PAKISTAN GEOGRAPHICAL REVIEW

Volume 27 ... Number 1

January 1972

Pakistan Geographical Review

Vol. 27, No. 1 January 1972

CONTENTS

The editors assume no responsibility for statements and opinions expressed by authors

---

EDITORIAL AND BUSINESS OFFICES
DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF THE PUNJAB
NEW CAMPUS, LAHORE.

Pakistan Geographical Review

Volume 27 January 1972 Number 1

THE BLOCK FIELDS OF THE SOUTHERN PENNINES*

MOHAMMAD SAID

INTRODUCTION

BURBAGE brook is a third order tributary stream of the Derwent river, and drains an area of about ten square miles in the Southern Pennines. The interfluves and valley slopes of the Burbage basin are dotted with spreads of block fields that occur at heights, ranging from 800 to 1400 feet. The block fields are developed on Rivelin Grit zone of the Millstone Grit series which consist of grit, sandstone and shales, belonging to the Upper Carboniferous period. The grit contains pebbles of various sizes and of different rocks and minerals. The fine material include quartz and feldspar grains, while mica is not plentiful, but becomes an increasingly important constituent, as the rock becomes fine grained, until in shale and fine sandstone it becomes the dominant constituent. The grit is massive bedded and shows a rectangular pattern of joints. It is for the most part gently dipping and forms mesas and cuestas with steep edges.

The density and spacing of the planes of partings are important controlling factors in the size, shape, and form of the block field material. The weathering of the grit along bedding planes and joints results in the disintegration of solid rock into block size material. The fine sandstone weathers into angular pieces, of cobble and gravel sizes. The presence of the fine sandstone is often expressed in the form of structural benches that control the underlying topography of the block fields. Because of the high density of the divisional planes, the shales are weathered

*The paper is a portion of author's unpublished Ph. D. thesis *The Pleistocene Geomorphology of the Burbage basin* (University of Sheffield, 1969)

Dr. Mohammad Said is Assistant Professor in the Department of Geography, University of Peshawar, Peshawar.

into fine material that forms the fine fabric in which the large blocks are embedded.

DISTRIBUTION OF BLOCK FIELDS

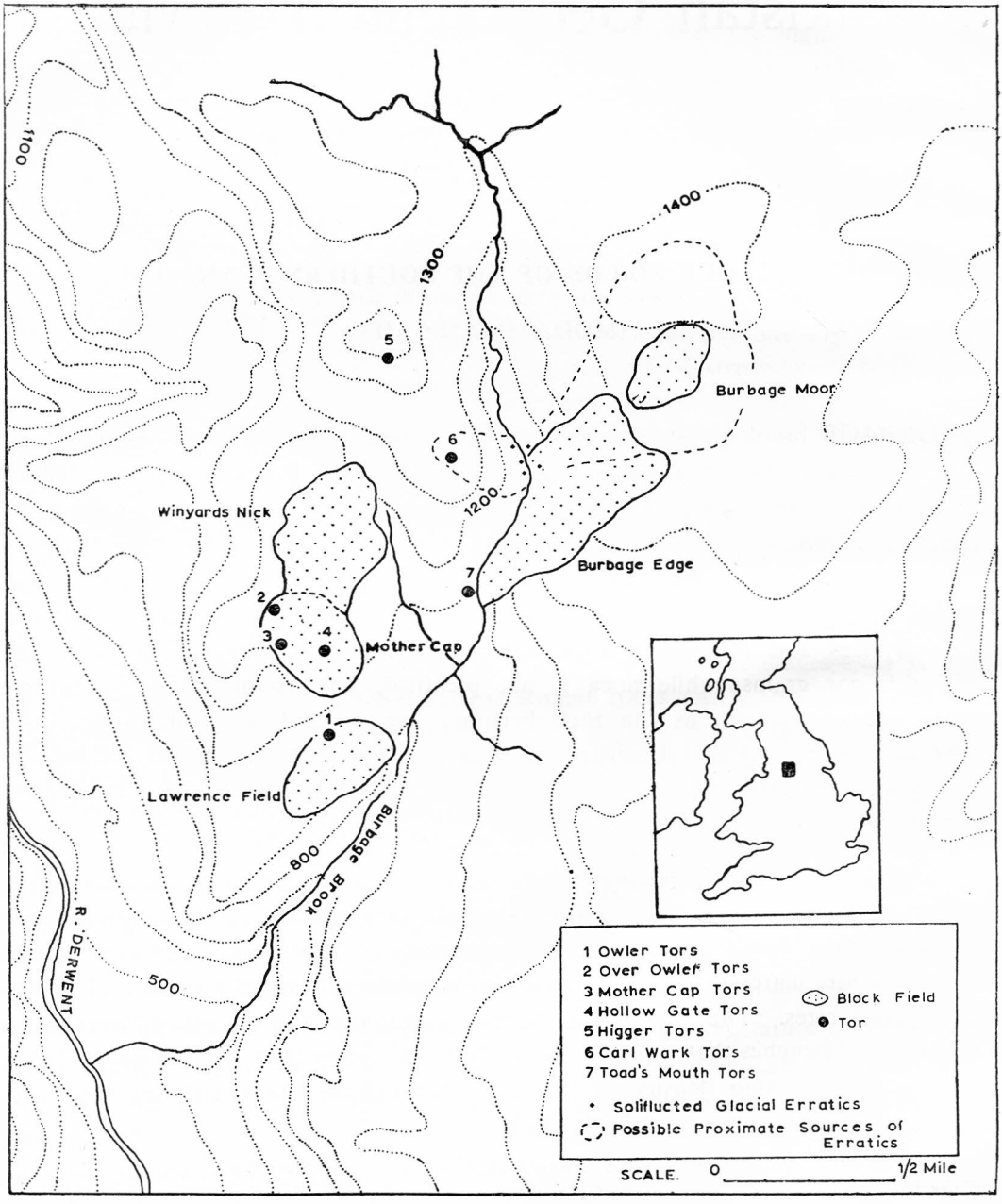

FIGURE 1

Block field is a term which has been used in several different ways. Dahl regards "every collection of blocks as a block field."[1] King[2] has used the term for blocks produced by marine erosion. Hogbom[3] has applied the term to spreads of blocks formed by glacial and frost action. The term has also been used by many authors in a more precise genetic sense. Thus Palmer and Radley[4] define block field as a collection of angular blocks produced by frost action. Demek employs the term in a very narrow sense....."we designate as block fields the areas, where boulders got to the surface as a result of removal of the surrounding finely weathered waste."[5] Linton's[6] definition also has genetic implications. He maintains that blocks are essentially formed by subsurface weathering in a warm climate. Because he considers blocks to be corestones, he prefers the term boulder field to block field.

Since block fields may be produced in a variety of ways, it is proposed, following Dahl that any large collection of blocks be called a block field, irrespective of its mode of origin.

Block Fields of the Burbage Area

Mother Cap Moor

Grid Ref. : SK/252806.

Height : 1100-1225 feet.

Aspect : Southeast.

Mother Cap Moor block field is developed on a gently dipping cuesta formed of Rivelin Grit. In the northwest, it shows a uniformly flat surface, where Over Owler, Mother Cap and a host of other tors rise from the rubble of blocks in the southwest, it leads gradually to a stepped slope formed by low free faces.

It carries no continuous vegetation cover; small, discontinuous patches of rushes (*Juncus offusus*) and mosses (*Sphagnum spp*) occur in places. Over a greater part of the area the blocks themselves are also bare though a few carry isolated patches of calluna peat. Prior to 1959, this area was covered completely by Ling (*Calluna vulgaris*), and in some places the blocks were buried under one to two feet of calluna peat. As a result of burning, the moor was stripped completely of both vegetation and underlying soil. Blocks are now scattered all over the surface. Their size varies from $15 \times 5 \times 3$ feet near Owler tor to $3\frac{1}{2} \times 2\frac{1}{2} \times 1$ feet near Mother Cap tor. They are predominantly oblate to bladed in shape, with practically no equant blocks.* Roundness analysis carried out near Mother Cap tor

*Shape has been found, using Zing's (1935) diameter ratio. In this method ratios b/a and c/b (where (a) (b) and (c) are length, breadth and thickness, respectively) can be used to define four shape classes : bladed, oblate, prolate, equant. By plotting these ratios on graph paper, an estimate of spherocity by Wadwell's method can also be obtained.

shows eighty-four percent of the material in R. C. I and II* (Fig. 2). This demonstrates the extreme angularity of the blocks. There is evidence of considerable weathering on some blocks. Relatively more intense weathering has taken place on rock fragments of cobble size. These show circular zones of weathering, 0.4 to 0.8 inches thick, an outer zone, from which iron has been leached completely and an inner zone of iron deposition.

ROUNDNESS AND SHAPE ANALYSIS OF THE MATERIAL ALONG SLOPE PROFILE III BURBAGE EDGE BLOCK FIELD

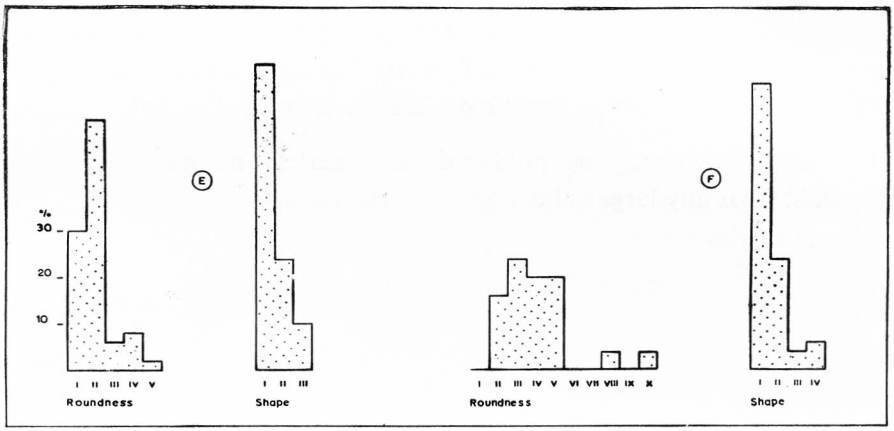

FIGURE 2

Two types of blocks are recognised: 1) blocks with weathering pits that are no longer developing and 2) those without pits. It is likely that the first group represents former tor tops which have fallen from the tor plinths; those in the second group have been produced from the underlying bedrock.[7] A section exposed at the

*Roundness of blocks has been determined on the basis of Cailleux's formula $9r/1 \times 1000$. Where r is the least radius of curvature in the principal plane, and 1 is the length. Values range from 0 to 1000, which have been divided into 20 classes.

Roundness Class	Roundness	Roundness Class	Roundness
R.C. I	0—50	R.C. XI	501—550
R.C. II	51—100	R.C. XII	551—600
R.C III	101—150	R.C. XIII	601—650
R.C. IV	151—200	R.C. XIV	651—700
R C. V	201—250	R.C. XV	701—750
R.C. VI	251—300	R.C. XVI	751—800
R.C. VII	301—350	R.C. XVII	801 - 850
R.C. VIII	351—400	R.C. XVIII	851—900
R.C. IX	401—450	R.C. XIX	901—950
R.C. X	450—500	R.C. XX	951—1000

top of a quarry (a few yards south of Mother Cap tor) shows grit blocks, underlain by fine gravel and sandy material. This material also fills numerous joints in the quarry. It is reasonable to suppose that the blocks were embedded originally in similar fine material, which has subsequently been eroded. Mechanical analysis of the fine fraction reveals only three percent clay.[8]

This area has been quarried extensively in the past; some quarries being worked primarily for millstones. A considerable number of millstones remains scattered widely all over the area. The millstones in general and their central circular holes in particular have been modified considerably by weathering and give some indication of the rate of weathering during the last 300 – 400 years.

Winyard Nick

Grid Ref. : SK/253810.
Height : 1100 – 1225 feet.
Aspect : Southeast.

It is developed on the back slope of a cuesta and has a smooth surface with little morphological differentiation. Over much of the block field, fine material has been eroded and the blocks are exposed at the surface; in a few places, however, the blocks are covered with calluna peat. As on Mother Cap the vegetation cover was destroyed by fire in 1959, and only in a few places are *Juncus and Sphagnum* present.

The average size of the blocks is $2 \times 1\frac{1}{2} \times 1$ feet; they are predominantly oblate sixty-two percent and bladed twenty-four percent but an appreciable number 8% of equant blocks is also present; roundness analysis indicates a maximum in R. C. III (Fig. 2). It is also significant to note that ten percent of the material falls between R. C. VII and IX. This suggests a greater rounding as compared to the Mother Cap blocks. The examination of blocks in relation to the block field surface indicates that they have undergone considerable weathering as well as rounding since their deposition.

Although the free faces are quarried over most of the area, there is no evidence of quarrying of millstone, as the average size of the blocks is too small for the making of millstones. There are many prehistoric remains, enclosures, stone circles, and barrows, which suggest this area was inhabited by man in very early times.[9] This area is also crisscrossed by packways, leading from Sheffield to Hathersage, which were in regular use from the Bronze Age until the middle of the nineteenth century. Some of the packways are deeply gullied and act as natural drainage lines.

Burbage Edge

Grid Ref. : SK/967813.
Height : 1095—1375 feet.
Aspect : West.

This block field extends from the Burbage Edge to the bank of the Burbage brook. It exhibits a series of structural benches, formed by sandstone bands. Blocks are scattered all over the area but they are exposed particularly south of the Parson brook where the slope is relatively steeper and has suffered considerable erosion of fine material. Spring action is manifest all over the area; where seepage occurs, sphagnum terraces (0—2° in gradient) have been formed; in places where spring action is relatively more active, large depressions occur, which are drained by small streams. The blocks are invariably covered with lichen and mosses. They are dark grey to very dark grey in colour; on breaking, however, they show fresh rock, generally reddish yellow. Where spaces exist between the blocks, they are colonised by *Deschampsia*; where fine material has been removed, the blocks themselves are overgrown with *Vaccinium*: this is especially so, on the stream banks, on the convexities of the terraces and on the foot-slopes of the free faces. On the other hand, where the slopes are relatively gentle and the water table is high, *Sphagnum* has buried the blocks completely.

The size of the blocks varies considerably. They are larger near the foot of the free faces; lower down however they are much smaller (6×5×3 feet). Oblate and bladed shapes are predominant near the free faces, while lower down equant and prolate shapes become important

ROUNDNESS AND SHAPE ANALYSIS OF THE BLOCK FIELD MATERIAL

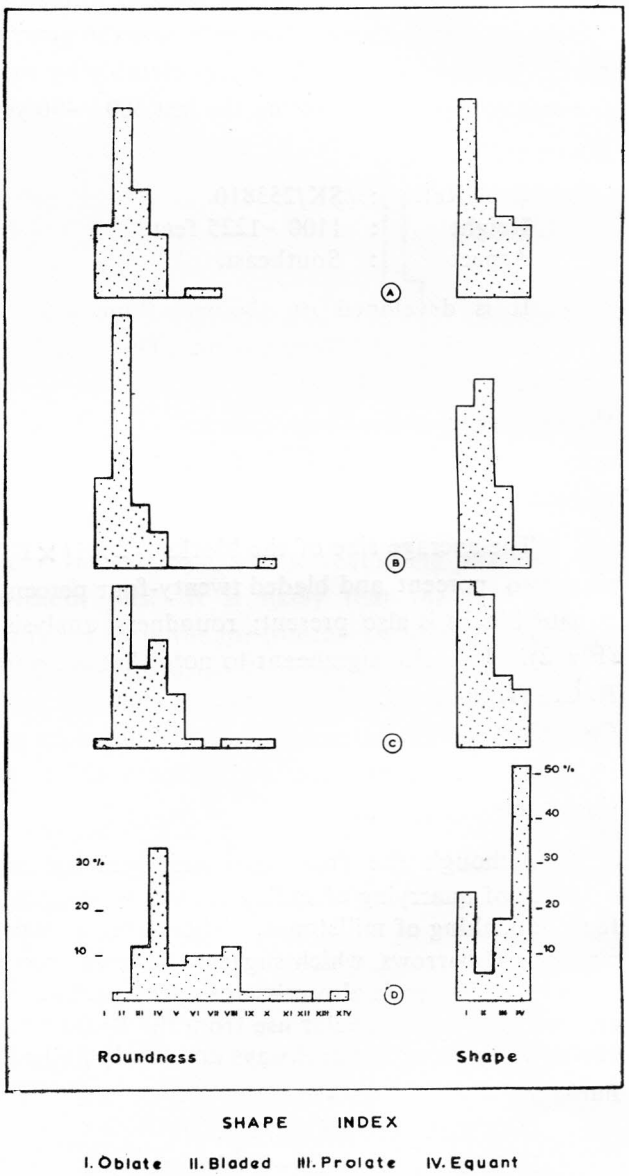

FIGURE 3

(Fig. 3). The blocks are very angular near the free faces, but become gradually rounded away from them. Fabric analysis of block size material shows a predominantly northwest orientation which is also the general slope direction (Fig. 4).

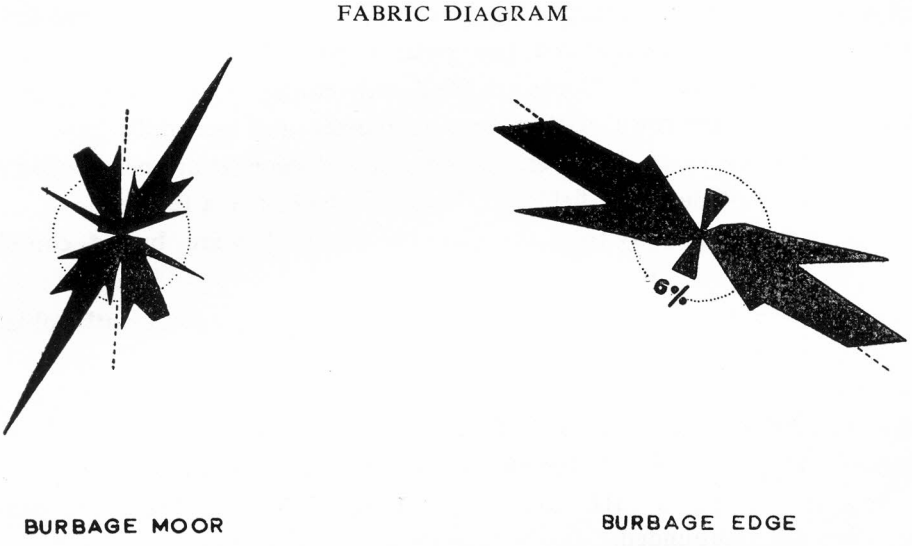

FIGURE 4

Blocks show various forms of weathering. Pits are found on many of them. Large blocks show weathering along bedding planes; in some cases they have been split into smaller blocks. Lapies are also developed on some blocks. By far the most conspicuous, however, is honeycomb weathering which is found in all stages of evolution.

This area has suffered considerable changes as a result of man's interference. There are remains of an iron furnace, probably belonging to the Iron Age; while Burbage Edge, as well as some of the large blocks, have been quarried. In addition, this area is crossed by a large number of packways some of which are fifteen to twenty feet deep, and are now occupied by streams and gullies. Where packways cross steeper slopes to join relatively gentle surfaces small fans have been formed owing to deposition by gullies.

Burbage Moor

Grid Ref. : SK/269818
Height : 1375/1400 feet
Aspect : South, Southwest

This block field lies to the west of Radcar brook and extends as far as Burbage Edge. The surface on which the block field is developed, slopes (5°—6°) south-west

and cuts across the gently dipping Rivelin Grit (8°W). Except to the west, it is surrounded on all sides by peat bogs, varying in thickness from three to nine feet. It is dissected by numerous gullies and streams, which drain the surrounding peaty areas.

The block field is characterized by the complete absence of *calluna* and *deschampsia; juncus* and *sphagnum* occur in a few isolated patches. Over a greater part the intervening spaces between the blocks are filled with eroded peat and wash material. The blocks are not overgrown with lichen or mosses and generally have a fresh appearance ; in a few cases, however. stumps of *Calluna* peat are perched on them. Near the boundary of the block field and the peat, blocks rise a few inches above the peat surface, but further away from the main block field they are buried completely by peat.

The blocks average about $5 \times 3 \times 2\frac{1}{2}$ feet in size, are predominantly oblate to bladed (forty four percent and twenty two percent respectively) (Fig. 5), and include a relatively higher number of equant blocks (sixteen percent). Roundness analysis shows fifty-eight percent of the material in R. C. I & II, the maximum occurring in the latter group. R. C. IV has a larger number of blocks than R. C. I, and a few blocks also occur in R. C. VI and VIII. It is clear that while the blocks are generally angular, a few are subrounded.

Fabric analysis of block-size material shows no marked preferred orientation (Fig. 4). This is probably because many of the blocks have been derived from the underlying bedrock and not been carried sufficiently far, by solifluction, to acquire any downslope orientation. There is no evidence of lapies or honeycomb weathering ; small weathering pits (four to five inches diameter) are developed on a few blocks that rise slightly above the block field surface. Sections are aviailable along the gullies, which show that large blocks are underlain by coarse sandy material. Mechanical analysis of this material indicates that it is composed predominantly of sand with little clay. It seems more probable that the large blocks now exposed on the surface were embedded initially in this fine material.

Lawrence Field

Grid Ref. : SK/253799
Height : 925—1000 feet
Aspect : South, Southwest

It is situated at a lower level than Mother Cap block field and is separated from it by the Sheffield-Hathersage Road. It shows a gently sloping surface which exhibits steps of bedrock ; in some places, the slope rises gently to the north, where it is crowned by Owler tors. The surface of the block field is covered by a thick mat of *Deschampsia*, from which blocks rise to a height of three to four feet. Where the fine material has been removed, the blocks are covered by clumps of *Vaccinium.*

SHAPE ANALYSIS OF THE BLOCK FIELD MATERIAL

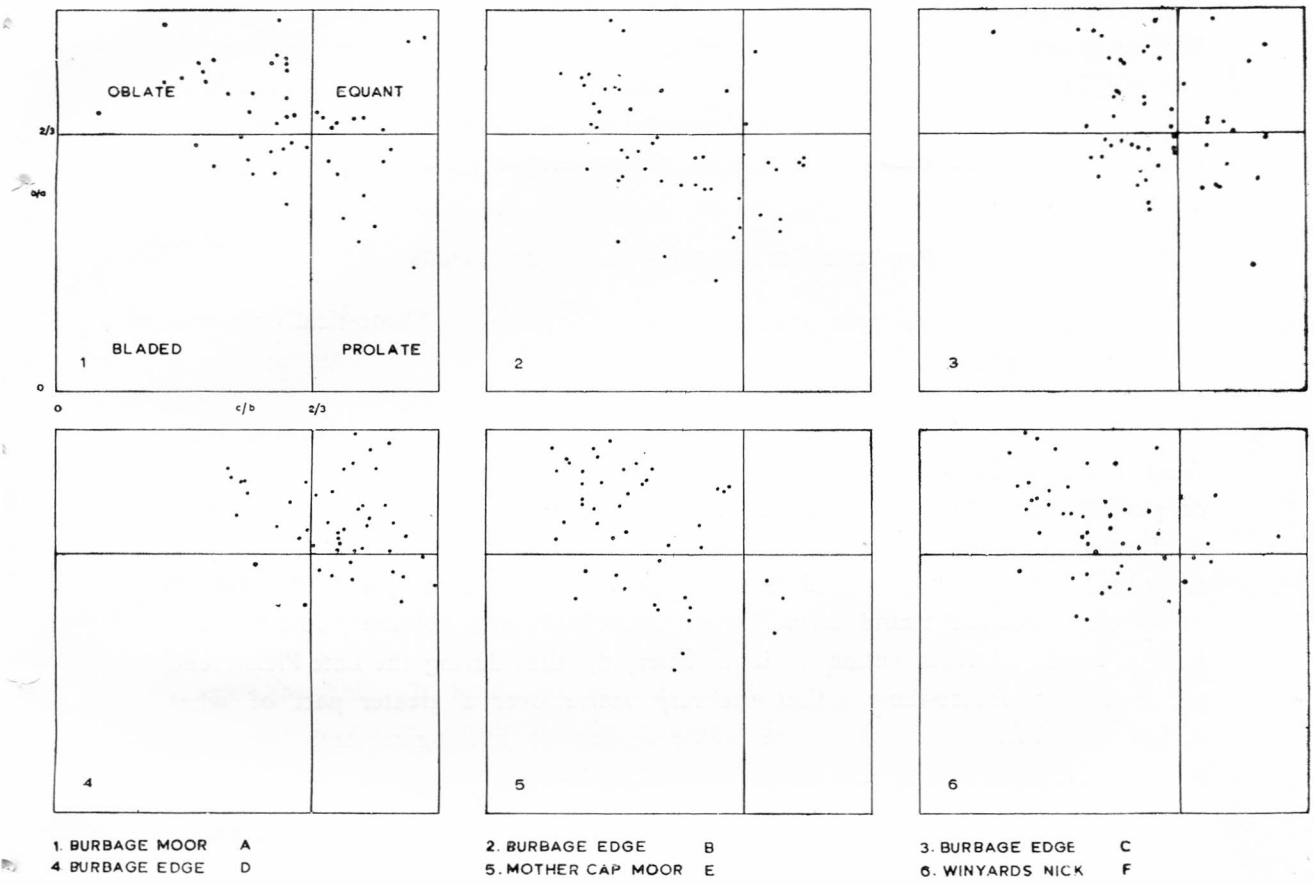

FIGURE 5

The blocks are composed mainly of grit ; most are mottled by mosses and lichen, and discoloured by weathering. The average size is $3 \times 2 \times 1\frac{1}{2}$ feet, but blocks as large as six to seven feet are also present. They are for the most part angular, but no roundness or shape analysis was made, as this block field is not significantly different from that on Mother Cap moors. The blocks do not show any honey-comb weathering. Some blocks exhibit cracks which are filled with sandy material, probably blown by wind. Sandy material also occurs on the tops of blocks that are occupied by stumps of *Calluna*. A survey of the block field revealed the existence of only two weathering pits, one of which is developing actively and the other is filled completely with peat and sand, and is overgrown by *Dischampsia* and *Calluna*. Crenellation is found on only one block. Rocking-stones were once very abundant here, but they have been destroyed.[10]

A section (SK/255799) exposed in a quarry along the southern part of the block field shows that the block field material consists of large grit blocks embedded in a sandy matrix. This material is also found in the major joints exposed in the quarry. This is covered with large blocks such as are seen on the surface of block field ; these are in turn covered by about two feet of wash material. Mechanical analysis of the head material suggests that clay accounts for an extremely small proportion of it.[11]

Previous Explanation of Block Fields

Block fields have been reported by many workers.[12] Theoretically they can be formed in a number of ways, practically, however, only a limited number of processes are considered to have been effective in their development. Thus block fields along ancient shore lines have been attributed to marine action[13], while those occurring in glaciated areas are believed to be the result of frost action on glacial till[14]. Block fields have often been explained in terms of subsurface weathering in a warm Tertiary climate. This type of block fields have been recognised by Demek, in the Bohemian massif, Czechoslovakia, and by Dahl in the Alpine parts of Scandinavia. Many block fields are, however, considered to be the result of frost action[15]. It is beleived, that during the Late Pleistocene, weathering by freeze-thaw action was very active over a greater part of what is the temperate zone today, and where favourable lithological and structural conditions existed, it produced extensive block fields.

The block fields of the Burbage area have been explained in four different ways.

1. Linton believes that the development of block fields is closely related to the genesis of tors. He looks back to a warm interglacial or pre-pleistocene phase during which the closely jointed rocks were weathered thoroughly, while the massive rocks were left as corestones. With the onset of a cold phase, the corestones together with the fine material were carried by the processes of wash and solifluction, and deposited as a block field. In support of his arguments Linton refers to the bimodal distribution of the block field material. He believes that the rounded blocks and the fine material in which they are embedded is fairly good evidence of chemical weathering.

2. Palmer and Radley believe that the block fields material was produced as a result of the retreat of free faces by frost action, during the last "stillstand of ice''. Contrary to Linton they think that the block field material was produced in a single phase of frost climate.

3. Cunningham[16], working on the block fields of Mother Cap moors, distinguishes two different types of blocks. Firstly, blocks that were originally tor tops, and secondly, blocks that were part of the basal platforms of tors. He argues that the first type of blocks was formed by the topping of tor tops by glaciation, while the second type was produced by frost action.

4. El-Enin believes that "they postdate the development of periglacial solifluction deposits contemporaneous with the Last Glaciation"[17].

The Genesis of Block Fields in the Burbage Area

Field and laboratory examinations show that blocks are extemely angular at the foot of free faces (Fig. 3). In fact, most of the blocks do not differ markedly in shape and ronndness from the joint-bounded blocks of bedrock in the free face. Similar material has been studied by many workers[18] all of whom interpret it as the frost weathered rubble.

Blocks are often embedded in a matrix of fine material. Linton and Cunningham believe this to be chemically weathered material, produced in a warm climate. Size distribution analysis indicate that it contains an extremely low percentage of clay (five percent) and a very large proportion of silt and sand.[19] This is the case not only in the head developed on the grit, but also in the head lying on the shale. It should be recalled that Rivelin Grit does not possess uniform lithological and structural attributes ; it very often consists of lenses of Grit, sandstone and shale. It appears that cryergic processes acting on this bedrock produced a variety of size separates, ranging from silt to large blocks, and it would appear that the bimodal distribution of particle sizes reflects to a very large extent the differential gelivation of Rivelin Grit rather than the chemically weathered regolith, produced in Tertiary time. It is not unreasonable to suggest that any Tertiary weathered material was removed by wash and stream during the early phases of Pleistocene and, perhaps, was never incorporated in the head. It is likely that glaciation has played an equally important role in the production of block field material. This is quite clear from the presence of a large number of glacial erratics in the head. This material has been examined in detail[20], and it appears to be part of glacial till that has been reworked by solifluction, Unfortunately grit lithologies are not particularly favourable to the production or preservation of striae; therefore it is not easy to determine the extent to which any block is the product of glacial erosion. However, it is not inconceivable that some of the blocks may have been produced in this way.

If the blocks were produced in the manner suggested by Linton they should exhibit a greater roundness at the foot of free faces which should decrease gradually away from the free face, indicating that the corestones were subjected to

atmospheric weathering. On gently sloping interfluves, where material is moved relatively slowly, a high concentration of corestones might be expected. The roundness analysis indicate that the blocks on the interfluves and at the foot of free faces are angular. Further away from the free faces they are more rounded (Figs. 2 & 3). This suggests that the block have been rounded subsequent to their detachment from bedrock. There is reason to suppose that, as in river deposits so in the head, roundness is related to the distance and time of travel of a block from its source.

It may be noted that there are striking differences between the roundness of sandstone and grit fragments (Fig. 6). As a rule the sandstone fragments are very angular, while those of grit are relatively rounded. It appears that the angularity of sandstone is largely due to its splitting along and across the bedding planes. It may also be recorded that the sandstone fragments usually possess one or more sub-rounded corners. It seems very likely that the breaking and rounding took place contemporaneously with periglaciation. Obviously, during the mass movement of this debris, a certain degree of roundness would be achieved ; but it is conceivable, that this would be overshadowed by the effects of frost splitting. On the other hand, the relatively rounded grit fragments are usually weathered by the weakening of cementing material. They are split relatively less frequently along bedding planes. Thus within a given time grit becomes more rounded than sandstone. Clearly the variation in between the roundness of grit and sandstone is largely a matter of lithology and has no genetic significance.

A COMPARATIVE STUDY OF THE ROUNDNESS OF GRIT AND SANDSTONE FRAGMENT ALONG SLOPE PROFILE III, BURBAGE EDGE BLOCK FIELD

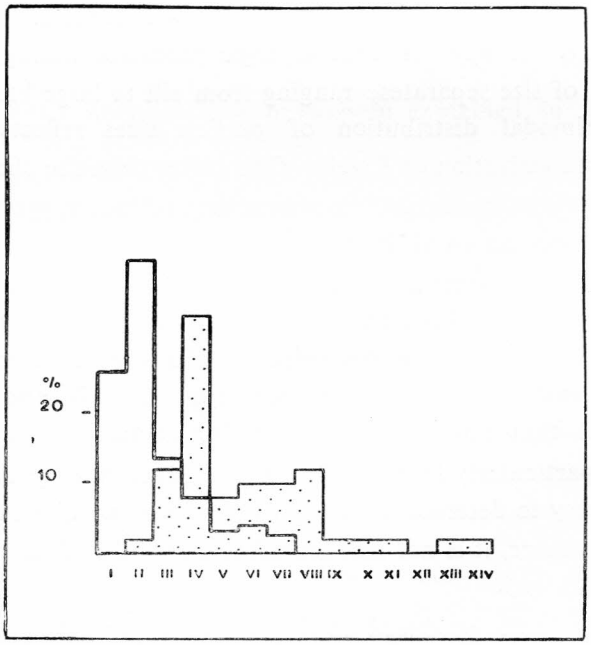

FIGURE 6

Grit blocks are found in all shapes—oblate, equant, bladed, prolate – but they are dominantly either oblate or bladed (Fig. 6). The preponderance of these shapes probably suggests that the average thickness of the grit bed is less than the spacing of the joints. It appears that bedrock is split by frost action into oblate and bladed blocks and that the equant and prolate blocks are derived from the weathering of these two primary shapes. Nevertheless, there is evidence, that is some cases prolate blocks could have been produced directly by frost action on the bedrocks, for example, Burbage Edge. Further away from the source, for example, the free face, oblate and bladed blocks decrease in number, while there is a corresponding increase in equant and prolate blocks (Fig. 3). This is usually achieved through the weathering of the oblate and bladed blocks. It has been found that this weathering generally results in a greater number of equant as compared to prolate blocks.

Shape and roundness are two independent characteristics.[21] However, a comparison of the two attributes suggests that there is some relationship between them. Thus the blocks show greater roundness when they are equant, but equant blocks are not necessarily rounded.

A large part of the block field material was derived from the free faces, by such processes of mass movement as pebble fall, rock fall, and rock slide. This quite evident from the remains of scars on the free faces. This material accumulated at the foot of the free faces, where its fine fraction was winnowed by meltwater and deposited in the concavities. The coarse material consisting of gravels, cobbles and blocks was moved downslope by creep. On gentler slopes, the material was churned up by frost action, and transported predominantly by solifluction, as is clear from the fabric analyses (Fig. 4).

The morphology of the block fields suggests the presence of well-developed terraces (Fig. 7). The examination of sections in these terraces suggests that they are cut primarily in the bedrock and are only veneered with a thin layer (3 to 10 feet) of head. They are probably erosional surfaces, which have been considerably modified by cryergic processes. It is suggested that such landforms may be called *Cryergic Surfaces*. There are a few terraces in Burbage the Edge block field which are entirely composed of head material. These constitute the only solifluction terraces, identified in this area.

The Age of Block Fields

Because block fields are associated with the development of free faces, their formation is likely to post-date the initiation of the edges. It has been suggested that free faces were first initiated during the waxing cold of the Antepenultimate Glaciation.[22] It is logical to suppose that any such production of free faces during

MORPHOLOGY OF THE BURBAGE EDGE BLOCK FIELD

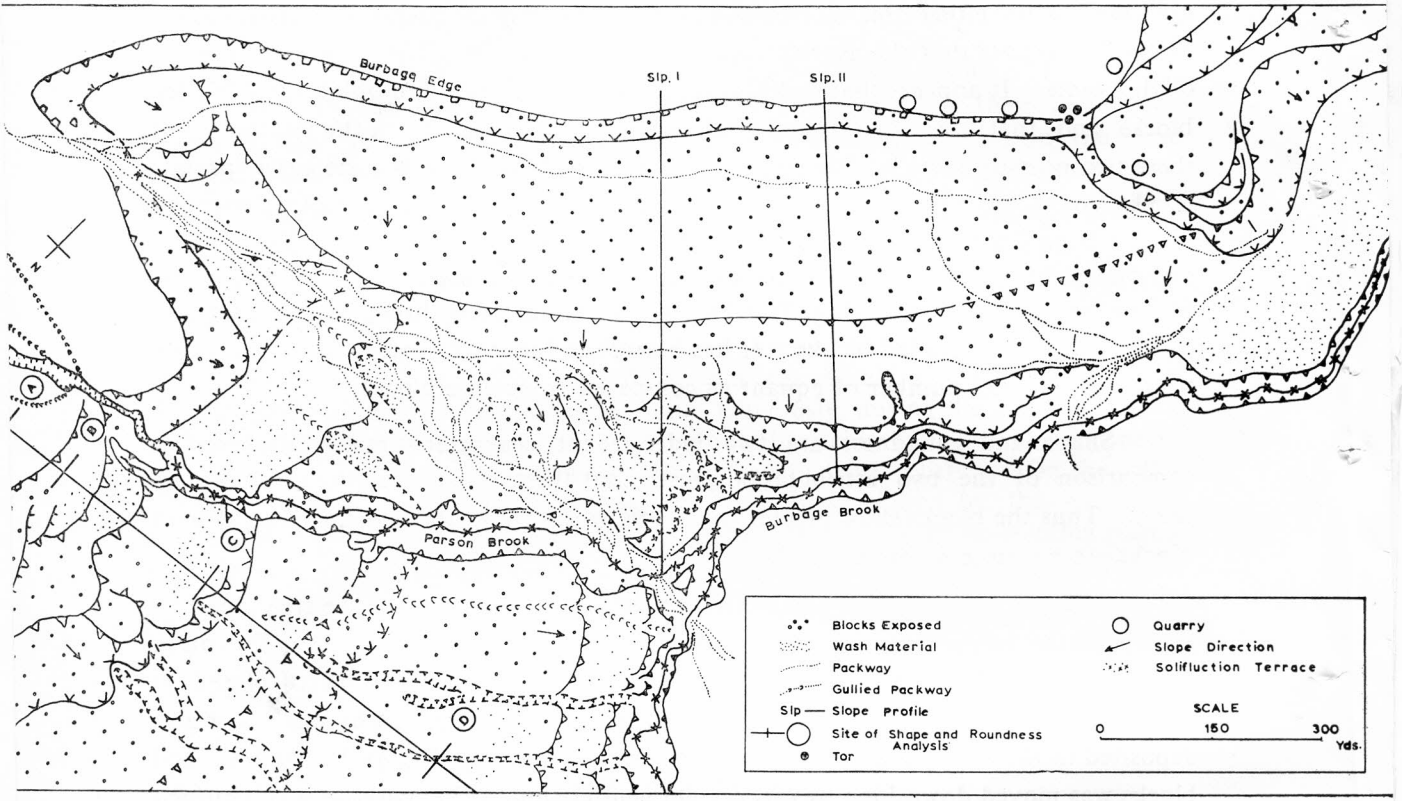

FIGURE 7

the early Pleistocene was accompanied by the formation of block fields. Any initial block field so produced would presumably incorporate many corestones, as envisaged by Linton. However it must be emphasized that no corestones can be recognised in any block field that exists to-day.

It has also been suggested that this area was invaded during the Antepenultimate Glaciation by ice which blanketed the landscape with widespread patches of till.[23] These glacial deposits were subsequently reworked by cryergic processes and incorporated in the head. It is also possible that some of the block field material might include products of glacial erosion. While little is known of the bio-climatic conditions of the older Pleistocene it is fairly well established that this area was not invaded by ice during either the Penultimate or the Last Glaciation. During these periglacial phases the active evolution of free faces and the chiselling of tors out of bedrock must have been accompanied by the production of block field.

The Late-glacial history of the block fields is known in greater detail. There is definite stratigraphic evidence that block fields were formed in both the Lower Dryas and Upper Dryas, and that their development ceased temporarily during the intervening short warm phase (Allerod oscillation, C-14 dated 11,590 ± 360). There is also evidence that during the Allerod, soil and vegetation developed on the block fields. It is is generally believed that cold conditions ceased by the end of Late-glacial period.[24] Consequently the gelifraction which produced the blocks and the solifluction which moved them came to a halt, and the active formation of block fields stopped.

The Post-glacial Modification of Block Fields

During a greater part of the Boreal (zones V, VI) the block fields were covered with a thick growth of forest, dominated by an alder-birch formation.[25] A significant change in the climate occurred about 5000 B.C. when a large increase in rainfall took place. The increase in rainfall was more pronounced on the higher areas than on lower land.[26] Thus the degree to which the Atlantic and Post-atlantic conditions affected the landscape also varied considerably. It is therefore convenient to deal with the Upper (Burbage moors) and Lower block fields (Lawrence Field, Mother Cap moors, and Winyard Nick) separately.

Upper Block Fields

With increasing rainfall in the Atlantic period, considerable leaching of the soil took place. Pollen records show a gradual opening of woodland to allow a much more luxuriant development of grasses; the trees soon became rooted in peat, and woodland succumbed to bog.[27] Over much of the area a continuous mantle of peat mire, poor in nutrients and waterlogged, spreed across large stretches of country. There is evidence that before the development of peat, the block field passed through a phase of erosion during which both forest soil and vegetation were carried away. This is evident from the fact that trees and forest soil are not preserved everywhere under the peat. There is no evidence to suggest that in the Sub-boreal bogs were completely dried out or colonised by forest. Neither was peat growth interrupted; apparently little change in the distribution of peat plants took place.[28]

During the Sub-atlantic a serious climatic deterioration occurred. The increasing rainfall had marked effects on peat growth. There is evidence that about six feet of peat developed during this period in the Ringinlow bog; in other places, growth of fresh *Sphagnum* was so rapid that blanket peat tended to develop its own drainage system and became readily subject to erosion.[29] Conway has suggested that peat erosion could have started at any time after 500 B.C. This is

confirmed by our observation in section IX where about five feet of eroded peat has been deposited over pine and birch tree fragments for which a radiocarbon date of 2470 ± 80 (520 B.C. ± 80) has been obtained.[30]

Peat erosion marks an important stage in the development of the higher block fields, because it was after the erosion of peat, that the block fields were exposed, as we see them today. Since then, there has been no significant change in their morphology. At times, block fields have been covered by calluna moors; this is evident from the presence of isolated stumps of *Calluna* peat on some blocks. The heather has, however been subjected to recurrent burning by man, and the block fields have never been allowed to become completely buried by peat.

Lower Block Fields : Very little is known about the lower block fields during Atlantic times. It is, however, conceivable that, although the tree line might have been appreciably depressed, the Boreal vegetation would not be destroyed completely. We are more certain about the nature of vegetation in the Sub-boreal. It is very likely that the block fields were covered by woodland composed of *Corylus, Pinus* and *Betula*.[31]

The Sub-atlantic was marked by the onset of wet and cold conditions and increasing human activity. Evidence has been provided to show that the vegetation was not seriously affected by the deterioration of climatic conditions; indeed it left undisturbed, this area would support a dense growth of woodland. It has been suggested that this vegetation was cleared by man in three different stages[32], 1) at the end of the Bronze Age, i.e., 495 B.C. 2) in Roman times (A.D. 220), and 3) on several occasions between A.D. 1400 and 1830.

It is significant to note that each phase of deforestation initiated a new phase of erosion, as a result of which the forest soil and the underlying fine material that filled voids in between the blocks, were carried by wash and streams, and deposited in the concavities and stream valleys. This redistribution of fine material is the unmistakable evidence of deforestation and is the most outstanding event that has taken place in the Post-glacial history of the block fields. It appears that prior to the removal of the vegetation cover, the blocks were embedded in a matrix of fine material and buried under a deep forest soil. The removal of vegetation and the consequent erosion of soil gave the landscape its present rugged appearance. Thus this apparently typical periglacial landscape has in fact, undergone many changes in the Post-glacial.

Apart from deforestation, man has effected the block field landscape in two other important ways. This area is crossed by many packway, ranging from a single track to several dozen; the Winyard Nick in particular appears to be ploughed by

them. Because of their continuous use during so many centuries, some of these have been carved to a depth of fifteen feet. Most of the packways were abandoned by the middle of the nineteeth century. Since then they have become natural drainage lines and have been modified considerably by gully erosion. Where they cross concavities (e.g. Burbage Edge. Winyard Nick) they have been filled completely with wash and in places thirty to fifty feet wide alluvial spreads have been formed.

Quarrying has also contributed to some extent to the present form of the block fields. The presence of pre-historic remains indicates that quarrying began in this area in the Bronze Age. This is evident from the use of quarried stones in stone circles, barrows, and enclosures. However, it is only recently (last 200 to 300 years) that the bedrock exposures in the block fields have been quarried on a large scale, chiefly for millstones. In fact many of the block fields are littered even now, with abandoned millstones. Centuries of quarrying have left the block fields with huge scars, shallow depressions and fallen tors; so that little of the landscape seems natural today.

References

1. Dahl, E.: "Refugieproblement og de Kvartaergeologiske metodene," *Svensk Naturkun-skap*, Stockholm (1961).
2. King, C.A.M. and Hirst, R.A.; "The boulder-fields of the Alan Islands," *Fennia*, 89 (1964), pp. 5-41.
3. Hogbom, B.: "Uber die geolgische des Frostes," *Bull. Geol. Inst.*, XII (1914), Uppsala.
4. Palmer, J and Radley, J. "Gritstone tors of the English Pennines," *Z.Geomorph.*, 5 (1964), pp. 37-52.
5. Demek, J. : "Slope development in granite areas of Bohemian Massif (Czechoslovakia)," *Z. Geomorph.*, Supp. 5, (1964), pp. 83-104.
6. Linton, D.L. : "The origin of the Pennine tors - An essay in analysis," *Z. Geomorph.*, 8 (1964), pp. I-24.
7. See Demek, *op. cit.*
8. Said, M : *The Pleistocene geomorphology of the Burbage basin*, unpub. Ph.D. Thesis, University of Sheffield (1969).
9. Armstrong, L. : *Prehistory. In : Sheffield and its region*, Sheffield (1956).
10. Bateman, T.: *Ten years digging in Celtic and Saxon grave hills in the counties of Derby, Stafford and York, from 1848 to 1858*, (1861).
11. See Said, *op. cit.*
12. Judson, S.: "Rock-fragment slopes caused by frost action in the Jura Mountains (Aims), France," *J.Geol.*, 57 (1949), pp. 137-142.

    Wahrhaftig, C.: "The frost moved rubble of Jumbo dome and their significance in the Pleistocene chronology of Alaska," *J.Geol.* 57 (1949), pp. 216-231.

    Stevenson, G.R. : "Solifluction phenomena in the Lower Hutt area," *New Zeal. J. Sci. Tech.*, B (1957), pp. 38, 279-296.

    See Demek, *op. cit.*

    See Palmer & Radley, *op. cit.*

    Waters, R. S. : "The Pleistocene legacy to the geomorphology of the Dartmoor," *Dartmoor Essays* (1964), pp. 73-96.

King, C.A.M. and Hirst R.A., *op. cit.*

El-Enin, H. S.A.; *An examination of the evolution of surface form in the area drained by the Sheaf Upper and Middle Don with particular reference to the Quaternary era*, unpub. Ph. D. Thesis, University of Sheffield (1964).

Dahl, E.: "Block field, weathering pits and tor like forms in the Narvick mountains, Nordland, Norway," *Geogr. Ann.*, 48, (1966), pp. 55-85.

13. See King, *op. cit.*
14. Rapp, A. and Rudurg, S.: Recent periglacial phenomena in Sweden," *Biui. Pergl.*, 8 (1960).
15. See Wahrhaftig, *op. cit.*, Palmer and Radley, *op. cit.* and Walter, *op. cit.*
16. Cunningham, F.: "Tor theories in light of South Pennine evidence," *East Mid. Geogr.*, 24 (1965) pp. 424-433.
17. See El-Enin, *op. cit.*
18. See Palmer and Radley, *op. cit.* and Waters, *op. cit.*
19. See Said, *op. cit.*
20. *Ibid.*
21. Wadwell, H.: "Volume, shape and roundness of quartz particles," *J.Geol.* 43 (1935), pp. 250-280.
22. See Said, *op. cit.*
23. *Ibid.*
24. Jessen, K. and Farrington, A.: "The bogs at Ballybetagh, near Dublin with remarks on Late-Glacial conditions in Ireland" *Pro. Roy. Ir. Acad.*, B. 44 (1938), pp. 205-260.

    Godwin, H : *The History of the British flora*, Cambridge (1956).
25. Conway, V.M.: "Ringinglow Bog—Sheffield," *J.Ecol*, 34 (1947), pp. 149-181.
26. Woodhead, T.W. and Erdtman, O.G.E. : "Remains in the peat of the Southern Pennines," *Naturalist Lond.*, 835 (1926), pp. 245-253.
27. See Conway, *op. cit.*

    Conway, V.M.: "Ringinglow Bog—Sheffield," *J.Ecol.*, 36 (1949), pp. 148-170.
28. *Ibid.*
29. See Woodhead and Erdtman, *op. cit.*
30. See Said, *op. cit.*
31. *Ibid.*
32. *Ibid.*

LAND REFORMS IN WEST PAKISTAN

JAMSHAID HUSSAIN

AGRICULTURE in West Pakistan faces the task of increasing total production to support its rapidly growing population as well as for exports to earn needed foreign exchange. It is estimated that agricultural output in the last decade has been expanding by about 5.8 percent per year, and this rate is a minimum required in order to meet the growing desires of a population expanding at a rate of 2.6 percent per year; plus per capita increases in income of 2.9 percent per year. In addition, the structure of population is becoming increasingly urban. Since the labour that moves to urban sectors must be fed, the labour remaining in agriculture has to produce more for the market. If it does not, serious problems including inflation will be encountered.

Up to the present, increases in output have come from the expansion of cultivated area rather than through increasing per acre production. As the remaining culturable land is marginal for cultivation, the policy makers have begun to realize that ways must be found to accelerate the productivity on existing agricultural land.

It is considered by some that the most rational method of achieving such a goal is through the adoption of modern technology which can increase per acre yield. But it is my purpose in part to show that in West Pakistan they are only necessary conditions. Sufficient conditions for improvement can only come from a change of attitude, and for this change new relationships to land are needed, relationships which are chiefly expressed by the systems of land tenure. With a defective land tenure system, the associated agricultural systems are also defective. The proposals for the Second Five Year Plan[1] claims that the defective land tenure system is one of the main causes of low agricultural productivity in Pakistan. The same argument has been expressed by the West Pakistan Land Reform Commission, stating that "various experts have given various reasons for the current stagnation in production, among which water logging and salinity, shortage of water, unfavourable weather conditions are the causes most often mentioned. All these factors have, at one time or another affected production adversely. We nevertheless believe that an important factor contributing to the present situation has also been the structural defects in the composition of the rural society."[2]

Dr. Jamshaid Hussain, is Research Officer, Department of Agricultural Economics, West Pakistan Agricultural University, Lyallpur.

Obstacles for agricultural development

Under tenancy conditions prevailing in the country, five major defects are of great concern which impede agricultural development :

1) Farmers have little or no incentives to increase production, especially under crop-sharing tenancies; the return from any extra effort the tenant makes he must share with the landlord;

2) Farmers have no suitable access to productive credit; usually they can get credit only at the will of the landlord and at very high interest rate ;

3) Managerial responsibility is divided between tenant and landlord, and the landlord is rarely development oriented;

4) The tenant's occupancy and livelihood is insecure as the landlord can dismiss him more or less at will and find another tenant instantly. This discourages the tenant to improve the land for better production. If he does, the landlord increases the rent;

5) The tenant's social status in the community is low as a result of his dependence upon his landlord. Landlords tend to oppose the development of co-operatives and tenants access to them because they reduce the landlord's and merchant's bargaining power in the market.

Major remedies

To overcome the obstacles mentioned above, there are in principle two major remedies :

1) Land expropriation, with or without compensation and redistribution of land to the tenants, at a purchase price payable over a period of years or free of charge.

2) Restriction on the landlord's exercise of his bargaining power by government control of rents, and protection of the tenant's occupancy rights, access to credit and free participation in community affairs.

One or the other, or both, constitute the core of contemporary government land reforms programme. Now let me give a short snap of the efforts made by the government during the last twenty-five years to solve the tenure problems through land reforms.

Land reform refers to changing the customary and formal legal rights, duties and privileges that govern transactions between people and regulate their control over resources. It deals with power relationships between individuals and groups.

LAND REFORM BEFORE 1959

Land reform measures which appeared in West Pakistan before 1959 were for two reasons basically different from the reform introduced in 1959. First, most of the regulations specified in those reforms were not put into practice, and second, all of them were introduced by the established political leaders—professional politicians consisting of landlords and lawyers. Even though most of the reforms did not have much practical meaning, some of the regulations are still valid legally. Therefore I will present a brief outline of these reforms.

Land Reform by the Muslim League

The first attempt at land reform was made by the Muslim League Government. The Muslim League Agrarian Committee was set up in 1949 for the purpose of recommending long-term and short-term measures for the betterment of agriculture in West Pakistan. As far as the long-term measure was concerned, the ceiling was set up at 150 acres in an irrigated area, 300 acres in semi-irrigated area, and 450 acres in rainfed area. As a short-term measure, the committee recommended the abolishment of occupancy tenancy, the abolition of *Jagir*, the security of tenure for tenants, the reduction of rent and the abolition of illegal exactions.

Several attempts at tenancy reforms were made by the former provincial governments of Sind, Punjab, and North-West Frontier province before they were integrated into a single province of West Pakistan in 1955. These so-called Tenancy Laws were enacted in 1950 and 1952 along the lines of the short-term proposals. The laws of Sind and the Punjab had some loopholes, and it is believed that they did not produce the desired results. The tenants were more fortunate in N.W.F. province where about two lakh became full owners. Nothing was done to help the tenants in Baluchistan, Bahawalpur and Khairpur.

LAND REFORMS OF 1959

In the mean time, the then Commander-in-Chief of the Army, became dissatisfied with the state of affairs in Pakistan. He thought that it was his duty to save his country from the selfishness and muddle of the politicians, so he abrogated the constitutions and proclaimed martial law. In order to accelerate rural progress he promised to introduce "radical" land reforms. A commission was appointed and "within a short period of less than three months", as the Chairman put it, "they completed their work."[3] The presidential cabinet accepted their recommendations within four days and the West Pakistan Land Reform Regulation (MLR 64) was issued in January, 1959. General Ayub Khan, undoubtedly considered these reforms as a gigantic revolutionary step. However, the members of the Commission, all of them seasoned bureaucrats do not at all pretend to be revolutionaries. They have

concisely outlined the problem as they saw it and proposed only moderate solutions. They admitted that large estates in West Pakistan, instead of promoting the development of agriculture were in fact obstructing it. The Commission also admitted that the tenant farmers and even more the agricultural labourers were in a miserable condition. Moreover the problems arising from the present land tenure system i.e, limited expansion of land, inequitable distribution of land, fragmentation of holdings, lack of initiative and enterprise and concentration of power into the hands of a few were also considered.

Approach to Solution

In order to remedy the defects mentioned above arising from the present land tenure arrangements, the commission felt it was a minimum requirement to adopt the following measures :

a) Ceiling on individual ownership, in order to break concentration of landed wealth, to narrow down inequalities of opportunities and to encourage a more intensive land-use and productive investment.

b) Acquisition of the land in excess of the ceiling for re-distribution to landless tenants and holders of uneconomic holdings on payment of a fair price, along with an active programme of resettlement of this class on newly reclaimed Government land and with a view to improving their social and economic status and enlisting their energies for greater production.

c) Conversion of occupancy tenancies into full ownership.

d) Abolition of *Jagirs* and elimination of other adventitious and intermediary interests, in order to simplify the tenure system and to relieve the present growing of interests in land.

e) Security of tenure to the tenants, fixation of fair rent, elimination of illegal exactions, compensation for improvements in case of premature disturbance, in order to provide the incentive for a fair return proportionate to effort.

f) Encouragement of the creation of a strong middle class and laying the foundation for owner-operated farms on holdings of economic size through consolidation of existing holdings, prevention of fragmentations by making holdings below a certain size impartiable and elimination of small inefficiently managed farms.

g) Expansion of co-operatives and strengthening of credit and marketing facilities with a view to increasing production.

h) Improvement of the conditions of employment of agricultural labourers.

ACTUAL RECOMMENDATIONS TO BE IMPLEMENTED

Ceiling on holdings

Ceiling on individual ownership was set at 500 acres of irrigated land and 1000 acres of unirrigated or land equivalent to 36,000 Produce Index Units.*

Exemption

The land under orchards up to 150 acres was allowed to be retained in addition to the ceiling as long as it was in a compact block of not less than ten acres and also was registered as an orchard in the revenue records at least since Rabi, 1956/57. The land owned by the recognized teaching Institutions and Universities for the purpose of research and demonstration, and the land possessed by the charitable and religious institutions, was exempted from resumption. The land under existing stud and livestock farms might be retained over and above the ceiling, if the Government thought it would be in the national interest. The area equivalent to 12,000 Produce Index Units (P.I.U.) was allowed to be retained by all or any of the heirs.

Choice of area

The first opportunity to select the land to be retained was given to the owner of such land. It was provided that he should have to select, as far as possible, a compact block of land not less than sixty-four acres in the Divisions of Khairpur and Hyderabad, and not less than fifty acres in other Divisions.

Compensation

Compensation for the resumed land was decided to be paid on a progressively diminishing scale using Produce Index Unit as shown below :

For the first 18,000 P.I.U.	Rs. 5/-	per unit.
For the next 24,000 P.I.U.	Rs. 4/-	"
For the next 26,000 P.I.U.	Rs. 3/-	"
For the next 72,000 P.I.U.	Rs. 2/-	"
For the balance P.I.U.	Rs. 1/-	"

Payment for the resumed land was to be made by the non-negotiable and non-transferable, but heritable bonds bearing taxable simple interest at the rate of three percent per annum and redeemable in twenty-five years.

Redistribution of the resumed land

The Commission recommended that the resumed land "should first be offered for sale, in block of not less than the size of a subsistence holding (i.e. sixteen acres in

*Produce Index Unit=Gross produce value/Total matured area ratio of the district.

the Khairpur and Hyderabad Divisions and twelve and a half acres in the rest of the country), and not more than of an economic holding. Any land left over might be sold to other deserving persons. The sale price was regulated and was not to exceed Rupees eight per P.I.U. in any case. Repayment should be made by installment over a sufficiently long period. The money realized by the sale of such land should be pooled and be used to pay compensation, interest, and administrative charges, etc.

Restraint on Partitioning

One of the unique measures which appeared in the land reform is the restraint on partitioning of holdings regulated as follows :

i) A joint holding comprising an area larger than an economic holding should not be allowed to be partitioned if as a result of the partition no part of the holding taken together with the area which the owner may possess already will remain equal to an economic holding or any of its part will fall below the size of the subsistence holding.

ii) An economic holding should not be allowed to be partitioned.

iii) A joint holding with an area less than an economic holding but greater than a subsistence holding shall not be allowed to be partitioned if thereby the size of the holding of each individual, taken together with the area he may possess already becomes less than subsistence holding.

iv) A joint holding with an area equal to the subsistence holding or less should not, in any case, be allowed to be partitioned.

v) The Commission not only recommended restraint on partitioning, but also restraint on the management of the joint holdings comprising an area equal to or more than an economic holding, and on the alienation of such holdings by scale, gift and mortage. In order to encourage farming on an economic scale of land, the Commission suggests that, in case of such joint holdings, a person should be selected to be a manager of the farm and the other members would receive their shares of income, or they may sell their shares to the manager to whom a Government loan would be available. If this procedure is not workable, the Commission may acquire the holding on payment of compensation. As regards the restruction on alienation, they ruled that no one who owns land equivalent to an economic holding or more should be allowed to alienate any portion of it which reduces the size below the limit of the economic holding, but he may alienate it as a whole.

Abolition of Jagir

Jagirs of what ever kind, were abolished. Any *jagir* lands in excess of the ceiling were resumed without any conpensation. By this reform, even *jagir* in favour of religious, charitable, or educational institution, and *jagir* created for the general public utility purposes, were abolished.

Security of Tenure

As for the security of tenure to the tenants, the Co mmission recommended the following:

1) No tenants should be ejected unless it is established in a revenue court that he has (*a*) failed to pay rent; or (*b*) used the land in manner which renders it unfit for the purpose for which he held it; or (*c*) failed to cultivate the land without sufficient reason; or (*d*) sublet his tenancy.

2) The right of ejectment on the plea of *Khudkasht* where it exists should be withdrawn.

3) A tenant should not be ejected from the house provided by the landlord so long as he continued to be a tenant of any part of the land under that landlord.

4) In case of ejectment the tenant should be entitled to get compensation for improvements or "disturbance".

As far as the rental arrangement is concerned, it was decided that the existing basis on which the produce of land and Government duties are apportioned between the landlord and the tenant under the law or custom prevailing in the locality, should continue. The landlord should be debarred from increasing the rent or the tenant's share of Government dues if any, unless he can establish that he is entitled to a higher rent, on account of change in the complexion of the tenancy due to the introduction of irrigation or change in the burden of taxation, etc. Similarly, the tenant should also have the right to obtain reduction in rent if warranted on account of change in the burden of taxation etc. The Commission also prohibited *Abwab* (cesses) in excess of rent and *Begar* (free labour) to be imposed in any shape on the tenants.

Utilization of Uncultivated Culturable Land

The Commission recommended a law to stimulate the landlord's initiative to develop their uncultivated culturable land. This was subsequently enacted as the West Pakistan Utilization Ordinance in 1960. Under the law, if the Controller (Officer of the Revenue Department) finds any culturable land left undeveloped for two years,

he is entitled to order the landlord to develop it within two years. If the landlord fails to do so, it is offered by the Government to another on a long-term lease.

Land Resumed and Distributed under 1959 Reforms

In the Handbook of Agricultural Statistics, published in June 1964 by the Planning Commission the following figures are given:

I.	*Area Resumed:*		
	1. Uncultivated		
	i) Culturable waste	6,99,438	acres
	ii) Forest	1,96,675	,,
	iii) Hills	1,31,170	,,
	iv) Rivers	1,00,080	,,
	v) Other areas	1,284,91	,,
	Total	12,55,854	acres
	2. Cultivated	9,39,450	acres
	Total	21,95,304	acres
II.	*Area sold to Tenants*:	6,51,411	acres
	No. of tenant purchasers	56,906	
	Area sold to small owners	25,708	acres
	No. of small owner purchasers	2,562	
	Area sold under auction	85,420	acres
III.	*Compensation Assessed* :	Rs. 791	lakhs
	Bonds issued upto 30-6-62	635	,,
	Bonds redeemed upto 30-6-62	122	,,
	Interest paid from 1-1-60 to 30-6-62	Rs. 60	,,

Taking into consideration the number of farm families with holding below the subsistence level (Table I) the distribution of 6,51,411 acres to 56,906 tenants cannot be applauded as a great achievement however difficult it might have been to dispossess

the powerful. The colossal proportion of the land ownership problem as well as the pressure on the land can be seen in the following three tables:[4]

TABLE 1—FARMS OF LESS THAN 12.5 ACRES IN WEST PAKISTAN, 1961.

Farm size	Farm numbers	Percent of the total	Farm area in acres	Percent of the total
Under 1.0 acre	7,42,000	15	3,34,000	3
1.0 to under 2.5	8,42,000	18	13,45,000	1
2.5 to under 5.0	6,06.000	16	29,11,000	6
5.0 to under 7.5	5,81,000	12	35,46,000	7
7.5 to under 12.5	7,59,000	16	73;57,000	15
Total :	37,44,000	77	1.54,93,000	32

SOURCE : *Pakistan Census of Agricuture* 1961.

TABLE 2—FARMS OF OVER 12.5 ACRES IN WEST PAKISTAN, 1961.

Farm size	Farm numbers	Percent of the total	Farm area in acres	Percent of the total
12.5 acres to under 25 acres	7,29,000	15	1,25,33,000	26
25 to under 50	2,86.000	6	9,94,68,000	19
50 to under 150	87,000	2	65,39,000	13
150 acres to above	14,000	less than 0.5	48,96,000	10
Total	11,16,000	23	3,34,36,000	68

SOURCE : *Pakistan Census of Agriculture* 1961.

TABLE 3—NUMBER AND AREA OF AVERAGE SIZE OF FARM HOLDINGS IN W. PAKISTAN BY TENURE, 1961.

Type of holding	Number	Percentage	Area in acres	Percentage	Average of the holding
Owner cultivator	15,63,000	41.6	1,51,40,000	40.9	9.7
Owner-cum-tenant	6,74,000	17.9	78,32,000	21.1	11.9
Tenants	15,20,000	40.5	14,06,500	38.0	9.3
Total	37,57,000	100.0	2,43,78,500	100.0	

SOURCE : *Pakistan Census of Agriculture* 1961.

Of the 37,57,000 holdings, 37,44,000 are below the subsistence level of 12.5 acres. Tenants operate 15,20,000 of these holdings, whose average total area is 9.3

acres of which only 7.6 acres is the cultivated area. These figures were completed in 1961. Five Years after the land reforms of 1959, only 56, 906 more tenants became owners and only 2,562 small owners received more land. We do not know how many landlords lost what proportion of their large estates. But evidently the reforms did not enlarge the number of present proprietors in any significant manner and only slightly improved the terms of tenure for tenants.

Land Reform of 1972

On the 1st of March, 1972, President Bhutto announced a new series of land reforms and rural development measures. These are embodied in Martial Law Regulation 115 of 1972. The ceiling is now lowered from 500 to 150 irrigated acres and from 1000 to 300 non-irrigated acres. Exemptions for stud farms, orchards, shikargahs, etc, are no longer allowed. The only exemption is an additional twenty percent of the ceiling for owners of tractors and tubewells. All gifts and transfers after 20th December, 1971 are declared void. But transfers upto the extent of the ceiling to each individual member, of a family made between lst March, 1967 and 20th December, 1971 are admissible. As the productivity of land varies from place to place, the criteria fixed for determining the ceiling is the produce index unit which could be as low as five per acre for waste land in Baluchistan and as high as 120 per acre for double cropped land in Lyallpur. The acreage of the ceiling, therefore, will differ widely. A drastic departure from the 1959 land reforms, is the resumption of excess land without compensation, and its distribution to tenants free of any cost. In the previous dispensation the land owners got an average of rupees 350 per acre and the tenant purchaser paid rupees 800 per acre. Obviously the tables have now been turned.

How much land would be resumed and distributed by 1972 Land Reform

It is very difficult to make an estimate as the correct figures would be available only after the returns have been filed by the large owners. The Pakistan Census of Agriculture of 1961 indicates that altogether there are 14,000 estates of over 150 acres comprising 48,96,000 acres (Table II). If the ceiling had been a flat 150 acres for each of these 14,000 owners the surplus land would have been 27,96,000 acres. But there are several variables. For unirrigated land the ceiling is 300 acres. Again in most places the P.I.U's may not be 100 per acre but much less. Thus where the P.I.U. rate is fifty per acre the ceiling would rise to 300 acres. Moreover, the permission of transfer to individual members of the family may also raise the ceiling for many of the 14,000 large estates to even 1,000 acres or more. After 1959, 9.39 lakhs of cultivated and 12.55 lakhs of uncultivated land were resumed. Let us hope, inspite of the above speculations, that much more land would be

available in 1972. Certainly the claimants by this time are more numerous, more expectant and more vociferous.

Other Principles of Martial Law Regulation 115

Martial Law Regulation 115 accepts the principles of the "economic holding" advocated by the 1959 Commission. It also encourages the establishment of an enterprising middle class among the farmers. It confirms the restrictions imposed in 1959 for the impartability of economic and subsistence holdings. Similarly it does not abolish tenancy but hopes for the ultimate promotion of occupancy tenants to owners, and tenants-at-will to occupancy tenants. The legal provision of security of tenure in the 1959 reforms are further confirmed and a lower rate rent and share is prescribed for the benefit of the tenant.

Now let us have a comparative study of the main features of the land reforms of 1959 and 1972.

Land Reforms 1959

1. Ceiling on ownership :

   i) 500 acres of irrigated land and 1000 acres of rainfed or an area equivalent to 36,000 Produce Index Units.

2. Additional allowances :

   i) An orchard not exceeding 150 acres provided it is in compact blocks of not less than 10 acres each.

   ii) Transfer of land by gifts to heirs up to an area equivalent to 18,000 P.I.U.

   iii) Land of value of 6,000 P.I.U. may be given to female dependents.

   iv) Owners of stud and livestock farms allowed to retain such additional areas as the Government may consider necessary.

Land Reforms 1972

1. Ceiling on ownership :

   i) 150 acres of irrigated land, 300 acres of rainfed land or an equivalent to 12,000 P.I.U.

2. Additional allowances :

   i) An exemption of additional 20% of the ceiling area for the owner of tractors and tubewells.

   ii) All other exemptions or concessions withdrawn except for exemption allowed to recognized educational institutions.

   iii) Historical shikargahs exempted but will be run by the state.

   iv) No transfer of affected area by way of gift to heirs or female dependents.

   v) Land over 100 acres acquired by Government servants during his tenure of Office or in the course of retirement shall be confiscated.

   vi) Title of all land acquired by exchange from the border area of the defence belt to save interior cancelled.

Land Reforms 1959	*Land Reforms 1972*
3. Compensation to old owners : *i*) For first 18,000 P.I.U. at Rs. 5/- per unit. For the next 24,000 P.I.U. at Rs. 4/- per unit. For the next 36,000 P.I.U. at Rs. 3/- per unit. For the next 72,000 P.I.U. at Rs. 2/- per unit. For the balance Rs. 1/- per unit. *ii*) Compensation was to be paid in fifty half-yearly equated installments in the form of transferable, but non-negotiable bonds bearing interest 4% per annum on the unpaid balance.	3. Compensation to old owners : *i*) No compensation to owners for surrendered land. *ii*) All resumed land will go to the tiller who will not pay a paisa for it.
4. Regulation of Landlord-tenant relations : *i*) Occupancy tenants were made owners of land. *ii*) No tenant should be ejected unless it is established in the revenue court that he has *a*) failed to pay rent, *b*) Mismanaged the land, *c*) sublet his tenancy and, *d*) failed to cultivate land.	4. State land : *i*) All state land reserved exclusively landless tenants or owners below subsistence holding. *ii*) Auction of state agricultural land banned—price of state land will be realized in easy installments.
5. Fixation of subsistence and economic holdings : *i*) 16 acres in Khairpur and Hyderabad divisions and 12½ acres in other irrigated divisions were declared as subsistence holdings. *ii*) 64 acres in Khairpur and Hyderabad divisions and 50 acres in other irrigated divisions were declared economic holdings. *iii*) Laws were enacted for the maintenance of economic and subsistence holdings.	5. Landlord-tenant relationships : *i*) Arbitrary and capricious ejectments, shall stop forthwith ejectments possible, only if tenants fail to pay landlord's share in farm produce or rent. *ii*) Liability for payment of water rates shall be shifted from tenant to owner of land. *iii*) Present practice of tenant meeting cost of seed shall cease.

Land Reforms 1959	*Land Reforms 1972*
6. Other provisions :	6. Miscellaneous provisions :
i) Abolition of Jagirs.	*i*) All land in pat feeder area in Baluchistan will be resumed without compensation and will be granted to poor farmers of the region.
ii) A sound programme for consolidation of scattered and fragmented holdings.	*ii*) Integrated programme of rural development emphasized.
iii) Credit facilities for tenant-owners.	*iii*) Need for developing rural co-operative reiterated.
iv) Abolition of intermediary interests.	*iv*) An allocation of Rs. 1000 crore for remaining period of Fourth Plan for Agriculture Development.
v) Measures with regard to apportionment of produce between the tenant and the landlord.	
vi) Prohibition of illegal exactions.	
vii) Provision of facilities to the new owners.	

ACHIEVEMENT OF LAND REFORMS OF 1959 UP TO 7-2-1968

Total area resumed	2,352,716	acres
I. *a*) Number of tenants to whom resumed land has been sold under the sales scheme	150,000	
b) Area sold to them	455,000	acres
II. *a*) Number of tenants to whom resumed land has been sold under the upgrading scheme	46,000	
b) Area sold to them	300,000	acres
III. *a*) Number of small land owners to whom resumed land has been sold under the upgrading scheme	4,000	
b) Area sold to them	100,000	acres
IV. Total amount of compensation payable to affected declarants	9,260	million
V. Annual savings from abolition of Jagirs	3.1	million
VI. Area consolidated from 1960-61 to 1968-69 or nearly 32% of the fragmented area	12,546,000	acres

PROBABLE EFFECTS OF 1972 LAND REFORMS

1) The land reforms recently announced may lead to some structural changes in the production pattern of our agricultural sector. The total land to be resumed for distribution among various categories of tenants is estimated to be 5.5 million acres and nearly four lakh tenants are likely to become small land owners.

2) Likely increases in the income of farmers of lower income group and reduction in that of higher income group.

3) Landlord-tenant relations may be worsened further because the liability for payment of water rate and providing seed is now that of the owner. Such a situation may create unhealthy atmosphere not conducive to the growth of agriculture.

4) Investment in agriculture is likely to slow down affecting adversely the capital formation in agriculture due to the creation of uncertainty and painful adjustment to the new economic environments.

5) May create more employment opportunities and reduction in the seasonal unemployment dependent mostly on the launching of vigorous rural works programme and increase in the intensity of cropping on smaller farms.

Approach to Research

There is a theoretical concept that one of the reasons of low agricultural productivity in Pakistan is due to the defective land tenure system. It is argued that as forty-two percent of the total area is cultivated by the tenants, another seventeen percent by owner tenants as against forty-one percent by the peasant proprietors, the total production does not increase to the desired extent despite the existence of modern techniques and concerted efforts of the State by way of providing sources of irrigation to new lands and scientific inputs of sufficient magnitude.

It is believed that a piece of land will yield less if it is cultivated under any other type of tenure as compared to an owner operator and that the difference in productivity is attributed to the insecurity of occupancy. It is thought that a tenant generally does not exploit the land resources using adequate amount of factors of production nor does he care to make improvements of permanent or semi-permanent nature in the land under his plough.

The policy makers of the country are greatly handicaped in decision making to evolve correct measures, due to lack of reliable data and subsequent analysis, to be able to formulate the best alternative procedures to correct the existing situation. To overcome the situation Land reforms have been suggested in various regimes which are based mostly upon common knowledge and approximations.

Objectives of the study

Land Reforms are a recent development in Pakistan and there is not much literature available which may be reviewed. To study the reality of the above mentioned statements i. e. how far land tenure is responsible for low agricultural productivity, a survey was carried out by the author consisting of eighty farms of

different tenure classes (e. g., owner operator, cash-rent, and batai farms) in Sargodha District in the year 1967-68. The study mainly aims at comparing the tenants and the owner operator farms of equal size (e. g. half a square) with respect to their costs and returns. The comparisons are given below :

(*i*) Comparison of labour and capital input.

(*ii*) Comparison of cropping patterns, cropping intensities and yields per acre of important crops.

(*iii*) Comparison of gross returns and net returns per farm and per acre.

The field work was conducted personally by the author to obtain reliable data and for this interview method was used. A detailed well planned questionnaire was drawn up with the objective to investigate and ascertain the main features of the agricultural situation which prevail in the area. The second objective was to analyze and describe the effect of land tenure on the productivity of land. A study of this kind cannot possibly measure the total results of the land tenure but roughly estimate the economic relations of investment made by the cultivators. Although this study is an old one as it relates to the year 1967-68, when very little inputs (i. e. fertilizers and improved seeds) were used, but it is hoped that the results of such a study at present will give more significant difference in productivity on various farms due to the modernization of agriculture.

Computation of inputs and outputs

Cost accounting method was applied to calculate the inputs which included the labour employed on the farm and the capital invested in it. With regard to labour, all farm workers whether engaged permanently or casually were taken into account. The capital invested was in the form of cost of maintenance of farm animals, interest and depreciation of farm implements alongwith their maintenance charges, cost of seed, fertilizer, water rates and taxes.

All farm products raised were valued at harvest prices. The gross income was arrived at by multiplying the total quantity of produce with the harvest prices of different commodities. This was further worked out by dividing the gross income by the total number of acres to get per acre income. The gross income was further reduced to net income per acre by deducting the expenditure incurred on the farm.

Input

Labour input per acre. Average labour input per acre was Rs. 116.24 on the farms of owner operator and Rs. 109.44 and Rs. 107 in the case of cash tenants and *batai* tenants respectively. It is clear that the farms of the owner operators were more labour intensive as compared with those of their counterparts. This may be on account of putting more family members on their farms.

Capital input per acre. Average capital input per acre was Rs. 160, 156 and Rs. 150 on the farms of owner operators, cash rent tenants and *batai* tenants respectively. The figures showed that the difference in capital investment in farming by the owner operators and cash rent tenants was not so significant as in the case of *batai* tenants. It is due to the fact that the owner operator and cash rent tenant have full managerial control over the land and are the sole recipient of the farm profit. Moreover uncertainty does not enter the entrepreneur relations of the owner operator. While in the case of *batai* tenant, short duration impose insecurity and impair his incentive for capital investment in farming. Moreover another principle underlying the absence of incentives is that when a tenant has to give his landlord half of the return to each dose of capital and labour that he applies to the land, it will not be in his interest to apply any dose, the total return from which is less than twice enough to reward him.

Total input per acre. It was calculated that the average total input per acre was Rs. 276.24 on the owner farms as compared to Rs. 265.44 and Rs. 257 on the cash rent and *batai* farms respectively. The high cost of inputs on the owner farms was also due to the large quantity of fertilizer used.

Output

Cropping pattern. The acreage under different crops grown on the three categories of tenures showed that sugarcane and cotton were the main cash crops in the area, occupied on the average 1.90 acres and 2.10 acres on the owner farms. On the cash rented and *batai* farms sugarcane was grown on the average on 1.85 acres and 1.70 acres while the average under cotton was calculated as 1.92 acres and 1.28 acres respectively.

The average acreage under sugarcane and cotton was lower on the *batai* farms as compared to owner operators cash rented farms. In comparing the owner and cash rented farms, the difference was not so high as in case of *batai* farms. Wheat is the staple food crop of the area and occupied the major portion of the area on all classes of tenure. Our findings showed that there was a slight decrease in the acreage under this crop on the cash rented farms followed by *batai* farms when compared to the owner operated farms.

Cropping intensity. Cropping intensity which refers to the number of crops raised during a year on a particular piece of land is one of the major factors responsible for income variation. The findings revealed that higher intensive land use was on the owner farms which was due to greater incentive and better farm planning. The average cropped area worked at 12.05, 11.45 and 10.38 acres on the three categories of farm respectively. When compared to the owner operated farms, it was lower by 13.86 percent on the farms cultivated by *batai* tenants.

Gross income. The average gross income per farm and per acre calculated at Rs. 4,684.20, Rs. 4,311.53 and Rs. 4,110 respectively. It averaged Rs. 370.47, Rs. 340.48 and Rs. 320.88 per acre on the three classes of farm operators in order. As such, the gross income per farm on the farms cultivated by *batai* tenants was lower by 12.28 percent when compared to the gross income on the owner operated farms.

Net income. In order to compare the economic efficiency of the three categories of farms, the net income was arrived at by deducting the total costs of operating the farms from the respective gross income during the year. The net income figures per farm averaged Rs. 1,169.51, Rs. 992 and Rs. 911 on the three classes of farms. On per acre basis the net income arrived at Rs. 93.52, Rs. 79.36 and Rs. 72.88 on the owner operated, cash rented and *batai* farms respectively.

It is evident that the owner operators and cash rent tenants had been successful in raising their net returns per acre as compared to *batai* tenants due to more incentive, better farm planning, use of good quality seed of improved varieties, intensive use of manures and fertilizers and also due to the availability of capital.

The findings of the study support the contention that *batai* system in this country should be condemned in the larger interest of output per unit of area. Relatively, low returns to *batai* tenants may be attributed to the lesser incentive for additional efforts when compared to the owner operators and cash rent tenants. This is due to the defective system of land tenure which has a corresponding effect on farm productivity and requires readjustment and rationalization.

References.

1. *Second Five Year Plan, Government of Pakistan, 1960*, p. 184.
2. *Report of the Land Reforms Commission for West Pakistan, 1959*, pp. 19, 22-23, 48, 67, viii.
3. *Ibid.*
4. *Census of Agriculture*, 1961.

LAHORE: PHYSICAL SETUP

M. MUSHTAQ

LAHORE is a typical inland city of Pakistan. It stands on the left bank of the Ravi river at about one mile from the river and occupies a very vantage position in the Punjab in West Pakistan. The sea is 765 miles away while the mountain ranges of the Himalayan system are about 150 miles to the north and north-east. Lahore serves as a communication and administrative centre of West Pakistan. Almost all the important cities of this region of West Pakistan are at a moderate distance from Lahore. These cities are important agricultural and manufacturing centres of the country and are well provided with roads and railways. (Figs. 1 & 2).

Two principal considerations in the foundation of the ancient city of Lahore on its present site were commerce and strategy. The most important Asian highways converged on to this place. These routes had been followed, wave after wave, by the people beyond the north-western borders of the subcontinent since time immemorial. At almost all the places where the transcontinental routes intersected each other and traversed the rivers, ancient settlements had sprung up. These places served as commercial centres and developed facilities for the exchange of goods. Generally, trade was carried on in cattle and grains, which were sold or exchanged for industrial products. Such points in the north-western part of the subcontinent were Jhelum, Lahore, and Thaneswar on the Grand Trunk Road. At these places the route respectively crossed the Jhelum, Ravi and Saraswati (Sutlej) rivers. Farther south smaller routes crossed the Indus river at Dera Ismail Khan, Dera Ghazi Khan and Chenab river at Shorkot and Multan. Again a route from the north crossed the Ravi where it joined the Multan-Lahore route and the route from Sirsa through Saraswati to Thaneswar. A less important route, through the Kurram valley, crossed the Indus river at Kafirkot, extended to Lahore, crossing the Chenab river at Chiniot. Tibet was also connected with Lahore by a route that lay through the valley of Kashmir. Through Lahore these routes continued to Delhi (Fig. 3). Apart from nodality, Lahore enjoyed the advantage of having firm ground near the river which offered a well defined crossing as well as the feasibility of the construction of buildings near the river.

Dr. Mushtaq is Lecturer in the Department of Geography, University of the Punjab, Lahore.

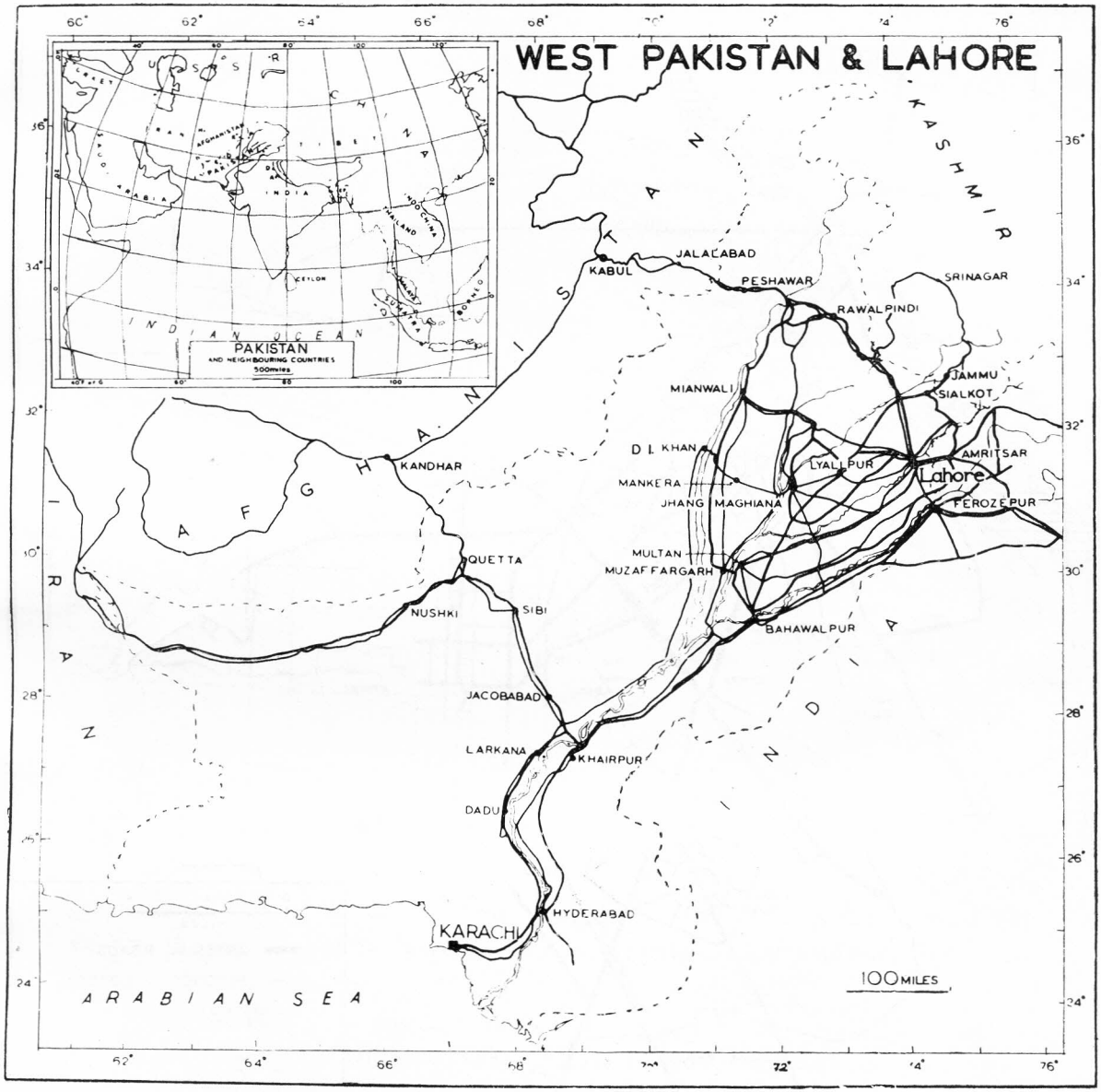

FIGURE 1

These routes served as highways for invaders from Central Asia and Persia who often decided the fate of the subcontinent. The city of Lahore played a very decisive role in all such adventures. Hence defence was also an important factor in the selection of its site. Defence against the possible advance of enemies from the north-west, was provided by the river. Another consideration, perhaps equally important, was the availability of suitable water supply within the confines of the

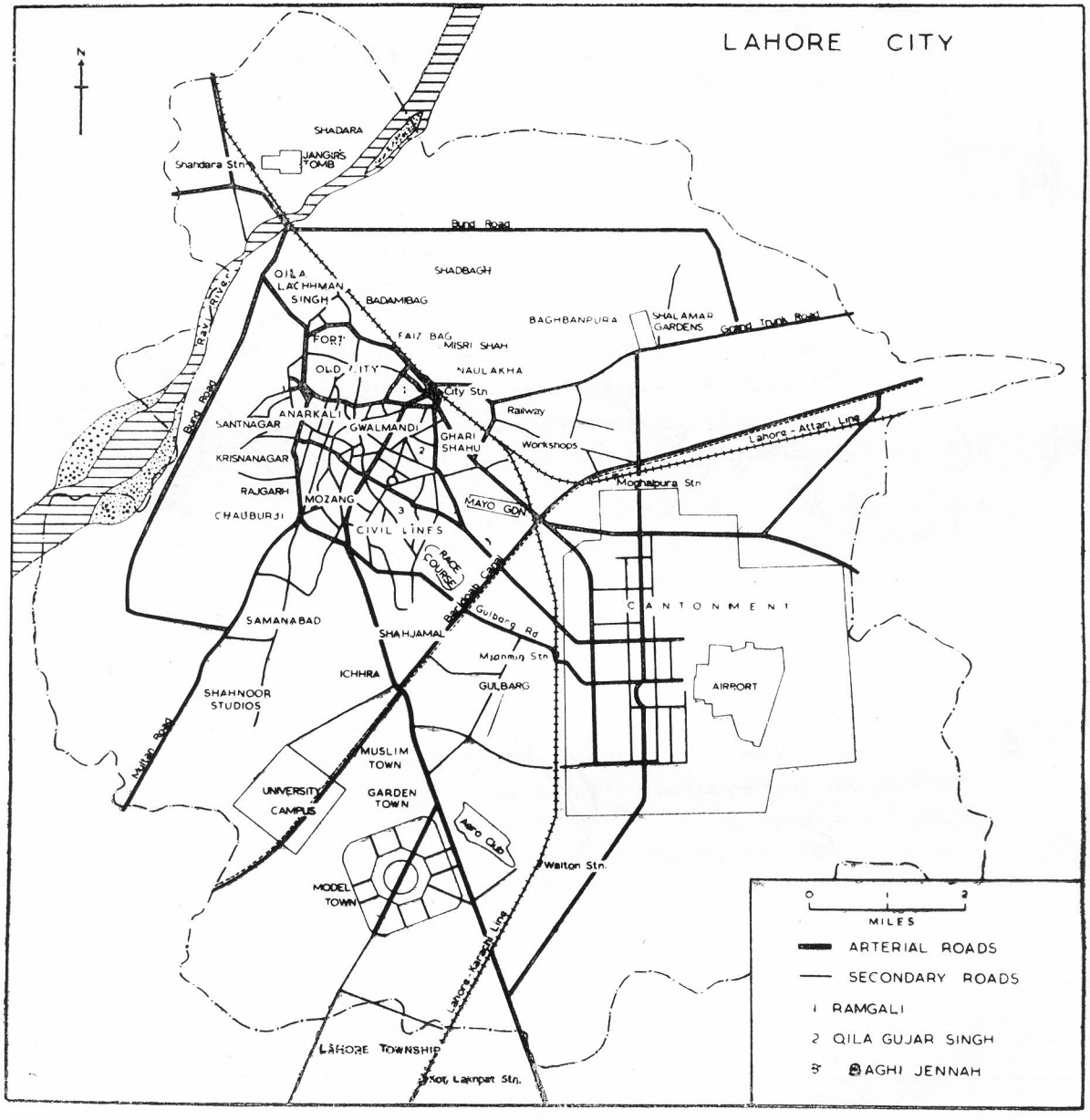

FIGURE 2

site. The combined effect of these factors gave a commanding position to the city, due to which it emerged as an important administrative as well as a strategic centre.

The strategic importance of the city was first emphasized by Sher Shah in 1530 A.D. He regretted on his deathbed that he had not razed the city to the

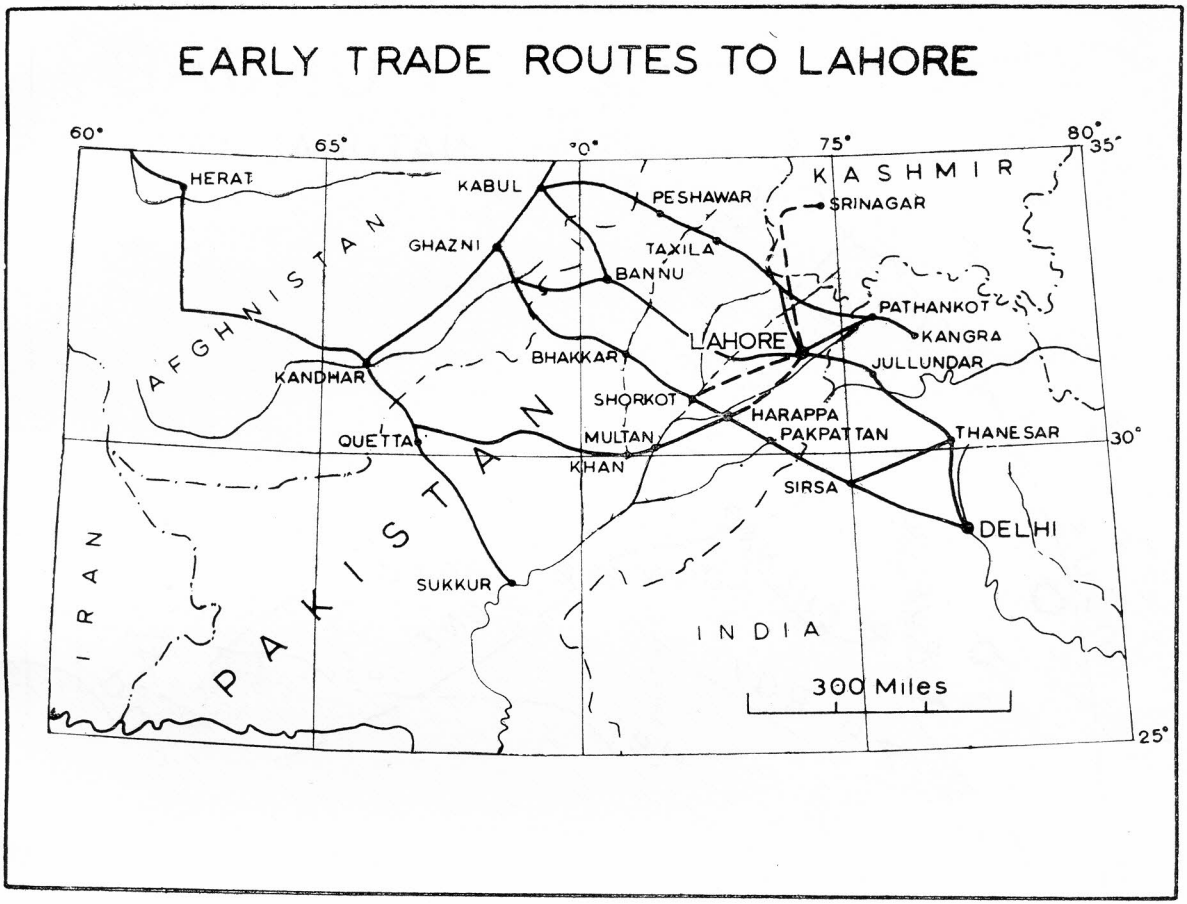

FIGURE 3

ground at the time of his retreat. "For," he said, "such a large city should not exist on the very road of an invader, who, immediately after capturing it on his arrival could collect his supplies and organize his resources there".[1]

In addition to the favourable site, the city enjoys the advantages of location between two different geographical zones. It is situated in a fertile alluvial plain, having a transitional position between the dry south and south-west, almost a desert, and adequately wet north and north-east (Fig. 4). The wet region comprises the fertile submontane which recieves rainfall in summer as well as in the winter seasons. The agriculture in this region has been important, enriching the "hinterland" of the city, and has enabled the city to play an important role in the history of the subcontinent. The fertile alluvial soil has been made productive on account of the availability of sub-surface irrigation water. The water table is fairly high, and water can easily be lifted to the surface by employing animal power.

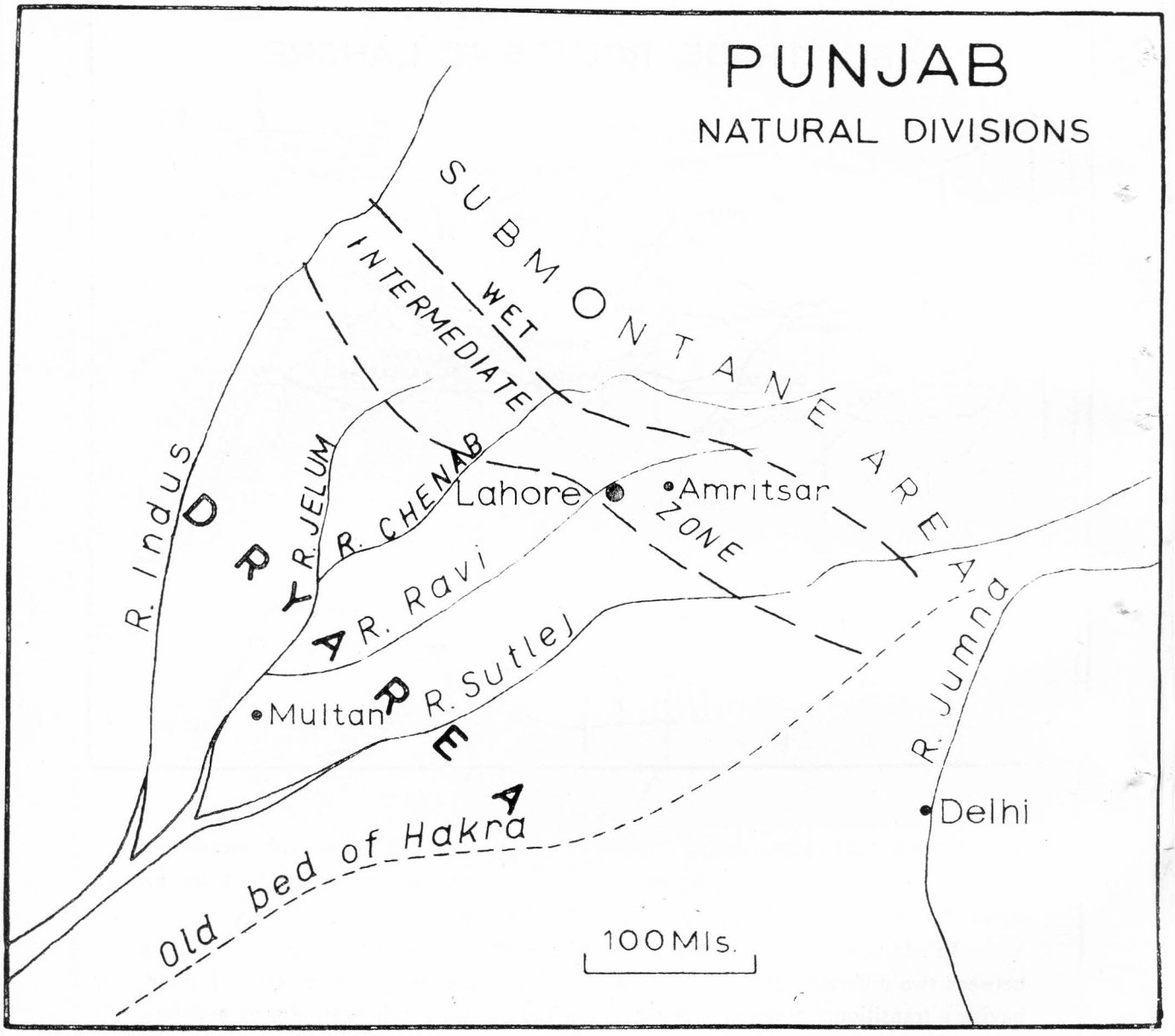

FIGURE 4

Site

Figure 5 shows the physiography of the site of the city. The Ravi river encircles the city on three sides. The land to the north, west and north-east drops to the shallow flat-bottomed valley where the river is extensively engaged in lateral erosion. Along the left bank of the river runs a bluff of higher land which is a very important feature. It is like a step and is locally known as *dhaia*, immediately after which the

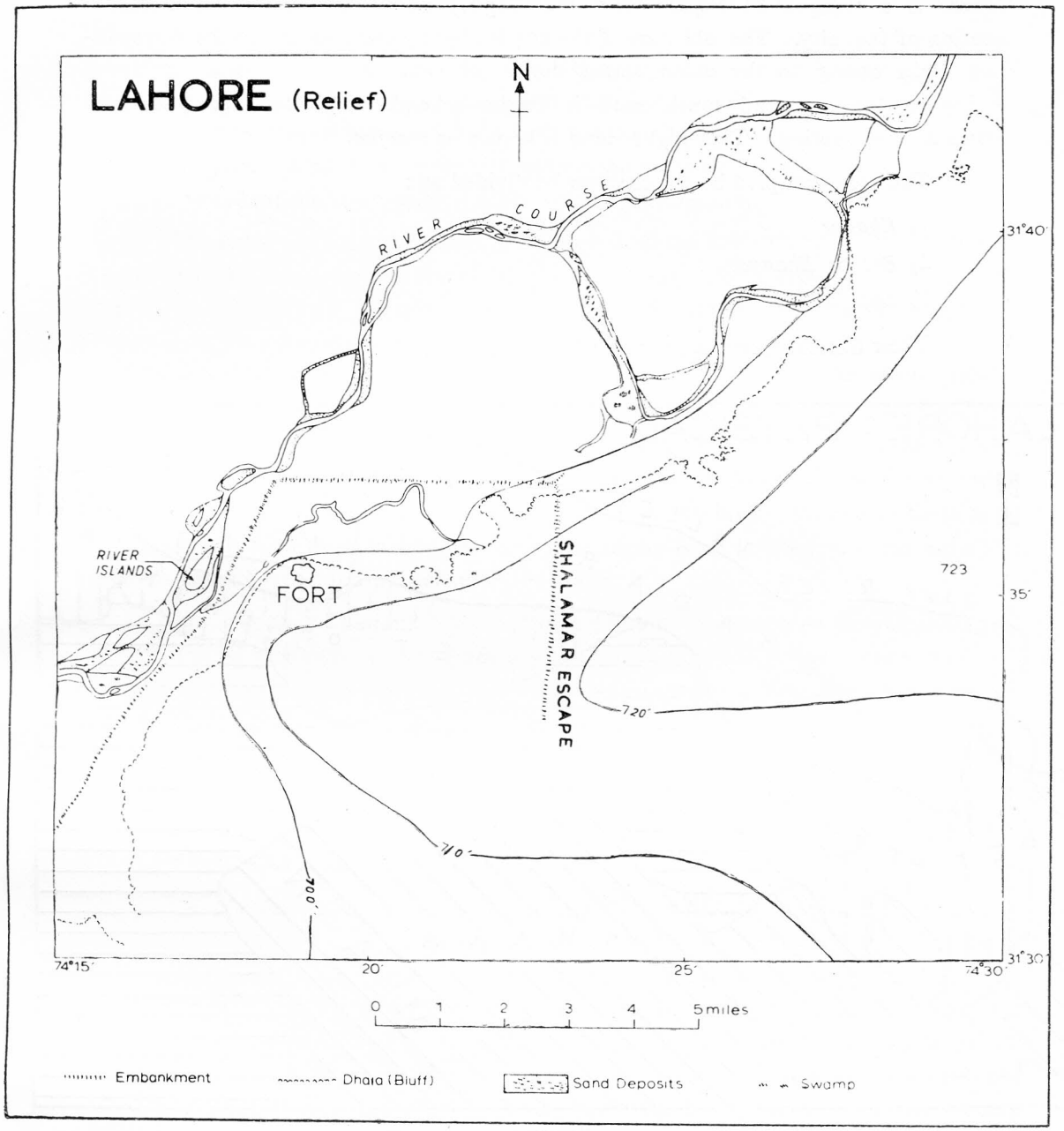

FIGURE 5

river valley starts. Hence it is a boundary between the flood plain and the higher land. A chain of settlements, including the city of Lahore, is found along the *dhaia*. The height of the city is 707 feet above sea-level, and that of the river is 697 feet. The higher land is fairly level and rises gradually towards the south and east.

There is a 'tongue' of higher land extending from the east through the northern section of the city. The old part of the city is slightly elevated above the surrounding plain owing to the accumulated debris of centuries. The land continues rising to the east and south until it attains a height of 723 feet above sea level in its eastern section. This higher land is known as *manjha*.

The area occupied by the city can be divided as :

1) *Khadar*
2) *Bet* or *Bhangar*
3) *Manjha*

Their distributution is shown in Figure 6.

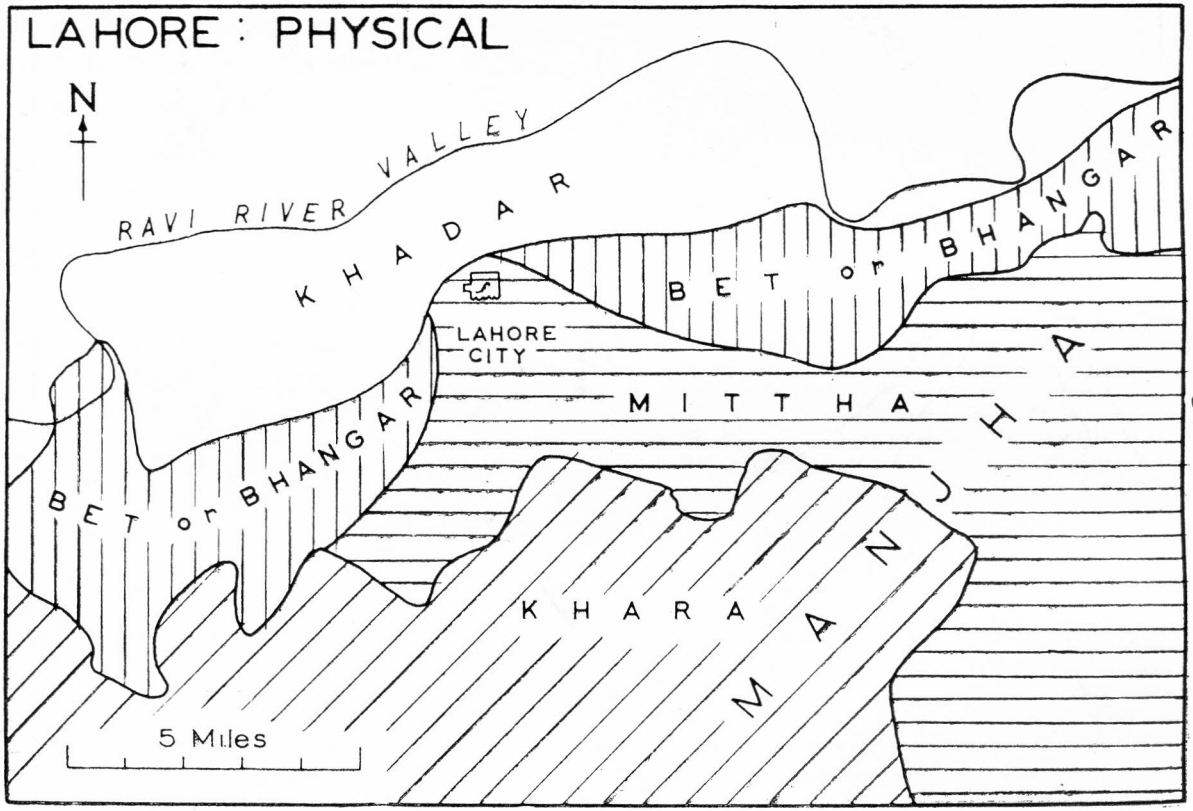

FIGURE 6

1) *Khadar* : The low-land occupying a broad tract of land immediately after *dhai* is called *khadar*. It is formed of newly deposited material and approaches the active river course. It is submerged during the period of high water in summer when the river is replenished by the rains and melting snow in the Himalayas. Large

amounts of silt are deposited during this period which add to the fertility of the soil. Sometimes, during the high-floods, the river spreads large tracts of sand, which make the land useless for cultivation. In winter the river water recedes and is confined to a winding course. It is in this season that *khadar* is available for cultivation and the valuable wheat crop is sown and harvested, before the river starts encroaching again. This land does not need any irrigation during the dry winter season, because the soil retains abundant moisture, sufficient for the crop to mature.

2) *Bet or Bhangar : Khadar* is separated from the *Bhangar* by an abrupt bank or bluff from four feet to twenty feet in height. This bank has entirely disappeared in parts near Lahore under the intensive process of cultivation which has been going on since times immemorial. It can elsewhere easily be noticed due to the presence of various settlements along it. *Bhangar* differs from the *khadar* mainly due to the fact that it is an older deposited material. Floods do not encroach upon this land until the water level is exceptionally high. The soil is fertile and very suitable for agriculture. The much needed water for irrigation is supplied by wells which can easily be dug as the water-table is reasonably high. Whenever there is an exceptionally high flood in summer the whole region is inundated and an extensive destruction of crops and properties is the result.

3) *Manjha :* The land beyond *Bhangar* attains its maximum height and again starts sloping gradually to the river valley on the other side. The central region is called *Manjha* or Bar (a doab). It is still older deposited alluvium than *Bhangar*. It is a fairly level 'crest' of land and does not offer any special physical characteristics. It is 723 feet above the sea level in the east and slopes down gradually to 690 feet to the west. It can easily be divided into two parts :

a) Manjha Mitha
b) Manjha Khara

a) Manjha mitha : occupies the greater part of the city area with the exception of the north-eastern and north-western flanks which are *Bhangar* areas. *Manjha mitha* has sweet underground water due to which it is known as *manjha mitha*. The soil is a mixture of clay and fine sand along with a mixture of *kankar* (limestone gravels). The *kankar* is useful for roads as paving material and for the manufacture of lime. The clay has served the city as the most important raw material for the bricks which are needed for the city's buildings. The soil is fertile and the eastern section is important for its vegetables. It is in fact due to this sweet water that there is no problem of water supply in the city. There are numerous open shallow wells and hand-pumps in the outer areas.

b) Manjha khara : covers the city area to the south, mainly the localities to the east, west and south of the cantonement. The underground water is saline due to

which the region is called *manjha khara*. The soil contains considerable amount of nitric salts and, therefore, the ground water is neither suitable for drinking nor for irrigation. The rainfall being scanty, cultivation totally depends upon the supply of water from canals. Until water was brought by canal, there was little natural growth of any sort and cultivation was totally absent. It was a sparsely populated tract without the means of obtaining good drinking water for man or beast. The land was a desolate waste full of *kallar* (alkaline soil). Later, canal irrigation gave a new life to the region and now it has become a most important market gardening region of Lahore. Vegetables of all kinds are grown throughout the year and supplied to the city. At the same time fodder crops, for the cattle in the city, are also grown. This region also provides fresh milk for the city's population.

Drainage

The relief of the city area shows a low upland running from east to west, not much higher than the surrounding lowlands (see Fig. 5). The three sides of the doab are drained into the river valley through the lowland areas. There are several drains leading the city's water out to the river. The main drainage lines run to the north, north-east and west. The bed of the old Ravi river serves as a natural outlet, and most of the city's drains to the north, north-east and north-west conduct their water to the old Ravi. Drainage to the south, south-west and south-east, outside the old city, is not adequate, because here the drains are connected by long channels to the river. Due to a small gradient, they produce difficulties like stagnation and bad smell and the channels are always insufficient whenever there is storm water to be drained away. This also involves a large amount of labour in order to keep them working.

The Ravi River

In comparison with other rivers of West Pakistan the valley of the river Ravi is a little less broad and the banks are generally higher and firmer. There are also comparatively fewer channels and intervening islands of sand. However, the course of the river has numerous meanders which have reduced its usefulness for water transport. The main characteristics of the river course can be noted in Figures 7 and 8. The river has always been active in shifting its course from one place to another. Every year after the rainy season, when the river water retreats after high floods, there are marked changes in its bed. Several previous loops are deserted and new ones added. It passes in a semi-circle to the north of Lahore making a circuitous bend from the east.

The amount of water in the river is subjected to vast seasonal and monthly changes. Generally speaking the volume of water is small in the winter and early

summer months. It increases gradually with the approach of summer when snow in the mountains starts melting. As a matter of fact this river has a very small catchment area, 3000 square miles, in the Siwaliks, and that too lies outside the snow zone of the Himalayas. Therefore this river, unlike other big rivers like the Chenab and Jhelum, does not receive large quantities of melt water. The supply of water increases when the rains set in during the monsoon season. The approach of monsoons, early July to mid September, give rise to a great change in its volume. The high water season lasts until October. After the peak volume is reached, the fall commences which is also as steep as is the rise. In winter the river becomes almost dry, with a small stream struggling in the sandy bed which is due to subterranean seepage. This condition is caused by the Upper Bari Doab canal which runs at full capacity during the whole winter season.

In the monsoon season the river sometimes receives exceptionally large amounts of water which cause devastating floods. It ravages the surrounding areas and renders large tracts useless for cultivation by leaving behind loose sand deposits. The city of Lahore, being situated on the bank, only a few feet above the river level, is, therefore, subjected to severe floods. The most affected parts are the low lying localities on the east, north and north-west of the old part of the city as shown in Figure 5. The rest of the city escapes even the highest floods.

An example of the impact of these floods on the city is given by those experienced in 1950 and 1955. The flood of 5th September, 1950 was the worst in the flood history of the city. "The river level rose six feet in twenty four hours, which was three feet higher than the highest ever recorded near the city."[2] It attained a total height of 15.2 feet at the bridge gauge. It caused seven breaches in the Mahmud Buti bund, which runs along the left bank of the river and inundated all the low-lying localities to the east of the railway line. The railway track between city and Shahdara railway stations was submerged under water and railway traffic with the north was cut off. On the other side also low-lying localities were flooded by water several feet in depth.

The Shalamar escape, generally considered vital for the safety of the city, was breached at six places and allowed the flood waters to rush straight towards the city. The railway track offered a check in the free flow of water and thus filled the whole area like a lake formed by a dam. The under bridges for traffic provided outlets and thus added to the ferocious speed of the water.

This flood had hardly receded when another followed only after fourteen days. It proved worse than its predecessor both in intensity and extent. It attained a height of 15.6 feet and completely filled the suburbs of the city. Consequently all the ser-

vices in the city came to a standstill. It bred several kinds of diseases and great loss was caused to the property and crops in the suburbs.

A similar flood was again experienced on 6th October, 1955, which was totally unexpected in this month. This time also water had overridden the protective embankments and had filled the city suburbs in two hours only.

The factor responsible for the floods on such a large scale is the tortuous course of the river. There is a big bend on the back of Shalamar gardens which is a great obstacle in the free passage of the river water. The water, after striking against it, over-rides the *dhaia* and follows the old river bed. A similar bend exists on the western side of the city where water is forced to take a sharp turn to the north-west. These meanders, naturally, are responsible for the accentuation of flood intensity.

The shifting nature of the river bed and flood ravages had been forcing the authorities to take remedial measures from time to time. At one time the river flowed by the city walls. Its encroachment had caused an alarm in 1662. Emperor Aurangzeb had constructed a massive embankment of bricks and mortar along the river bank for a dis tance of four miles which saved the city from destruction. Portions of this huge work could recently be seen to the north-east of the fort and village of Bogiewal. The river soon after abandoned its old course. Later, during the British period, a strong embankment of stones and earth was constructed. The object of its construction was to assure safety of the railway line by the company which owned the railway line. A complete security from floods was provided after 1955 by the Government by constructing earthen embankments, all along the river bank. Now the city is encircled by a strong embankment, sixteen feet to seventeen feet high, with metalled roads on top serving the outgoing and incoming traffic of the city.

Climate

Occupying roughly a central place within the vast plains and thus being little affected by the moderating infiuence of the distant sea, and lying within the warm temperate region, Lahore enjoys a delightful winter with occasional cyclonic rains. The summer season is extremely hot with a short rainy season. Broadly speaking the climate is endowed with transitional characteristics by being situated within the dry south and south-western plain, almost a desert, and the moist submontane region on the north and north-west. From November to the middle of March the weather is quite comfortable having mean temperature conditions more or less similar to those of the English summer. At the end of March the temperature begins to rise rapidly and by the end of June the city becomes one of the hottest stations of the Indo-Pakistan subcontinent. The atmosphere remains almost dry for a long period, and about the end of June the monsoon bursts

resulting in a change in the weather. The temperature falls a few degrees within a few days and remains more or less steady till October, after which a sharp fall follows in November. Owing to a comparatively high humidity, coupled with high temperature from July to October, the weather of Lahore sometimes becomes uncomfortable. October is the most unhealthy month of the year. The rainfall stops and high humidity and heat causes the rapid decay of vegetation. The results are fever, dysentry, cholera, malaria and other epidemics which give an uncomfortable time. In November and December the air is clean, and one can hardly imagine a more charming climate. In February there is a short spring which is soon followed by a hot and dusty summer in early April.

The change in temperature during the period of a year can well be understood from the temperature graph (Fig. 7*a*). January is the coldest month with an average mean temperature of 54°F. Then there is a gradual rise in temperature until the month of June, which is the hottest month with an average daily mean temperature of 92.5°F. After this a gradual fall commences until it reaches its minimum in January.

But the temperature conditions of Lahore are so variable that the average mean montly figures do not give the true picture of the whole situation. The mean daily maximum and minimum temperatures of individual months of the year would give a better idea of the temperature conditions. The daily temperature varies from 68°F in January to above 100°F in June while night temperatures fluctuate

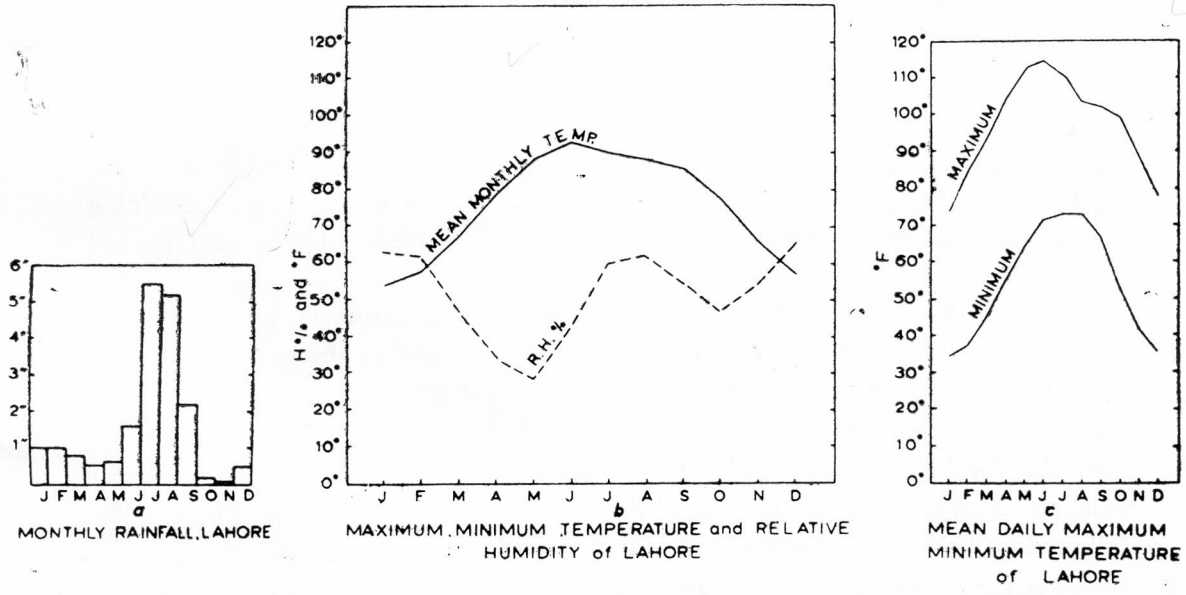

FIGURE 7

from 40°F in winter to 80°F in summer. It will be interesting to note the absolute temperature figures to get a true idea of extremes of climate. Both maximum and minimum temperatures are surprisingly variable. Temperatures above 100°F are found for six months of the year and even in cold winters the mid-day sun is strong enough to cause sunstroke. It shows the true continental characteristics of the climate of Lahore. Like all the land-locked cities the days are hot throughout the year, whereas it is the nights which give an idea of winter. In summer the nights are warmer, rather hotter, than the days in winter.

Rainfall : In the case of its rainfall also Lahore lies in a transitional zone. On the south and south-west it is very scanty and on the north and north-east is abundant and well distributed. Near the foothills it is thirty-five inches a year and decreases to less than twenty inches in the region in which in the foothills city of Lahore is situated. This abrupt decrease is due to the fact that the increase of distance from mountains results it minimising the effect of topographic influence on the rainfall. This effect is very notable both for summer and winter rainfall. The city is well noted for its unreliable total and uneven distribution of rainfall during the year.

Lahore receives an average of 19.2 inches of annual rainfall, nearly seventy-seven percent of which falls during the months of July, August and September. This period is the rainiest period of the city. The remainder of the rainfall normally falls towards the end of June, the beginning of October and in the months of January and February. The remaining part of the year remains more or less dry. Rainfall is seasonal and unevenly distributed (Fig. 7*b*).

Summer Rainfall is due to the summer monsoons. They normally approach the city in the third week of June, but rains generally start at the end of June or the first week of July, and continue until the end of September with occasional breaks. The monsoons are variable in intensity. July and August are the rainiest months followed by September when monsoons lose their intensity and rainfall decreases.

Winter Rainfall in Lahore is attributed to the Mediterranean cyclones which travel towards this region, in winter, though these depressions become fairly weak while crossing the north-western mountains, but still give enough rainfall which is most needed at this time of the year. Though Lahore receives much less rainfall than the foothill stations in the north-west, but still this small amount brings a welcome change in the dry cold weather of the city, January is the wettest month followed by February, December and March.

Rainfall Characteristics : The rainfall in Lahore has extremely variable characteristics. Its total differs from year to year. It appears as if departure from

the normal is the rule and not an exception as is clear from Figure 10. In one year there may be very high rainfall and next year it may fall to a very low level or may not fall at all. This annual variation for the normal rainfall had always been the cause of disastrous consequences. The years of low rainfall were the years of famines and those of heavy rainfall were accompanied by floods, epidemics and vast losses of property and life.

The variable nature of rainfall becomes very notable if it is studied on the basis of each month. The average rainfall for June is 1.6 inches but as much as seven inches of rainfall is not uncommon for some years and in others there may not be any rainfall at all or it is unable to be recorded. July, the rainiest month for the city, with an average rainfall of 5.5 inches may get more than sixteen inches for one year and may not get any for the next one. Similar is the case of winter months which also show abnormal variations.

The rainfall is also noted for its torrential nature. On several occasions more than eight inches of rainfall have been recorded within twenty-four hours. This torrential nature of rainfall gives the idea of Savannah type of climate, though the city lies far away outside the tropics.

Other Climate Phenomena : The city of Lahore does not experience abrupt changes in weather. The weather is noted for its relatively calm conditions throughout the year. Wind direction is from the north-west during the winter months, but in summer, monsoons bring a change in the direction and it comes from the east for at least three months. In winter wind is never stronger than a light breeze but in summer it becomes regular and steady though never too strong.

There are two calm periods, one in the beginning and the other at the end of the summer season. They are noted for their occasional duststorms locally known as *Andhi*. They mostly come from the north-west and sometimes may have a velocity of more than forty miles an hour. These storms are followed by cool and refreshing weather. The storms bring enormous quantities of dust along with them which reduce visibility to a minimum. They are mostly concentrated in the months of May and June.

The other notable phenomenon is *Loo*. This is a hot and dry wind which blows in summer before the approach of monsoons. Though its effects in the city are largely reduced, it still proves an uncomfortable phenomenon. Every possible outlet that can serve the purpose of ventilation is closed to check the entrance of this scorching wind. No method of refreshing and cooling the air is of any avail. This hot and dry air brings in its wake a great deal of discomfort and misery. It starts blowing, generally, after eleven in the morning and continues until evening. At night conditions become relatively cool and a comfortable sleep is possible in the open.

Relative humidity, as a rule, varies from season to season. The relative humidity curve for Lahore takes a downward trend from January (sixty-three percent) to May (twenty-eight percent). In June it starts moving up again and rises sharply with the increase in moisture in the atmosphere due to the monsoons and reaches its maximum in August. In these months both high heat and humidity give rise to oppressive conditions. From September onward the relative humidity curve again shows a downward trend, as in Figure 7*b*. The relative humidity values, on the whole, remain low throughout the year for the evening especially, even in the rainy season.

The hot weather conditions though uncomfortable are still health promoting. It is, perhaps, due to the dry conditions which give ample scope for quick evaporation and help to keep the human body comfortable. Energy is kept at a high level and the population remains active.

Climate influence is traceable on building structures. Flat roofs are response to the requirements of open air sleeping space, which is essential in the hot dry summer whereas in cold countries 'closed' houses are the rule. Spacious courtyards are generally attached to the houses, which are further provided with verandahs and shady trees.

The physical factors discussed above have a great influence on the physionomy of the city. Considering the expansion of the city's built-up area, the physiography has directed it along definite lines and this has given rise to a special pattern of routes and a specific shape to the city. The shape of the city is directly related to the land conditions. This becomes clear by comparison of Figures 5 and 6. The northern and western side of the city is occupied by the river valley. The fort is situated on the *Dhaya* (old high bank) of the river. The western side is covered with *Khadar* which is the newest formed land by the river. The north-eastern and south-western sections of the city have *Bet* or *Bhangar* land which is comparatively older than *Khadar*. The land in both these sectors is less firm for the purpose of setting up buildings. It is due to this fact that the price of land here is much lower than the firmer land to the east and south of the city. Naturally these land conditions have offered the city the axes of expansion to the east and south.

The major arteries of the region in which Lahore is situated followed these two axes. To the east the city was connected with Amritsar and Delhi, now in India, and Multan and Karachi to the south. Obviously the city expanded along these two lines.

Before the establishment of Pakistan both Lahore and Amritsar were exerting a considerable influence on each other in the economic and social fields. Amritsar, a

district headquarters, possessed its own independent status, was more or less a binary partner of Lahore. The pull of each other was considerable. The city of Lahore was expanding more rapidly along the Lahore-Amritsar line. But after the establishment of Pakistan both these cities were separated. Lahore being much nearer the border could not maintain its expansion along this line. The southern axis thus became the principal axis of expansion. The city of Lahore was much inflated after the establishment of Pakistan and almost all the important expansion has taken place towards the south between Multan road and the railway line to Multan and Karachi.

Secondly, the physical condition of land has given a fan like shape to the city. Almost all the roads converge on to the old city which further unite into a single road to cross the river. This peculiarity has given rise to a typical road patttern which is directly related to the expansion of the city's built-up area, The present road pattern, as is clear from Figure 2, is the result of the influence of two foci which are the railway station and the commercial centre of the old city, together with its contiguous areas. It is also clear that the original pattern of roads was established to serve only one focus that is, in the New Anarkali region where administrative and commercial functions of the city were located. So the Multan, Ferozepur, Mall (Shahrah-i-Quaid-i-Azam) and Allama Iqbal roads were the main intra-town roads, while Grand Trunk Road served as the main regional artory of commerce. Later came into existence the transverse roads.

Similarly, the expansion through time of the built-up area seems to have its relationship with the physical conditions of the region of location of Lahore. At first the Civil Lines station was established to the south of the old city. The Railway Station, Railway workshops, Railway residential colonies and cantonment were established to the east and south-east. Later, the well-to-do residential districts, like Gulberg, Model Town were established on the firm land areas between the Multan road and the railway line. This extensive area is a part of *Manjha*, which is an older alluvial formation. On the other hand the *Bet* or *Bhangar* areas of the city to the south-west and north-east are occupied by low-class residential quarters. These areas are susceptible to floods and the drainage problem. Drainage problem is particularly accentuated on account of a very gentle slope of the land. Consequently the expansion of the city's built-up area on these sides have been slow.

References

1. Latif, S. M., *Lahore* (1892), p. 24.
2. Baqir, M., *Past and Present, 1953 Flood Report*, pp. 262-267.

GEOGRAPHICAL RECORD

GEOGRAPHY IN THE UNITED KINGDOM

NAFIS AHMAD

The study of geography and the application of geographic knowledge has made significant progress in recent years in the United Kingdom. This is the impression gained during a visit in the autumn of 1972 when several major schools of geography were visited and discussions held with a number of eminent British geographers. More specific information and statistics are based on a report prepared on behalf of the Royal Society's British National Committee for Geography, 1972.

There are at least fifty departments of geography in the British Universities including those most renowned in the world. These schools are concerned with teaching, research and publications. Though systematic geography continues to be the bed-rock of the manyfold disciplinary aspects of modern geography, yet increasing attention is being focussed on training and application of applied geography. Research in British departments of geography is financed by the funds channelled through the University Grants Committee (the major source of finance for all British Universities), occasional grants obtained from the British, American and other foundations, and the money made available by two of the British Government's Research Councils, namely, the Natural Environment Research Council (NERC) interested in physical geography and the Social Science Research Council (SSRC) mostly in human geography. The SSRC funds for geography are used both for scholarships to brilliant students as well to research workers of established reputation. This assistance has particularly advanced the cause of applied geography in recent years. The NERC has given generous support to the Experimental Cartography Unit in London.

Research

The research in economic and social geography and planning problems has largely become problem-oriented. The quantitative approach and methods of quantification and use of models and statistical and computer data have been commonly used. Much of the socio-economic research being undertaken is essentially in applied geography. The important part played by geographers in planning during the period since the establishment of a planning ministry in Britain in 1943 was recently surveyed (1971) by a leading geographer, a pioneer in this field. Geographers are also cooperating with official bodies such as the Countryside Commission, the Nature Conservancy and Sports Council. The nature of their concern and work has been indicated in the publication of a variety of books covering subjects such as agriculture, population studies, regional variations and land and leisure etc. Extensive literature by geographers has been published in books and papers on fields in applied geomorphology, climatology, biogeography, environmental studies, remote sensing, cartography, historical geography and methodology. An outstanding example of organised scientific publications in geography is the appearance of Geographical Abstracts since 1960. They consist of six parts : Landforms and Quarternary, Biogeography, and Climatology, Economic Geography, Social Geography and Cartography, Sedimentology, and Regional

Professor Nafis Ahmad visited a number of geography departments and area study centres and met eminent geographers and heads of departments in British Universities in September-October 1972. He is also grateful to the British Council for their assistance.

and Community Planning. Numerous papers of interest to geographers are abstracted and the coverage of various fields is made as complete as possible. Several well known atlases have been produced by geographers as distinct from those prepared by Cartographic firms and institutes. These include such notable examples as 'National Atlas of Disease Mortality in United Kingdom' (1970), the 'Atlas of London and London Region' (1968), 'Historic Towns' (1969), 'Atlas of West Midlands' (1971) and Maps of the Second Land Utilization Survey of England and Wales (since 1962).

National Committee for Geography

An important step in the progress of geography was the reorganization of the British National Committee for Geography which had been set up in 1920 by the Council of the Royal Society in its capacity as the national adhering organization to the International Geographical Union. The Committee was reconstituted in 1970 with widened professional membership and representation of learned societies such as the Royal Society, and the British Academy as well as some government departments. It is now concerned with many matters affecting geographers and their participation in international conferences. It also administers the funds available for research through the 20th International Geographical Congress Fund (established in 1964) and the trustees of the Dudley Stamp Memorial Fund. It has been given the responsibility along with other similar institutions to train cartographers in departments of geography.

Geographical Societies

Well known societies such as the Royal Geographical Society, the Royal Scottish Geographical Society, the Geographical Association, the Institute of British Geographers and other bodies have greatly contributed to the development and progress of geographical knowledge through their expanding membership and widened activities. Geographers have been playing an increasingly important part in the organization of the annual meetings of the British Association for the Advancement of Science. Most recent handbooks for the BAAS meetings have been written and prepared by geographers since 1964. All the famous geographical societies publish their own journals which are renowned the world over for their coverage and quality of geographical material. Non-geographers and people in other disciplines use this material in many ways.

Geography in British Universities

Educationally, geography is strongly represented in the British Universities and polytechnics, colleges of advanced technology and colleges of education. Since most Universities recruit their students in common through UCCA (Universities Central Council on Admission), according to a recent report it is possible to see the importance of geography in recent years. Geography has been one of the subjects greatly in demand coming behind only Mathematics and English and ahead of other humanities, sciences and social studies :—

Number of Students Admitted

	1970-71	1967-68
Mathematics	6,041	4,681
English	5,897	4,523
Geography	4,432	4,169
History	3,809	3,391
Economics	3,417	4,070

This shows that in the last few years geography has been one of the subjects most in demand on entrance to the University. As a result, geography departments in the British universities have grown to be amongst the biggest departments. In fact, in some instances, they are the biggest, graduating between fifty and hundred Honours students each year. This has led to recruitment of large staff and widening of courses taught and spread into science and social studies faculties in addition to the faculties of arts and humanities, and increasing the output of post graduate and research work. The pressure created by geography at all levels has led to the opening of geography courses in polytechnic institutes and colleges of education. Inter-departmental

programmes of study with geography have been started along with environmental studies, social studies, area studies, science studies and planning. Thus in the United Kingdom geography is expanding its impact throughout higher education and is preparing people for an ever-widening range of careers. Environmental research and management, government research and administration, finance and business are taking an increasing number of geography trainees from the universities.

In 1972, there were 10,915 students of geography registered in fifty-two universities and colleges of advanced technology. Of this number about fifty-three percent took single Honours degrees, and the number of those obtaining joint Honours degrees was almost fourteen percent. Departments graduating about eighty Honours students each year included such well known universities as Cambridge, Durham, Leeds, Sheffield, Oxford, Aberystwyth, Swansea, Birmingham, Liverpool, Manchester, Edinburgh, Exeter and Newcastle. The number of postgraduate students enrolled in 1972 was 950 and of these about forty-five percent were Ph. D. students, the rest were in Masters degree groups. In terms of postgraduate enrolments, the largest departments were, London School of Economics, Birkbeck College, University College, Hull, and Edinburgh. Most geography departments are being centred in science faculties (forty-four percent). There were thirty percent in art, twenty-two percent in social science and four percent in the newly created faculties of environmental studies.

All departments teach systematic geography, supported by quantitative methods. Each department emphasises certain fields, but the leading fields of interest include geomorphology, urban geography, biogeography, transportation, population and settlement. Other specialisms are resource management, economic geography, quantitative methods, applied geography, computer mapping, cartography and perception geography. There has been almost an explosion in the number of option courses for Honours degree to develop special aptitudes. Though there has been a 'quantitative revolution' in geography in British Universities, still there is good deal of emphasis on masterly description of regions and landscapes. Some of the new fields engaging the attention of geographers are environmental analysis, population, pollution studies, regional science soil studies and perception geography.

The teaching of geography in several British Universities has been providing a basic training for planning careers. Twenty out of the thirty-six university institutions teaching Honours degrees in geography offered courses labelled as 'applied geography'. Geography has been figuring as one of the key subjects in training in physical planning and as a pivotal subject in interdisciplinary instruction in several social sciences. Geographical training and its application is usefully contributing to all environmental planning and preservation of the country's landscape. Indeed, the British geographers are actively exploring new frontiers of geographical thought.

Instrumentation, Staff and Library

Most large departments are well staffed with 'specialists' and ample space is provided for laboratory, instruction, museum, map collections and library. There is considerable insrtumentation and this use is extending into mechanised cartography, mapping devises and field work. In area study centres there are excellent opportunities for special research work with the help of good stock of literature, reports, statistics, maps and expert guidance.

House Form and Culture, Amos Rapoport, University College London. Prentice Hall Inc. Englewood Cliffs N.J. (1969), x and 146 pp, diagrams, references, index.

Cultural Geography, taken in the sense of interpretation of environment, enables the analysis and synthesis of space relationships between various active agencies of change. The resultant changes in the landscape become the cause of several new processes. The most active and potent agency is that of man that influences the space relations and this impact is also fairly lasting.

From the very inception of human life struggle for existence within the environment seems ordained. Human struggle is for the utility of possiblities within the environment. This struggle has always been going on and as human creative capabilities are accelerating day in and day out, so the command to benefit is enhancing.

Naturally the first fundamental thing to help fight and achieve benefits for existence was a house—resort for mankind and a place for security (Quran 2 : 125). House was the only place to provide defence and thinking and planning could be done there. The house is accepted as the base of all the activities that are concerned with human existence. House is a place vital for existence, preservation and protection, and naturally has to be arranged and organized according to the needs, wits and capability of man. Undoubtedly different environments offer different chances and demand different ways to benefit from them. It is therefore imparative that people in different surroundings should show different ways of organization of their houses.

In House Form and Culture, the author has very rightly made a distinction between a primitive and a vernacular house form. This suggests two levels of progress of human societies. The shape of their houses, seems mainly based on their environmental knowledge, than on the concepts and values of their societies which are the outcome of their understanding and interpretations of the combatant phenomena.

The author of this book has scrutinised very well the dictates of natural phenomena like that of climate etc. At the same time he has vividly traced the cultural adulterations through importation from different environments.

The imported traditions, thoughts and techniques always become much more potent, as is clear from numerous evidences in different parts of the world, than the local combat needs. Further even in the same environment a community of people may produce different forms of houses by applying different techniques. In this case their attitudes towards life or their understanding about life itself, play an important part in determining the forms of houses.

The author has further explored the role of both material and methodology adopted along with the choice of site and economic aspects of various people It seems that social and cultural aspects of human life are even more decisive than those of technology, material and economy of the people. Environmental phenomena like climate etc, act as variables in determining the forms of buildings and their arrangements in relation to the other houses of the community.

The book has been divided into six chapters. In the First Chapter the author has explained the nature and definition of the field of study. He stresses that instead of concentrating on the study of the achievements, through designing, and planning, by the highly organized societies in the past or even present, geographers should focus their attention on the vernacular achievements which have been ignored in architectural history and theory. It is a fact that built environ-

ment or the physical environment of man is not controlled by designers. As a matter of fact the present day architectural cultural studies have mainly been based on the historical monuments of repute and not much has been done on the evolution of house forms. This can be assessed only from the building which are vernacular in character. The study of mud houses and grass shacks, will point out the important and unimportant buildings and also their relationships in the environment. Here the author has reviewed in detail the literature concerning house forms. The need the method of study also has been discussed in detail.

In the Second Chapter various factors which enforce the need for shelter such as climate, and material construction and technology have been discussed. Also the selection of site has been scrutinized in the light of important components such as defence, economy and religion which impose restrictions. In the end physical determinism has been judged critically.

In the Third Chapter house forms have been reviewed in the light of socio-cultural factors. It is an established fact that people with different attitudes and ideals respond differently to varied physical environments. These responses vary from place to place because of social, cultural, economic and physical factors. Accepting the house as a basic institution, means that it becomes the centre of complex purposes. As the house is a cultural phenomena therefore its form and organization reflects cultural traits. Here the author has reviewed house forms in different culture in the world over and has discussed the attitude of different cultures toward house building.

In the Fourth Chapter, climate as a modifying factor has been discussed in detail. As the house provides shelter against climate, therefore, if a climatic scale is applied then in different climates house forms are bound to differ. These have been discussed in detail in the light of socio-cultural attitudes. This part of the book is particularly informative.

The Fifth Chapter deals with the role of the materials used and the technology applied for the construction of houses. Amongst the stratum of human society i.e. the primitive and peasants, there is always sacrcity of materials. In this case the resultant form depends on the material available to them. Naturally the technology applied will be to get maximum benefits against meagre resources. This aspect has been discussed vividly by quoting house forms all over the world.

In the Sixth Chapter a comparison is made of the modern and the ancient house forms in the light of dominating western culture. The account covers adequately the changing house forms in the developing countries through cultural infusions.

The book has as many as eighty-four illustrations and pictures elaborating upon the various forms of vernacular houses

M. MUSHTAQ.
University of the Punjab, Lahore.

The Indian Hill Station : *Kodaikanal,* Nora Mitchell, University of Chicago (1972), xii 199 pp., maps, diagrams, photographs, illustrations, tables, bibliography.

In low latitudes altitude may be advantageous to human occupation because of more congenial climate. This may, in a way, solve the problem of adaptation for the man coming from high latitudes and settling for one reason or the other in the low latitudes. With this advantage in view the hill stations were settled and developed in most of the tropical countries including India, where the British rulers during the colonial period developed a number of hill stations, with relatively low temperatures as the prime attraction.

The dissertation by Nora Mitchell of Kodaikanal School, Maduri, District Tamil Nadu, India represents a research into the raison d'etre of a hill station and can be regarded as a study in cultural geography.

The Indian Hill Station - Kodaikanal, belongs to a group of monographs which are based on personal research work. The work in review is significant in that is a pioneering effort in a particular field. Only a very few articles of this type exist.

The monograph, as described by the author in the introduction, consists of two parts. The first, primarily historical, focuses on the origins and development of Indian Hill Stations in general. It deals mainly with the colonial society out of which the hill stations have evolved.

The second part is basically functional in orientation and is based on field materials by which Nora Mitchell has described and analysed the functions of a specific Indian Hill Station, that of Kodaikanal in South India in terms of their effects on the landscape.

The work has been organized into six chapters. The First Chapter is an introduction to the research works and outlines the methodology used. In the Second Chapter, the rationale for Tropical Hill Stations with particular reference to Indian Hill resorts has been discussed in connection with the English man's perception of the health hazards faced by him in tropics. Patterns of tropical diseases like cholera, malaria leprosy, smallpox, dysentery, sunstroke etc, have been thoroughly looked into and in the light of the importance of this factor the hill stations have been described.

In the Third Chapter the locational development and distribution of hill stations in different parts of India has been discussed with reference to historical and geographical factors. In the Fourth Chapter an attempt has been made to measure and analyse the different functions of the specific hill station Kodaikanal, situated at an altitude of 7,300 ft in South India, in the Palni Hills. The background and origin of Kodaikanal has been investigated and its settlement pattern and functional structure thoroughly discussed. The Fifth Chapter deals with the changing functions of the Hill Station since 1947, the year of Independence.

In the concluding chapter the result and outcome of the research has been presented. A special mention has been made of urbanization and mobility. The conclusions drawn by the author are interesting and very informative.

The text is enriched by maps and tables which are excellent both as regards technique and cartography Photographs are carefully selected. In all respect the monograph, "*the Indian Hill Station Kodaikanal*" is an impressive and original work and can be an excellent guide for further research in this area of study.

MASAUD ASLAM MIAN
University of the Punjab, Lahore

PAKISTAN GEOGRAPHICAL REVIEW was instituted in 1949, replacing Punjab Geographical Review, which was started in 1942. The object of this publication is the dissemination and exchange of scholarly knowledge. Its volumes contain research articles on various topical and regional themes of Geography with particular reference to Pakistan. The Review is published half-yearly in January and July.

Submit all manuscripts and publications for Review to the Editor, Pakistan Geographical Review, Department of Geography, University of the Punjab, Lahore.

Address all communications regarding subscription and purchase of the back numbers to the Assistant Editor, Pakistan Geographical Review, Department of Geography, University of the Punjab, Lahore.

SUBSCRIPTION

Foreign	Inland
Annual $ 3.90 / £	Annual Rs. 10.00

Back Numbers

Volumes 1, 3 and 18 No. 1 not available.

Volume 11, Number 2, 1956 contains index from volumes 1 to 10.

Volume 17, Number 2, 1962 contains index from volumes 11 to 17.

Volume 22, Number 2, 1967 contains index from volumes 18 to 22.

Published by K. U. Kureshy, Editor, Pakistan Geographical Review
Printed at the Pakistan International Printers, 118. G. T. Road, Moghalpura, Lahore.