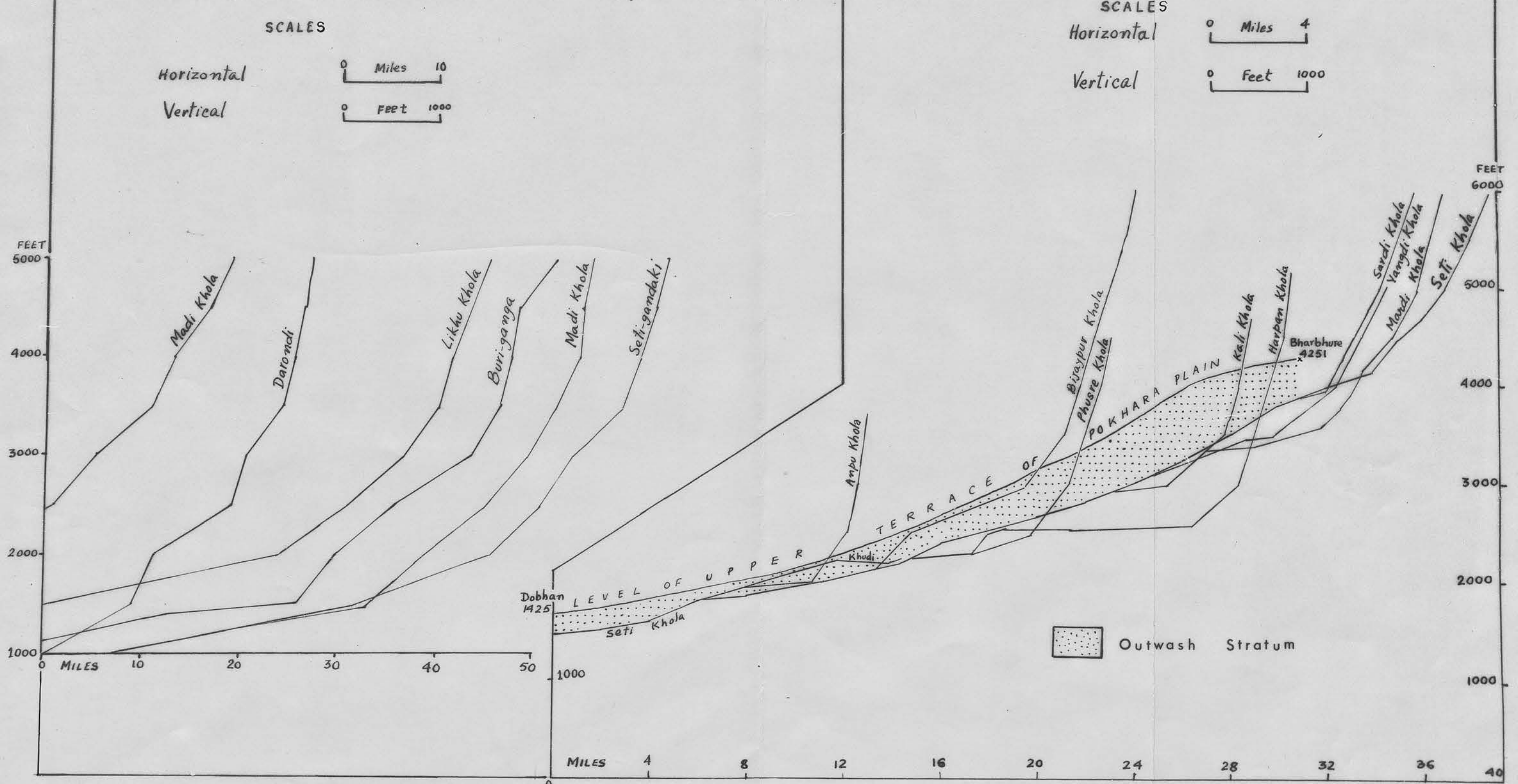


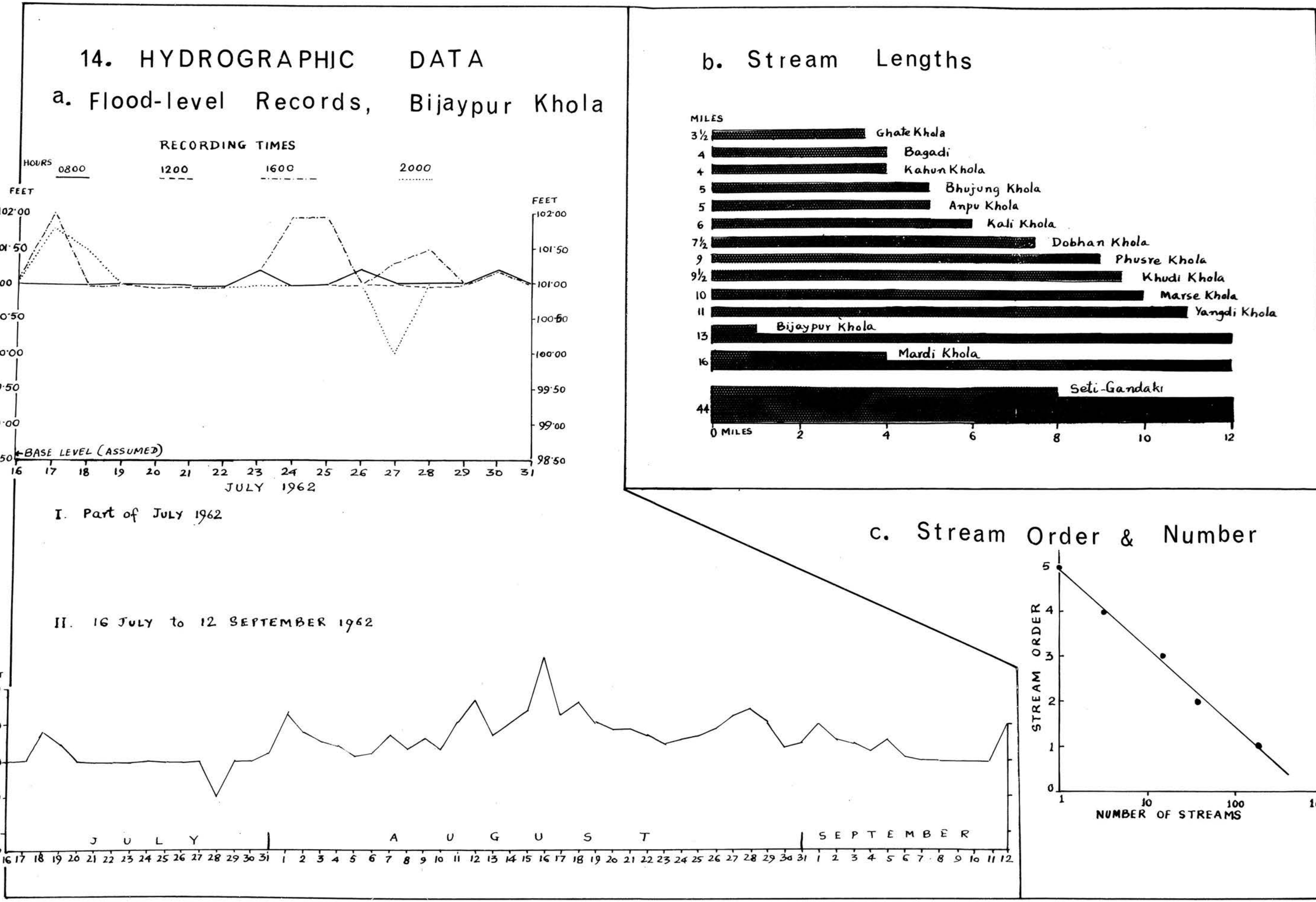
12. DRAINAGE PATTERN
Numerals indicate Stream Order
Perennial Streams
Seasonal Streams
Underground or Undefined
0 1 MILES 2 3 4
SETI SARDI SYSTEM
MADI SYSTEM
MARDI SYSTEM
YANGDI SYS.
HARPAN SYSTEM
ANDHI SYSTEM
SURAUDI SYSTEM
SYANGDI SYSTEM
SANGE-SYS.
KHALTE-SYS.
VIRDI SYSTEM
Seti Gandaki
Bhujung Khola
Mardi Khola
Yangdi Khola
Kahun K
Kali K
KAHUN
POKHARA
Kanalpokhari
Begnas Tal
Dipang Tal
Rupa Tal
Khalte Tal
Gunde Tal
Maidi Tal
Bagadi Khola
Phewa Tal
Marse K
Phusre K
Khudi Khola
Tal Khola
Ampu K
Dobhan K
Thar K
ANPU HILL

13. STREAM PROFILES

a. Long Profiies of Some Nepal Rivers

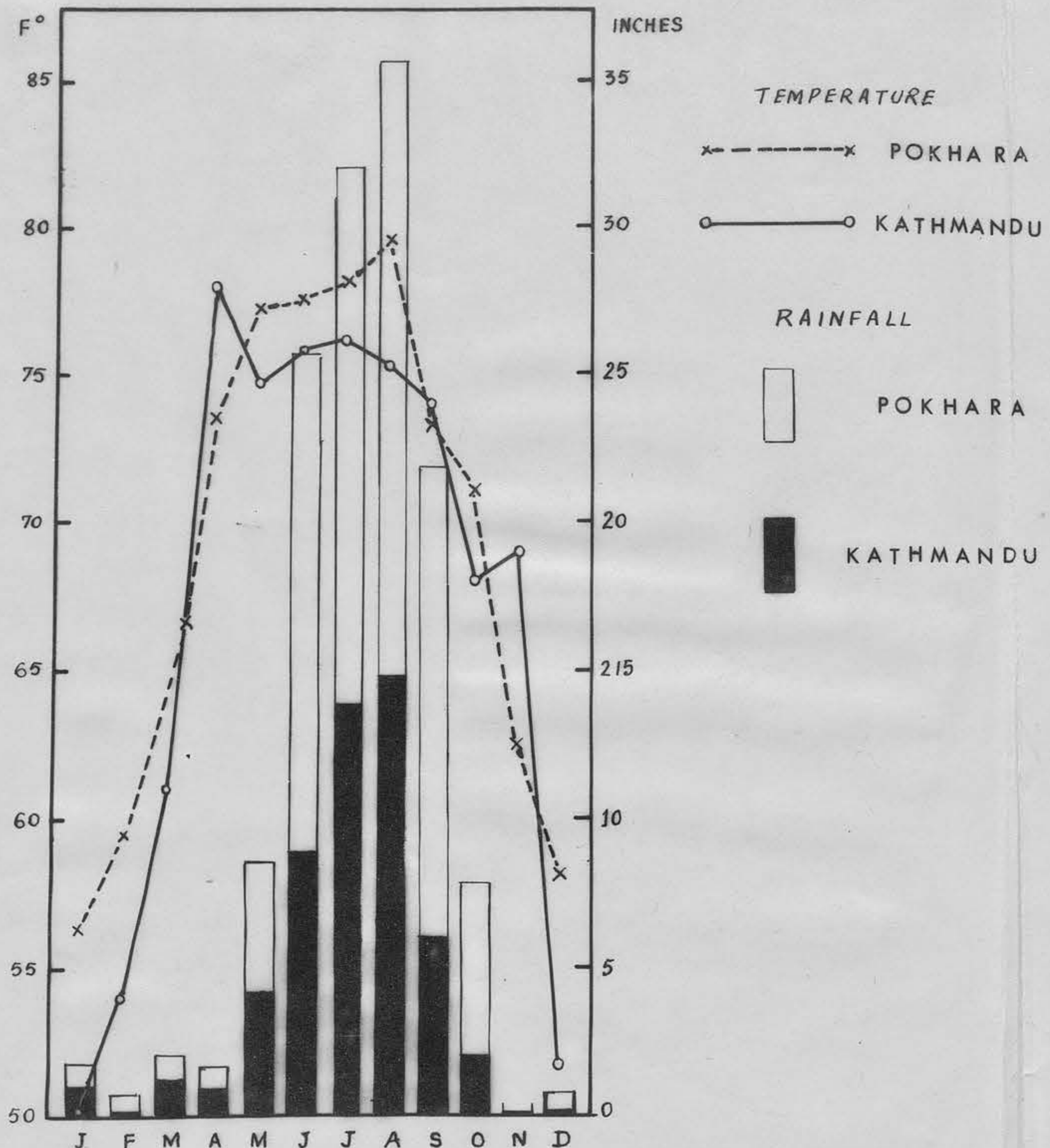
b. Seti and Tributaries



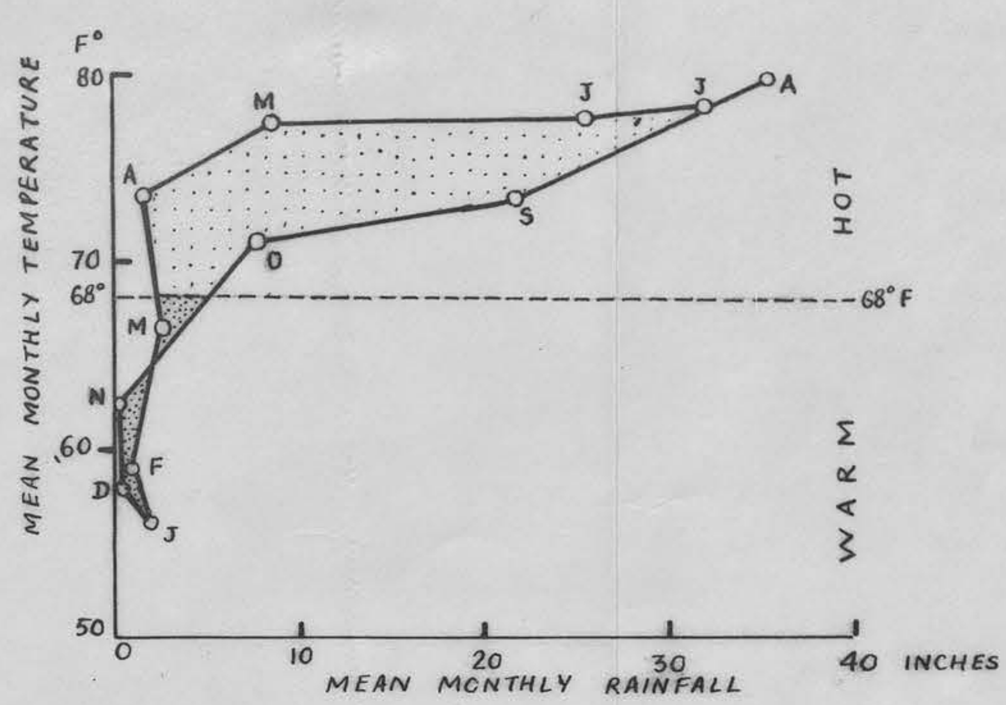

14. HYDROGRAPHIC DATA
a. Flood-level Records, Bijaypur Khola
RECORDING TIMES
HOURS 0800 1200 1600 2000
FEET
102·00
101·50
101·00
100·50
100·00
99·50
99·00
98·50
←BASE LEVEL (ASSUMED)
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
JULY 1962
I. Part of JULY 1962
II. 16 JULY to 12 SEPTEMBER 1962
FEET
103·00
102·00
101·00
100·00
99·00
98·50
JULY
AUGUST
SEPTEMBER
b. Stream Lengths
MILES
3½ Ghate Khola
4 Bagadi
4 Kahun Khola
5 Bhujung Khola
5 Anpu Khola
6 Kali Khola
7½ Dobhan Khola
9 Phusre Khola
9½ Khudi Khola
10 Marse Khola
11 Yangdi Khola
13 Bijaypur Khola
16 Mardi Khola
44 Seti-Gandaki
0 MILES 2 4 6 8 10 12
c. Stream Order & Number
STREAM ORDER
0 1 2 3 4 5
NUMBER OF STREAMS
1 10 100 1000

15. CLIMATIC DATA

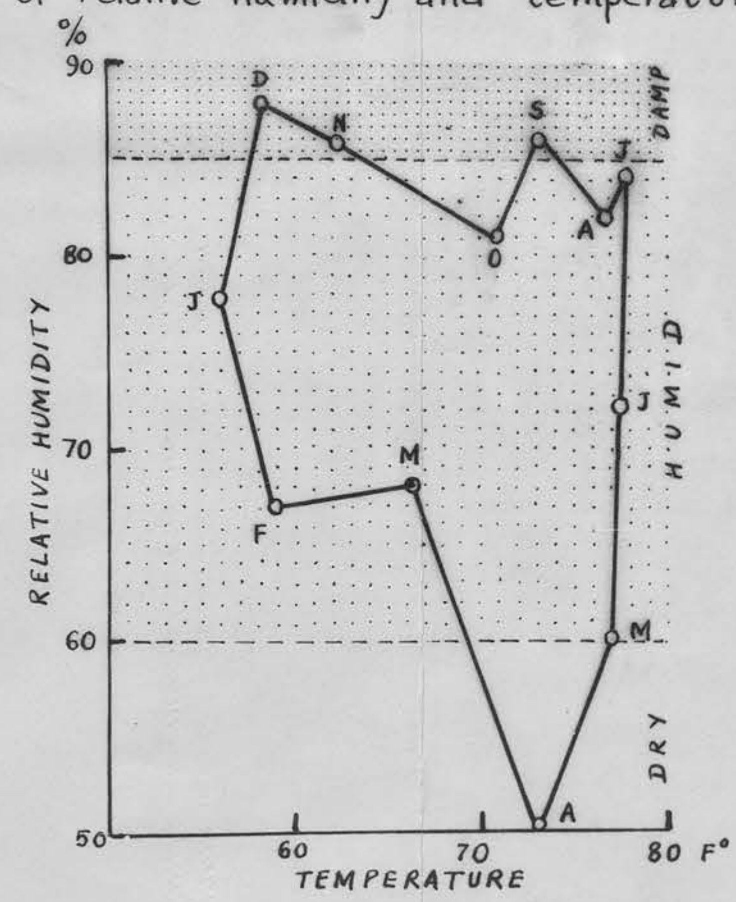
a. Comparison with Kathmandu

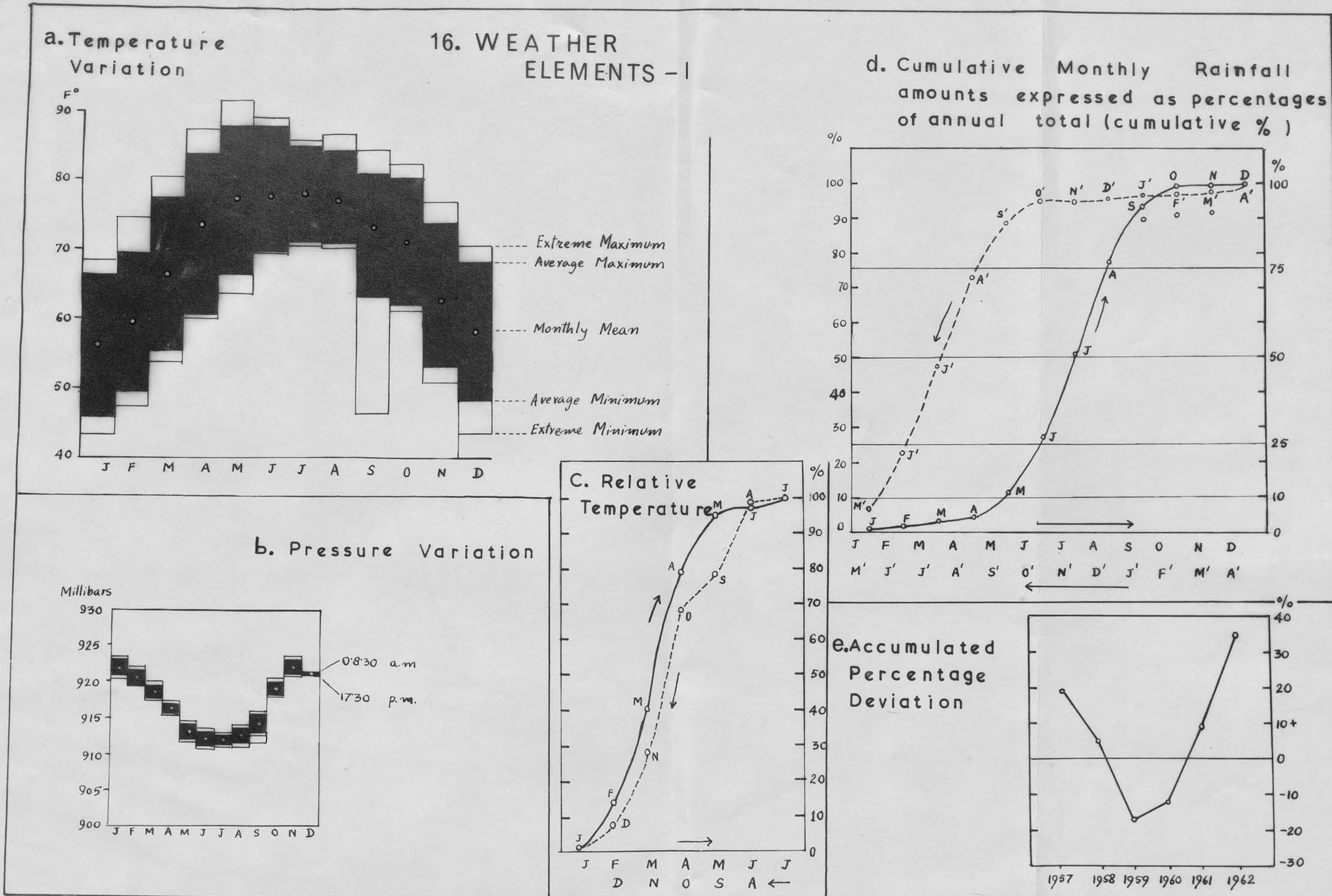


b. Temperature/ Precipitation Climograph

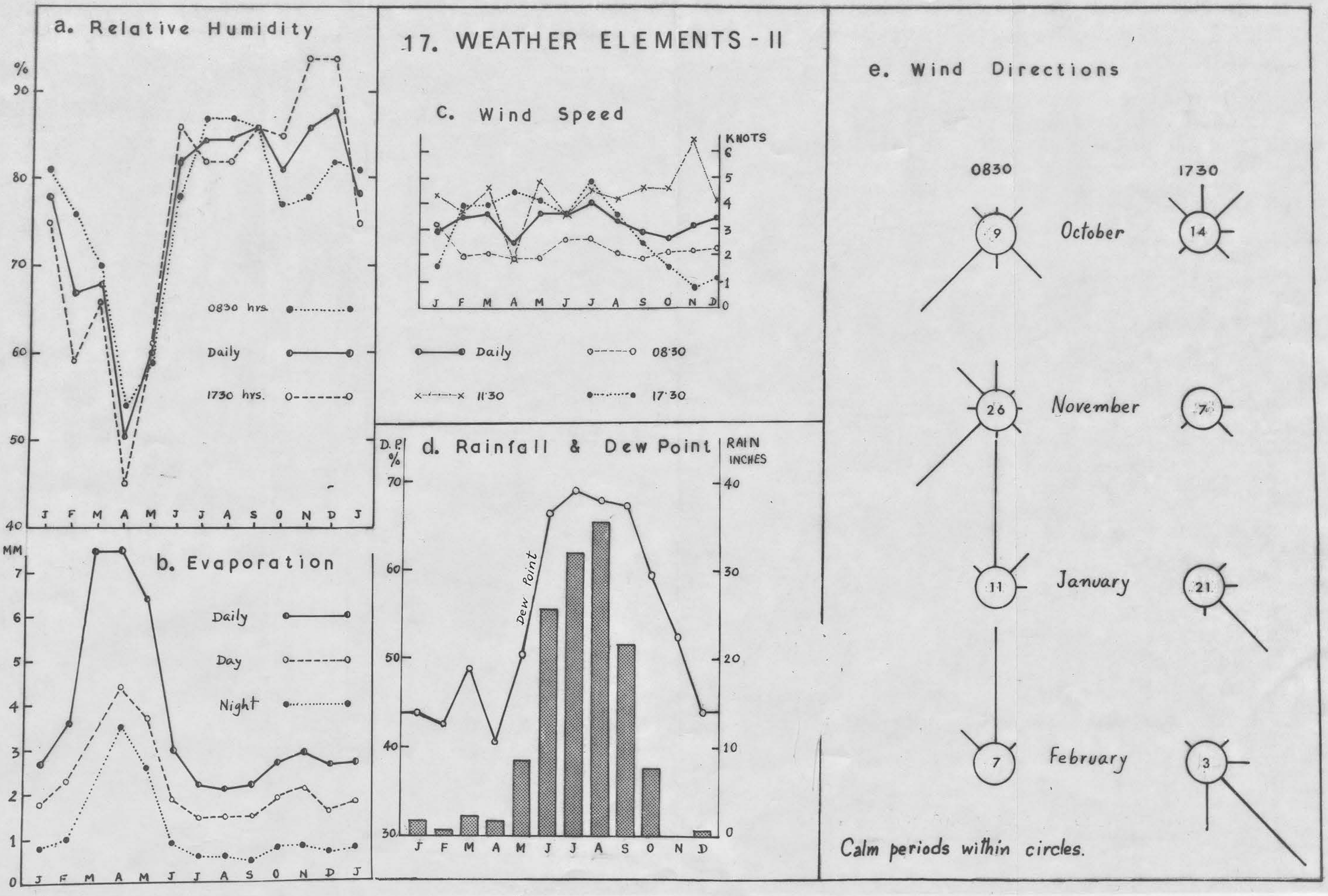


c. Climograph representing the correlation of monthly averages of relative humidity and temperature.



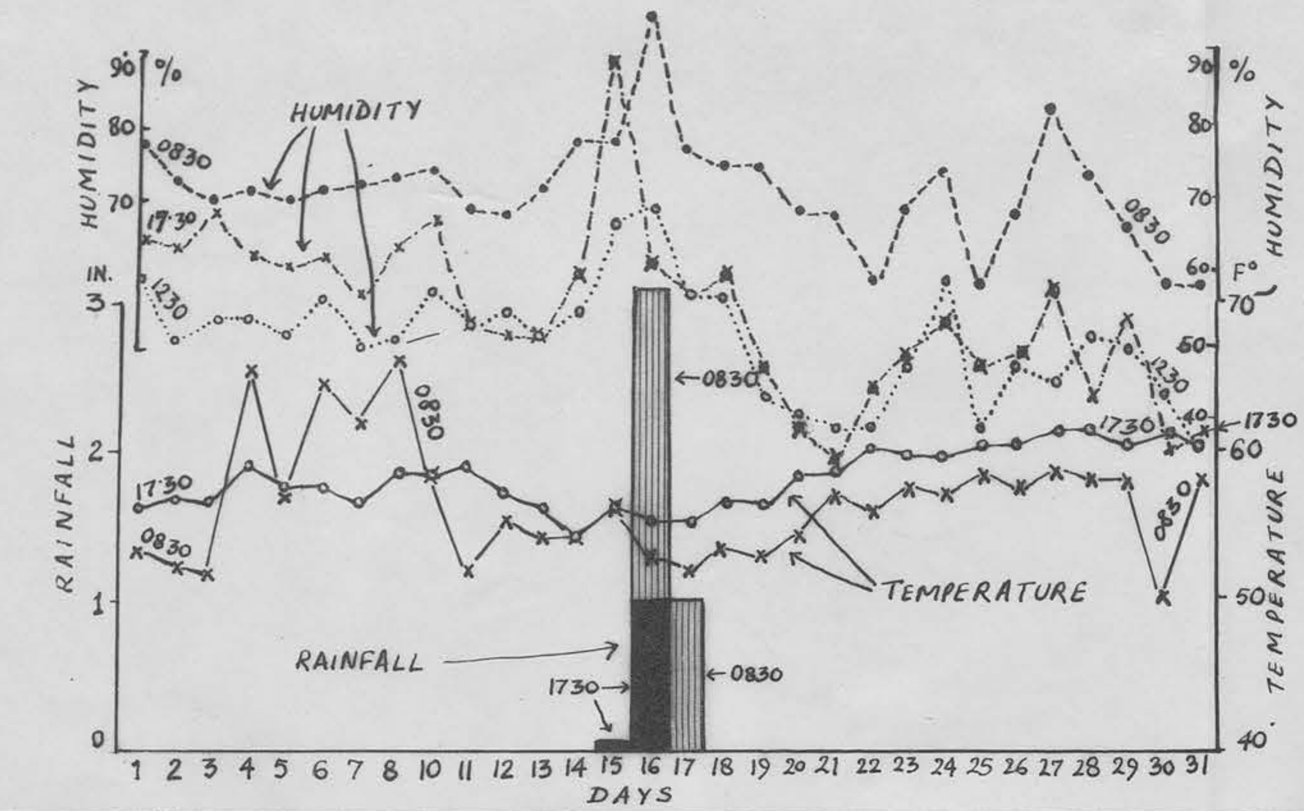

16. WEATHER ELEMENTS - I
a. Temperature Variation
F°
90
80
70
60
50
40
J F M A M J J A S O N D
Extreme Maximum
Average Maximum
Monthly Mean
Average Minimum
Extreme Minimum
b. Pressure Variation
Millibars
930
925
920
915
910
905
900
J F M A M J J A S O N D
08.30 a.m
17.30 p.m.
C. Relative Temperature
%
100
90
80
70
60
50
40
30
20
10
0
J F M A M J J
D N O S A
d. Cumulative Monthly Rainfall amounts expressed as percentages of annual total (cumulative %)
%
100
90
80
70
60
50
40
30
20
10
0
75
25
J F M A M J J A S O N D
M' J' J' A' S' O' N' D' J' F' M' A'
e. Accumulated Percentage Deviation
%
40
30
20
10+
0
-10
-20
-30
1957 1958 1959 1960 1961 1962

17. WEATHER ELEMENTS - II

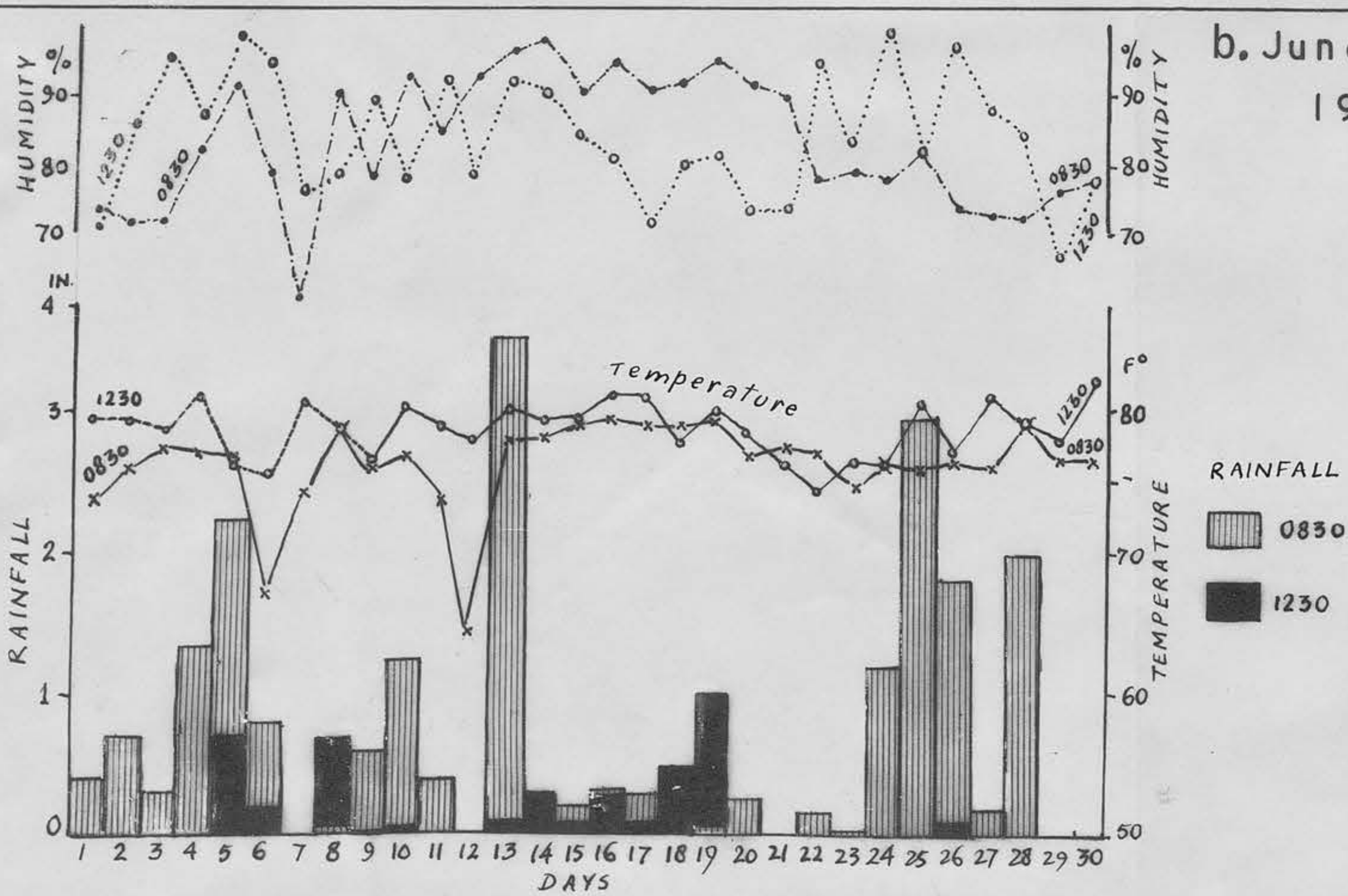


18. MONTHLY & ANNUAL SAMPLES

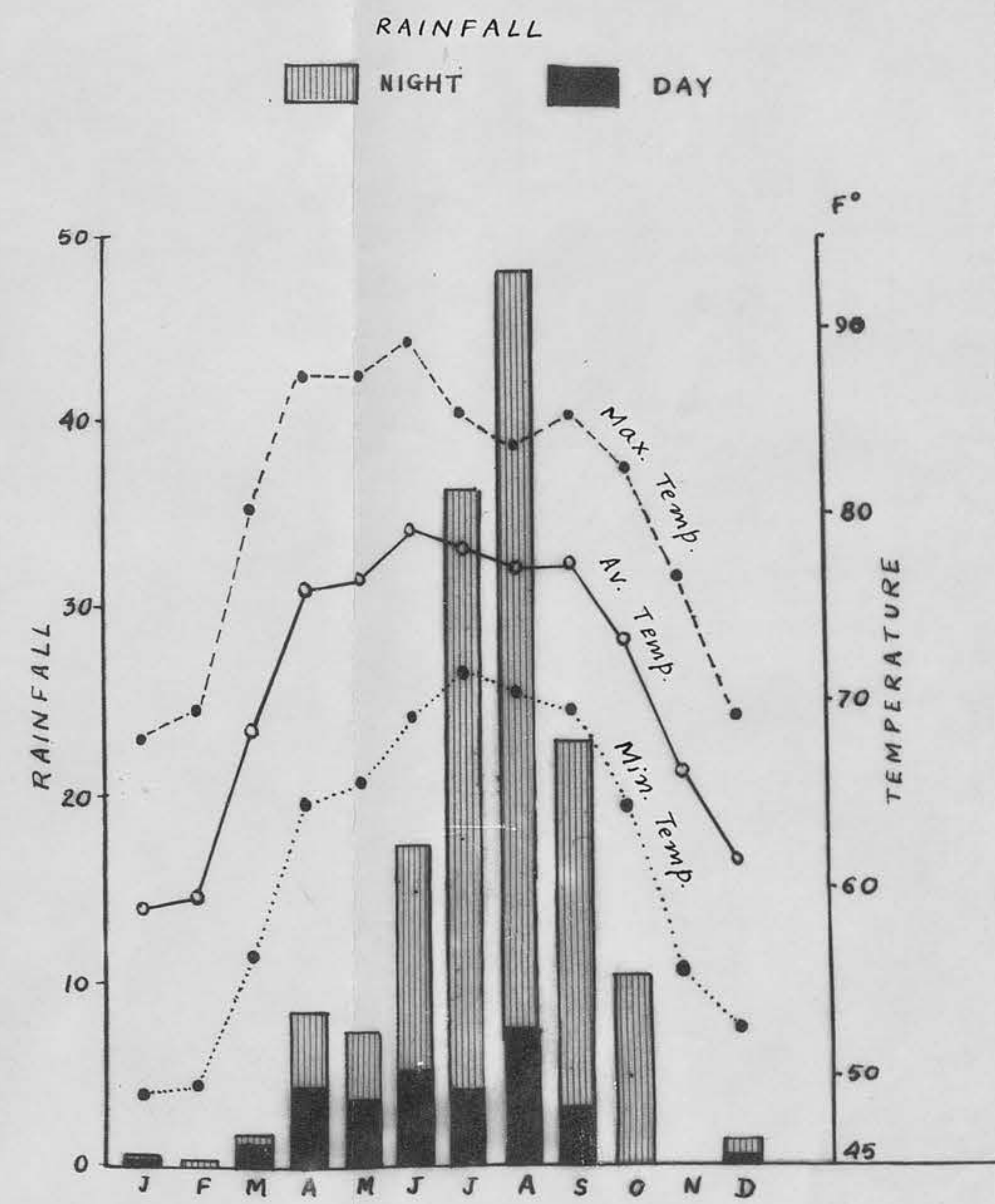
a. January 1963



b. June 1959



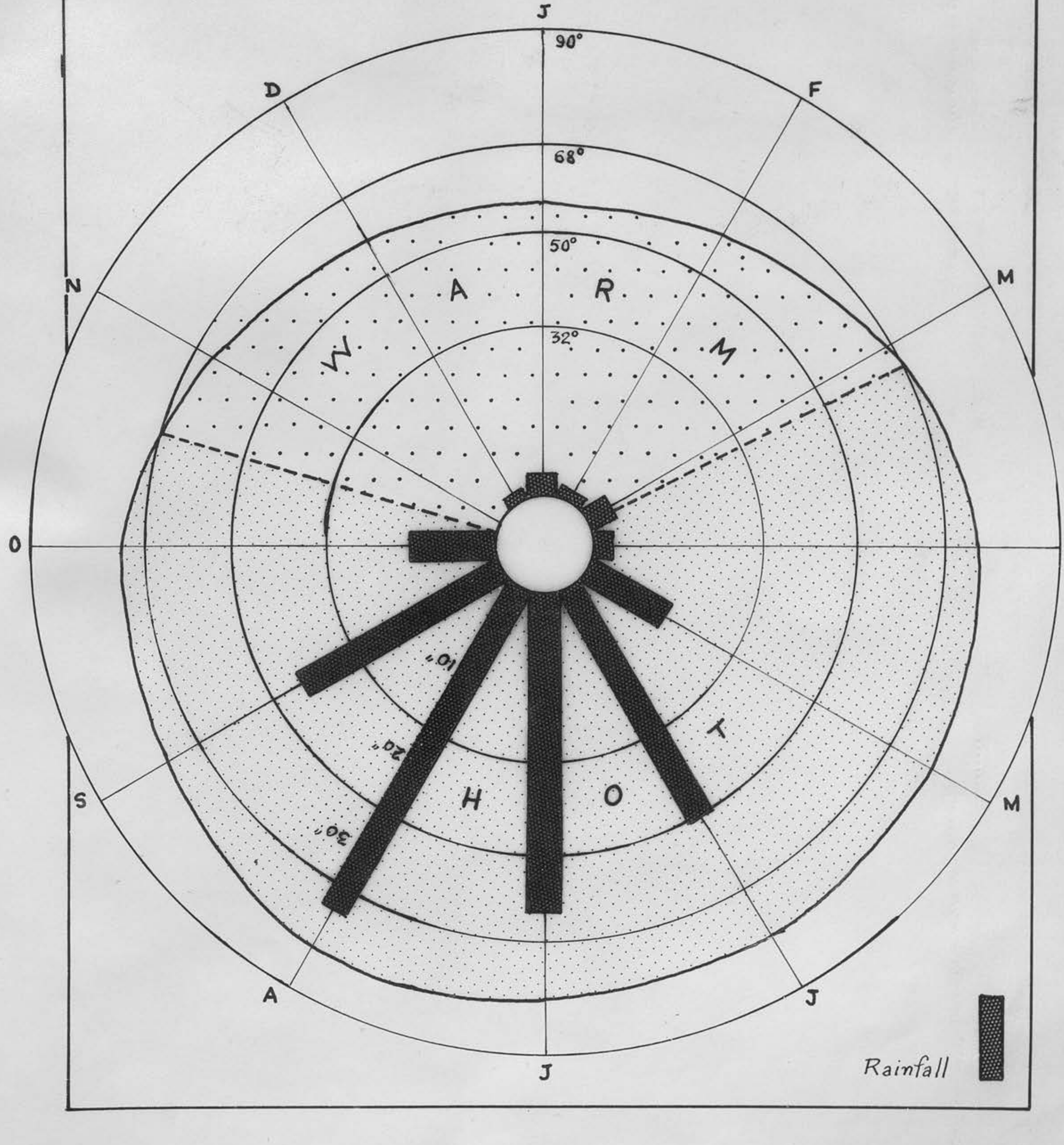
C. 1958

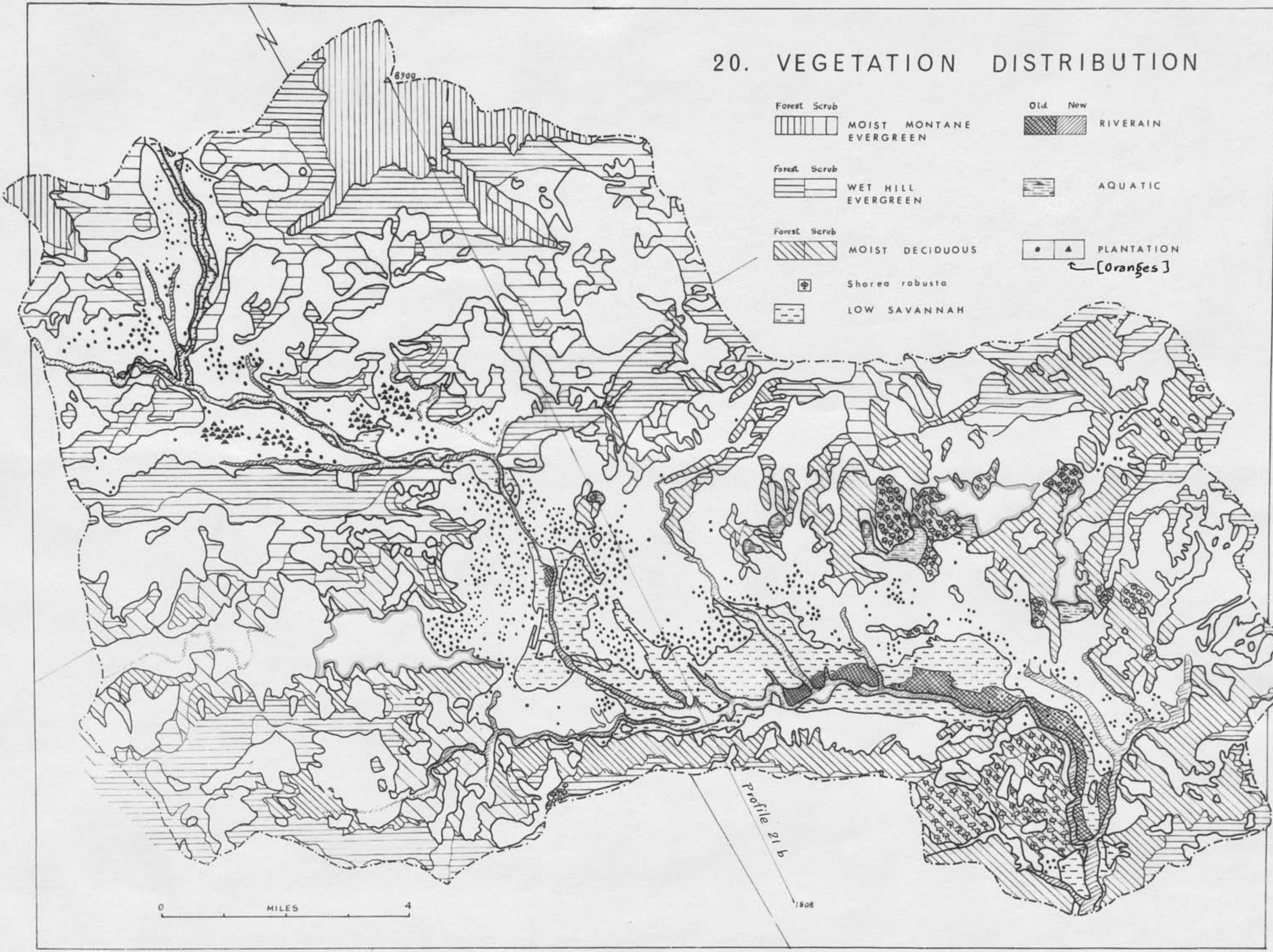


19. CLIMOGRAPH

POKHARA

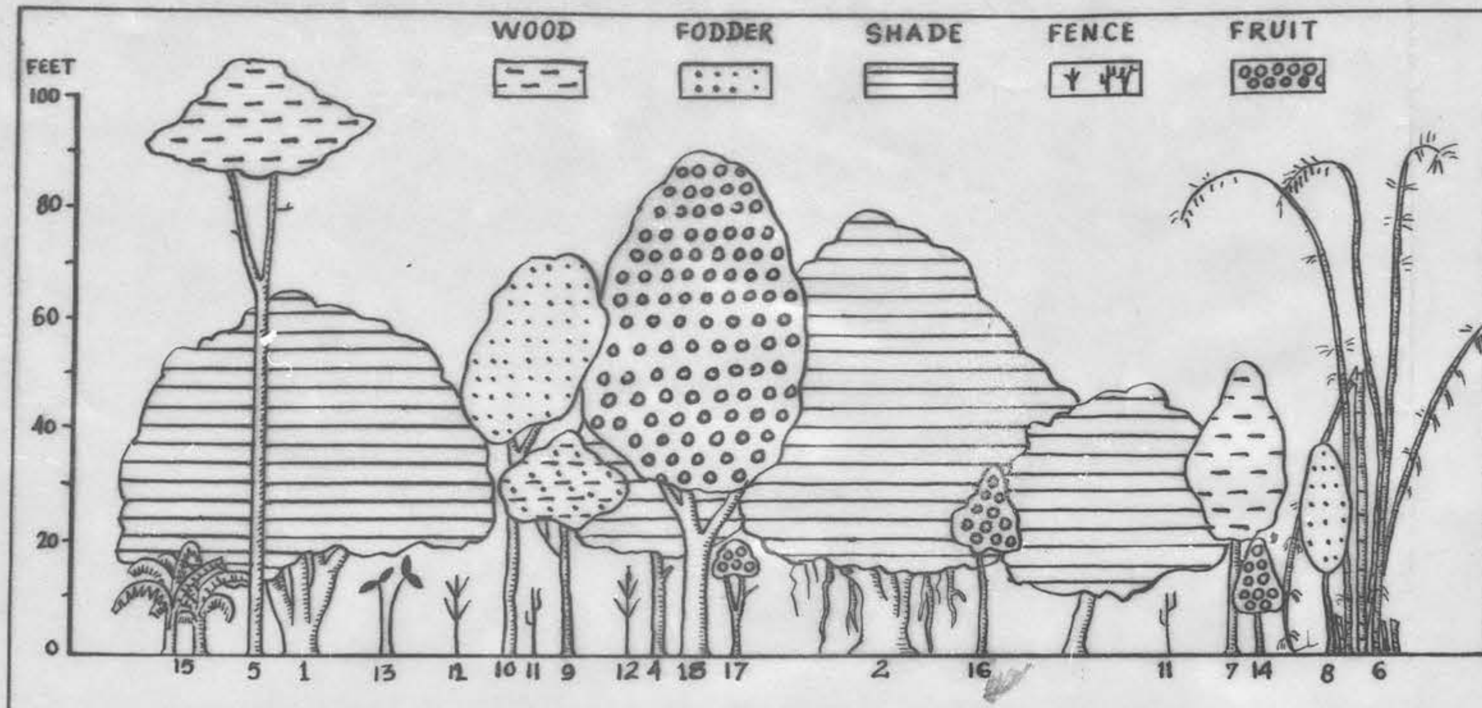
Altitude 2,750 ft. ; Long. 84° E ; Lat. 28° 15′ N.




20. VEGETATION DISTRIBUTION
Forest Scrub
MOIST MONTANE EVERGREEN
Forest Scrub
WET HILL EVERGREEN
Forest Scrub
MOIST DECIDUOUS
Shorea robusta
LOW SAVANNAH
Old New
RIVERAIN
AQUATIC
PLANTATION
[Oranges]
8900
1808
Profile 21 b
0
MILES
4
N

20.

a. Plain Plantations



SHADE: 1. Ficus religiosa
2. F. bengalensis
3. F. benjamina
4. Sapinus mukorossi

WOOD: 5. Salmalia malabarica
6. Dendrocalamus strictus
7. Schima wallichi

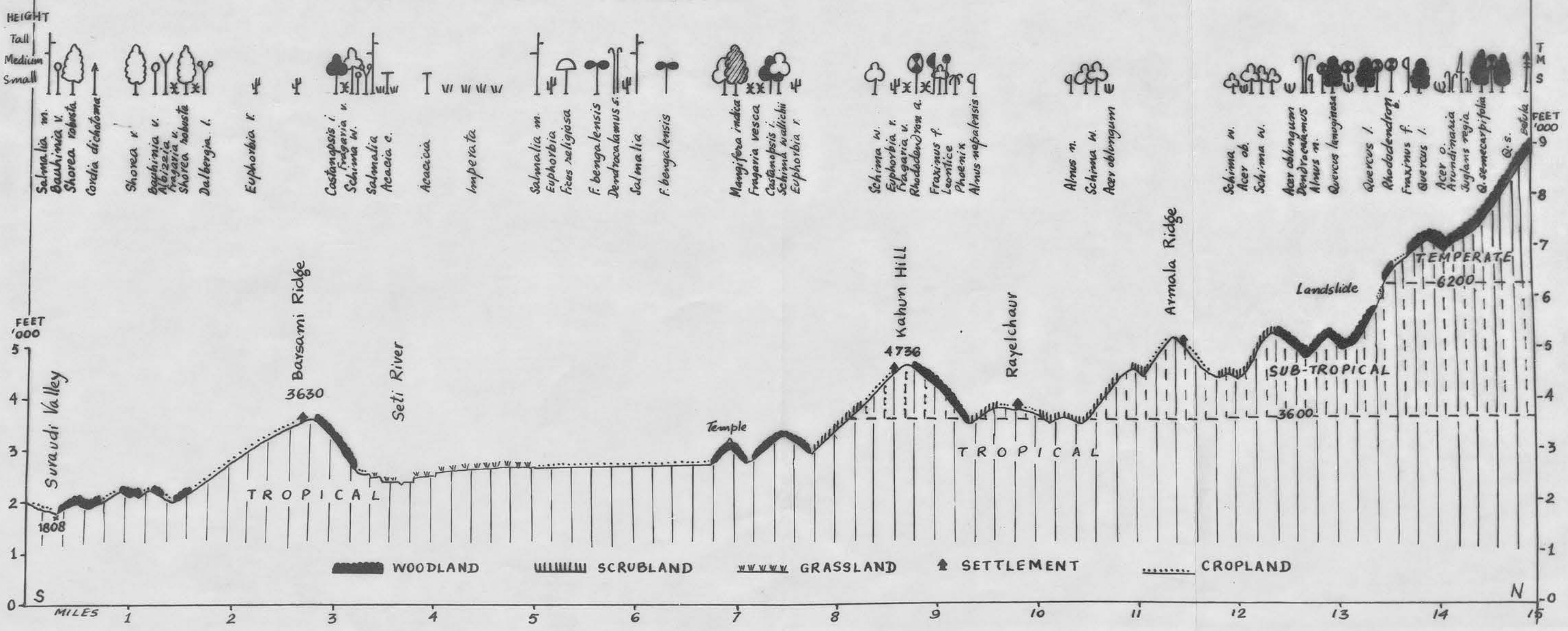
FODDER: 8. Ficus spp. 'Kadme'
9. Castanopsis indica
10. Ficus spp. 'Barar'

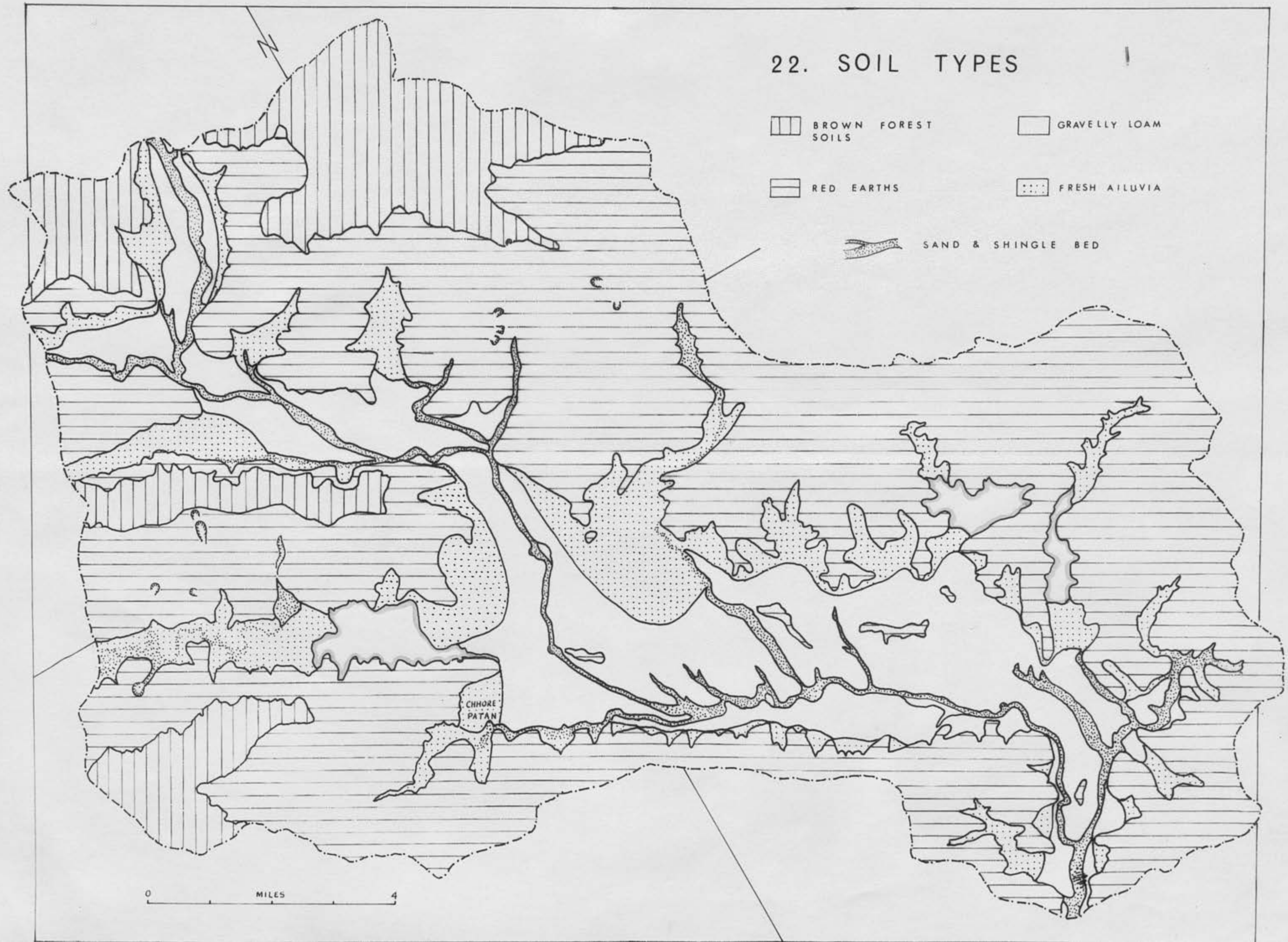
FENCE: 11. Euphorbia royliana
12 E. spp. 'Khirra'
13 E. spp. Poinsettia

FRUIT: 14. Orange
15 Banana
16 Jackfruit
17. Papaya
18 Mangifera indica

21. PROFILE DIAGRAMS

b. Climatic Plant Formations

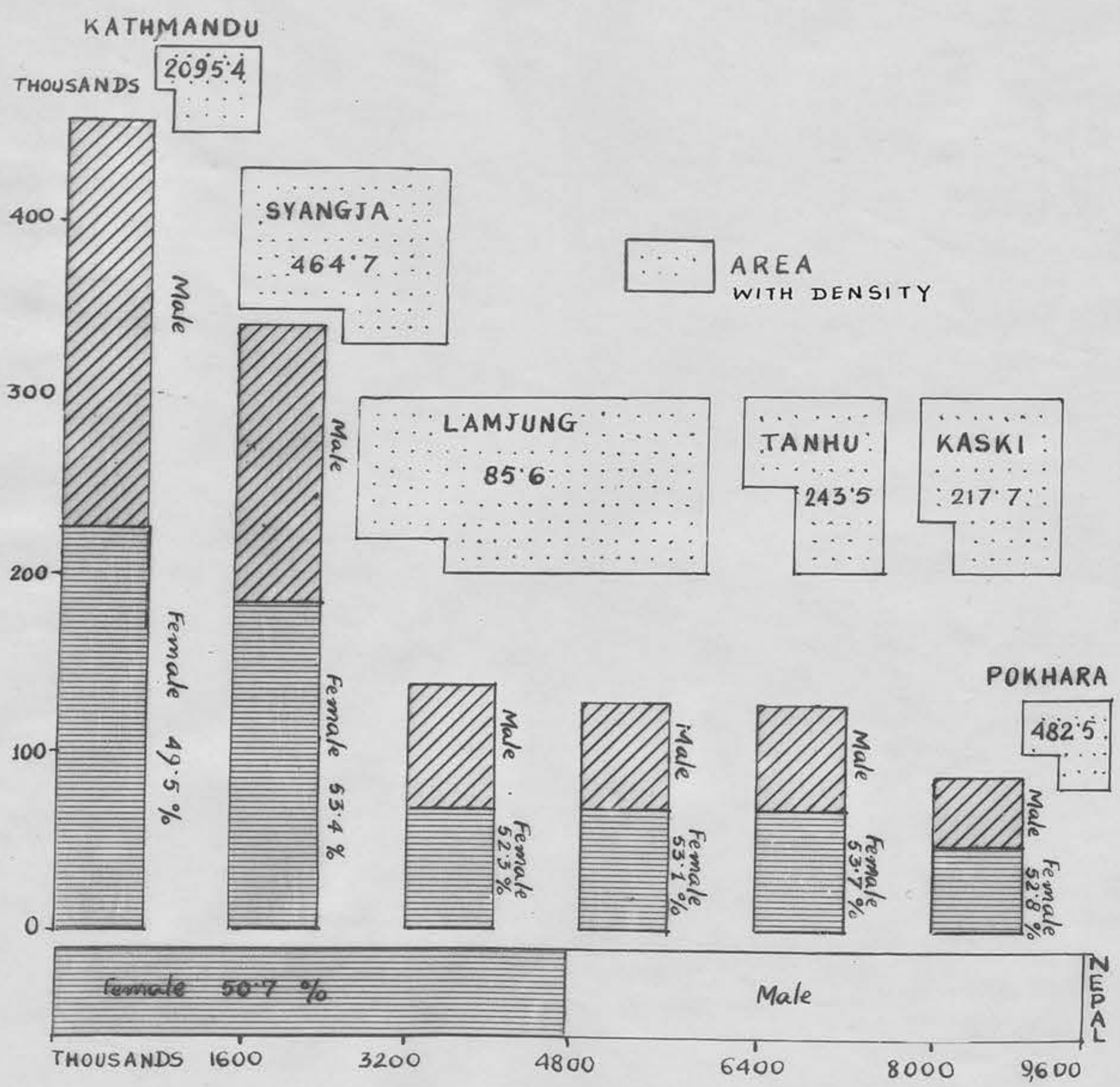




22. SOIL TYPES
BROWN FOREST SOILS
GRAVELLY LOAM
RED EARTHS
FRESH ALLUVIA
SAND & SHINGLE BED
N
CHHORE PATAN
0 MILES 4

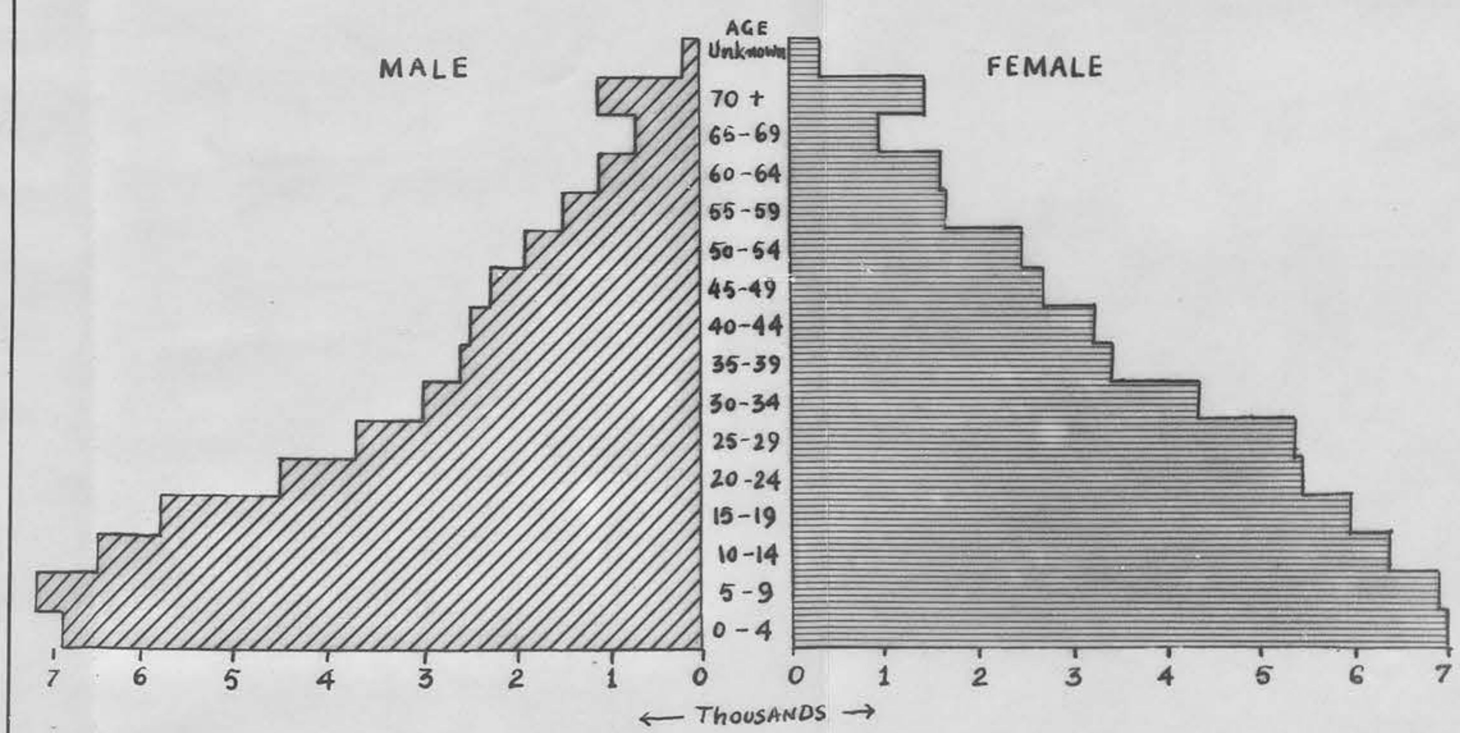
23. POPULATION

a. Area, Density, Sex Ratio

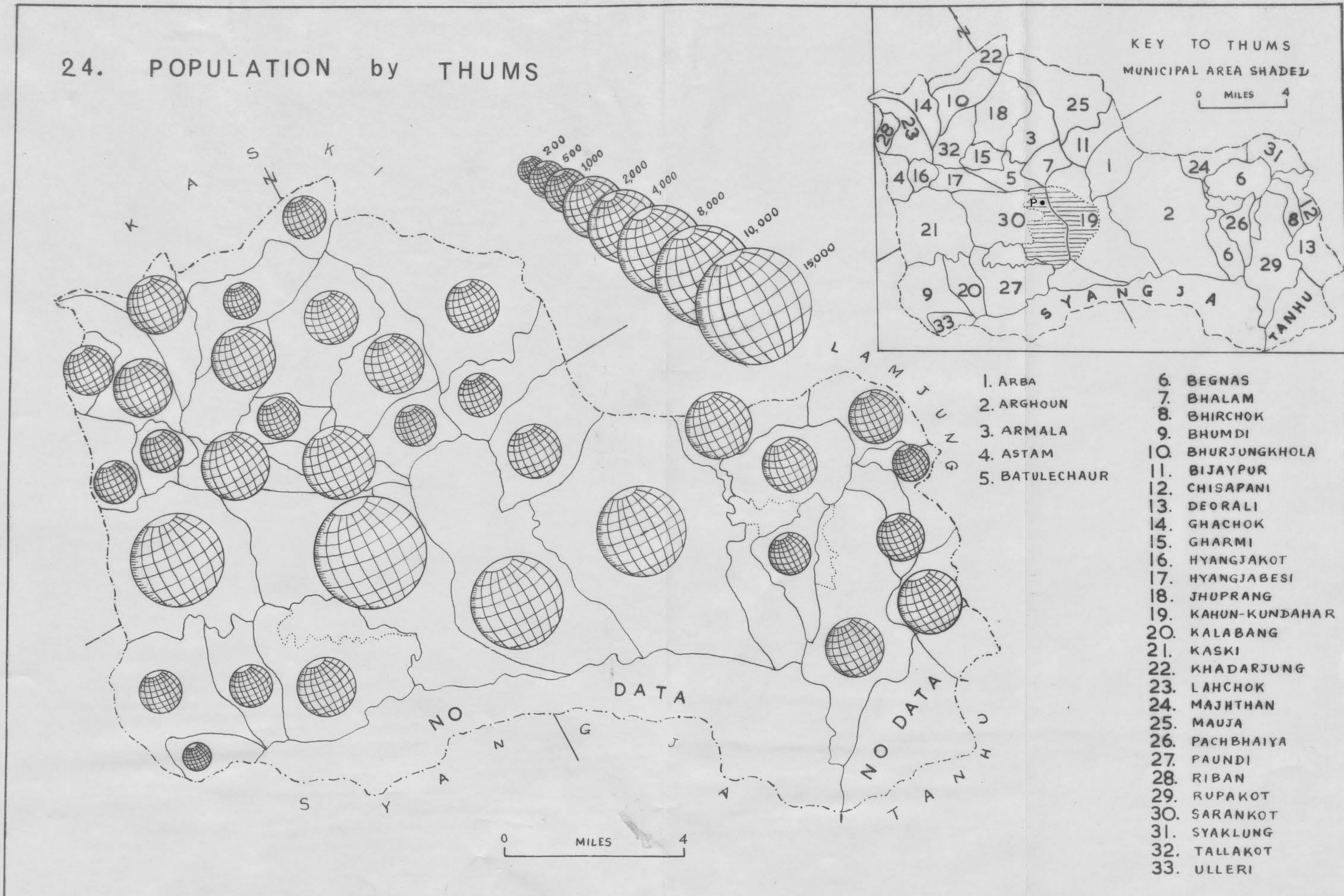


DENSITY OF POPULATION, NEPAL : 172 persons per square mile

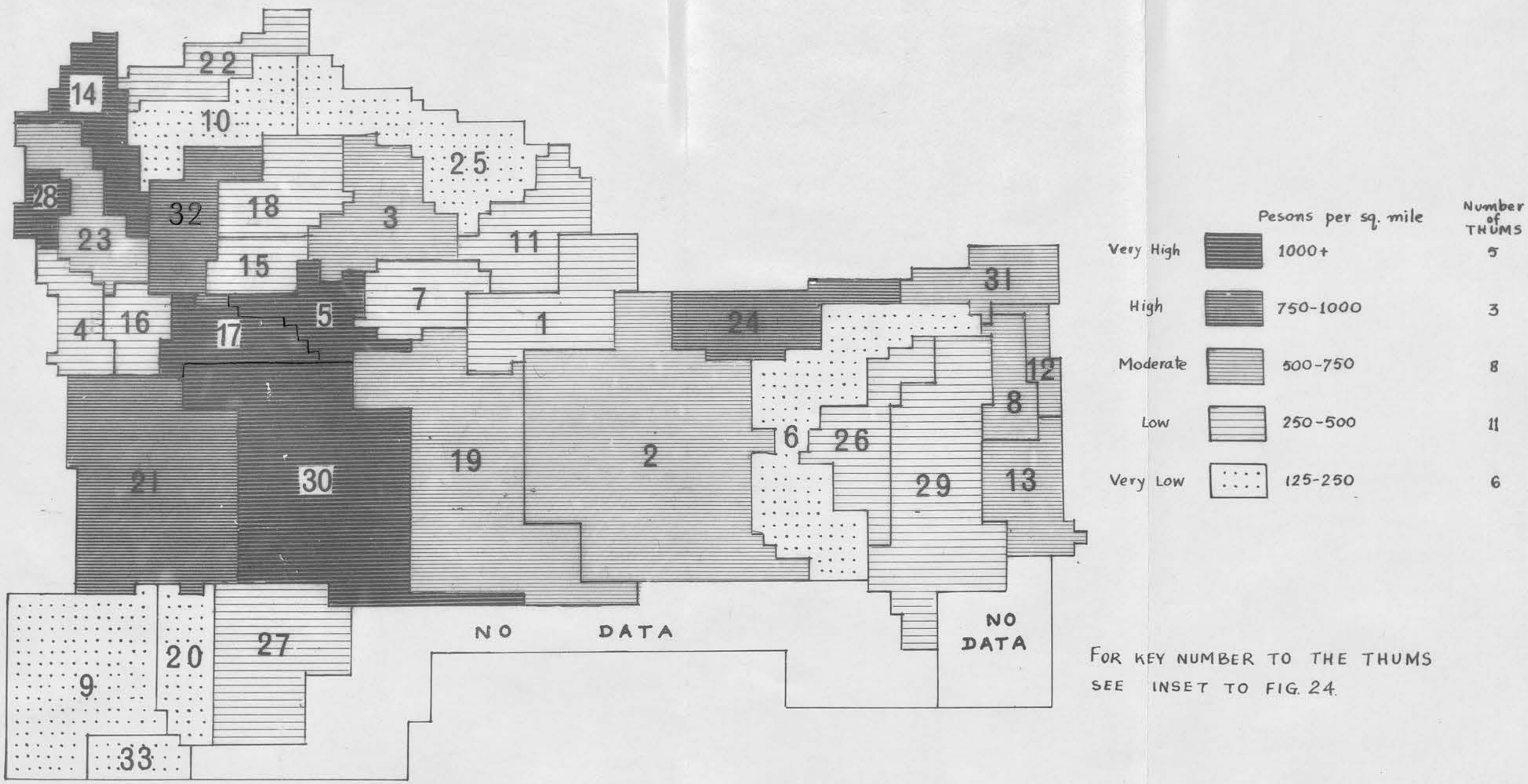
b. Age Structure Kaski District, 1954



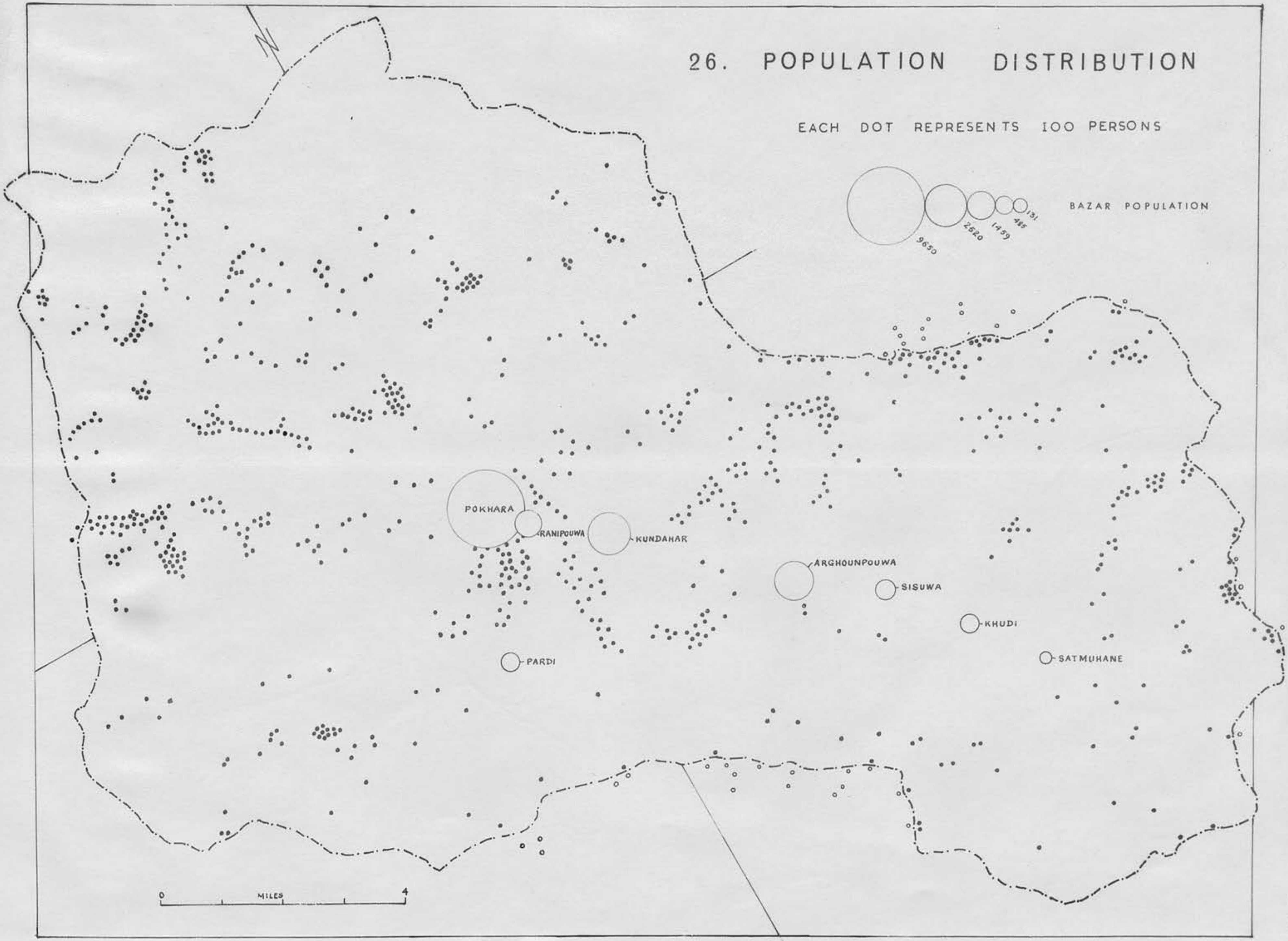
24. POPULATION by THUMS



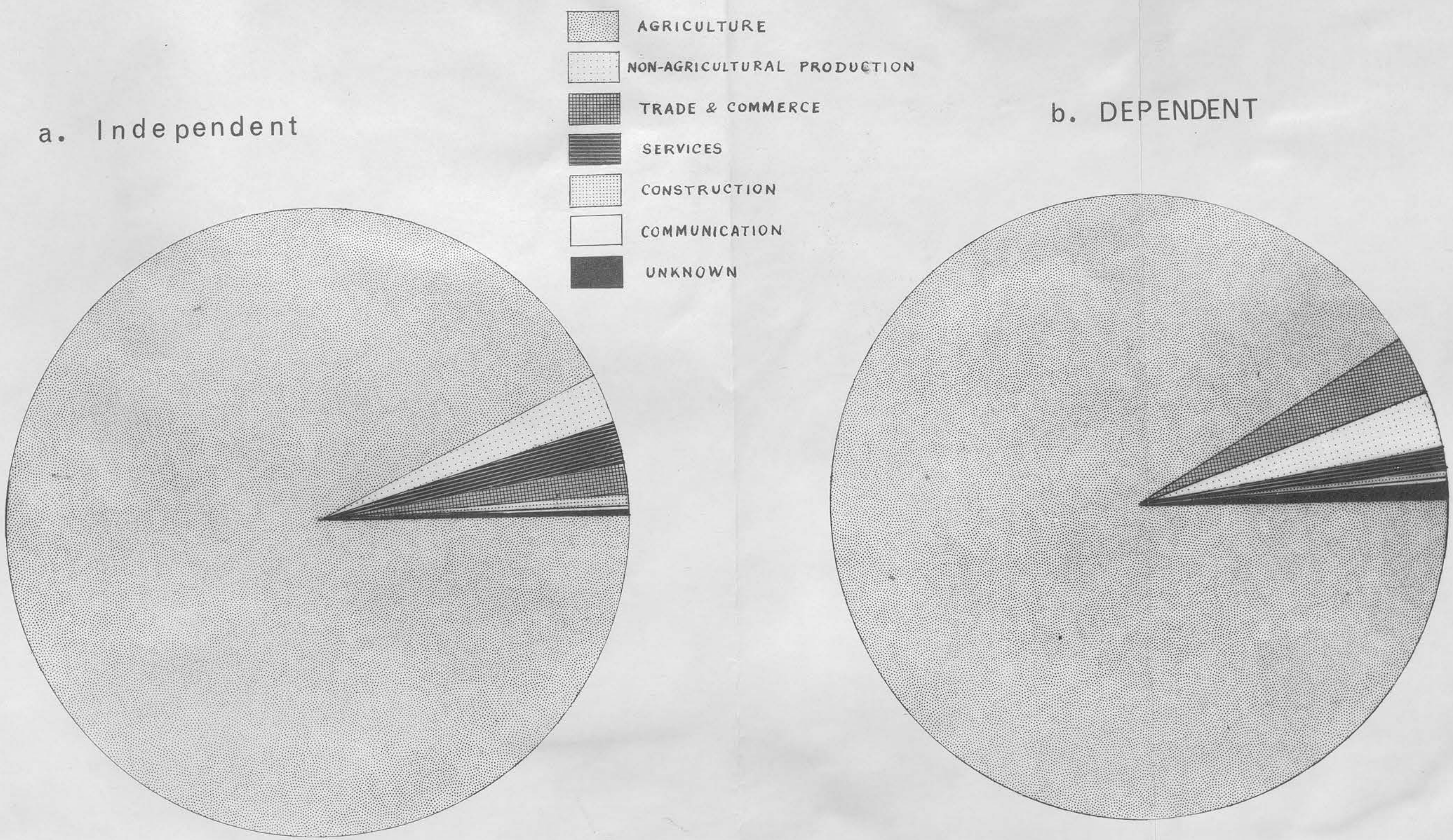
25. DENSITY by THUMS

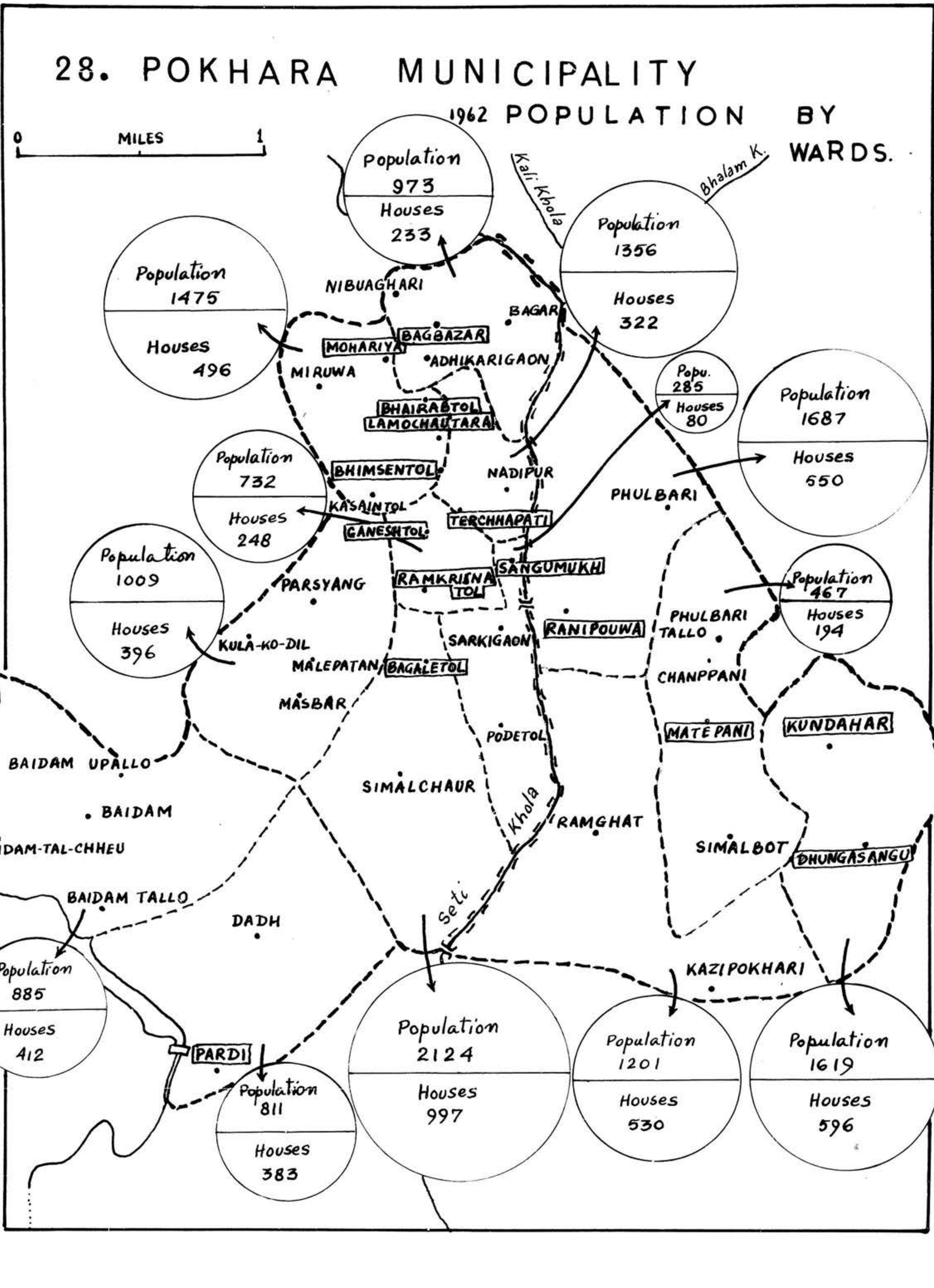


26. POPULATION DISTRIBUTION

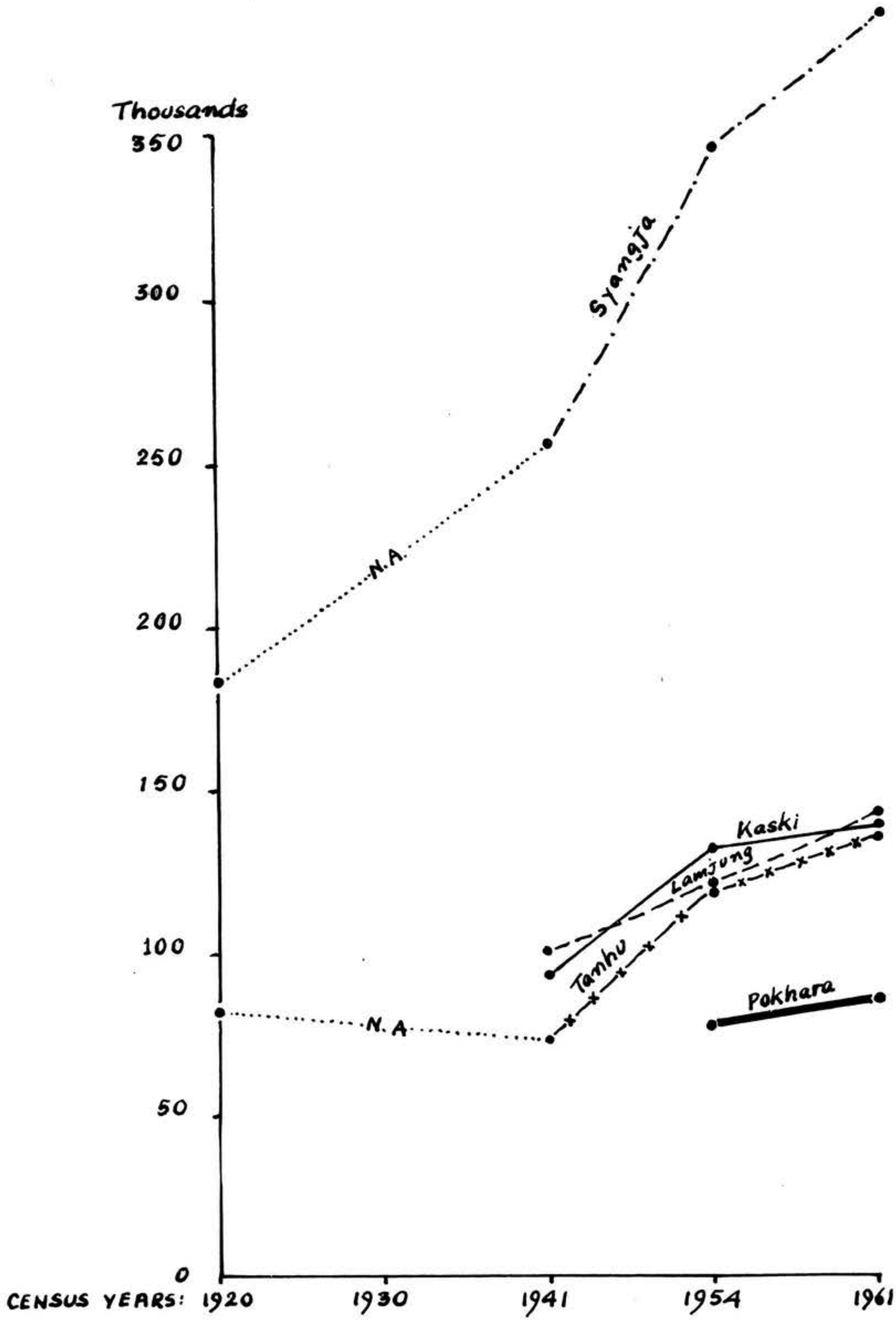


27. OCCUPATIONAL STRUCTURE, KASKI (1954)

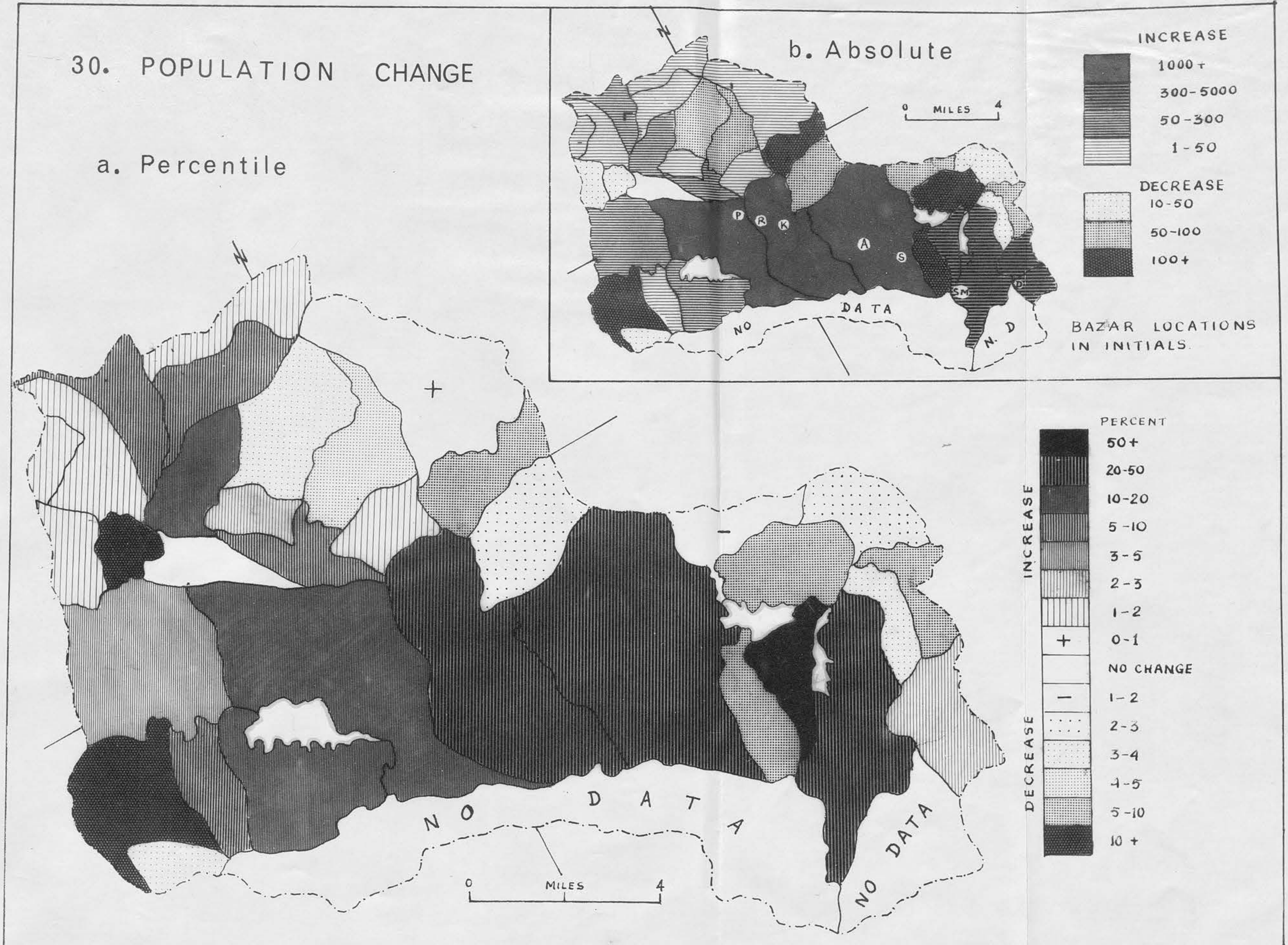


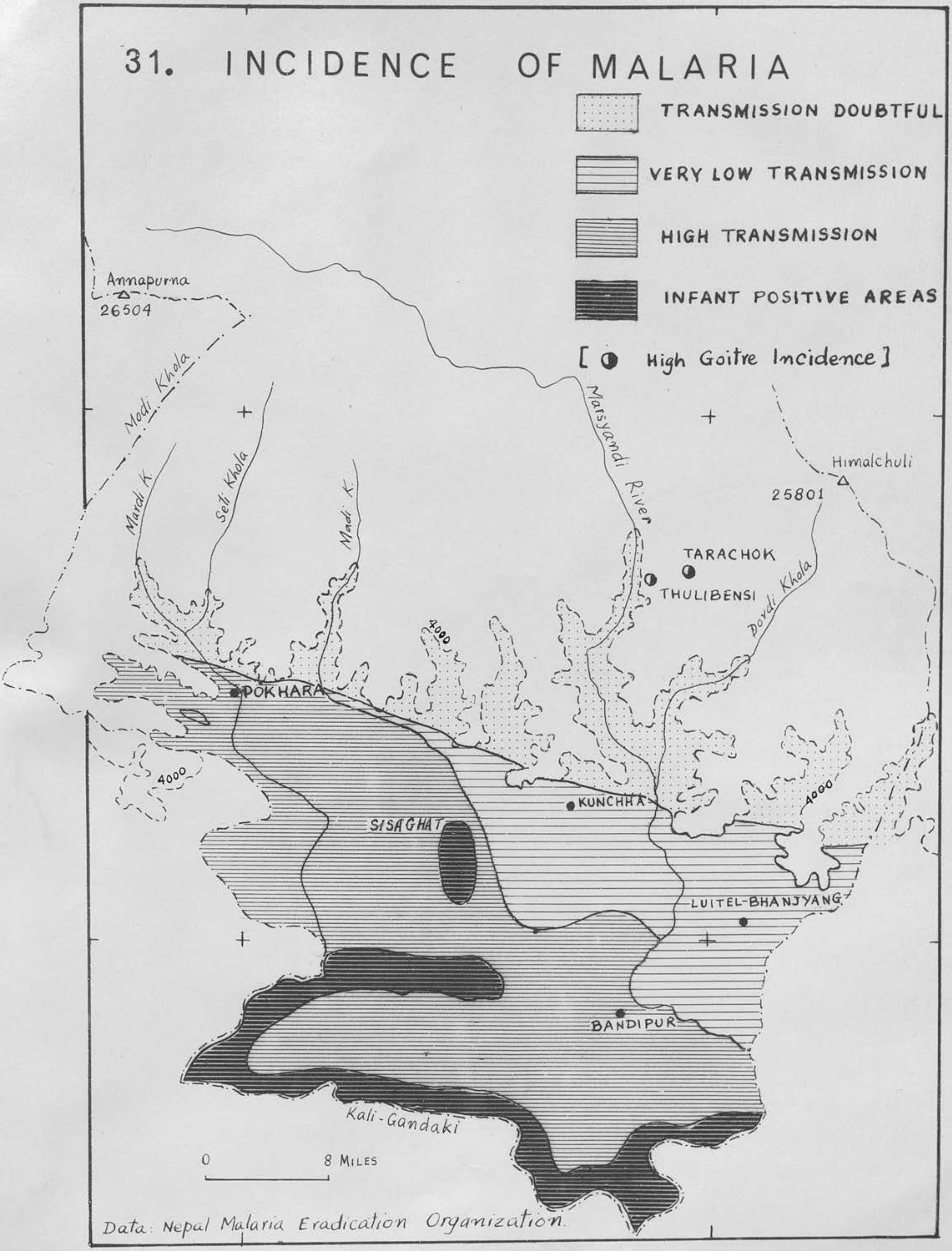

28. POKHARA MUNICIPALITY
1962 POPULATION BY WARDS.
0 MILES 1
Population 973 Houses 233
Population 1475 Houses 496
Population 1356 Houses 322
Popu. 285 Houses 80
Population 1687 Houses 550
Population 732 Houses 248
Population 1009 Houses 396
Population 467 Houses 194
Population 885 Houses 412
Population 811 Houses 383
Population 2124 Houses 997
Population 1201 Houses 530
Population 1619 Houses 596
Kali Khola
Bhalam K.
NIBUAGHARI
BAGAR
BAGBAZAR
MOHARIYA
ADHIKARIGAON
MIRUWA
BHAIRABTOL
LAMOCHAUTARA
BHIMSENTOL
NADIPUR
PHULBARI
KASAINTOL
TERCHHAPATI
GANESHTOL
SANGUMUKH
RAMKRISNA TOL
PARSYANG
RANIPOUWA
PHULBARI TALLO
SARKIGAON
KULA-KO-DIL
MALEPATAN
BAGALETOL
CHANPPANI
MASBAR
PODETOL
MATEPANI
KUNDAHAR
BAIDAM UPALLO
SIMALCHAUR
BAIDAM
Khola
RAMGHAT
BAIDAM-TAL-CHHEU
SIMALBOT
DHUNGASANGU
BAIDAM TALLO
Seti
DADH
KAZIPOKHARI
PARDI

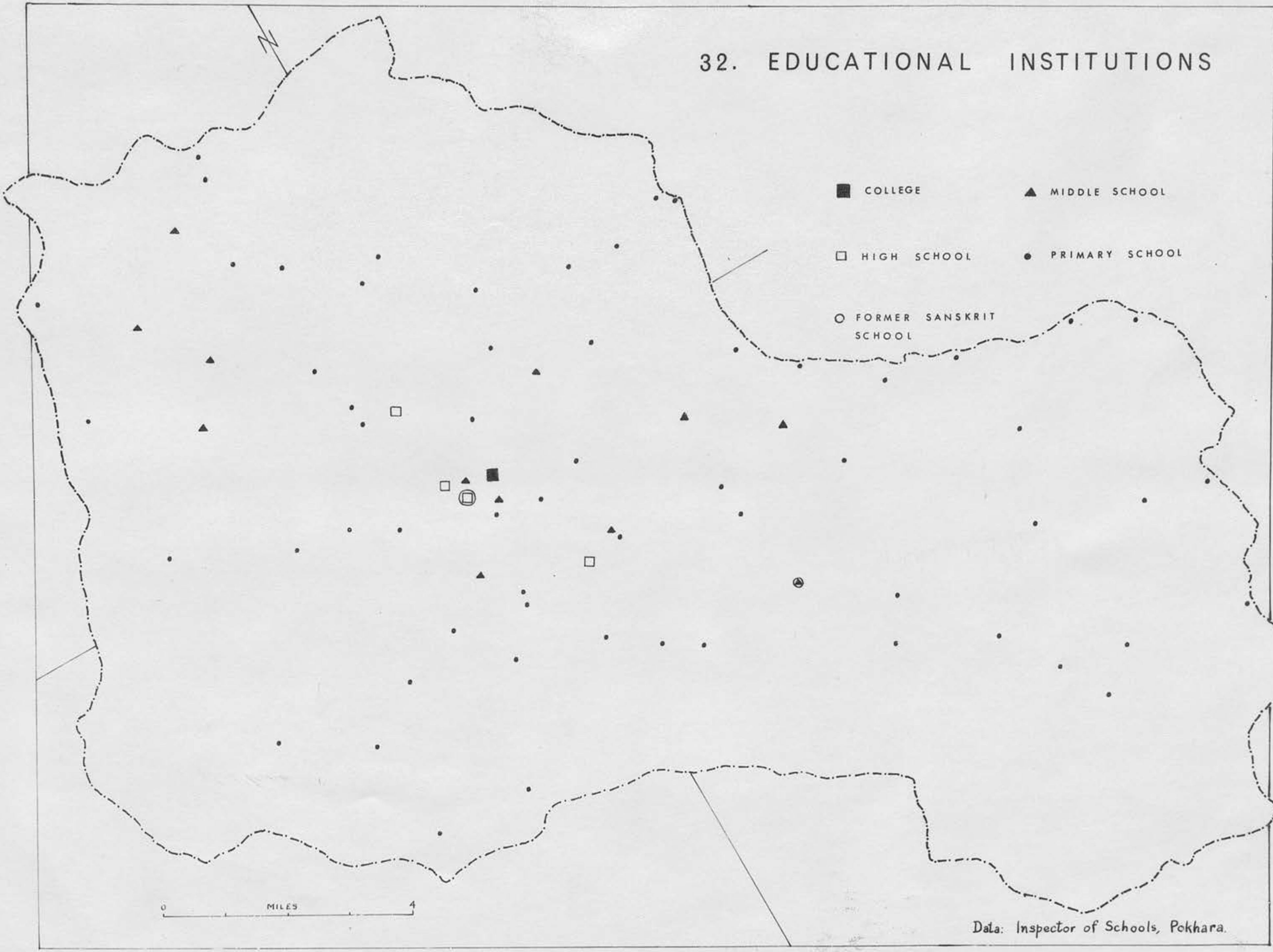
29. POPULATION INCREASE



30. POPULATION CHANGE

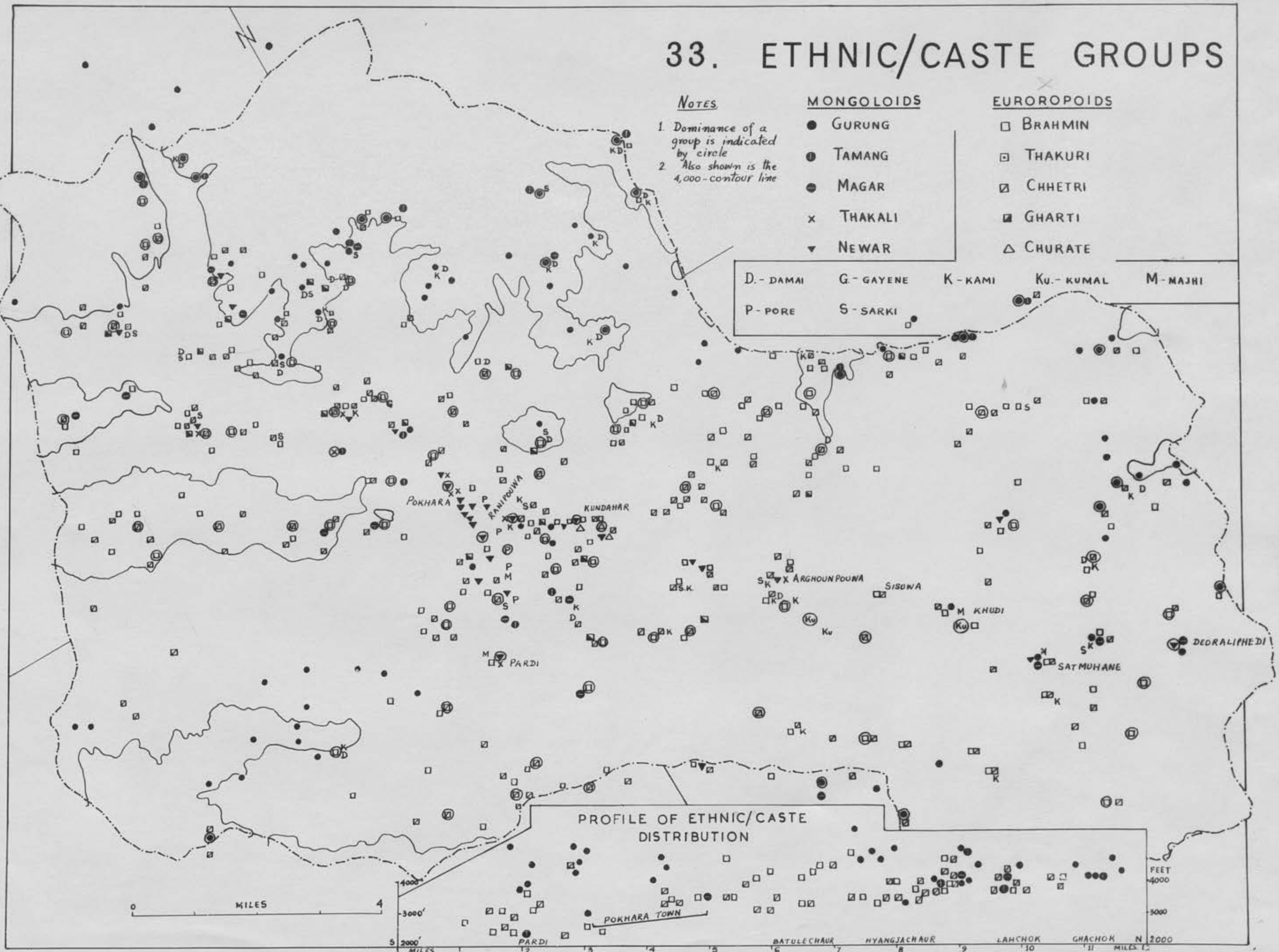


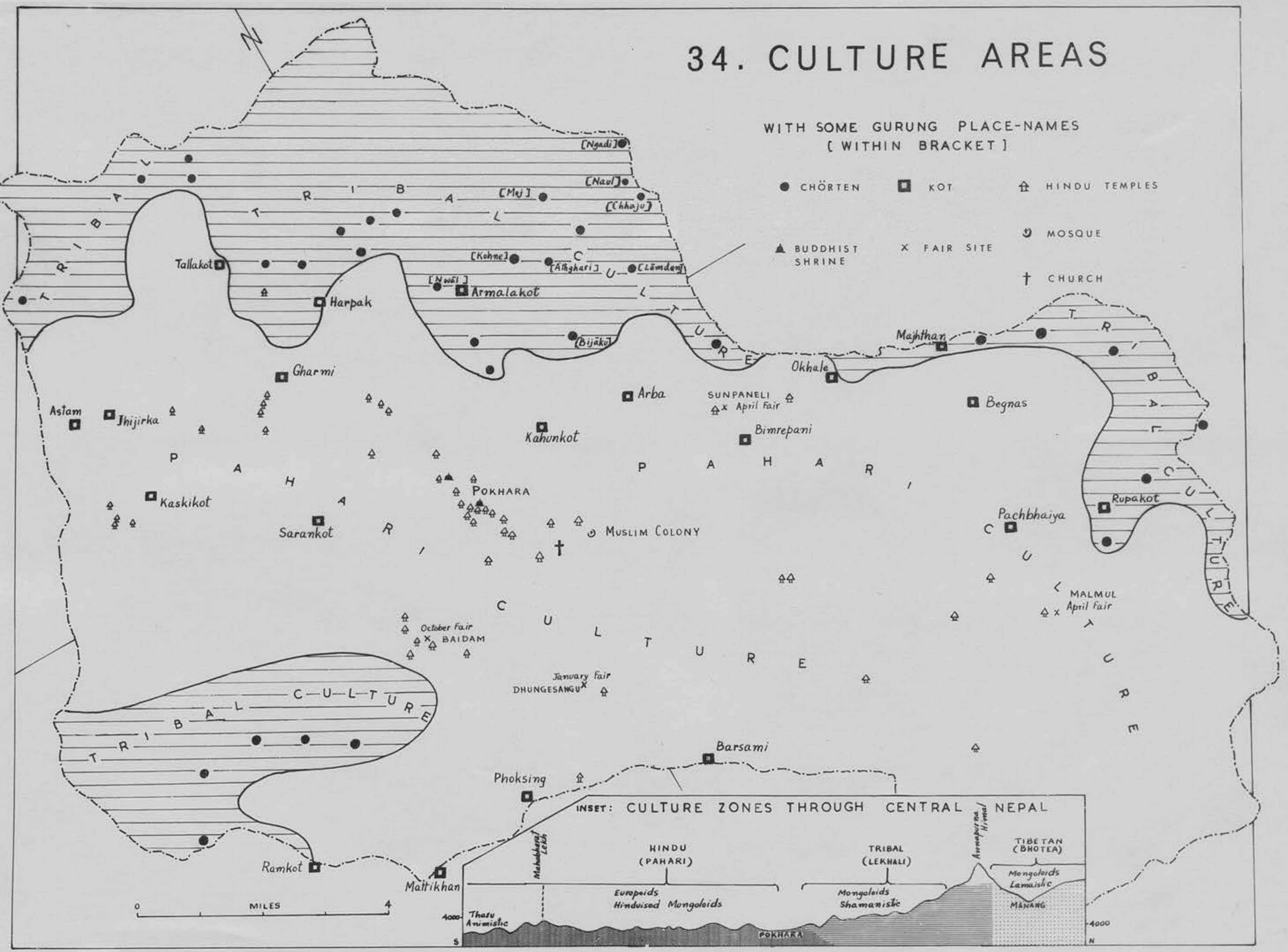

31. INCIDENCE OF MALARIA
TRANSMISSION DOUBTFUL
VERY LOW TRANSMISSION
HIGH TRANSMISSION
INFANT POSITIVE AREAS
[High Goitre Incidence]
Annapurna
26504
Modi Khola
Mardi K.
Seti Khola
Madi K.
Marsyandi River
Himalchuli
25801
TARACHOK
THULIBENSI
Dordi Khola
4000
POKHARA
KUNCHHA
SISAGHAT
LUITEL-BHANJYANG
BANDIPUR
Kali-Gandaki
0
8 MILES
Data: Nepal Malaria Eradication Organization


32. EDUCATIONAL INSTITUTIONS
COLLEGE
MIDDLE SCHOOL
HIGH SCHOOL
PRIMARY SCHOOL
FORMER SANSKRIT SCHOOL
0 MILES 4
Data: Inspector of Schools, Pokhara.

32.

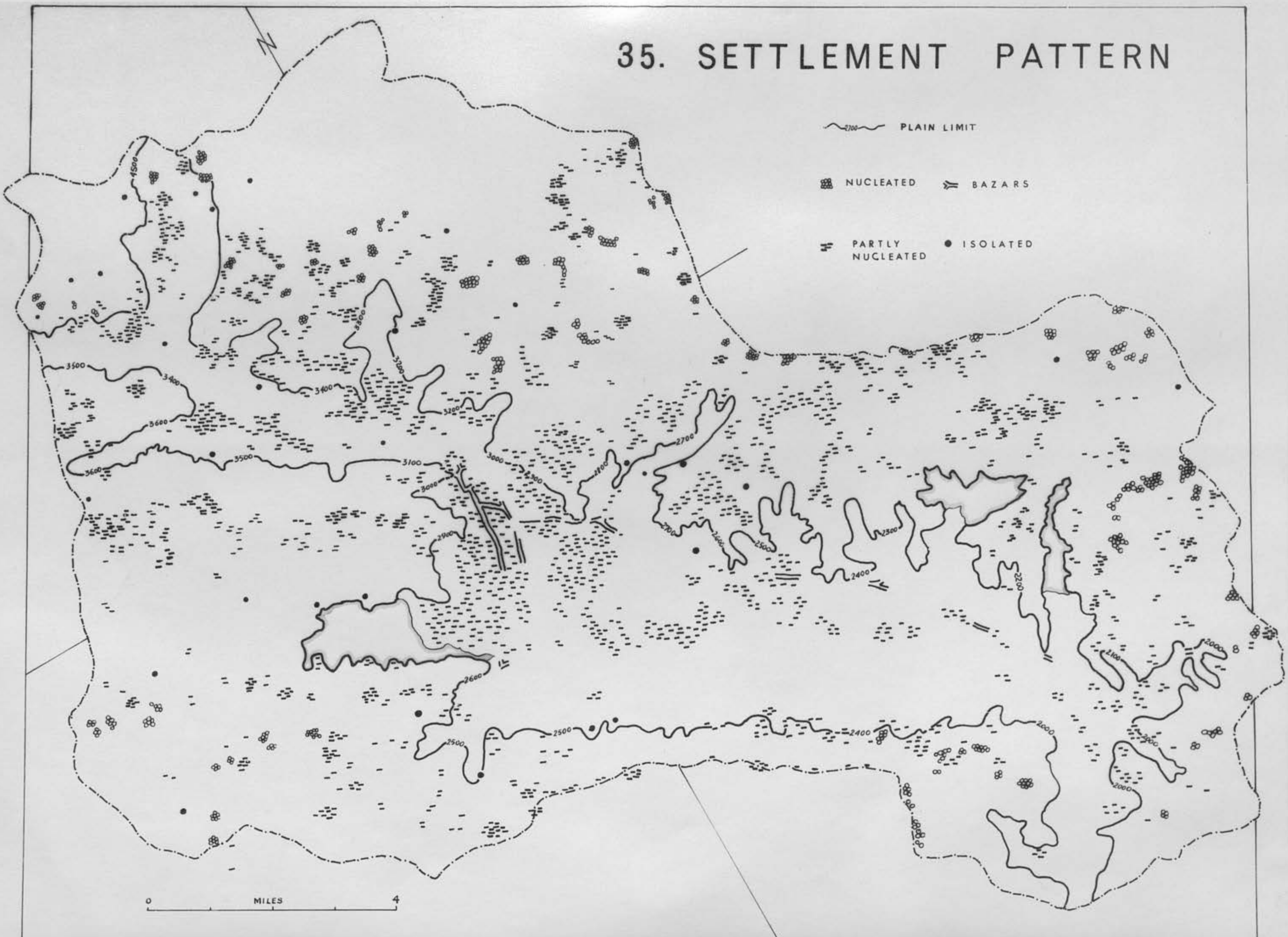
33. ETHNIC/CASTE GROUPS



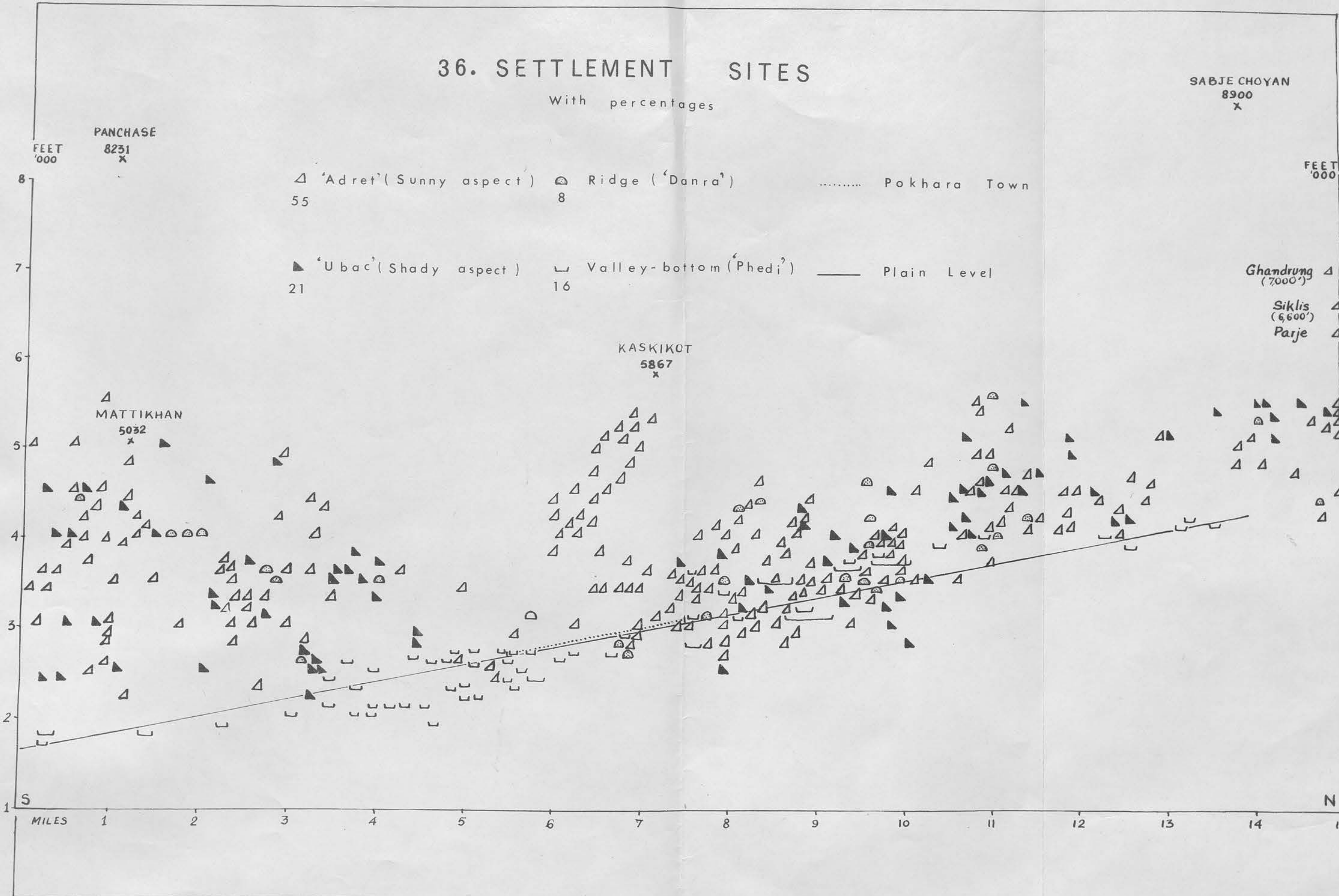


34. CULTURE AREAS

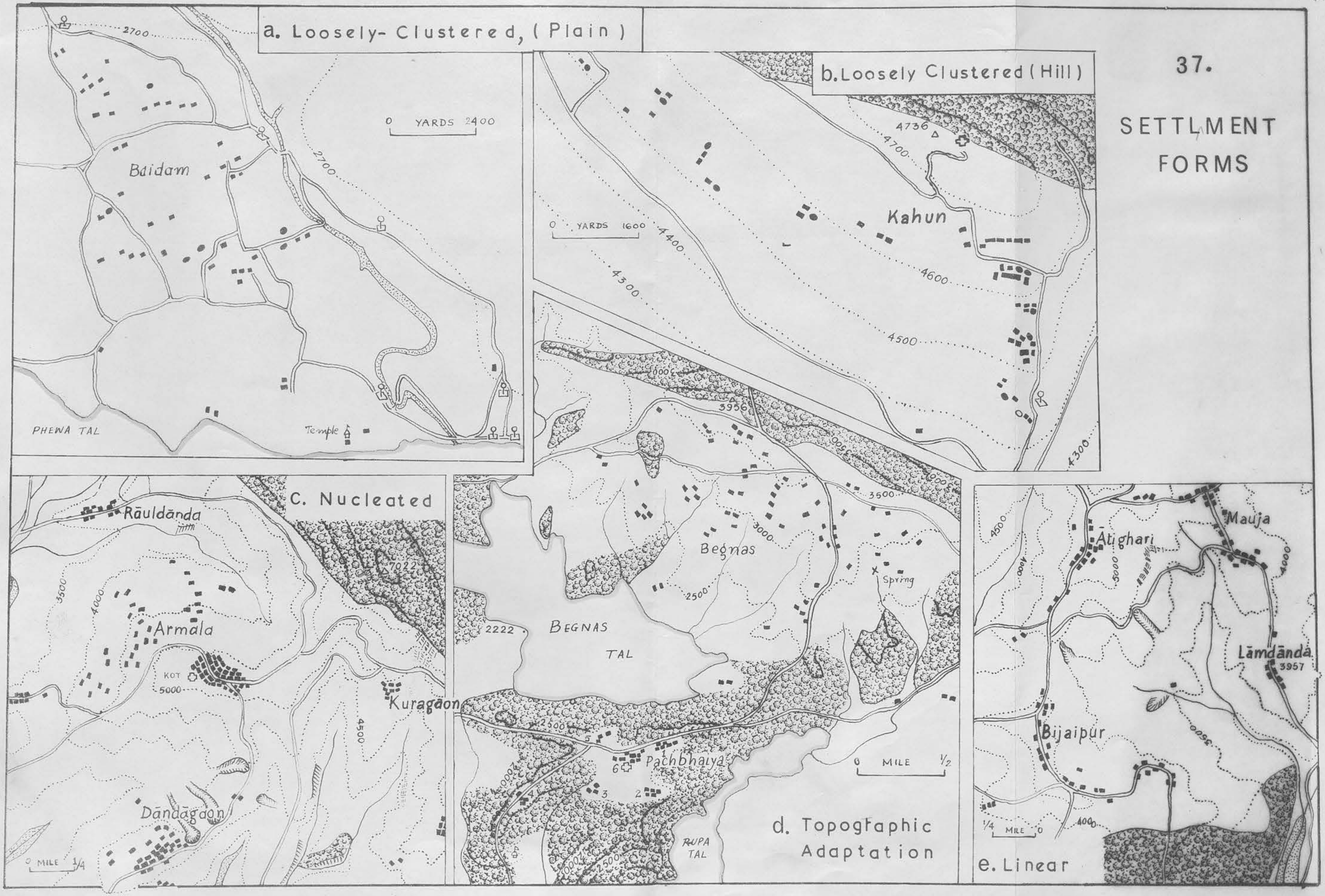
35. SETTLEMENT PATTERN

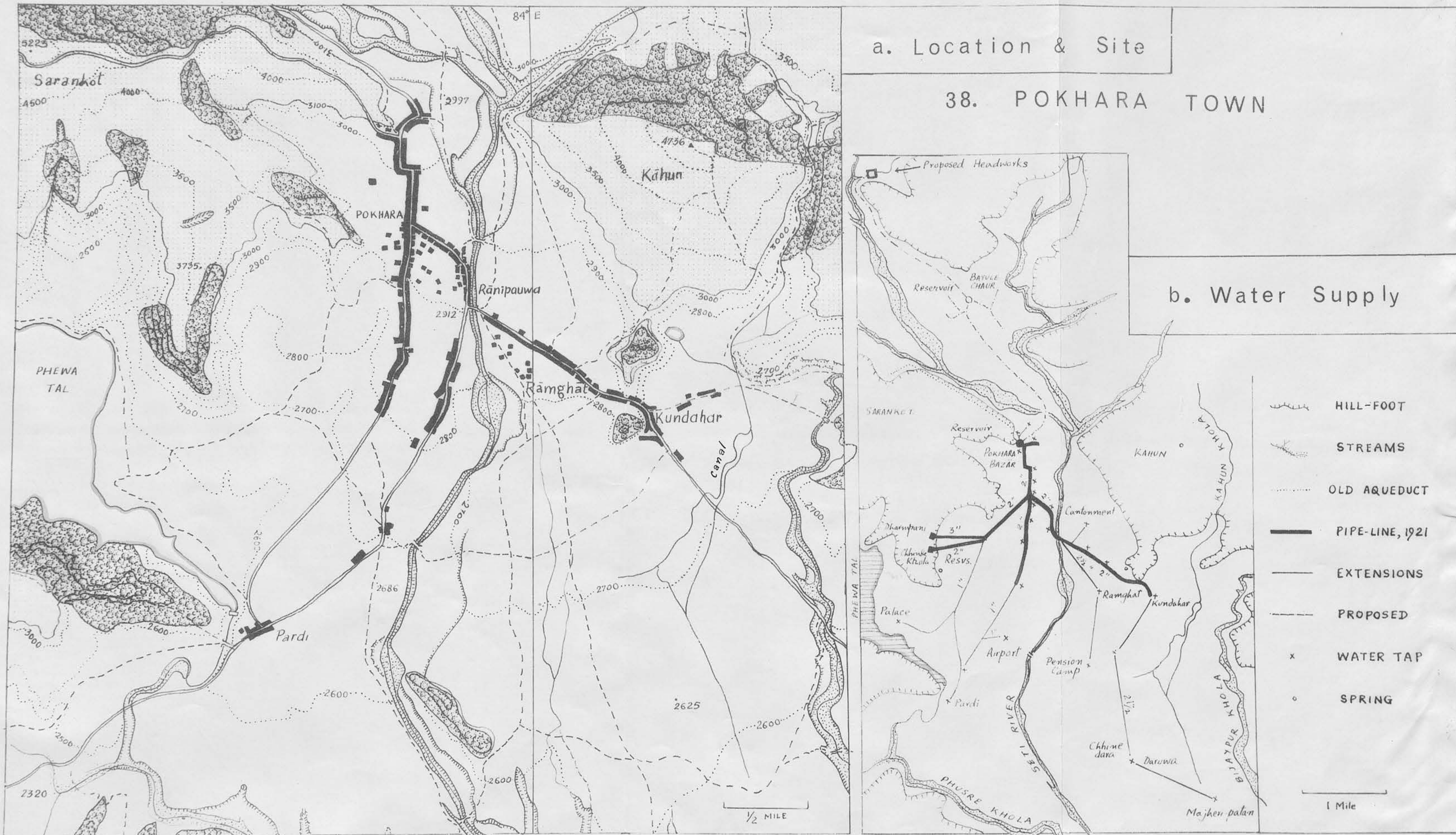


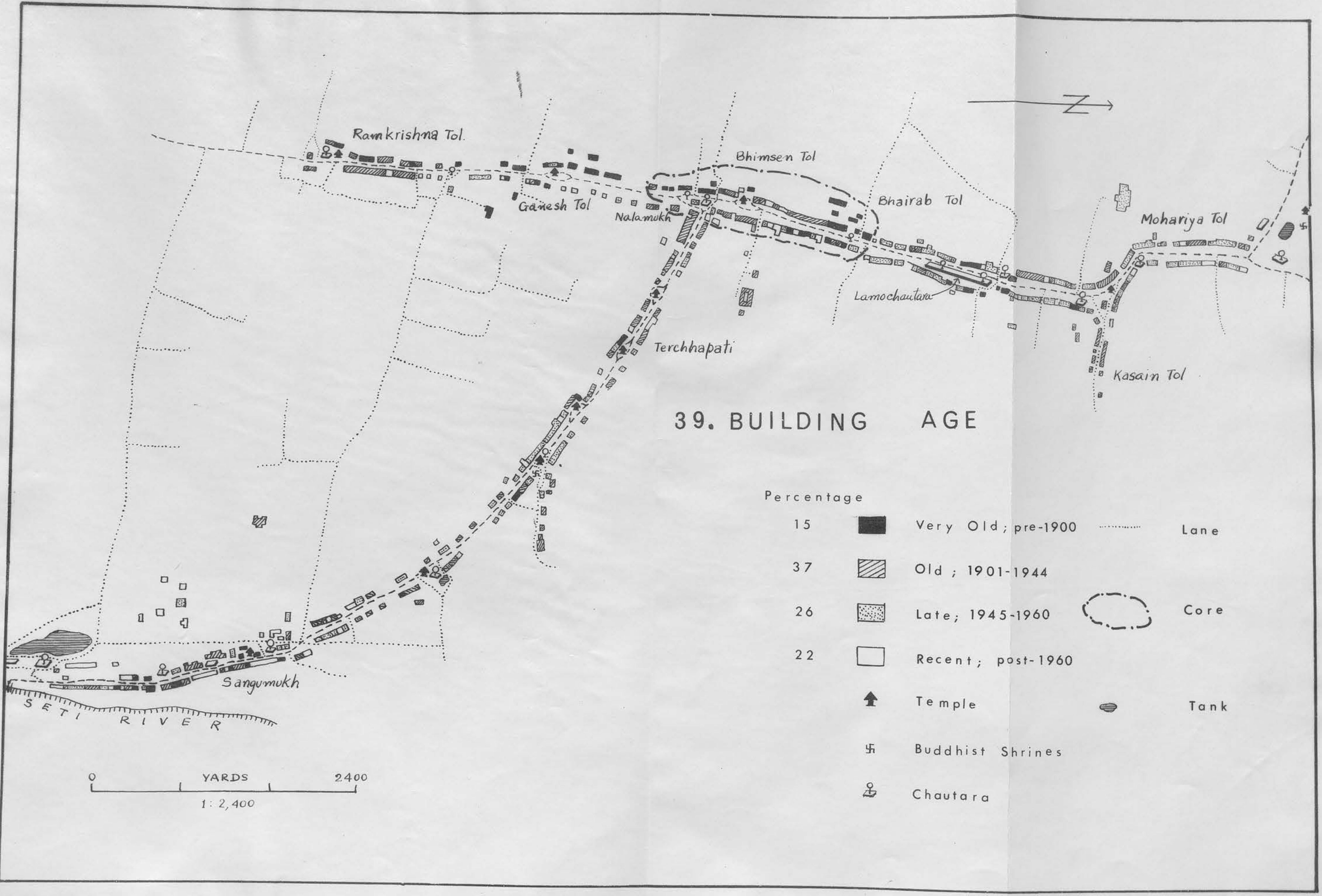
35.

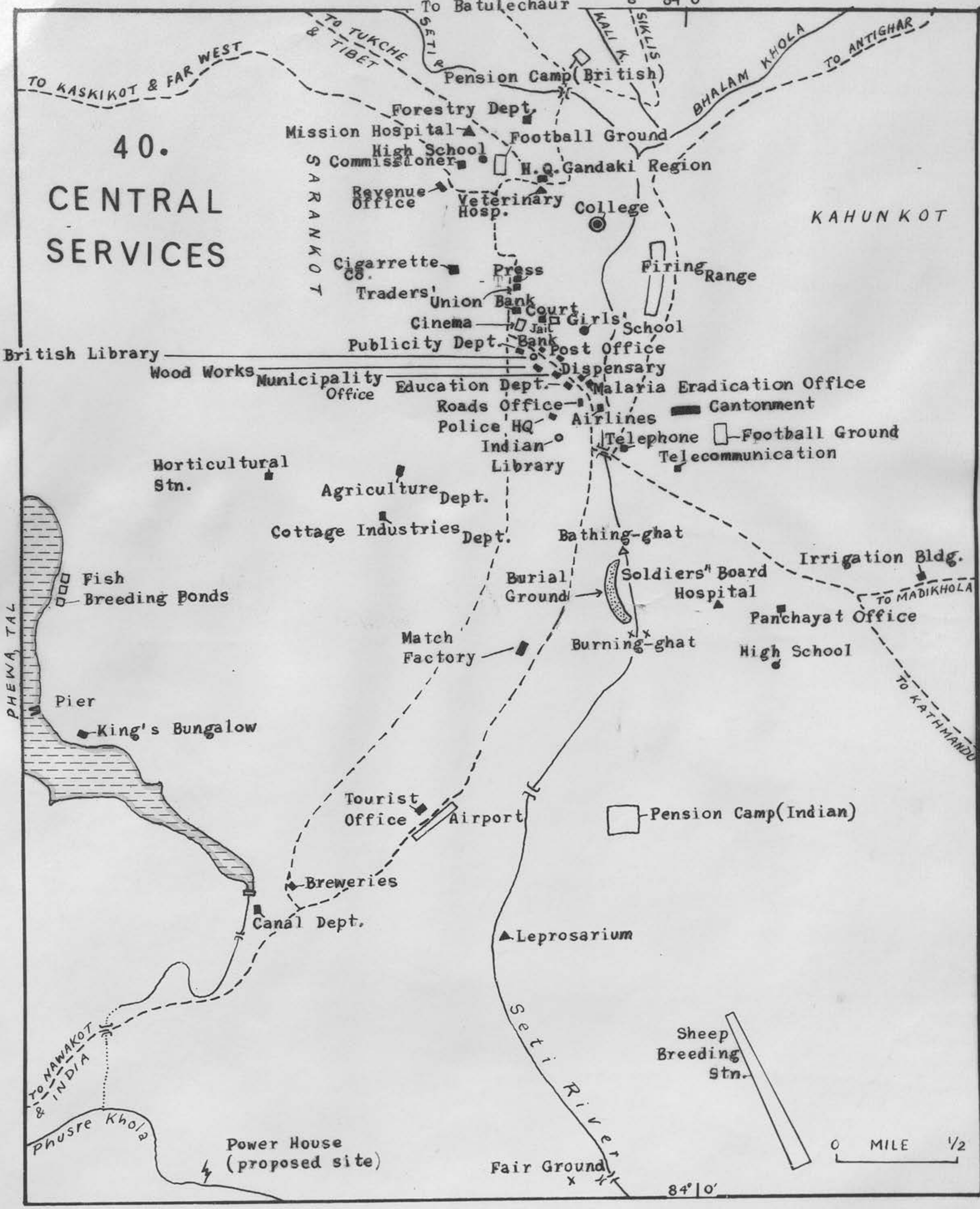


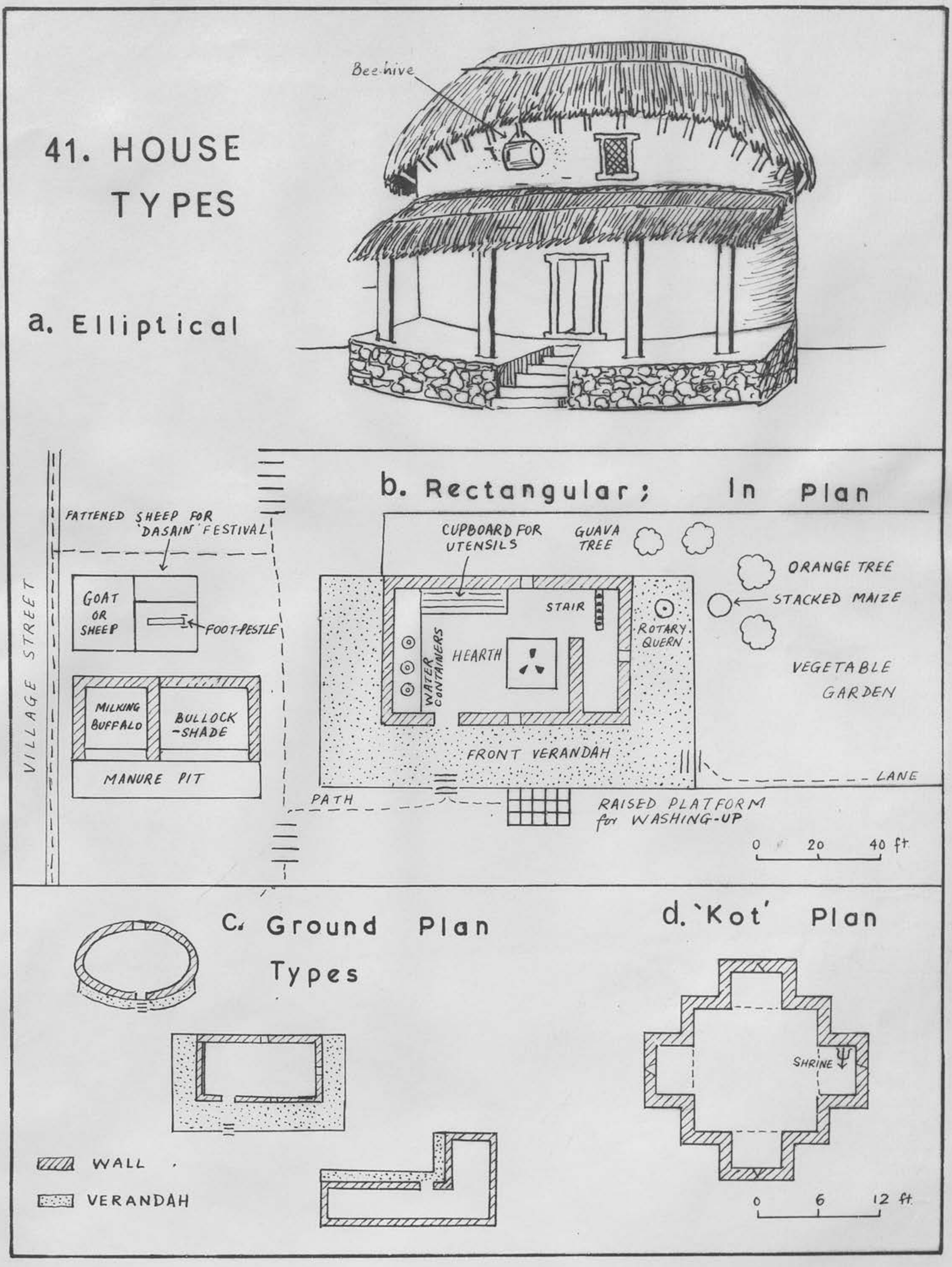
36. SETTLEMENT SITES
With percentages
'Adret' (Sunny aspect) 55
Ridge ('Danra') 8
Pokhara Town
'Ubac' (Shady aspect) 21
Valley-bottom ('Phedi') 16
Plain Level
FEET '000
PANCHASE 8231
MATTIKHAN 5032
KASKIKOT 5867
SABJE CHOYAN 8900
Ghandrung (7,000')
Siklis (6,600')
Parje
S
N
MILES
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

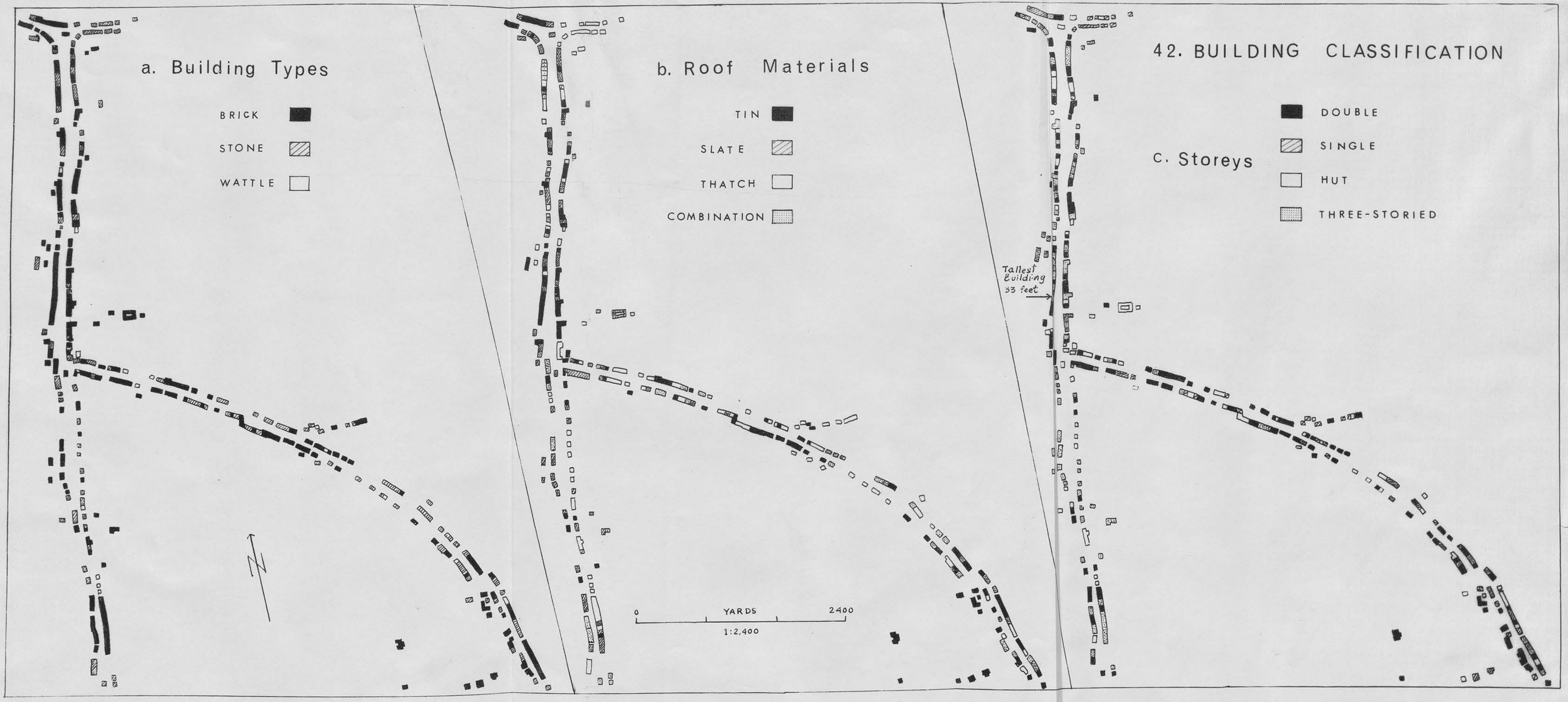

37.
SETTLMENT FORMS
a. Loosely- Clustered, (Plain)
2700
0 YARDS 2400
Baidam
PHEWA TAL
Temple
b. Loosely Clustered (Hill)
4736
4700
4400
4300
4600
4500
0 YARDS 1600
Kahun
C. Nucleated
Rāuldānda
Armala
KOT
5000
7022
3500
4000
4500
Kuragaon
Dāndāgaon
0 MILE 1/4
3956
3500
3000
2500
2222
Begnas
Spring
BEGNAS TAL
Pachbhaiya
RUPA TAL
0 MILE 1/2
d. Topographic Adaptation
Mauja
Ātighari
Lāmdānda
3957
Bijaipur
1/4 MILE 0
e. Linear


a. Location & Site
38. POKHARA TOWN
b. Water Supply
84° E
Sarankot
POKHARA
Rānipauwa
Rāmghat
Kundahar
Kāhun
PHEWA TAL
Pardi
Canal
1/2 MILE
Proposed Headworks
Reservoir
BATULE CHAUR
SARANKOT
POKHARA BAZAR
Cantonment
Dharmpani
Chhinne Khola
Resvs.
KAHUN
Palace
Airport
Pension Camp
Ramghat
Kundahar
PHEWA TAL
Pardi
SETI RIVER
PHUSRE KHOLA
Chhine dara
Daruwa
Majheri patan
BIJAYPUR KHOLA
KAHUN KHOLA
HILL-FOOT
STREAMS
OLD AQUEDUCT
PIPE-LINE, 1921
EXTENSIONS
PROPOSED
WATER TAP
SPRING
1 Mile


Ramkrishna Tol.
Bhimsen Tol
Bhairab Tol
Ganesh Tol
Nalamukh
Mohariya Tol
Lamochautara
Terchhapati
Kasain Tol
Sangumukh
SETI RIVER
39. BUILDING AGE
Percentage
15 Very Old; pre-1900
37 Old; 1901-1944
26 Late; 1945-1960
22 Recent; post-1960
Temple
Buddhist Shrines
Chautara
Lane
Core
Tank
0 YARDS 2400
1: 2,400

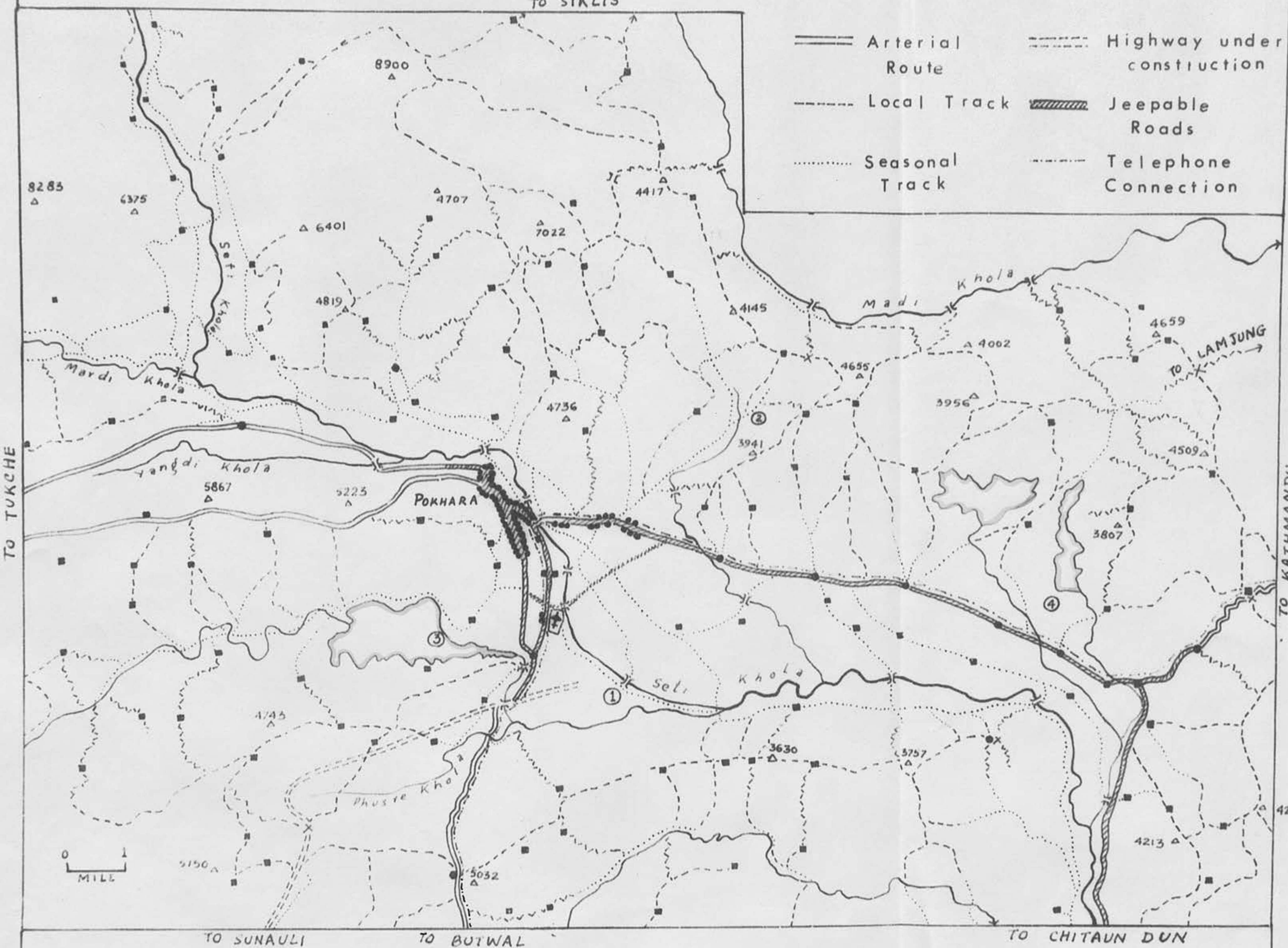

40.
CENTRAL
SERVICES
To Batulechaur
84° 0'
TO TUKCHE & TIBET
SETI R.
KALI K.
TO SIKLIS
TO KASKIKOT & FAR WEST
BHALAM KHOLA
TO ANTIGHAR
Pension Camp (British)
Forestry Dept.
Mission Hospital
Football Ground
High School
Commissioner
H.Q. Gandaki Region
SARANKOT
Revenue Office
Veterinary Hosp.
College
KAHUNKOT
Cigarrette Co.
Press
Firing Range
Traders' Union Bank
Court
Cinema
Jail
Girls' School
Bank
Publicity Dept.
Post Office
British Library
Wood Works
Dispensary
Municipality Office
Education Dept.
Malaria Eradication Office
Roads Office
Cantonment
Police HQ
Airlines
Indian Library
Telephone
Football Ground
Telecommunication
Horticultural Stn.
Agriculture Dept.
Cottage Industries Dept.
Bathing-ghat
Irrigation Bldg.
Fish Breeding Ponds
Burial Ground
Soldiers" Board Hospital
TO MADIKHOLA
Panchayat Office
PHEWA TAL
Match Factory
Burning-ghat
High School
TO KATHMANDU
Pier
King's Bungalow
Tourist Office
Airport
Pension Camp (Indian)
Breweries
Canal Dept.
Leprosarium
TO NAWAKOT & INDIA
Seti River
Sheep Breeding Stn.
Phusre Khola
Power House (proposed site)
Fair Ground
0 MILE 1/2
84° 0'


41. HOUSE TYPES
a. Elliptical
Bee-hive
b. Rectangular; In Plan
FATTENED SHEEP FOR 'DASAIN' FESTIVAL
GOAT OR SHEEP
FOOT-PESTLE
MILKING BUFFALO
BULLOCK -SHADE
MANURE PIT
VILLAGE STREET
CUPBOARD FOR UTENSILS
GUAVA TREE
ORANGE TREE
STACKED MAIZE
STAIR
ROTARY QUERN
HEARTH
WATER CONTAINERS
VEGETABLE GARDEN
FRONT VERANDAH
LANE
PATH
RAISED PLATFORM for WASHING-UP
0 20 40 ft
C. Ground Plan Types
d. 'Kot' Plan
SHRINE
WALL
VERANDAH
0 6 12 ft

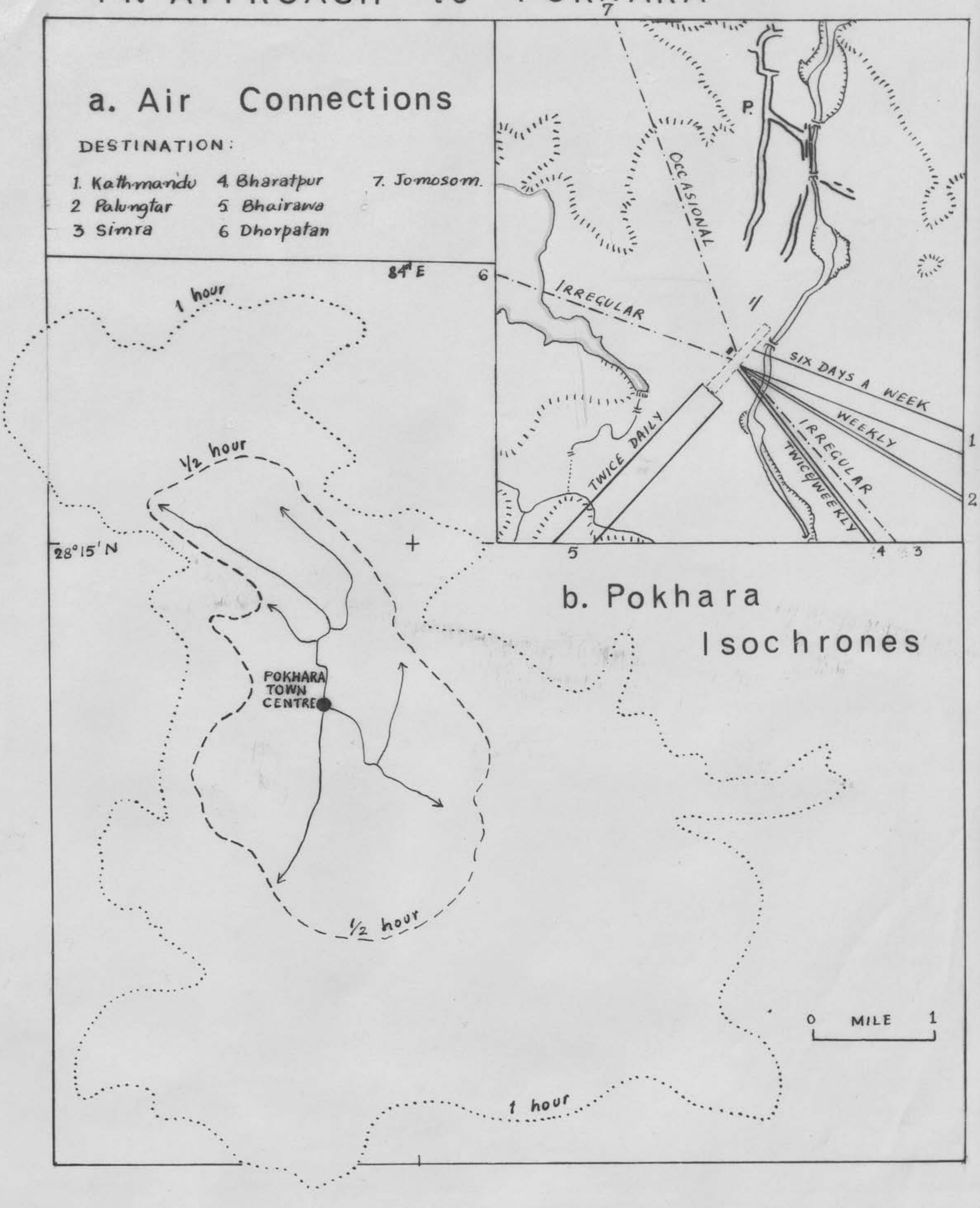


42. BUILDING CLASSIFICATION
a. Building Types
BRICK
STONE
WATTLE
b. Roof Materials
TIN
SLATE
THATCH
COMBINATION
c. Storeys
DOUBLE
SINGLE
HUT
THREE-STORIED
Tallest Building 33 feet
0
YARDS
2400
1:2,400

43. TRACKS & ROADS

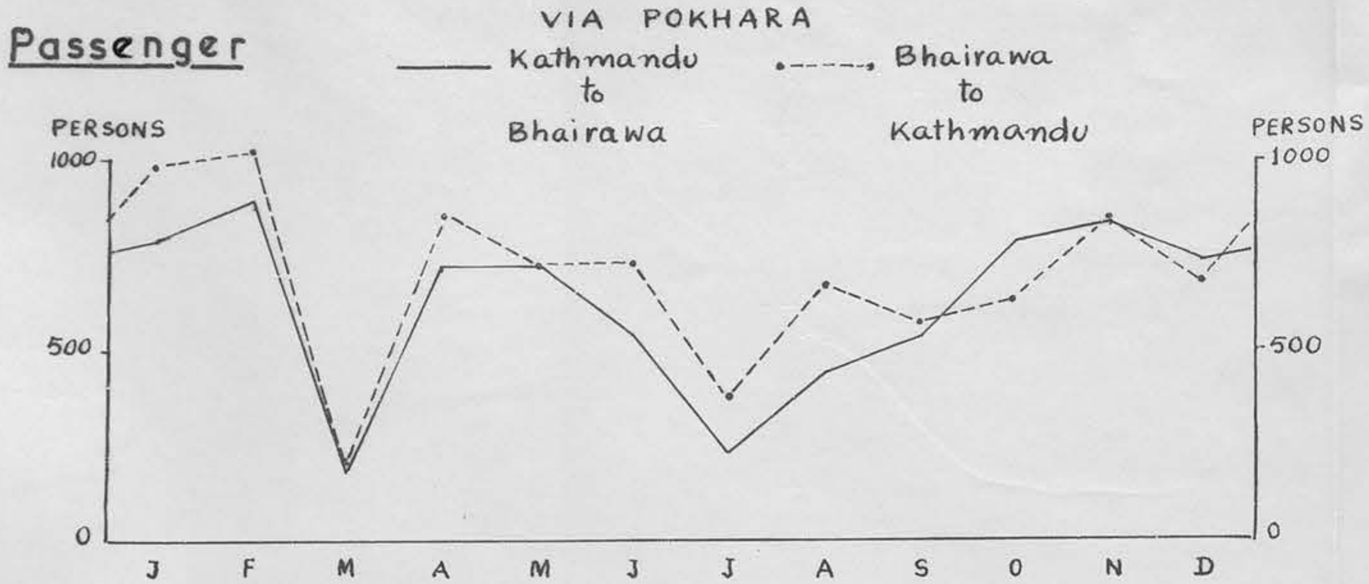


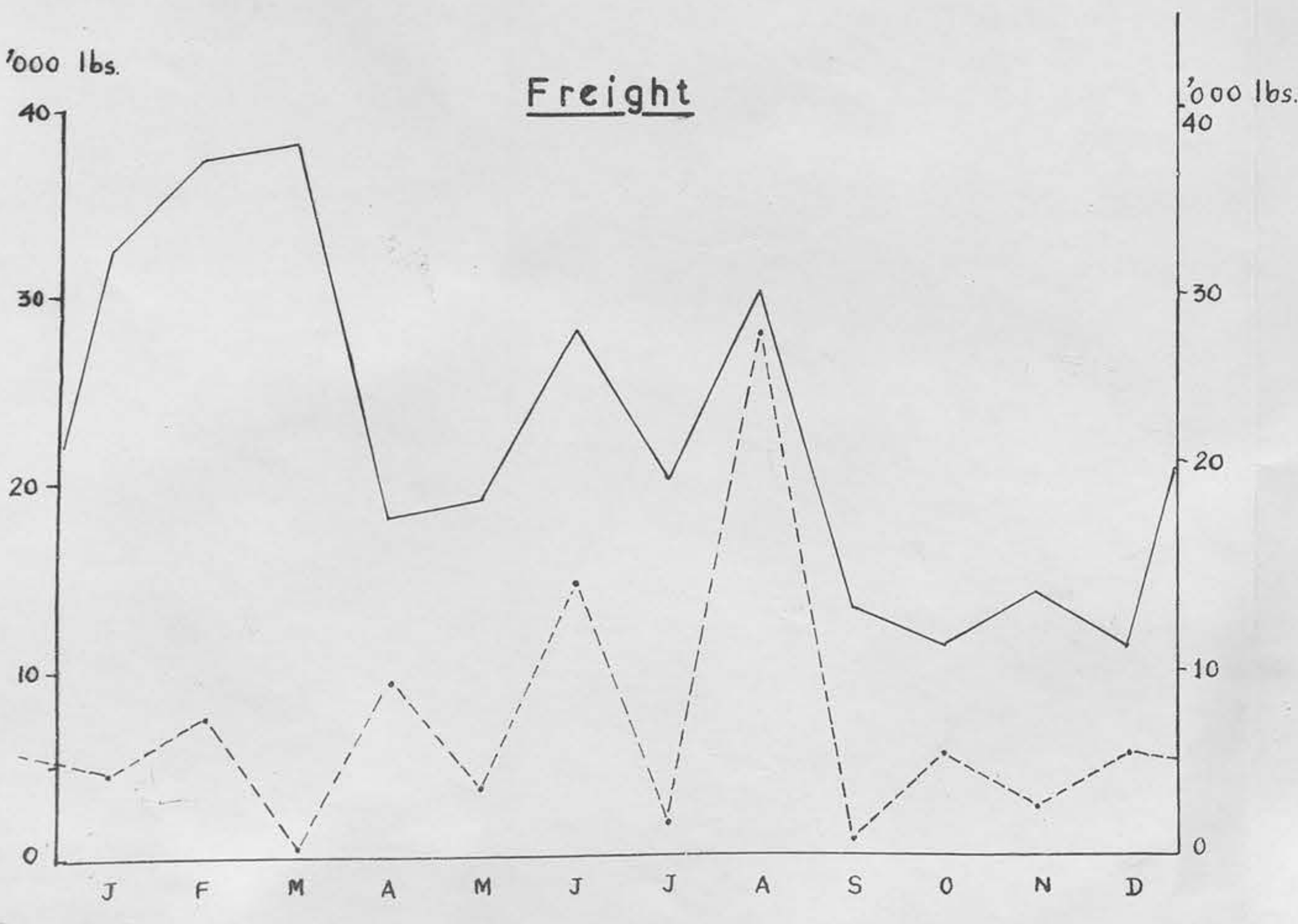
44. APPROACH to POKHARA



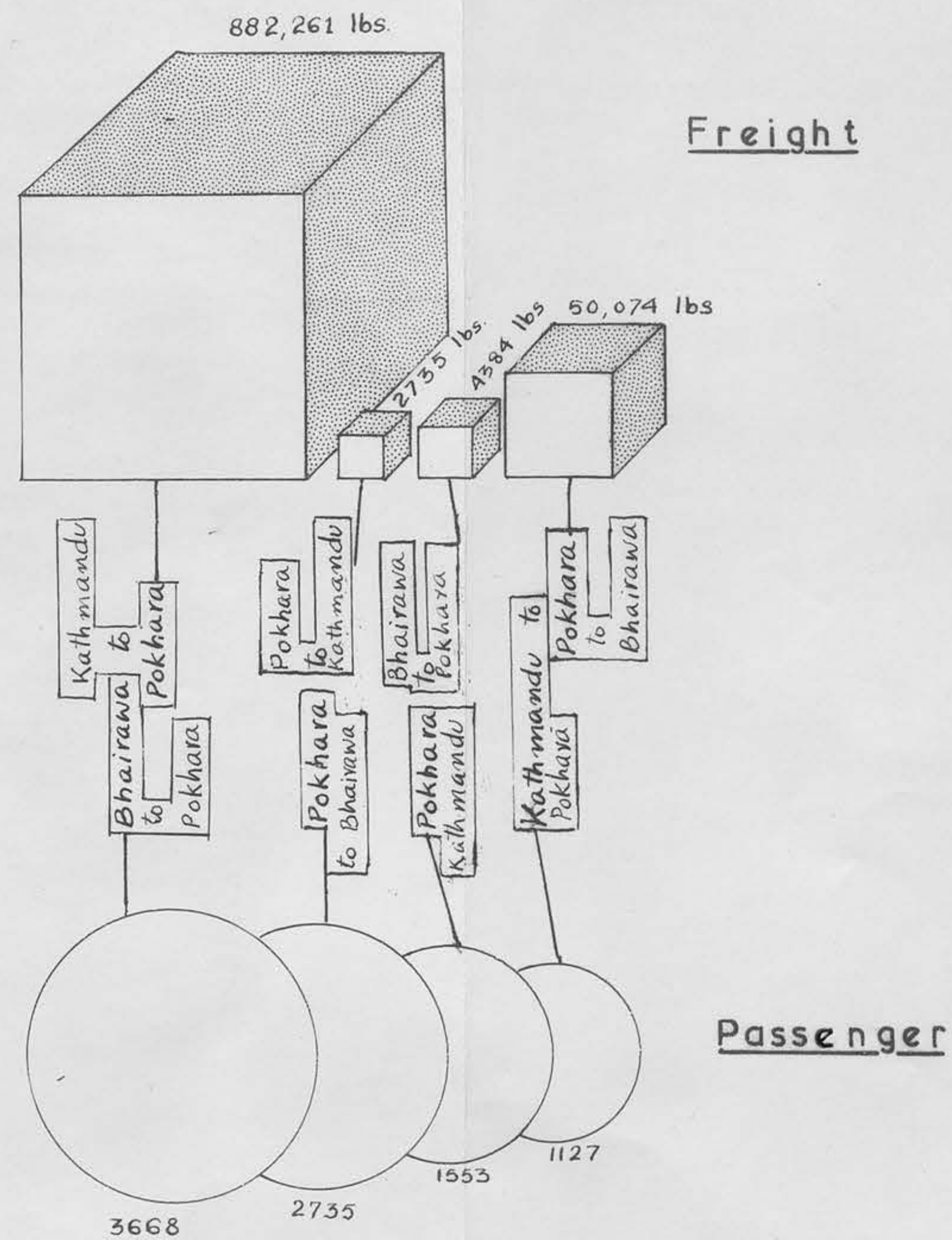
45. AIR TRANSPORT

a. 1960.

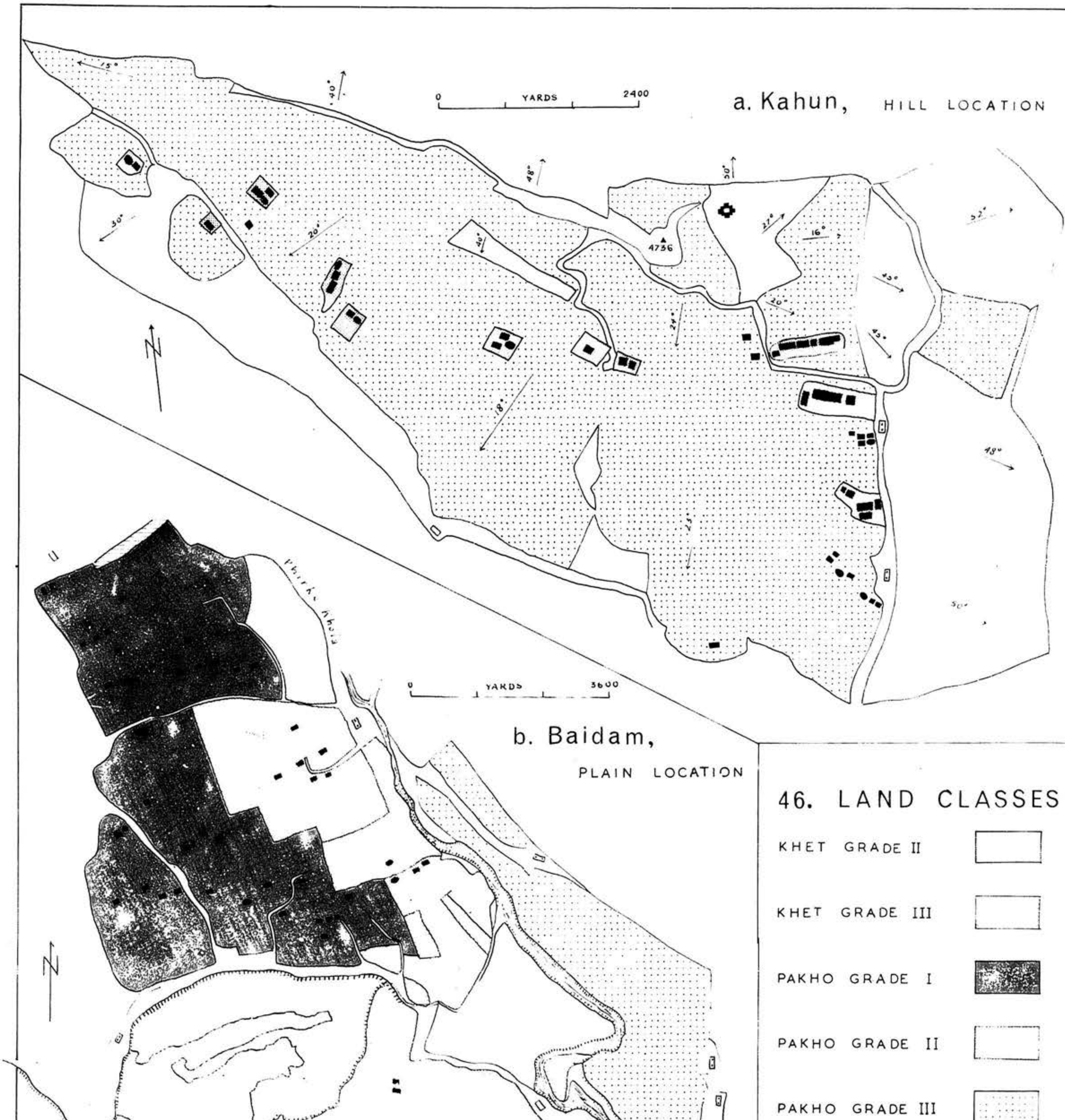




b. Sample Statistic, 5th Feb.– 10th April, 1957

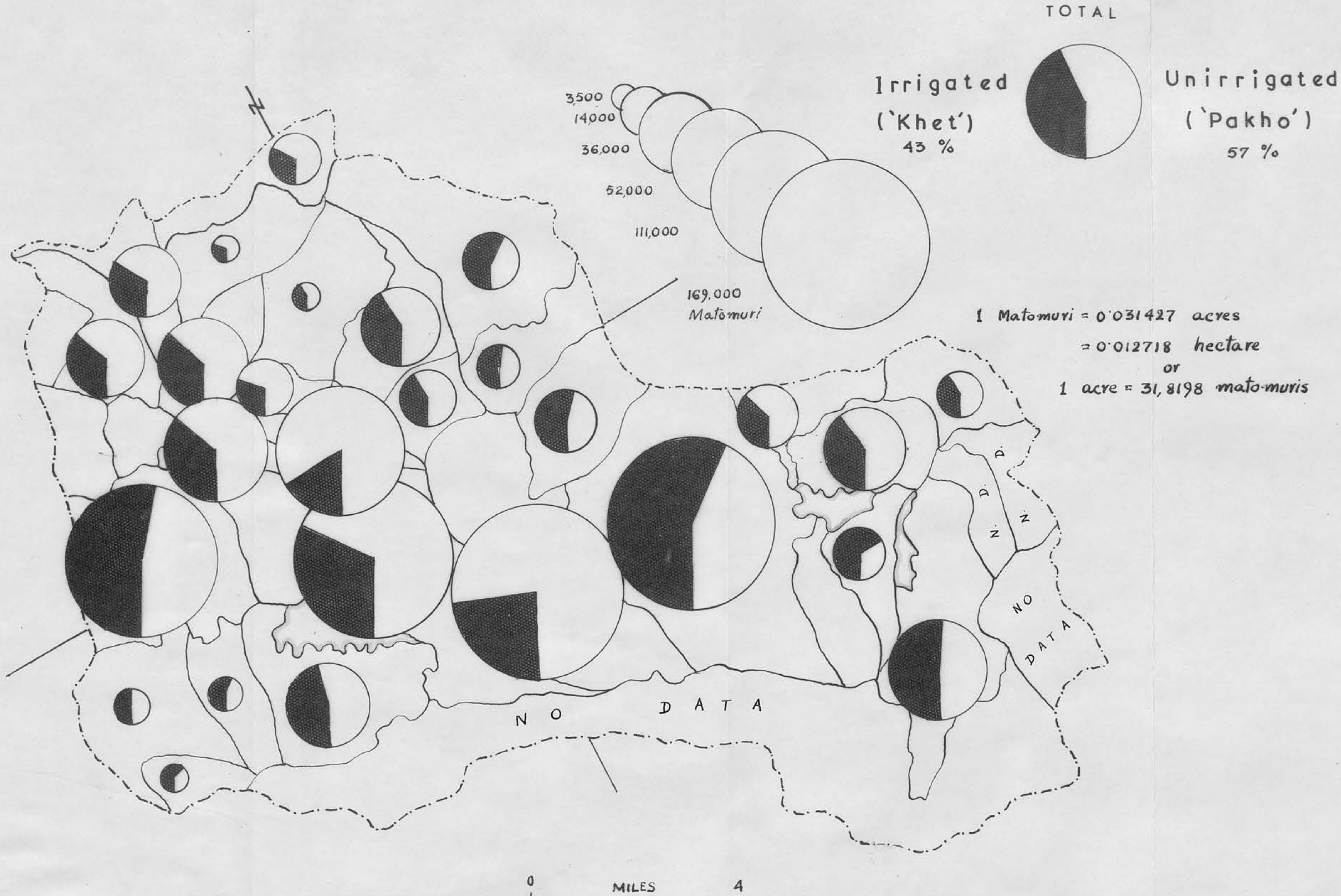


Data: Royal Nepal Airlines Corporation



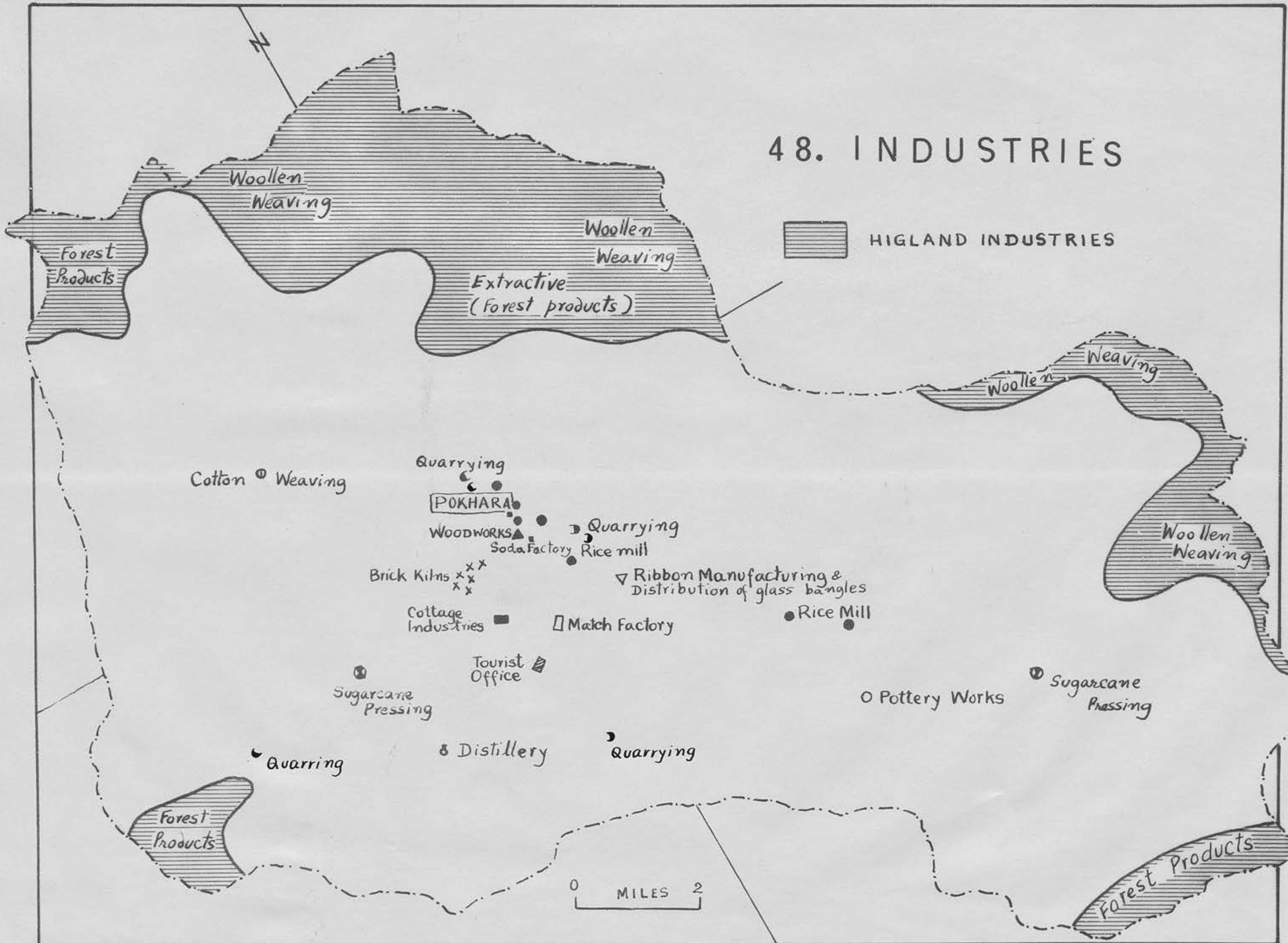
Data. Survey Dept Cadastral Maps.

47. CROPLAND

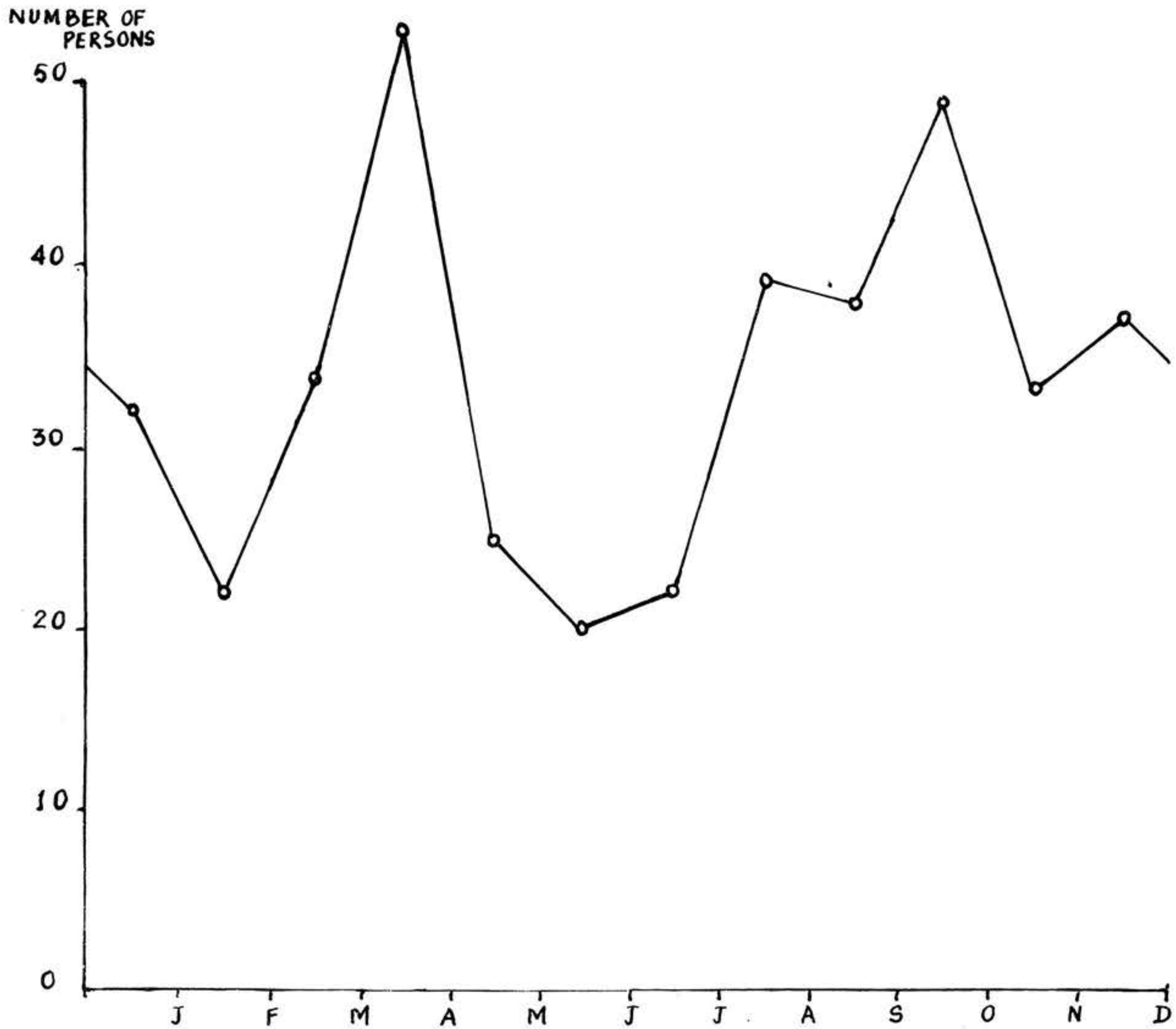


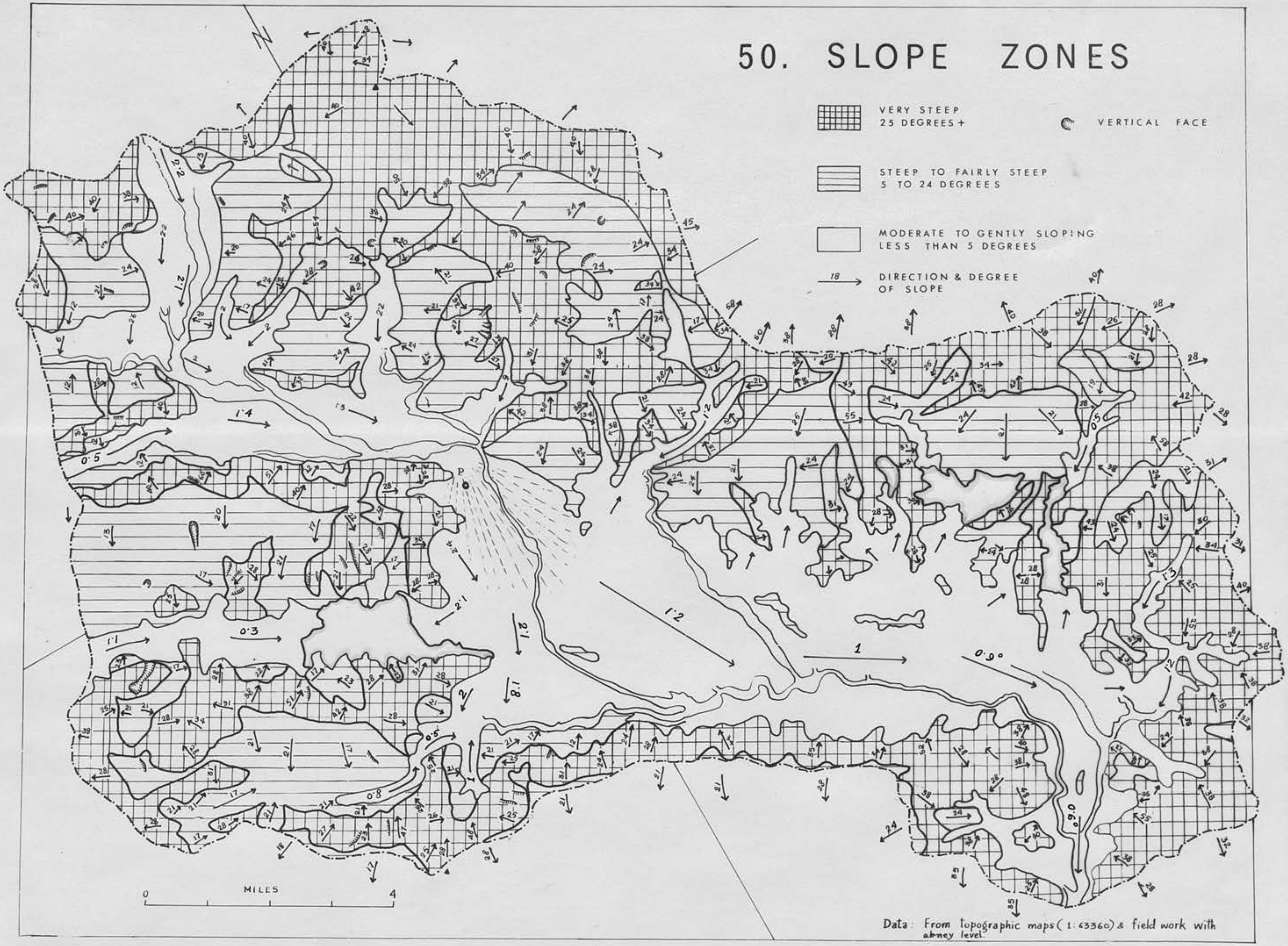
Data: Kaski district Revenue Office

48. INDUSTRIES



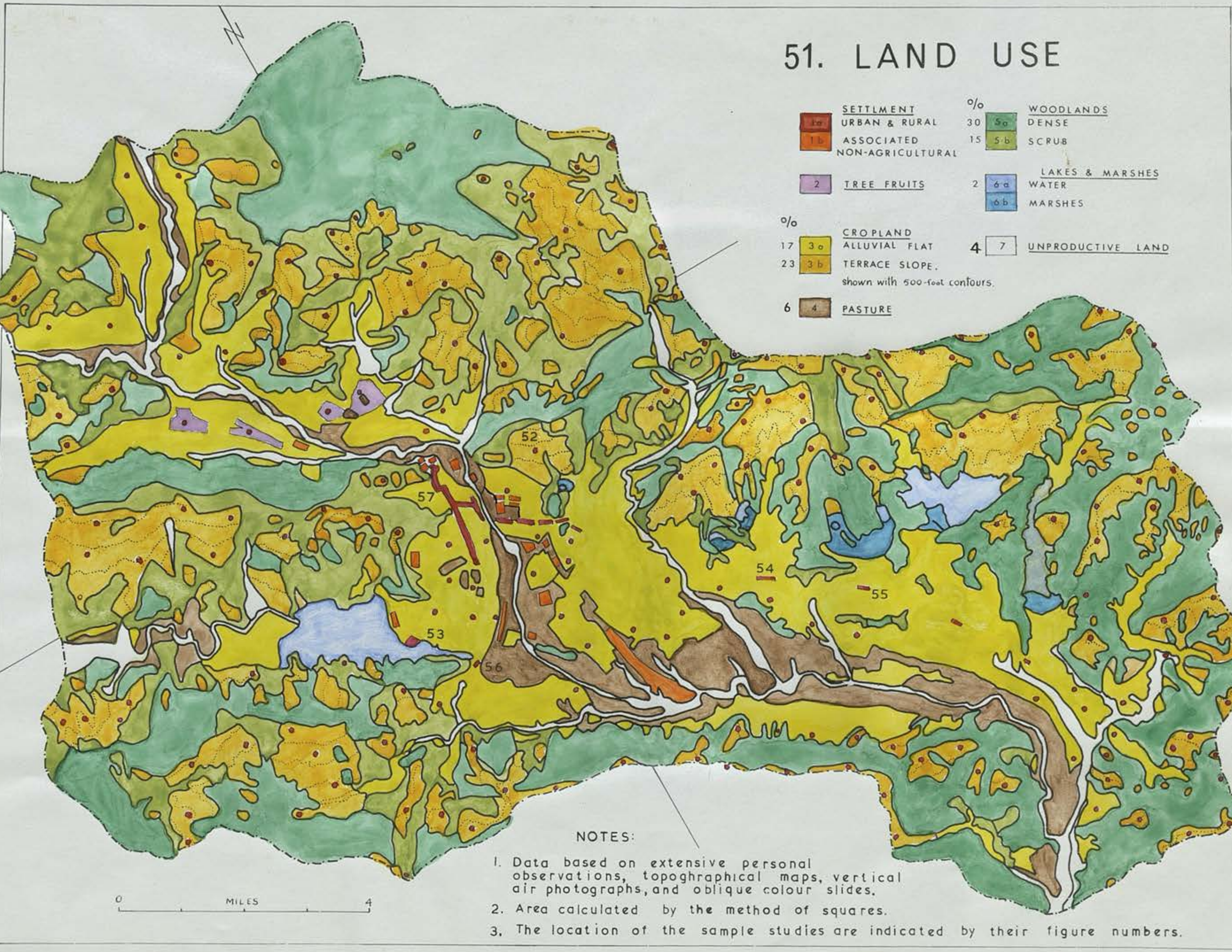
49. TOURIST TRAFFIC

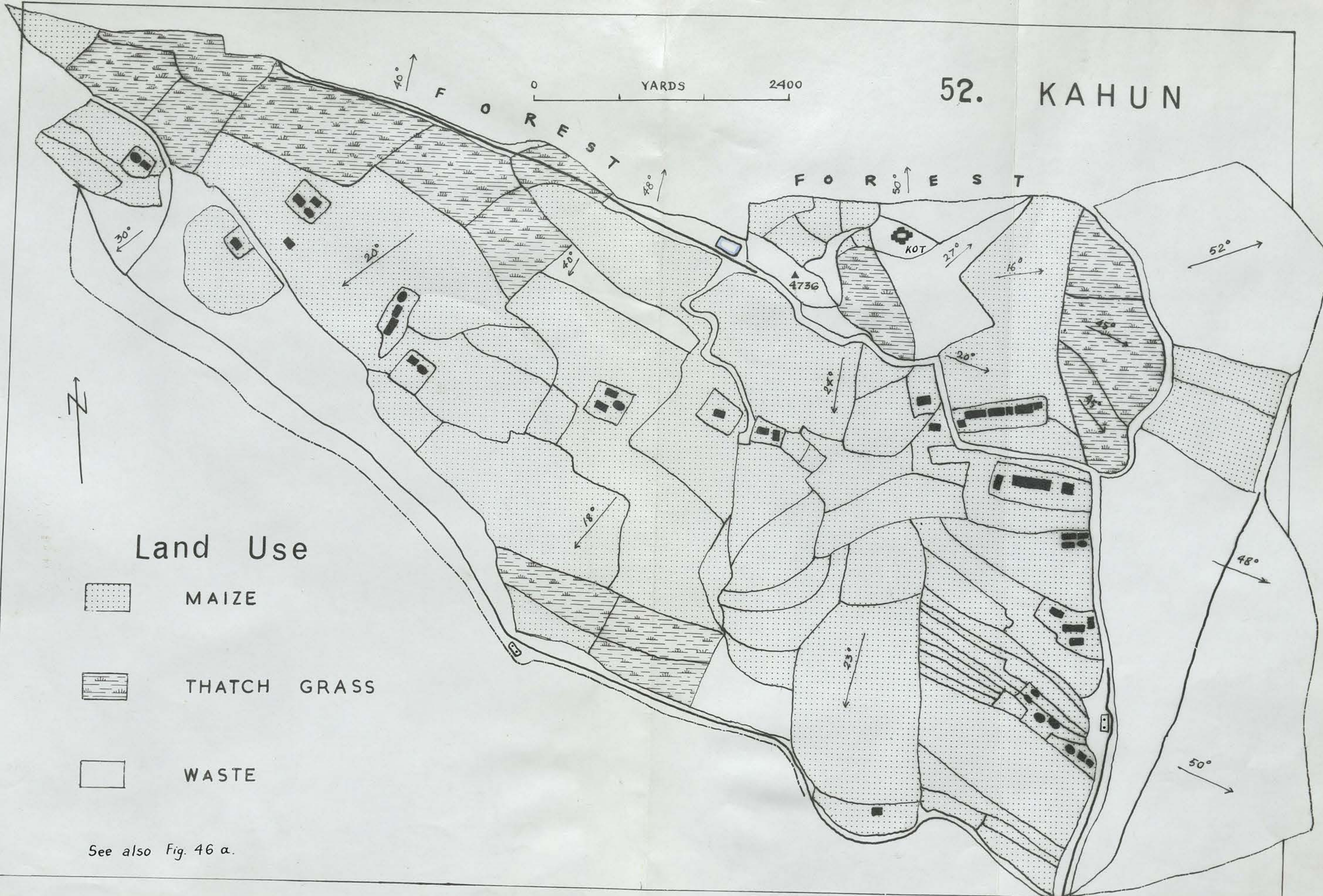


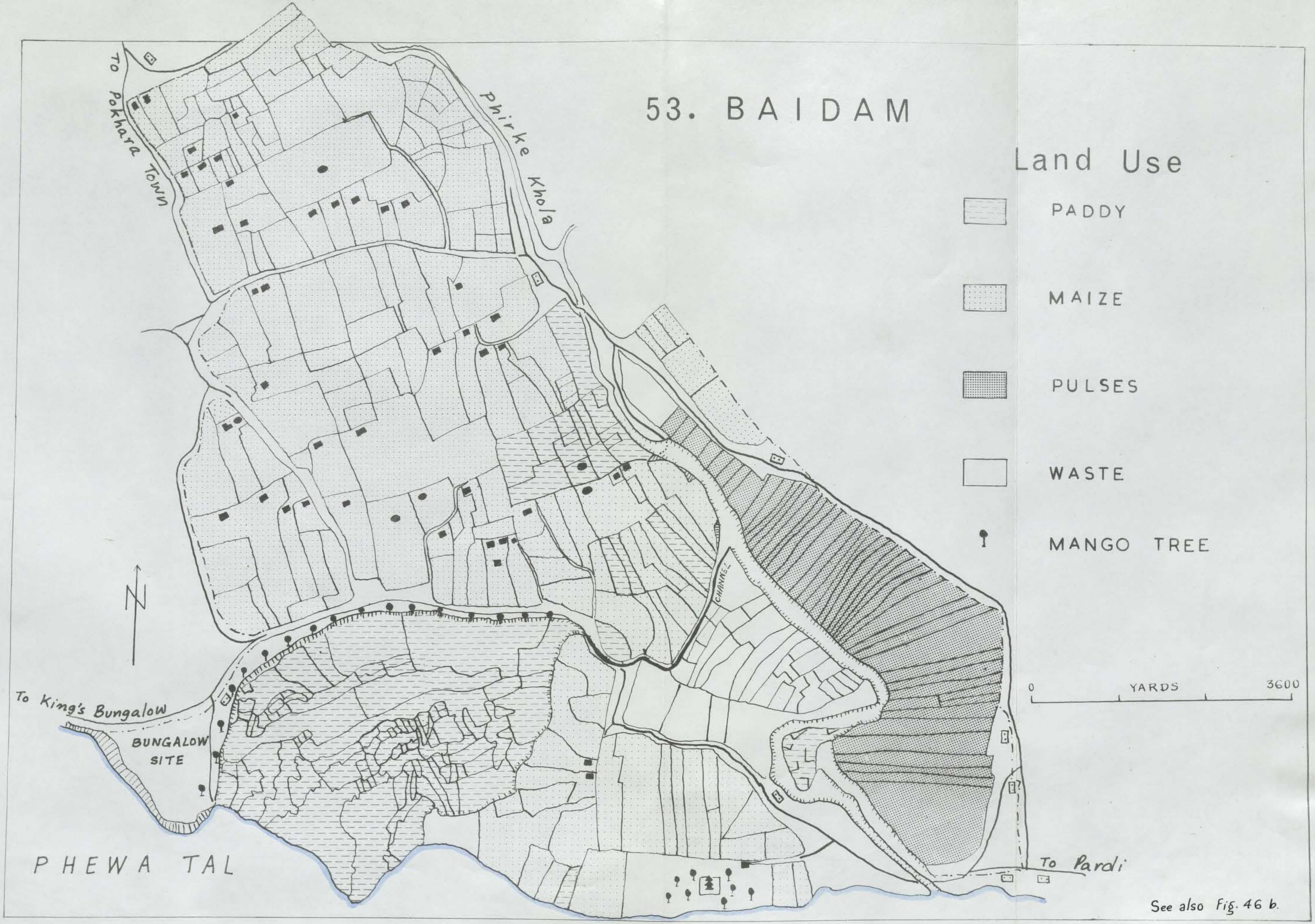


50. SLOPE ZONES
VERY STEEP
25 DEGREES +
VERTICAL FACE
STEEP TO FAIRLY STEEP
5 TO 24 DEGREES
MODERATE TO GENTLY SLOPING
LESS THAN 5 DEGREES
18
DIRECTION & DEGREE
OF SLOPE
MILES
0
4
Data: From topographic maps (1: 63360) & field work with abney level.

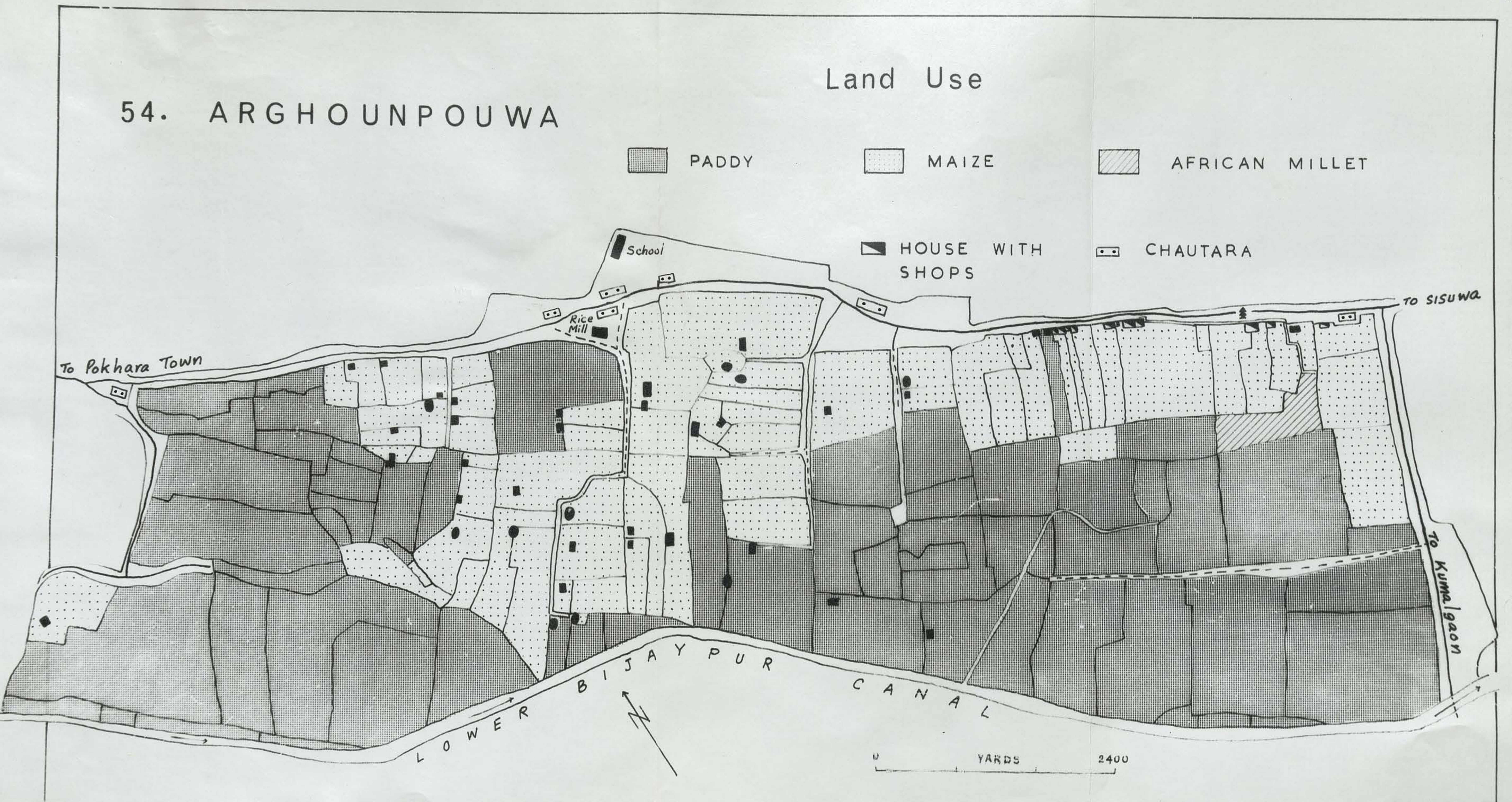
50.

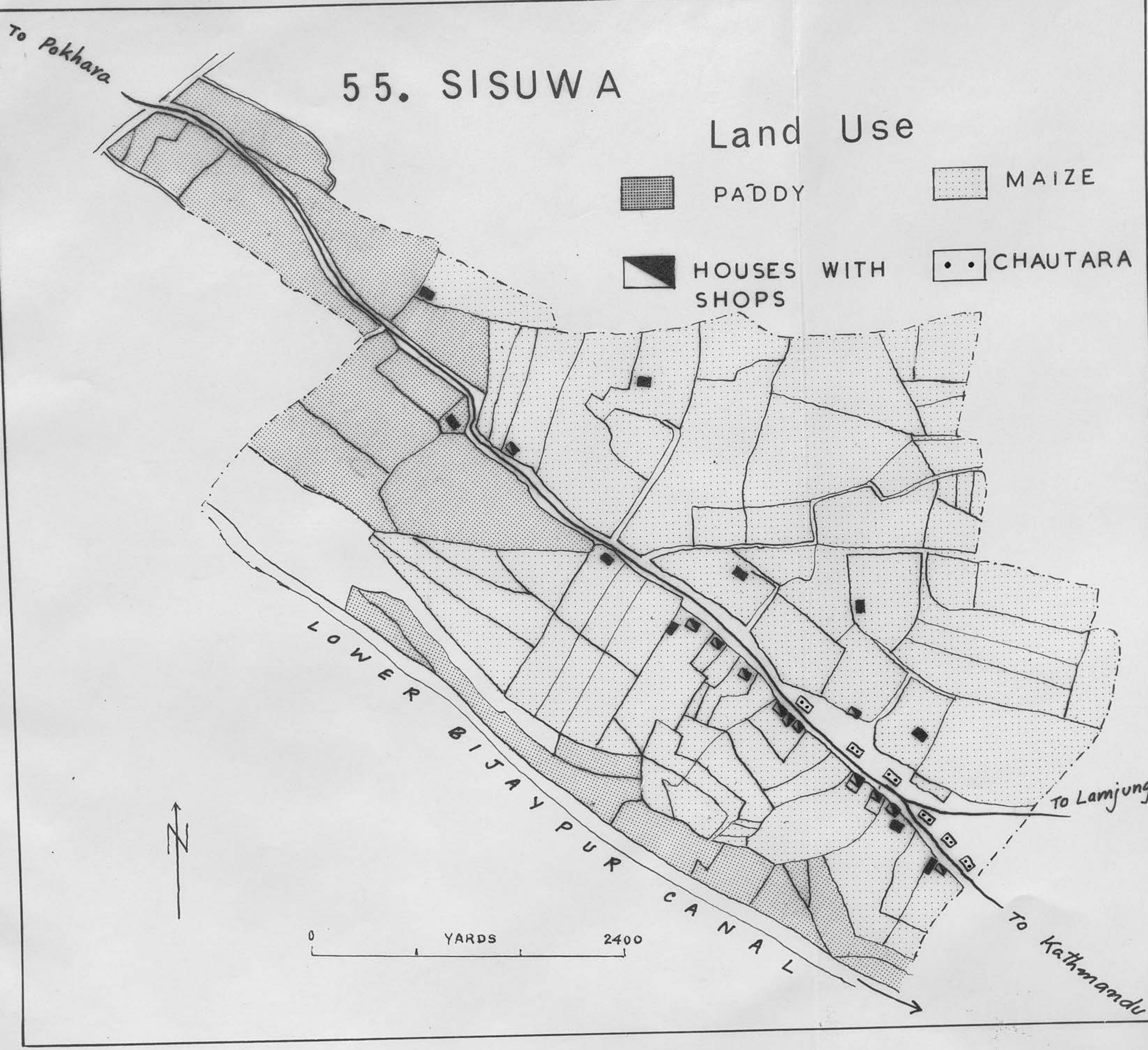

51. LAND USE
SETTLMENT
1a URBAN & RURAL
1b ASSOCIATED NON-AGRICULTURAL
2 TREE FRUITS
%
CROPLAND
17 3a ALLUVIAL FLAT
23 3b TERRACE SLOPE.
shown with 500-foot contours.
6 4 PASTURE
%
WOODLANDS
30 5a DENSE
15 5b SCRUB
LAKES & MARSHES
2 6a WATER
6b MARSHES
4 7 UNPRODUCTIVE LAND
52
53
54
55
56
57
0 MILES 4
NOTES:
1. Data based on extensive personal observations, topoghraphical maps, vertical air photographs, and oblique colour slides.
2. Area calculated by the method of squares.
3. The location of the sample studies are indicated by their figure numbers.

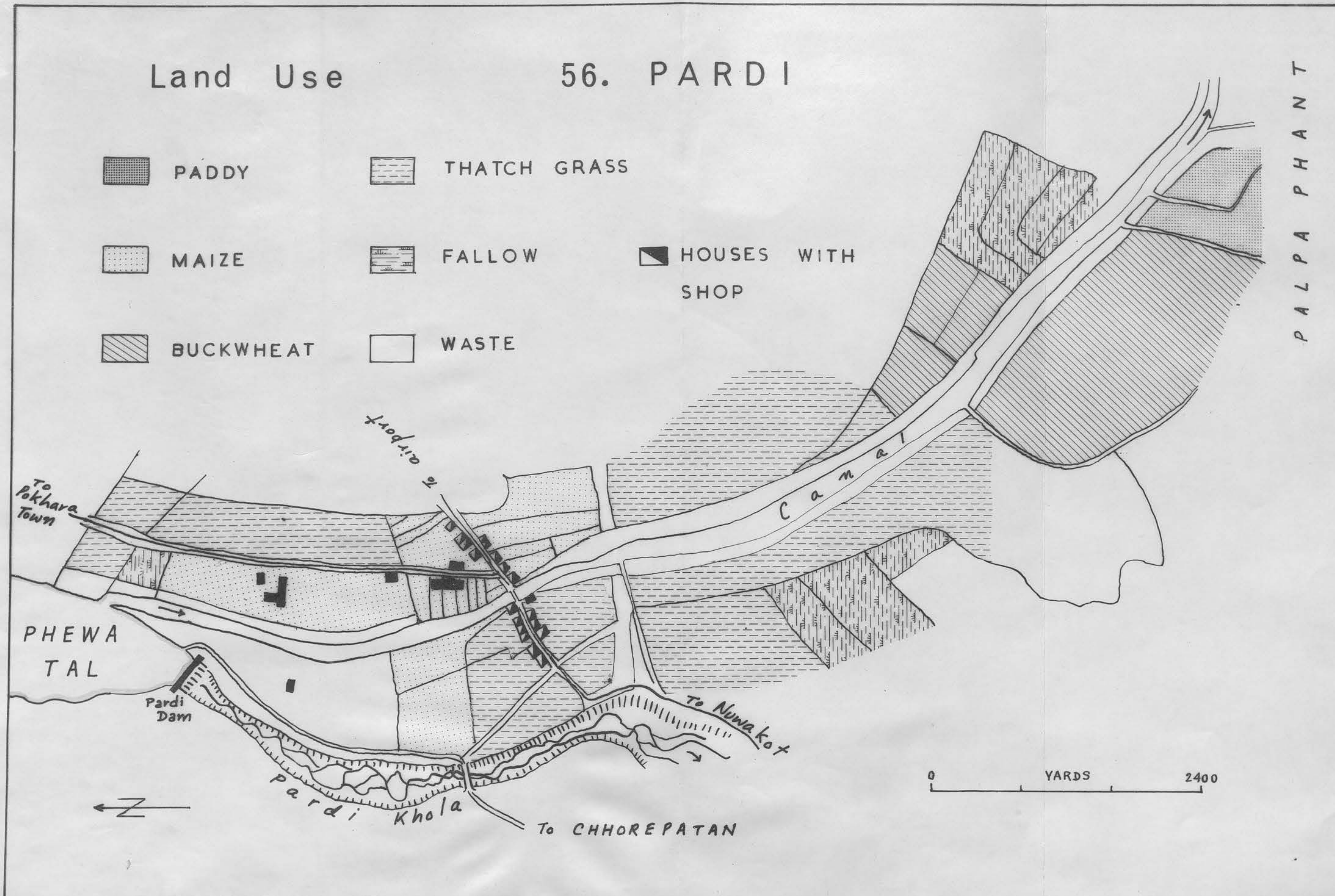

52. KAHUN
0 YARDS 2400
FOREST
FOREST
KOT
4736
40°
48°
50°
30°
20°
48°
27°
16°
52°
45°
20°
24°
45°
18°
23°
48°
50°
Land Use
MAIZE
THATCH GRASS
WASTE
See also Fig. 46 a.

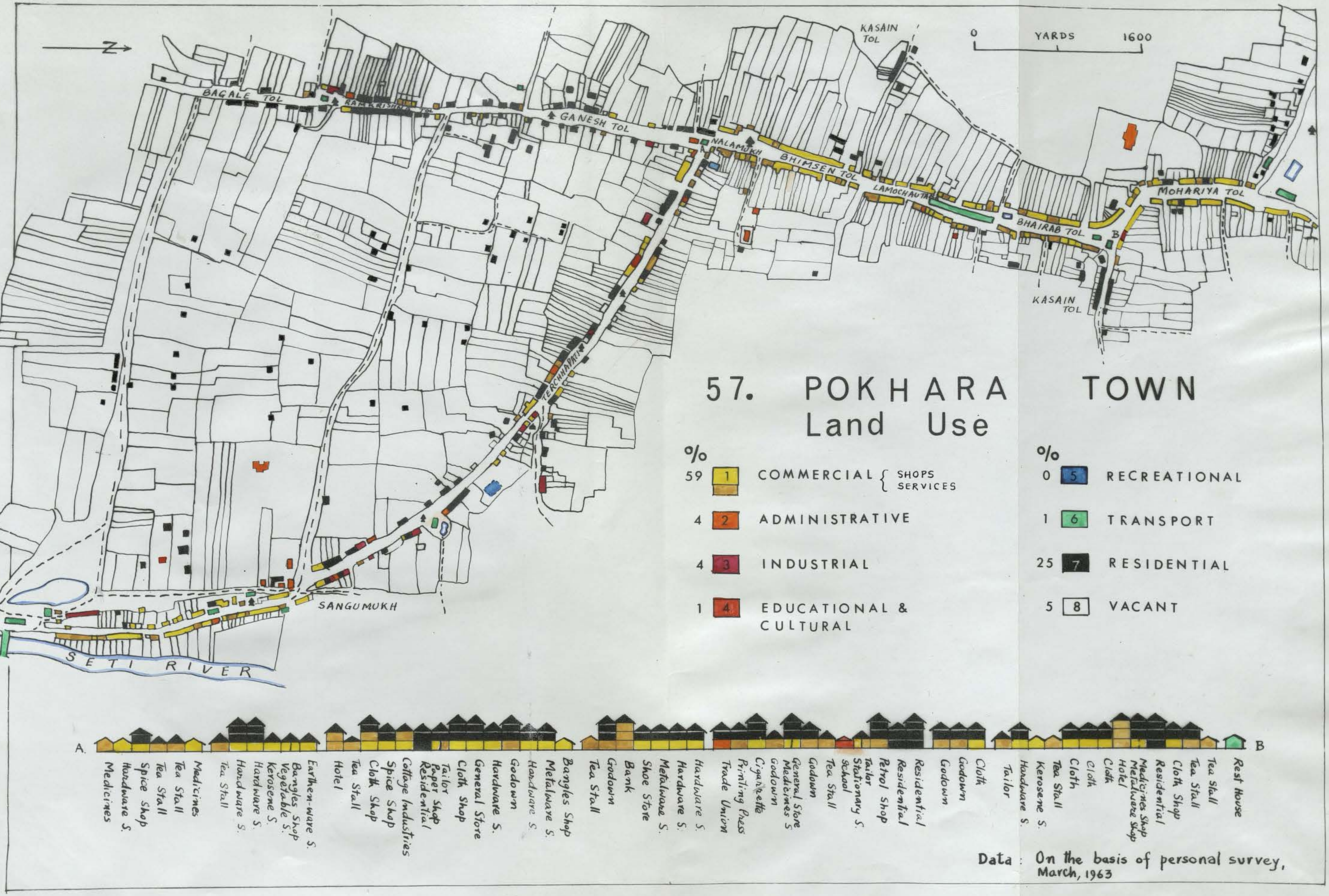


See also Fig. 46 b.

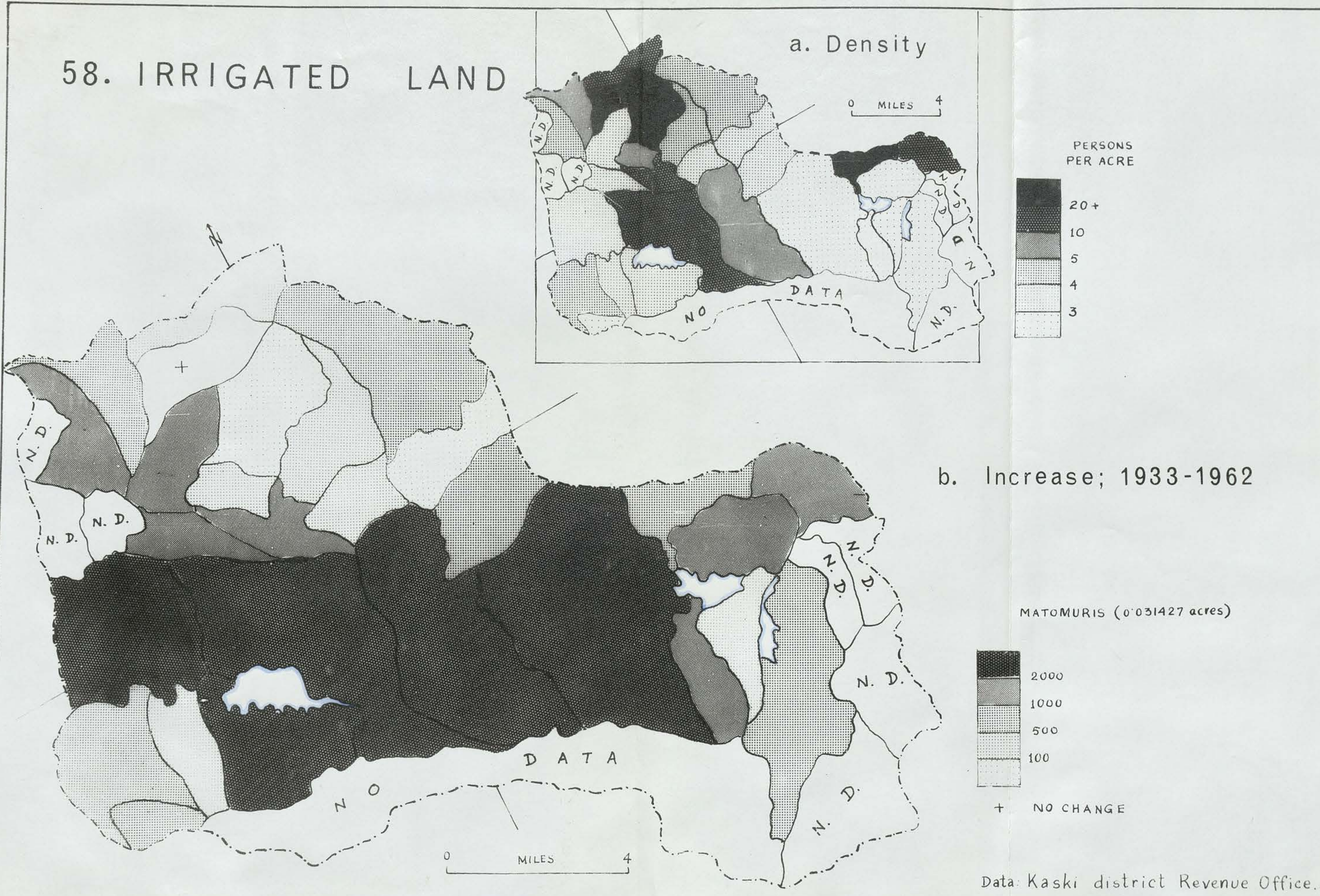

54. ARGHOUNPOUWA
Land Use
PADDY
MAIZE
AFRICAN MILLET
HOUSE WITH SHOPS
CHAUTARA
School
Rice Mill
To Pokhara Town
To SISUWA
To Kumalgaon
LOWER BIJAYPUR CANAL
0
YARDS
2400


55. SISUWA
Land Use
PADDY
MAIZE
HOUSES WITH SHOPS
CHAUTARA
To Pokhara
To Lamjung
To Kathmandu
LOWER BIJAYPUR CANAL
0
YARDS
2400


Land Use
56. PARDI
PADDY
THATCH GRASS
MAIZE
FALLOW
HOUSES WITH SHOP
BUCKWHEAT
WASTE
PALPA PHANT
To airport
To Pokhara Town
Canal
PHEWA TAL
Pardi Dam
To Nuwakot
Pardi Khola
To CHHOREPATAN
0
YARDS
2400

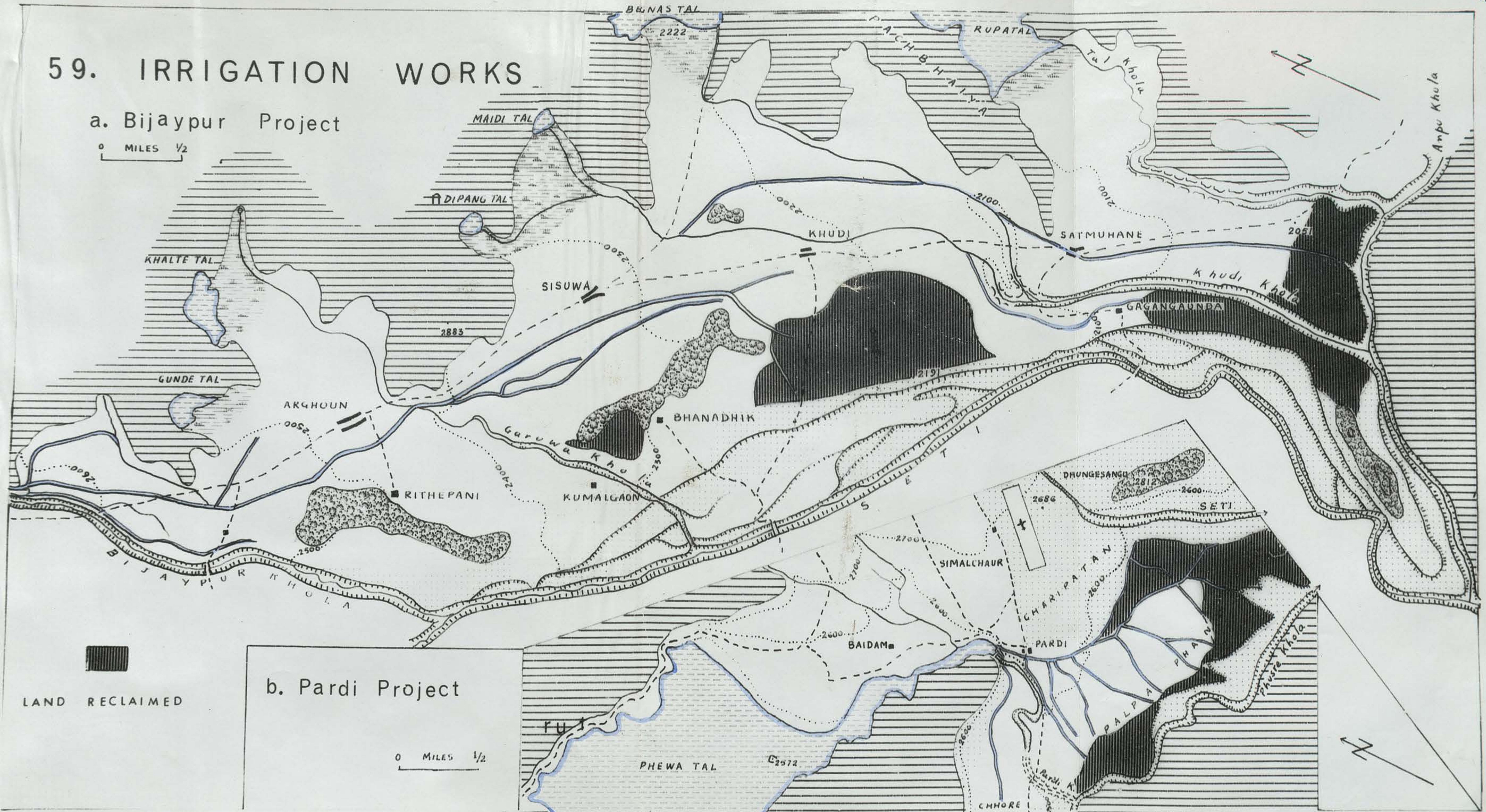

57. POKHARA TOWN
Land Use
%
59 1 COMMERCIAL { SHOPS SERVICES
4 2 ADMINISTRATIVE
4 3 INDUSTRIAL
1 4 EDUCATIONAL & CULTURAL
%
0 5 RECREATIONAL
1 6 TRANSPORT
25 7 RESIDENTIAL
5 8 VACANT
0 YARDS 1600
N
BAGALE TOL
RAMKRISHNA TOL
GANESH TOL
NALAMUKH
BHIMSEN TOL
LAMOCHAUTARA
BHAIRAB TOL
MOHARIYA TOL
KASAIN TOL
KASAIN TOL
TERCHHAPARI
SANGUMUKH
SETI RIVER
A
B
A.
B
Medicines
Hardware S.
Spice Shop
Tea Stall
Tea Stall
Medicines
Tea Stall
Hardware S.
Hardware S.
Kerosene S.
Vegetable S.
Bangles Shop
Earthen-ware S.
Hotel
Tea Stall
Cloth Shop
Spice Shop
Cottage Industries
Residential
Paper Shop
Tailor
Cloth Shop
General Store
Hardware S.
Godown
Hardware S.
Metalware S.
Bangles Shop
Tea Stall
Godown
Bank
Shoe Store
Metalware S.
Hardware S.
Hardware S.
Trade Union
Printing Press
Cigarette
Godown
Medicines S
General Store
Godown
Tea Stall
School
Stationary S.
Tailor
Petrol Shop
Residential
Residential
Godown
Godown
Cloth
Tailor
Hardware S.
Kerosene S.
Tea Stall
Cloth
Cloth
Cloth
Hotel
Metalware Shop
Medicines Shop
Residential
Cloth Shop
Tea Stall
Tea Stall
Rest House
Data : On the basis of personal survey, March, 1963

58. IRRIGATED LAND



Data: Kaski district Revenue Office.

59. IRRIGATION WORKS



60. REGIONAL TRANSECT

see also Fig. 21 b.

	NATURAL REGIONS	PAHAR (Sub-montane)			LEKH (Montane)
	SUB-REGIONS	KACHHAR (Low Hills)	BENSI (Lowland)	KACHHAR (Low Hills)	LEKH (High Hills)
ECONOMIC	LAND USE	CROPLAND TERRACED / WOOD-LAND	PASTURE ON SETI TERRACES / CROPLAND / WOODLAND / CROPLAND	CROPLAND TERRACED / WOODLAND with GRAZING / C / W / CROP LAND / WOODLAND with GRAZING / C / WOODLAND (SCRUB)	CROPLAND / WOODLAND SCRUB / WOODLAND WITH PATCHES OF CLEARINGS ('KHORIYO')
ECONOMIC	INDUSTRIES		POTTERY WORKS, CONCENTRATION OF NEW INDUSTRIES POK-	HARA TOWN / BASKET WEAVING & CANE WORKS	WOOLLEN WEAVING, FOREST PRODUTS
ECONOMIC	AGRICULTURE	MAINLY MAIZE, WITH SOME CATTLE	LIVESTOCK FEEDING / PADDY IN SUMMER; FALLOW IN WINTER	DRY CROPS / GRAZING / Paddy / Wood / MAIZE / GRAZING / Paddy / GRAZIN-	G / MILLET & MAIZE / & SHEEP REARING
CULTURAL	POPULATION	MODERATE DENSITY SOME MIGRATION	/ MODERATE DENSITY WITH BAZAR NUCLEAS NEW SETTLERS FROM THE HILLS	LOW DENSITY SOME DECREASE BY EMIGRATION	VERY LOW
CULTURAL	SETTEMENT	PARTLY NUCLEATED /	RURAL: PARTLY-NUCLEATED HOMESTEADS; URBAN: NUMEROUS BAZĀRS	PARTLY NUCLEATED /	NUCLEATED /
CULTURAL	PEOPLE	EUROPOIDS AND HINDUISED MONGOLOIDS	MAINLY EUROPOIDS (BRAHMIN, CHHETRI), WITH CONSIDERABLE MIXING OF PEOPLE IN BAZARS	MAINLY MONGOLOIDS (GURUNG, MAGAR) WTH SOME POCKETS OF EUROPOIDS	EXCLUSIVELY MONGOLOIDS
PHYSICAL & BIOGEOGRAPHICAL	SOIL	RED EARTHS LATERITIC	GRAVELLY LOAM WITH VERY LOW WATER-TABLE	RED EARTHS, PARTLY LATERITIC	BROWN FOREST SOILS
PHYSICAL & BIOGEOGRAPHICAL	VEGEATION	MOIST DECIDUOUS (Shorea robusta)	LOW SAVANNAH / PLAIN PLANTATIONS (Shade, shelter, fodder, plants)	WET HILL EVERGREEN (Castanopsis indica & Schima wallichii)	MOIST MONTANE EVERGREEN (Oak, Rhododendron, spp.)
PHYSICAL & BIOGEOGRAPHICAL	CLIMATE	SUB-TROPICAL	TROPICAL	SUB-TROPICAL	TEMPERATE with snowfall above 6,000 feet in the hills.
PHYSICAL & BIOGEOGRAPHICAL	DRAINAGE	SHORT SEASONAL STREAMS, SPRINGS	SPRING ZONE / PERENNIAL STREAMS THOUGH FEW NO SEASONAL STREAMS OR SPRINGS	FEW PERENNIAL AND NUMEROUS SEASONAL STREAMS	SHORT BUT PERENNIAL STREAMS NUMEROUS SPRINGS, SOME HOT SPRINGS
PHYSICAL & BIOGEOGRAPHICAL	GEOMOR-PHOLOGY	SCARP RIDGE WITH MODERATE RELIEF	GENTLY SLOPING PLAIN WITH TERRACES / AND CONGLOMERATE INLIERS	ANTICLINAL COMPLEX WITH MODERATELY HIGH RELIEF, LANDSLIDES	HIGH RELIEF OF STEEP SLOPES
PHYSICAL & BIOGEOGRAPHICAL	GEOLOGY	QUARTZITE, SCHIST, LIMESTONE, PHYLLITE	GRAVEL STRATUM (c. 150 ft.) WITH CONGLOMERATE INLIERS	PHYLLITES, QUARTZITES BOULDER-BEDS, ROCKS OF LOWER METAMORPHIC CHARACTER	QUARTZITE, PHYLLITE, SCHIST, LIMESTONE, DOLOMITE, & SHALE / QUARTZITE, SCHIST, GRANITE, GNEISS

COMPONENTS