Pakistan Geographical Review

Vol. 25, No. 1 January, 1970

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

Pakistan Geographical Review

Volume 25 January, 1970 Number 1

URBAN HOUSING PROBLEM IN WEST PAKISTAN[1]

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THE present article seeks to analyse the urban housing situation in West Pakistan, with special reference to cities (urban centres with 100,000 and over population), as it obtained in 1960, the year for which somewhat detailed published data were available. The study is of particular relevance in planning as it provides a considerably reliable measure of housing shortage.

Housing shortage, with the attendant overcrowding, is one of the major sources of human misery. In the urban centres of West Pakistan its incidence is chronic. With the ever increasing urbanisation of our region of study over the past several decades the back-log has been accumulating.

Retrospective View

In order to have a retrospective view of the housing situation, the average number of urban dwellers per house has been calculated for the past six censuses, starting from 1911. The year 1911 has been selected as the starting point, because since then the census figures of 'houses' have been comparable, owing to the uniformity of definition.[2] Before 1911, the census concept of 'house' was different from what it is now. The average number of urban dwellers per house at the time of the last six censuses is given in Table 1.

[1]Article contributed to the 17th All Pakistan Science Conference, Karachi, 1965.

[2]For definition see *Census of India*, 1911, Vol. XIII, Part I, p. 20, *Census of India*, 1941, Vol. XII, Part I and *Census of Pakistan*, 1960, District volumes, Part III.

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TABLE 1—URBAN POPULATION, NUMBER OF HOUSES IN URBAN AREAS AND THE AVERAGE NUMBER OF URBAN DWELLERS PER HOUSE, WEST PAKISTAN, 1911—1960

Census Year	Population returned as urban (in thousands)	Recorded number of houses in the urban areas (figures in thousands)	Average number of urban dwellers per house
1911 ...	1,831	391	4.68
1921 ...	2,141	454	4.71
1931 ...	2,921	591	4.94
1941 ...	4,169	710	5.86
1951 ...	4,949*	1,004*	4.93*
1960 ...	9,654	1,672	5.77

*In the 1951 Census, number of houses in Karachi was not recorded. The Population of Karachi has, therefore, been subtracted from the total urban population of West Pakistan for the calculation of the average number of urban dwellers per house in 1951.

The figures reveal that the average number of dwellers per house returned a constant increase from 1911 to 1941. The fall in the average number of urban dwellers per house in 1951 is illusory, and appears to have been related to the non-inclusion of the figures for Karachi, where the number of houses were not recorded at the time of the census. In 1951, Karachi accounted for 17.7 per cent of the total urban population of West Pakistan. The non-inclusion of such an important urban centre must have marred the meaningfulness of the average figures for West Pakistan. The average number of dwellers per house again registered an increase in 1960.

The percentage increase of the recorded urban population and the number of houses in towns reveal the following :

1) While there has been a progressive increase in the decennial rates of growth of urban population the percentage increase in the number of houses has been variable.

2) The increase in the number of houses has not kept pace with the population increase. The gap widened over the period 1931—1960.

The inference is, therefore, clear that the housing situation in our towns deteriorated during the period 1911—1960. The deterioration became more marked during the period 1931—1960. The back-log thus created is of "substantial proportion".[3]

[3]Outline of the Second Five Year Plan, *op. cit.*, pp. 88—91.

It was estimated at the time of the formulation of the second Five Year Plan that some 800,000 families required to be provided with houses in urban areas of Pakistan, including Eastern and Western Wings.

Housing Situation

For analysing the housing situation at the time of the latest Housing Census (1960), only 'cities' have been studied.

Table 2 gives the average number of persons per household in the cities.

Table 2—Average Number of Persons per Household, 1960

City	Average number of persons per household
Karachi	5.3
Lahore	5.8
Hyderabad	6.0
Lyallpur	5.6
Multan	5.9
Rawalpindi	5.5
Peshawar	5.8
Gujranwala	6.5
Sialkot	6.6
Sargodha	5.9
Quetta	5.6
Sukkur	5.7

In this and the other subsequent Tables, containing data for the 12 cities of West Pakistan, the names of cities are written in descending order of population, Karachi being the most populous.

In all the cities the average number is over five signifying that the average size of urban households is large. A household, according to the census definition, is a "collection of persons" living and eating in one mess with their dependents, relations, servants and lodgers, who normally reside together in a house.

A breakdown of the household size of cities is given in Table 3.

TABLE 3—PERCENTAGE HOUSEHOLDS TO THE TOTAL, BY NUMBER OF PERSONS, 1960

City	Percentage households by number of persons									
	1	2	3	4	5	6	7	8	9	10 & over
Karachi ...	7.1	10.1	12.4	14.1	13.8	12.4	9.8	7.1	4.7	8.4
Lahore ...	6.8	8.9	10.5	12.5	13.1	12.7	10.6	8.1	5.6	11.0
Hyderabad ...	5.8	9.1	10.8	12.9	12.9	11.9	10.2	7.9	5.3	13.0
Lyallpur ...	5.1	9.2	12.1	14.3	14.1	12.9	10.2	7.6	4.9	9.4
Multan ...	5.4	8.2	10.2	12.7	13.4	12.6	10.7	8.2	5.6	12.8
Rawalpindi ...	10.4	10.4	11.1	12.5	12.5	11.8	9.3	7.4	4.9	9.8
Peshawar ...	9.2	9.9	10.6	12.4	12.2	11.9	9.9	7.6	5.3	10.8
Gujranwala ...	4.2	6.5	8.8	11.5	12.5	12.9	11.5	9.3	6.9	15.6
Sialkot ...	6.1	7.9	9.1	10.7	11.8	11.8	11.1	8.6	6.7	16.1
Sargodha ...	7.0	8.9	10.4	12.3	13.6	12.9	10.4	8.1	5.4	11.1
Quetta ...	10.6	10.4	10.8	12.2	11.3	10.4	8.8	7.8	5.3	12.2
Sukkur ...	8.8	10.2	11.2	12.4	12.7	11.5	9.7	7.6	5.1	10.9

The Table shows that the percentage of larger households (of over 5 persons) is quite high. It varies between 42.4 percent in Karachi to 56.2 percent in Gujranwala.

Percentage of households by tenure to the total households is given in Table 4.

TABLE 4—HOUSEHOLDS BY TENURE, 1960

City	Percentage households to the total		
	Owned	Rented	Free
Karachi ...	42.9	39.5	17.6
Lahore ...	33.4	47.1	19.3
Hyderabad ...	57.4	20.6	22.0
Lyallpur ...	57.5	25.1	17.3
Multan ...	58.4	26.2	15.3
Rawalpindi ...	26.3	53.9	19.8
Peshawar ...	29.8	53.2	16.9
Gujranwala ...	58.2	25.5	16.3
Sialkot ...	54.0	24.2	21.8
Sargodha ...	41.1	34.5	24.4
Quetta ...	27.1	39.7	33.2
Sukkur ...	26.4	40.2	33.1

The Table shows that the percentage of owned households is generally low. It varies between 26.3 percent in Rawalpindi to 58.4 percent in Multan. Out of the twelve cities under review it is over fifty percent only in five cities. The generally low percentage of owned houses in these urban centres confirms the view expressed by Davis[4] that many rural-urban migrants have a distaste for permanent urban living, which is "partly attributable to the crowded, dismal and unhealthful conditions of urban housing".[4] The view further finds support from the fact that, in general, higher percentage of rented households is in those urban centres where the rate of increase of population has recently been faster.

The analysis of households, by number of rooms (Table 5), is revealing.

TABLE 5—HOUSEHOLDS BY NUMBER OF ROOMS, EXPRESSED AS PERCENTAGE OF THE TOTAL, 1960

City	Percentage households by number of rooms									
	1	2	3	4	5	6	7	8	9	10 +
Karachi ...	70.3	20.5	5.1	2.4	0.9	0.5	0.1	0.1	0.0	0.1
Lahore ...	59.1	22.4	8.5	4.5	2.1	1.3	0.6	0.4	0.2	0.5
Hyderabad ...	70.4	21.9	4.7	1.8	0.5	0.3	0.2	0.1	0.0	0.2
Multan ...	48.8	28.8	11.0	5.4	2.2	1.3	0.5	0.4	0.1	0.5
Lyallpur ...	61.5	24.3	6.9	3.4	1.3	0.9	0.4	0.3	0.1	0.3
Rawalpindi ...	47.9	29.7	9.9	6.2	2.4	1.7	0.7	0.5	0.3	0.6
Peshawar ...	54.8	22.7	10.7	5.7	2.3	1.6	0.6	0.4	0.2	0.4
Gujranwala ...	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Sialkot ...	39.2	26.4	14.5	8.5	4.2	2.6	1.2	1.0	0.5	1.4
Sargodha ...	61.7	21.0	7.8	4.0	1.9	1.4	0.7	0.4	0.3	0.8
Quetta ...	54.6	24.3	10.5	5.1	1.8	1.2	0.5	0.4	0.1	0.7
Sukkur ...	58.8	26.5	7.5	3.9	1.4	0.9	0.3	0.3	0.1	0.1

N.A.—Not available.

The percentage of households living in one-two room tenements is extremely high, varying between sixty-six percent in Sialkot to over ninety percent in Hyderabad, Karachi and Sargodha. These figures are convincingly indicative of extremely low standards of housing of city-dwellers. One or two-room tenements are obviously the poorest dwellings in which such high percentages of urban households dwell. The average number of persons per household varies between 5.3 in Karachi to 6.5 in Gujranwala (see Table 2). But the family size of the poorer people living in these one-two room tenements is appreciably bigger than that of the richer people living in better houses. It can, therefore, be seen that the percentage population of the cities living in one-two room tenements is still higher than the above cited percentage figures of households reveal (Table 5).

[4]K. Davis, *Population of India and Pakistan*, Princeton, 1951, p. 148. The view in Davis is expressed about the urban centres of Pakistan and India taken together.

In case of Karachi, comparable figures of percentage households, by number of rooms, are available for the censuses of 1921 and 1931, apart from 1960. These are reproduced below.

TABLE 6—PERCENTAGE OF HOUSEHOLDS TO TOTAL POPULATION, BY CLASS OF TENEMENTS, IN KARACHI, 1921, 1931 AND 1960

Class of tenements	Percentage at the census of		
	1921	1931	1960
One room ...	58	58	70
Two rooms ...	23	24	21
Three rooms ...	7	8	5
Four rooms ...	4	5	2
Five rooms ...	2	1	1
Six and over rooms ...	6	4	1
Total ...	100	100	100

It will be seen that the percentage households in one-two room tenements increased considerably in 1960 as compared with 1921 and 1931. It was ninety-one percent in 1960, as compared with eighty-one percent 1921 and eighty-two percent in 1931. The increase in the percentage households living in one room tenements has been even more remarkable; it was fifty-eight percent in 1921 and 1931, and as high as seventy percent in 1960. It is a sad commentary on the standards of housing of Karachi population, deteriorating progressively with the passage of time. The same deterioration, with a difference only of degree, can be presumed with reference to other urban centres, although in the latter case comparable figures of the nature given above are not available.

OVERCROWDING

Average number of persons per room, by tenure of occupied premises, is given in Table 7.

TABLE 7—AVERAGE NUMBER OF PERSONS PER ROOM, BY TENURE OF OCCUPIED PREMISES, 1960

City	Average number of persons per room			
	Total	Owned	Rented	Free
Karachi ...	3.6	3.7	3.5	3.7
Lahore ...	3.2	3.0	3.4	3.5
Hyderabad ...	4.2	4.4	3.8	4.1
Lyallpur ...	3.4	3.1	3.3	3.5
Multan ...	3.1	2.9	3.3	1.8
Rawalpindi ...	2.7	2.6	2.7	2.9
Peshawar ...	3.1	2.9	3.1	3.2
Gujranwala ...	2.9	2.7	3.2	3.4
Sialkot ...	2.7	2.6	2.8	3.1
Sargodha ...	3.3	3.1	3.4	3.6
Quetta ...	3.1	3.0	3.0	3.3
Sukkur ...	3.3	3.3	3.0	3.8

Number of persons per habitable room is a reasonably reliable measure of intensity of occupation of dwellings. It is termed as 'occupancy rate'. In recording the number of persons for calculating occupancy rate, children below ten years of age are counted as half persons and children under one year are not counted. The 'instructions to the enumerator' embodied in the Housing Census Register, 1960, and other explanatory notes regarding housing census do not make any mention of counting children below ten as half persons and children below one year of age as non-entities. For purposes of ascertaining occupancy rate, the number of persons per room obtaining in Table 7 is inflated, as in the count both children under ten years and children under one year are recorded as 'persons'.

Habitable rooms for the purposes of calculating occupancy rate include bed rooms, living rooms and dining rooms and exclude bath rooms, kitchens and toilets. The census definition of 'room' described as "broadly a compartment of House large enough to be slept in" seems to be somewhat nearing the concept of room as understood for ascertaining occupancy rate. However, there was a likelihood of counting, under the said census definition, of sizable kitchens, side rooms and the like as 'rooms'. The census figures of rooms thus obtained are likely to be larger than what it would be under the concept of occupancy rate.

Both the number of persons and number of rooms having been inflated the result is that the census figures, giving the number of persons per room, will roughly, though not exactly, equate the occupancy figures. The number of persons per room in Table 7 is therefore, roughly taken for occupancy rate.

Statutory overcrowding in Britain is supposed to exist when the occupancy rate exceeds 2.0.[5] In case of Pakistan, allowing for the defective nature of figures in Table 7, explained above, we can reasonably, though arbitrarily, regard overcrowding to be in evidence when the occupancy rate rises between 2.5 and 3.0 and in clear existence when it is over 3.0 (persons per room figures of Table 7). It will as well be in keeping with our special sociological and psychological temperament, supposedly satiable with lesser living space as compared with the Western people.

From this measure, overcrowding is in evidence in all the cities of West Pakistan. It is of a less serious nature in Sialkot, Rawalpindi and Gujranwala, and of a more menacing nature in the rest of the cities under review, where the occupancy rate exceeds 3.0. Karachi and Hyderabad are worst affected, respectively with 3.6 and 4.2 occupancy rates.

In the poorer residential quarters of our cities overcrowding attains an alarmingly high incidence. The poorer quarters stand in apathetic contrast to the

[5] *The Density of Residential Areas*, Ministry of Housing and Local Government, Britain, H.M.S.O. London, 1952, pp. 4-5.

fashionable residential localities of a city. In the latter localities the dwellings are not only overcrowded but are decidedly under-occupied. This contrast is borne out by the following figures of occupancy recorded in the several areas of Lahore by the present writer, as a result of field work, conducted a few years earlier than the housing census of 1960 (Table 8). The recorded occupancy rate is under one in the fashionable residential area (Civil Lines). It is as high as 4.91 in the hard core of the city (Walled City).

TABLE 8—OCCUPANCY RATE IN SOME PARTS OF LAHORE

Locality		Occupancy rate (Counting children below 10 years as half persons and not counting children under 1 year of age)
Civil Lines	...	0.98
Samanabad	...	1.84
Krishnanagar	...	2.51
Walled City	...	4.91

Referring again to Table 7 the analysis of occupancy rate, by tenure of premises, is as follows :

1) Generally speaking, occupancy rate in tenements given free of rent to occupants (servants quarters, etc.) is as could be expected, somewhat higher.

2) Comparing the owned and rented houses, it is generally higher in the latter ones.

It needs mentioning here that our rural houses are by no means free from overcrowding. At best the rural dwellings are only slightly less overcrowded than the urban ones. But the contrasts noted above in the poor residential quarters and the fashionable residential localities of cities are certainly much less pronounced in rural settlements.

Still more revealing evidence of overcrowding in cities is furnished by the figures in Table 9.

TABLE 9—NUMBER OF PERSONS PER ROOM, EXPRESSED AS PERCENTAGE OF THE TOTAL CITY POPULATION, 1960

City	Number of persons per room, expressed as percentage of total city population.							
	Total Persons (Percentage)	Under 1	1	2	3	4	5 and over	Total of the preceding two columns
Karachi ...	100	0.7	6.9	12.8	15.6	13.9	49.9	63.8
Lahore ...	100	1.3	11.3	16.7	16.7	12.0	42.0	54.0
Hyderabad ...	100	0.4	4.1	10.6	14.5	12.4	57.8	70.2
Lyallpur ...	100	0.8	8.8	15.9	17.8	13.4	43.2	56.6
Multan ...	100	1.3	11.7	19.1	18.9	12.1	36.7	48.8
Rawalpindi ...	100	1.6	15.9	22.1	19.0	11.5	29.6	41.1
Peshawar ...	100	1.7	14.0	18.8	16.5	10 9	37.6	48.5
Gujranwala ...	100	1.8	15.0	21.3	18.5	10.4	33.0	43.4
Sialkot ...	100	2.7	18.2	21.9	17.8	9.3	30.1	39.4
Sargodha ...	100	1.4	11.3	14.7	15.9	11.6	47.7	59.3
Quetta ...	100	1.5	11.9	19.7	18.9	11.8	36.2	48.0
Sukkur ...	100	1.0	9.0	16.7	18.0	13.4	41.9	55.3

The percentage of population living in clearly overcrowded conditions (more than 3 persons sharing 1 room) is very high. It varies between 39.4 percent of total city population in Sialkot, though 54.0 percent in Lahore, 55.3 percent in Sukkur, 56.6 percent in Lyallpur, 59.3 percent in Sargodha, 63.8 percent Karachi, to as high as 70.2 percent in Hyderabad. The conditions to which such high percentages of urban population are condemned (as a result of overcrowding) must be miserable and appalling. Under these conditions man is likely to develop nihilism, a symptom of a diseased society. The situation, therefore, demands an immediate relief.

A significant point that emerges from the study of figures in Table 9 is that, although the percentage population living under overcrowded conditions is not in all cases directly proportional to the size of the city, an irregularly increasing trend of this percentage is discernible from the smaller to the larger cities. Similarly, cities as a size-class generally return higher percentage of people living under overcrowded conditions than the remaining urban centres of West Pakistan. This fact is borne out by a comparison of figures in Table 9 with the following figures compiled by districts (Table 10). A district includes a number of urban centres, which are smaller in comparison with the capital city.

TABLE 10—PERCENTAGE OF URBAN POPULATION LIVING UNDER OVERCROWDED CONDITIONS (4 AND 5 PERSONS PER ROOM) BY DISTRICTS, 1960

District	Number of persons per room, expressed as percentage of the total urban population of the dirstrict		
	4 persons per room	5 and over persons per room	Total of the preceding two columns
Karachi ...	13.9	50.7	64.6
Lahore ...	12.1	41.5	53.6
Hyderabad ...	12.6	56.7	69.3
Lyallpur ...	13.1	41.8	54.9
Multan ...	12.4	37.5	49.9
Rawalpindi ...	11.3	29.2	40.5
Peshawar ...	12.0	43.5	55.5
Gujranwala ...	10.4	29.7	40.1
Sialkot ...	9.1	26.1	35.2
Sargodha ...	13.3	35.8	49.1
Quetta ...	11.6	35.4	47.0
Sukkur ...	12.0	37.1	49.1

SPILL POPULATION AND HOUSING SHORTAGE

The spill population (which stands in need of rehabilitation outside the present limits of the brick-and-mortar area of cities) can be estimated with the help of figures in Table 9. The Government, on the basis of some sample sociological surveys, can fix the precise number of persons per room beyond which overcrowding, under our urban living conditions and family composition, sets in. Alternatively, the rough and ready yardstick of more than three persons living in one room[6] can be utilised. About half of such population can be regarded as spill population for which residential accommodation has got to be created; the present accommodation will suffice for the remaining half staying back. It will be noted that, taking any one example, say of Karachi, 63.8 percent of the total population living under overcrowded conditions is so distributed that out of it only 13.9 percent are in households of four per room and the remaining as much as 49.9 percent in households of five and over per room. This breakdown suggests that the estimate of spill population as half of the population living under overcrowded conditions (half of 63.8 percent in case of

[6]In the Provincial Census Report of 1951 a house with more than 5 inhabitants per room was termed as "congested". The word "congested" was obviously wrongly used for overcrowded. On the contrary, the average number of persons per room in Karachi in 1931 was 3.7, which was described in a state of overcrowding by the Census Superintendent, *Census of India*, 1931, Vol IX, p. 96.

Karachi) is quite realistic, and not liberal. Spill population of the cities under review has been calculated on the above basis (fifty percent of the population living under overcrowded conditions, with more than three persons per room). The spill population being divided by the respective average sizes of households of the several cities gives the number of dwellings required to be constructed in each cities. This estimate of housing shortage is embodied in Table 11.

TABLE 11—ESTIMATE OF HOUSING SHORTAGE, 1960

City	Total population (in thousands)	Percentage population living under overcrowded conditions, with over 3 persons per room	Spill population (50% of population living under overcrowded conditions)	Average number of persons per household (See Table 2)	Number of houses required to be built (obtained by dividing figures of Column 4 by those of Column 5)*
1	2	3	4	5	6
Karachi ...	1,913	63.8	612,160	5.3	115,500
Lahore ...	1,296	54.0	349,920	5.8	60,300
Hyderabad ...	435	70.2	152,250	6.0	25,400
Lyallpur ...	425	56.6	119,000	5.6	21,300
Multan ...	358	48.8	85,920	5.9	14,600
Rawalpindi ...	340	41.1	70,040	5.5	12,700
Peshawar ...	219	48.5	52,560	5.8	9,100
Gujranwala ...	196	43.4	42,530	6.5	6,400
Sialkot ...	164	39.4	32,310	6.6	5,100
Sargodha ...	129	59.3	38,250	5.9	6,500
Quetta ...	107	48.0	25,680	5.6	4,600
Sukkur ...	103	55.3	28,530	5.7	5,000
Total ...	5,685	...	1,609,150	...	286,500

*The figures have been rounded upto 2nd digit.

The allocation of over Rupees 300 crores in the public sector for housing development in Pakistan (including both urban and rural housing) under the Third Five Year Plan (1965—1970) is expected to go a long way in improving the housing situation in the country. Estimates of housing shortage, as worked out in Table 11, are likely to be of value to the Government for planning purposes. These estimates shall be corrected for population increase during the Second and Third Plan periods (1960—1965 and 1965—1970 respectively), on the basis of the existing rates of increase of individual settlements. This correction will be all the more necessary for urban centres, as a large component of urban population increase consists of adults derived as a result of rural-urban migration, together with the natural increase, comprising of minor children. As explained earlier, under occupancy rate, the housing requirements of adults are more than those of children under ten years of age, and infants under one year of age are not supposed to have any separate requirement of housing accommodation. The number of houses built during the Second Plan period shall have to be subtracted from these estimates to arrive at the final estimates of housing shortage to be tackled during the Third Five Year Plan period.

LANDFORMS OF THE INDUS DELTA

CH. JALAL-UD-DIN, ROBERT BRINKMAN
AND
CH. MOHAMMAD RAFIQ

THE purpose of this paper is to describe some of the important aspects of the landforms of the Indus delta which are markedly different from that of the Indus river floodplain. The study is based on reconnaissance surveys in areas of Thatta and Hyderabad Districts on both sides of the Indus river.[1]

The Indus delta consists of two main parts : an area of marine tidal deposits, the coastal belt; and an extensive plain which was deposited from fresh-water tidal river channels, the estuary plain.

The Indus delta has a very low gradient towards the sea. Both fresh-water and salt-water tides have had a determining influence upon the depositional pattern of the sediments. The silty sediments of the estuary plain have been extremely well sorted; they have higher proportions of silt and less clay than their counterparts in the river plain.

General Orientation

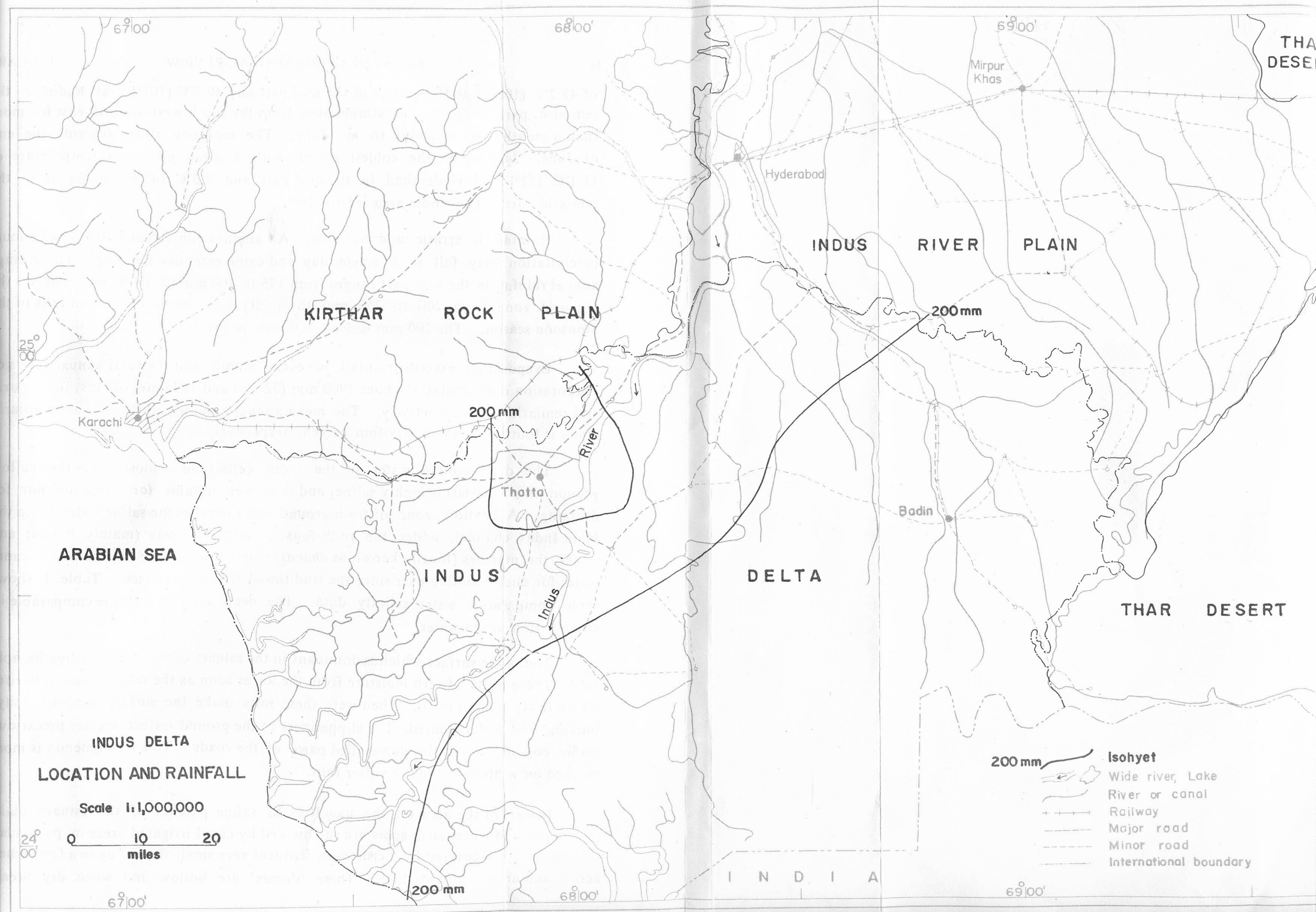
The Indus delta comprises the southern-most part of the vast Indus basin. It extends for about 80 miles northwards from the sea between 23°45′ and 25°10′ latitudes north and between 67°5′ and 69°20′ longitudes east (Fig 1). The estuary plain starts where the Indus river divides into a number of subrecent distributary channels. Its boundary with the Indus river plain to the north generally coincides with the northern boundary of widespread surface salinity that is characteristically hygroscopic. In the south and south-west the estuary plain gives way to a belt of extensive coastal marshes and mud flats that are periodically inundated by sea water and bordered by the sea. The eastern boundary of the delta is formed by the Thar desert, and its north-western boundary by the Kirthar rock plain.

The climate of the Indus delta is arid tropical marine in the north-west and semiarid tropical marine in the south-east. It is characterised by intense summer heat and mild winters. May is the hottest month with mean maximum temperatures

[1]The survey west of the Indus river was exploratory, not of standard intensity as east of the river. The assisstance of Messrs Hadi and Mushtaq and their colleagues in supplying field and map data are acknowledged with thanks.

The authors gratefully acknowledge the encouragement by Dr. M. Bashir Choudhri and Mr. M. Alim Mian ; the helpful comments by Dr. R. Dudal and the extensive comments and many improvements in form and content by Mr. H. Brammer.

Messrs. Jalal-ud-Din, Brinkman and Rafiq are Soil Survey Research Officer, Technical Officer, Soil Survey Interpretation (FAO) and Deputy Director, Soil Survey Project of Pakistan.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KIRTHAR ROCK PLAIN
INDUS RIVER PLAIN
THAR DESERT
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Karachi
Thatta
Hyderabad
Mirpur Khas
Badin
Indus River
200 mm
INDUS DELTA
LOCATION AND RAINFALL
Scale 1:1,000,000
0 10 20
miles
Isohyet
Wide river, Lake
River or canal
Railway
Major road
Minor road
International boundary

of 42.2°C (108°F) at Hyderabad in the arid part and 40.5°C (105°F) at Badin in the semiarid part. Strong dust storms blow from the south-west to north-east for more than a month from mid-May to mid-June. The monsoon starts towards the end of June. January is the coldest month with a mean minimum temperature of 11.1°C (52°F) at Hyderabad in the arid part and 8.3°C (47°F) at Badin in the semiarid part. The whole area is frost-free.

Rainfall is erratic and variable. An amount equivalent to the mean annual precipitation may fall in a single day and cause extensive flooding. The average annual rainfall in the arid part ranges from 175 to 200 mm (7 to 8 ins) and in the semiarid zone from 200 to 250 mm (8 to 10 ins). Most of the rain falls in the monsoon season. The 200 mm isohyet is shown in Fig 1.

Evaporation exceeds rainfall in every month and the total annual excess of evaporation over rainfall is about 1900 mm (72 ins) and 1675 mm (67 ins) in the arid and semiarid parts respectively. The mean annual humidity in the arid and semiarid zones is fourty-seven and fifty-four percent respectively.[2]

The deep ground water in the Indus delta (and in most places the shallow ground water as well) is highly saline, and is neither suitable for irrigation nor for drinking. A shallow zone of fresh ground water overlies the saline water along the main Indus channel, under the traditionally irrigated areas (mainly basins) and under the marshes (locally known as *dhands*) where people have been letting in canal water for duck shooting ever since the traditional irrigation started. Table 1 shows some comparative water salinity data. The deep ground water is comparable in composition to sea water.

The saline surface which is dominant in the estuary contains mainly hygroscopic salts. These salts absorb moisture from the air as soon as the relative humidity rises above thirty percent or so. When wet, these salts make the surface slippery, 'oily-looking' and dark coloured. The slipperiness of the ground surface creates precarious traffic conditions on the unmetalled parts of the roads. This phenomenon is most marked on winter mornings or after rain.

In part of the area on the uncultivated saline patches of the estuary plain in general, and where such spots are surrounded by canal irrigated areas in particular the soil surface is covered by a crust with frequent very small 'domes' up to a few inches across and an inch or two high. These 'domes' are hollow and when dry break

[2]L.I.P. 1966, *Lower Indus Report*, West Pakistan, Water and Power Development Authoitry. Hunting Technical Services Ltd. and Sir M. Macdonald and Partners, WAPDA, Lahore.

TABLE I—WATER SALINITY

General location	Depth feet	Mille-equivalents per litre						EC mmhos/cm	pH
		Ca	Mg	Na	HCO'_3	Cl′	SO_4''		
Indus delta, ground water									
Near Tanda Bago well LIP W-1	126—141	22	112	438	8	560	3.5	52	7.6
	234—249	60	187	975	8	1050	166	92	7.7
	332—347	63	649	1626	7	2208	123	160	7.3
Lower Indus river plains, ground water									
About 10 miles east of Padidan	218—228	39	126	422	3	284	301	52	7.0
well LIP W-113	327—337	41	125	428	3	300	291	52	7.3
Upper Indus river plains, ground water									
Near Gojra wells RTL-G11	170	28	44	35	4	71	32	10	7.7
12	280	28	53	89	5	123	43	15	7.8
13	400	9	29	92	4	103	24	13	7.7
Near Gujranwala wells RTL B-12	280	1.4	2.4	3.0	5.0	0.6	1.1	0.6	7.8
13	380	1.0	0.8	12.2	8.9	1.8	3.3	1.3	7.9
14	240	1.8	1.6	4.4	5.6	1.2	1.0	0.7	8.0
Indus river water ranges from		1.4	0.2	0.1	1.6	0.1	0.2	<0.5	
to		3	1.2	1	3	0.6	1		
Sea water		20	105	460	2	535	55		

SOURCE: THE TABLE IS BASED ON

L.I.P. 1966 (Volume 6, ground water), *Lower Indus Report*, West Pakistan Water and Power Development Authority. Hunting Technical Services, Ltd. and Sir M. Macdonald and Partners, WAPDA, Lahore. R. A. Shamsi and A. Hamid 1960. *Quality of ground water, Rechna Doab*, Basic Data Release No. 1, WAPDA (mimeo). C. D. Hodgman, (ed) 1962, *Handbook of Chemistry and Physics*, P. 3488. Chemical Rubber Publ. Co., Cleveland. O., 44th ed.

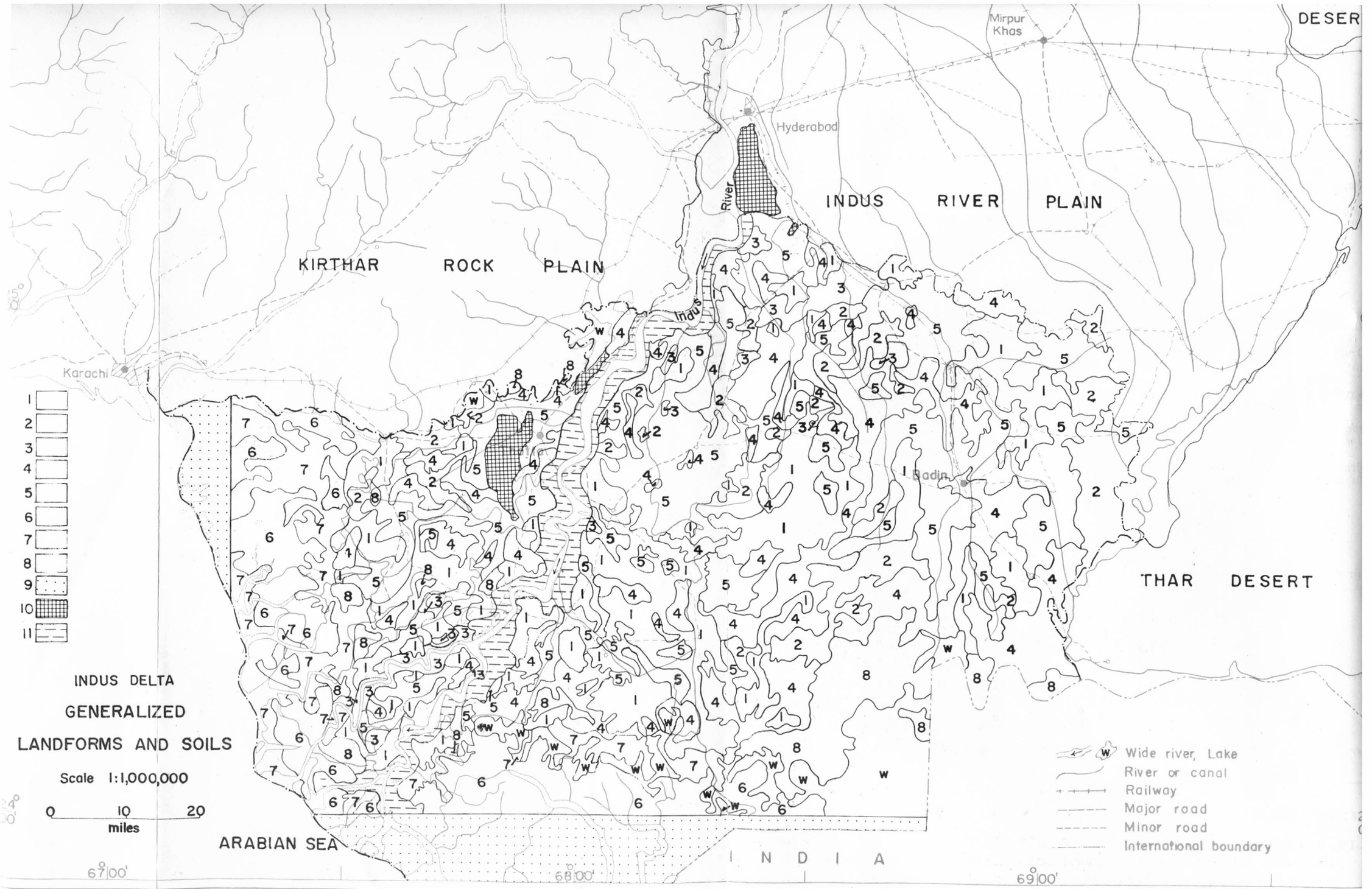

FIGURE 2

No.	*Landforms*	*Main soils and land types*
	Estuary plains	
1.	Spill areas	Gujo, Dari
2.	Saline bars and levees	Bulri, some Dari
3.	Nonsaline bars and levees	Sultanpur, some Shahdara

No.	*Landforms*	*Main soils and land types*
	Coastal belt	
6.	Tidal flats	Boriun
7.	Tidal ridges	Nangin
8.	Tidal basins	Jati, some coastal playas and marshland

under the feet with a crackling noise. The crust consists of salts with some admixture of clayey material. The domes are presumably formed after flooding, during drying out of the water-saturated topsoil, by the pressure of dissolved gases escaping when the soil solution becomes more concentrated and warmer.

Landforms

This paper deals with the main sedimentary landforms of the Indus delta (Fig. 2). Short descriptions and genesis of the soils will be described in a second article, in the next issue of this journal.

The scattered outcrops of hard limestone locally occurring in the Indus delta are outliers of the residual landscape to the north-west and are not discussed in this paper.

The active floodplain of the Indus river is less subject to tidal influence than previously since the river embankments have confined the water to one main course at all river levels. Artificial cover floodplain sedimentation conditions now prevail in the active floodplain, and a relatively even cover of silty and clayey sediment is deposited during the annual flood season. The active floodplain therefore belongs to the river plain rather than to the delta, and is not discussed in this paper.

Estuary Plain

Vast uniformly level silty flats and extensive clayey basins characterize the estuary plain (Fig. 3). There are also very fine sandy spill heads and meander bars, and some silty meander bars and long, narrow levees along main natural river distributaries. Saline estuary soils characteristically contain hygroscopic (Ca and Mg) chlorides and gypsum.

The levees, meander bars and spill heads are the highest places in the area. The levees and bars are nearly level to very gently sloping, silty, predominantly homogenized[3] and mainly saline (Bulri series). Some high parts of levees are stratified (Gujo series). The spill heads and a few high meander bars are made of very fine sands (Dari series) (Fig 3). The spill flats are extensive and level to nearly level. They are consistently silty, extremely sorted, strongly saline and generally laminated with low porosity (Gujo series). Some lower margins of the spill flats have homogenized material (Bulri series). The spill flats also contain some long, narrow, nearly level, parallel, very shallow channel deposits. These are very fine sandy, shallow over the main silty spill material and slightly lower than the surroundings. They may have a thin silty cover.

[3]Homogenization is a soil forming process through which an originally stratified or massive sediment with little stability against disturbance, is progressively transformed into a porous, stable, uniform soil material with well distributed organic matter.

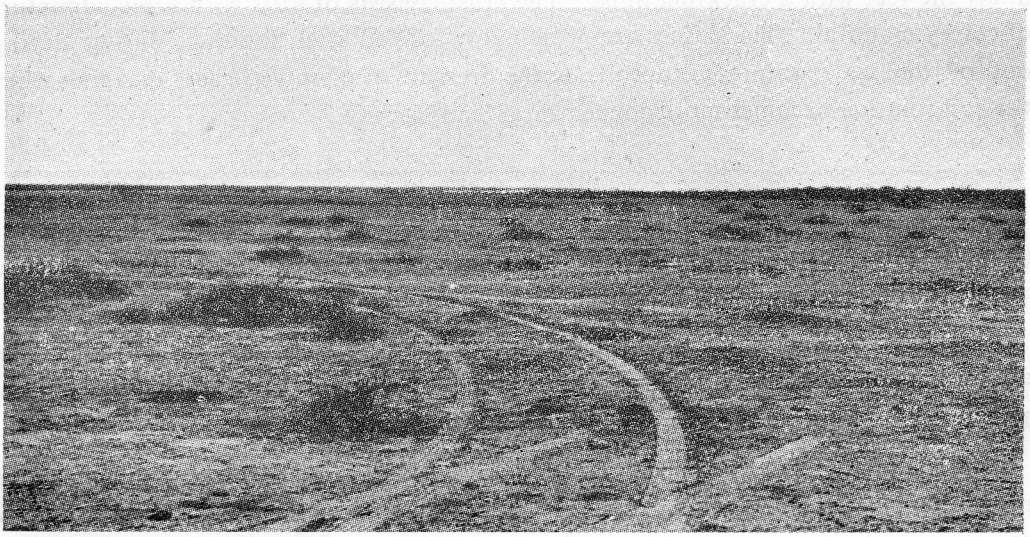

FIG. 3—Estuary plain. Level nearly barren, silty spill flat (mainly Gujo series).

FIG. 4—Estuary plain. Foreground clayey basin margin (Gungro series). Background very fine sandy meander bar (Dari series) with vegetation mounps.

Some long, narrow levees and bars along river distributaries have non-saline silty soils (Sultanpur and Shahdara series). These levees and bars are intrusions of the Indus river plain into the estuary plain.

The main estuary basins are occupied by non-saline, mottled, homogenized silty clays (Daro series) that have been under cultivation for centuries, ever since the traditional irrigation started. The shallow basins as well as the margins and higher parts of the main basins have mainly saline, mottled, homogenized silty clays (Gungro series) (Fig. 4). Some low basin ridges and basin margins have non-saline silty soils with a finer cover (Badin series). The deep closed basins have non-saline, homogenized, mottled and waterlogged clay soils (Dhand series) (Fig. 5). The deepest parts remain perennially under water and support sedges and water reeds (Marsh land). Outside the delta, in the normal river plain, many basins have non-saline, homogenized silty clays that are not mottled and are somewhat better drained.

On some of the sandy meander bars and within the saline clayey basins there are some vegetation mounds ranging from four to eight feet in height. On the bars, the mounds mainly consist of loose very fine sand. In the basins and on some bars, the material of the mounds is granulated saline silty clay. Clumps of mainly *wan* (Salvadora oleoides) grow on the mounds. These bushes have trapped wind-blown material, and have grown up higher with the rising surface of the mounds.

Coastal belt

The coastal belt is subject to regular tidal flooding by sea water (Fig. 5). The flooding frequency ranges from twice a day in the lowest places to about twice a month on the highest sites. The sediments are mainly clayey and are deposited by sea water but they originate from the Indus river. Most of the area is covered by clayey tidal flats (Boriun series), with some silty tidal ridges (Nangin series). The soils are stratified and strongly saline, the main salt being sodium chloride.

A small part of the area consists of clayey tidal basins, which probably are former estuarine floodplain basins, homogenized and subsequently invaded by saline tidal water after the Indus river shifted away to the west. They have homogenized and strongly saline soils (Jati series).

Part of the area is under tidal lakes, channels and creeks, and there are a few small coastal *playas*. These *playas* are level basins with a thick salt crust, accumulated by evaporation of sea water flooding the basins during occasional very high tides.

FIG. 5—Estuary plain. Clayey basin centre (Dhand series), ploughed for rice. Foreground small rice seed-bed.

FIG. 6—Coastal belt. Foreground silty tidal ridge (Nangin series). Background barren, clayey tidal flat (Boriun series) with small tidal creek. Far background another tidal ridge. A major creek (the lower course of a former distributary channel) draining part of the estuary plain runs from right to left through the tidal flat.

Genesis of Landforms

Sedimentation

The silty and very fine sandy spill soils of the estuary plain are extremely well-sorted: they have higher proportions of silt and less clay than their counterparts in the normal river plain[4]. This extreme sorting occurs during sedimentation under fresh-water tidal flooding.

Whenever spring tides occur in periods of high river discharge, downstream flow of the river and its distributary channels is retarded by the rising tide from the sea. The rise of water in such cases is very rapid, and large volumes of spill water are then released from the channels by overland flow in a period of a few hours. Very fine sand, the coarsest grade of sediment present in the river water, is dropped immediately at the spill heads. The water does not move only through the shallow and narrow spill channels, but a thick layer of muddy water flows with an even speed inundating the whole surrounding land. During this flow, mainly the silt fraction with little very fine sand and little clay settles on the spill areas. Some very fine sand settles in the shallow spill channels. The overland flow of the water is stopped after a few hours by the falling tide in the river or distributary channel. By the time the flood water reaches the shallow basins, the tide has become low, and most of the water moves out through the ebb channels, taking with it much of the clayey suspended sediment. Only where the level of a basin or a part thereof is lower than the level of the ebb channels, water stagnates and considerable deposition of clay takes place. Therefore, the normal sequence of sedimentation consists of very fine sands at the spill heads, silty material on the spill flats and silty clay or clay in the basins, separated from each other by relatively abrupt boundaries.

This deposition with extreme sorting of one sediment grade is in contrast to deposition in the normal river plain further north. There, the duration of overland flooding is generally longer and of gradually changing volume. During the flooding period, sediment of different grades is deposited at different times in any particular place on the levees, depending on the gradually decreasing speed of flood water with time; the fineness of the sediment increases toward the basins due to the speed of flood water decreasing with increasing flooding depth; and essentially all of even the finest sediment is deposited from the stagnant water in the basins.

The water leaving the estuary basins through the ebb channels still contains sediment: mainly dispersed clay and little fine silt. As soon as this reaches the point of mixture with salt water from the sea, the clay and silt coagulate into fine

[4]Gujo series (estuary plain) generally has 70—80 percent U.S. silt and Sultanpur and Shahdara series (river plain) generally 50—70 percent.

aggregates, with an equivalent settling diameter between ten and twenty microns[5] (fine silt size). From this moment, therefore, clay ceases to act "like clay" in sedimentation, and the sedimentary landforms of the coastal belt are like those of a silty spill landscape in spite of the clayey texture of most of the sediment. The extensive, level, clayey tidal flats are thus formed by tidal flooding with salt water carrying silt-size sediment aggregates, not dispersed clay as in the fresh-water tidal or river plain.

It should be noted that the present sedimentation conditions have become fundamentally different from those described above since the completion of embankments along the main Indus channel. Now, the distributary channels of the delta are not receiving river water any more, and deposition has virtually ceased except near the Indus mouth and along its main channel. Probably as a result of this, salt-water tides have invaded the southern edge of the estuary plain and have annexed some basins with homogenized soils to the coastal belt. They are now strongly saline with little or no gypsum by sea water leaching. Along the present Indus channel recent stratified river sediments now extend far into the subrecent estuary plain. Probably the peak discharge of the main channel increased, with a consequent decrease of tidal influence, after closure of natural distributaries by embankment.

[5]U. S. Whitehouse and L. M. Jeffrey, 1953. Differential settling of clay in saline water, Amer. Petroleum Inst. Project 51, Report 9, pp. 36-39, U. of Calif, Scripps Inst. of Oceanography.

MOBILITY OF FARM LABOUR IN SCOTLAND (1946—65/66): SOME INFLUENCING FACTORS[1]

A. H. RATHORE

The organisation of agriculture in Scotland reflects the sustained human response to a physical environment that suffers from excessive precipitation and low evaporation and, consequently, imposes certain limitations on agriculture. The history of farming and that of the people associated with it is an expression of these limitations. From the middle of the eighteenth century when Scotland made her debut from subsistence into commercial farming, the mobility of people working on land, particularly the hired labour, and its fluctuations in keeping with the changing rhythm of the economy, has been a normal feature of the rural demography. This article attempts to focus attention on some of the influences that have been in operation in the movement of farm labour within and outwith the farming industry in the post-war period between 1946 and 1965-66. Viewed analytically, these influences reflect the varying degrees to which farming types lend themselves to mechanical methods. The outcome of relationships, quite involved in character, has shown variations in the individual cases of farms as much as in the total number of workers in each type of farming. While machinery is the basic variable conducive to redundancy of labour on land, forces operating outwith farming so project their 'pull-effect' as to accentuate imbalance in farm-labour relationship.

Types of Farming and Variation in Hired Labour.

Scottish farming is essentially stock-oriented and exhibits a gradation of function and utility that rests on the altitudinal sensitivity and floral response. Farms vary in size and in their stock characteristics, the variation being in sympathy with their feeding quality and capacity. Stock farming is a complex operation entailing deep understanding of the correlation between the size and location of farms and the types of feed drawn from the natural and cultivated grasses. On that correlation hinges the propagation of breeds and their maintenance according to different age-grades. Being a hill country, unevenness of the ground

[1]An abstract based on the author's M. Litt. thesis on "The Role of Agricultural Labour in the Depopulation Trends in Rural Scotland" submitted in the University of Glasgow in 1968.

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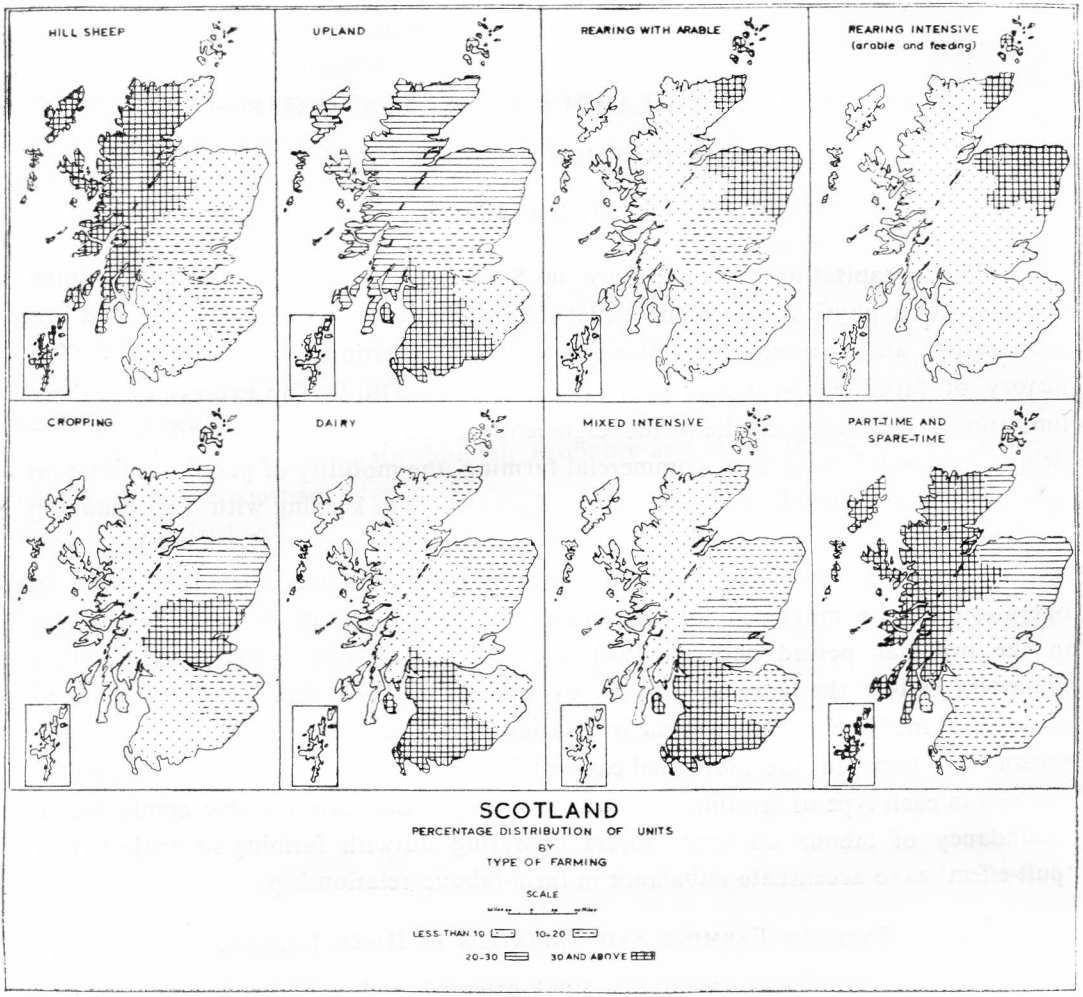

FIGURE 1

promotes a mixture of farm sizes and farming types in all regions although the general pattern of elevation and climatic differences are mirrored in their distribution (Fig 1). Each type is different from the other in the technique of husbandry and in the requirement of labour with the result that the impact of machinery on labour has been differential.

1) *Stock and Arable Enterprises*: On arable farms, particularly those with some cropping, requirement of labour is considerable and the effect of mechanisation on it proportionately marked. Hill sheep farms, on the other hand, need small labour force and restricted use of machinery. Even so the proportional reduction in total labour in their case was not inconsiderable, having been around a third in the survey period. Another variable influencing significantly, farm-labour relationship through reduction in man-hour requirement, is the improved management and husbandry.

This was borne out by the twenty-five percent to sixty-six percent reduction range in all types of stock enterprises and particularly in the arable-rearing. With a labour and machinery requirement lower than in some other types, arable-rearing has tended to be more responsive to the improved techniques and management than other enterprises (Table 1).

2) *Cropping and Dairy*: Cropping and dairy are in the higher grade of labour requirement and their amenability to change under mechanical influences is greater than the arable. Since the period of association with a specialised type of operation in these counts for the vocational weight of the worker, the restricted decreases in their case were attributable partly to dependence on specialist workers, such as the dairyman and the tractor-man, and partly to the trend towards enlargement of enterprises and a shift to the mixed and intensive farming for which labour is needed. Dependence on family labour was an influencing factor, particularly in dairy enterprise, operating on small and medium sized farms.[2] In the South West, the region specialising in dairy, family labour ranged between thirty percent and thirty-nine percent of the total labour.

TABLE 1—FARM LABOUR—PERCENTAGE VARIATION BY TYPE OF FARMING
1956-1966

Type of Farming	Total	Total Full-time	Full-time Males 20-65
Hill Sheep ...	31.3	26.8	40.0
Upland Rearing ...	25.6	22.5	19.1
Rearing Arable ...	66.2	85.5	59.7
Arable with Stock ...	45.5	43.0	39.5
Cropping ...	38.4	34.6	31.5
Dairy ...	41.0	36.2	33.6
Intensive ...	35.1	36.9	25.7
Small part-time Units ...	8.2	+ 1.9	+.5

SOURCE: DERIVED FROM THE DEPARTMENT OF AGRICULTURE FOR SCOTLAND STATISTICS.

3) In intensive farming the usually small size of the farm determined the requirement of labour and its variation. Although demands of the market necessitated emphasis on specialization and reliance on modern machinery, the purpose of enterprise is well-served by a balance in the man-hour requirement so that the proportional decrease in full-time labour was at par with cropping and dairy enterprises.

[2]Size of a farm (holding), in terms of acreage, ranges between one acre and thousands of acres; in the denominational sense, it depends on the location and the type of enterprise. Two hundred and fifty acres in hill sheep is small farm; in cropping and mixed types it could be regarded as medium to large.

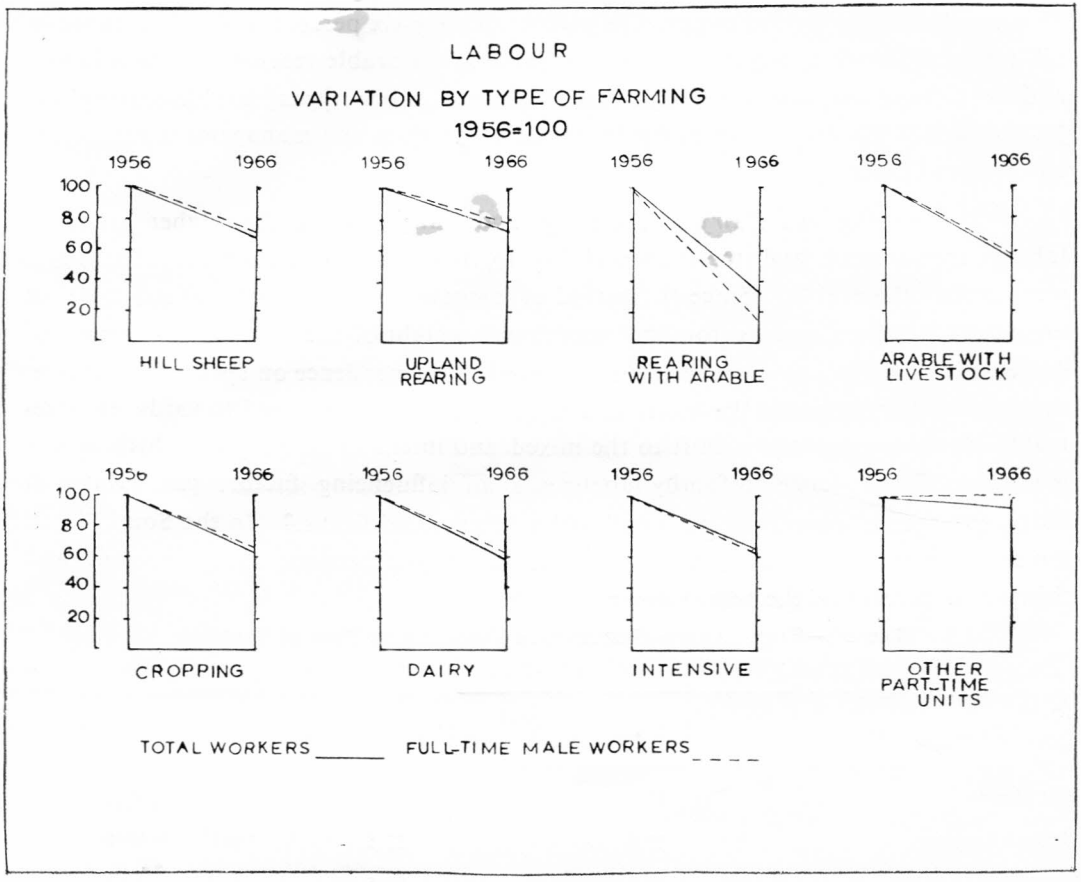

FIGURE 2

4) Small and part-time units are a different category. These cover a wide range of enterprises based essentially on the part-time occupation of the occupier and show a definite relationship to their location. In the North West (Highland) region these carry sheep or sheep and cattle while in the lowland areas a unit of that type could be devouted to mixed farming or market-gardening. A certain degree of intensiveness attaching to such units is related to the occupier's outlook to obtain maximum from the limited holding. The variation in total labour on such units was the least (—8%) in the survey period while full-time labour showed some increase, particularly in the over fifty years age-group, due to the family character of labour and high proportion of old people occupying "crofts" in the Highlands.[3]

Thus in an analysis of the variation in labour by the type of farming, correlation between change and relative dependence on mechanical devices and on improved management and husbandry in each type emerged as an outstanding aspect

[3] Units designed for subsistence farming.

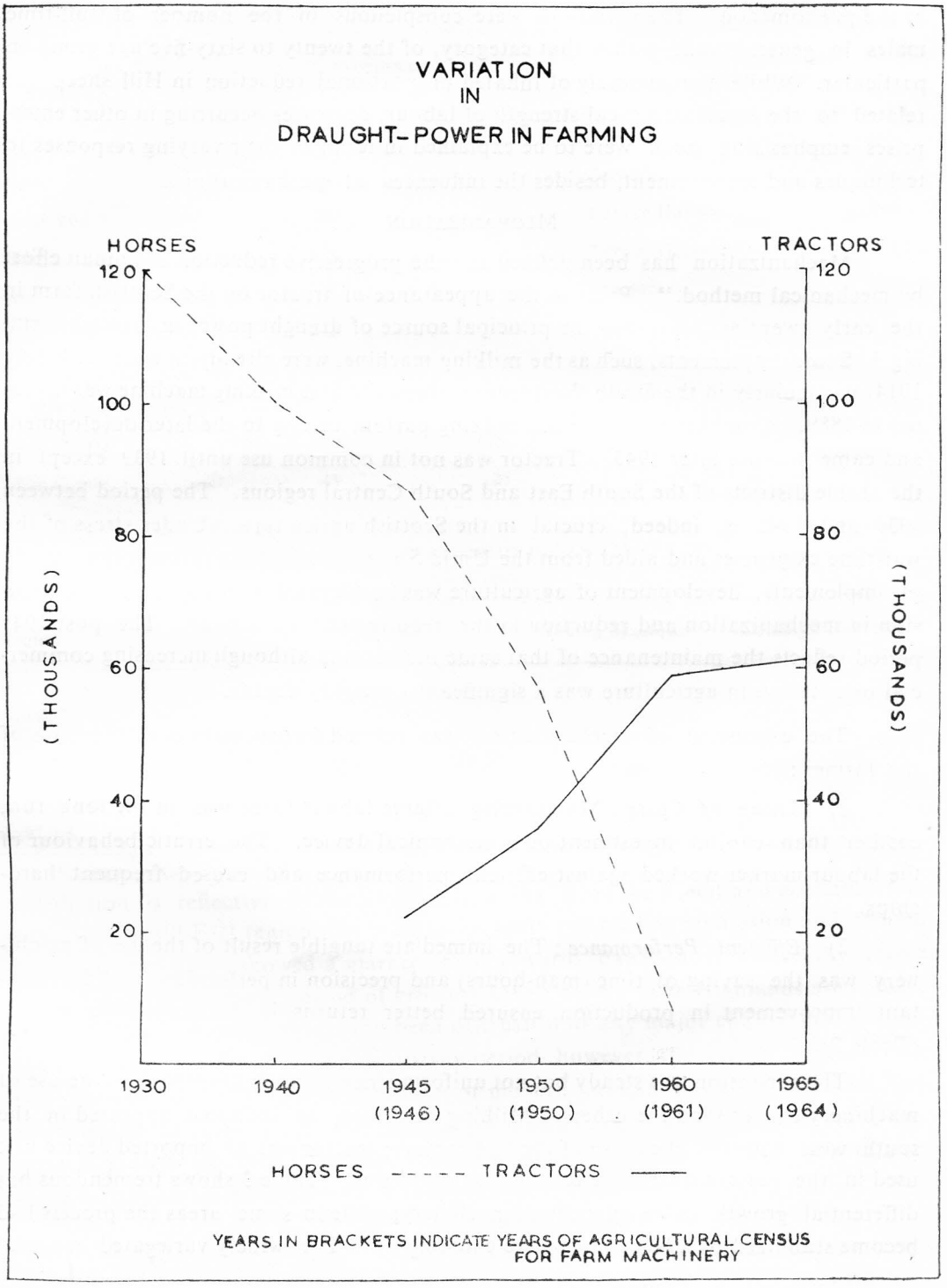
VARIATION
IN
DRAUGHT-POWER IN FARMING
HORSES
TRACTORS
120
100
80
60
40
20
(THOUSANDS)
1930
1940
1945
(1946)
1950
(1950)
1960
(1961)
1965
(1964)
HORSES ----- TRACTORS ——
YEARS IN BRACKETS INDICATE YEARS OF AGRICULTURAL CENSUS
FOR FARM MACHINERY

FIGURE 3

of the phenomenon. The variations were conspicuous in the number of full-time males in general and, within that category, of the twenty to sixty-five age group in particular. While the anomaly of inflated proportional reduction in Hill sheep was related to the small numerical strength of labour, decreases occurring in other enterprises emphasizing stock were to be explained in terms of their varying responses to techniques and management, besides the influences of mechanization.

MECHANIZATION

Mechanization has been defined as "the progressive reduction of human effort by mechanical method." Prior to the appearance of tractor on the Scottish farm in the early twenties, horse was the principal source of draught power in Scottish farming.[4] Some implements, such as the milking machine, were already in wide use before 1914, particularly in the South West region where the first milking machine was invented in 1889. Combine harvester and milking parlour belong to the later development and came into use after 1945. Tractor was not in common use until 1939 except in the arable districts of the South East and South Central regions. The period between 1939 and 1945 is, indeed, crucial in the Scottish agriculture. Under stress of the war-time exigencies and aided from the Untid States and Canada through the supply of implements, development of agriculture was accelerated with the resultant expansion in mechanization and reduction in the requirement of labour. The post-1945 period reflects the maintenance of that same momentum although increasing commercial orientation in agriculture was a significantly weighty factor.

The expansion of mechanization was related to two main considerations of the farmer :

1) *Saving of Costs* : Maintaining a large labour force was, in the long run, costlier than capital investment on a mechanical device. The erratic behaviour of the labour marker worked against efficient performance and caused frequent hardships.

2) *Efficient Performance* : The immediate tangible result of the use of machinery was the saving of time (man-hours) and precision in performance. The resultant improvement in production ensured better returns in a competitive market (Table 2).

The expansion was steady but not uniform since some districts took to the use of machinery earlier than the others. Milking machines, as indicated appeared in the south west towards the close of the last century; tractor was an imported device first used in the eastern districts after the first world war. Table 3 shows tremendous but differential growth in the quantity of machinery; while in some areas the process had become stabilized by 1945, others were catching up. The widely variegated regional

[4]After 1960 horses ceased to work on farms.

TABLE 2—MAN-HOURS PER WEEK ACCORDING TO CROPS AND FARM MACHINERY

Crops	Man-hours per week in Scotland		Farm Machinery 1946=100	
	1947	1962		1964
Wheat ...	33	25	Combine Harvesters	2,624.6
Potato and Sugar Beet ...	200	150	Forage Harvesters	880.0
Barley ...	33	25	Turnip Harvesters	143.2
Oats ...	33	30	Tractors	266.1
Turnips and Swedes ...	240	100	Milking Machines	192.9
Beans ...	200	35		
Per head cattle				
Daily Cattle ...	200	115		
Other Cattle ...	45	25		

SOURCE: AS IN TABLE 1.

TABLE 3– PERCENTAGE INCREASE IN FARM MACHINERY 1946-1964

Region	Tractor	Milking Machine	Combine Harvester
Highlands ...	476	43	1,267
North East ...	189	305	5,409
East Central ...	165	138	5,554
South East ...	87	109	1,058
South West ...	199	54	12,488
Scotland ...	166	93	2,525

SOURCE: AS IN TABLE 1.

distribution is reflective of the time-lag resulting from the social and economic factors. The North East region, for instance, with an established reputation and assured market for the stock, showed a marked trend towards dairy, a commercially viable enterprise in the post-war period of growing urban needs. The Highlands are conservative in outlook and have long been distrustful of any major change in the traditional modes of husbandry. In the survey period, however, the region appeared to have become inclined to the adoption of modern mechanical devices. Its relative isolation and distance from the centres of consumption was apparent from the arrested growth of dairy. Inflated combine number in the South West were related to the expansion in the crop land in that region.

WAGES AND HOURS OF WORK

A higher wage is the aspiration of every worker. The motivational environment that is the precursor of the process of mobility, is born of the coordinative

operation of certain variables such as a higher wage, provision of accommodational and social amenities and better recreational opportunities. Their cumulative effect could be spelt in terms of local sociology and personal psychology. Though each variable however economic is shot as a latent strain. How much a worker is to get in return for his labour determines, in the ultimate analysis, the degree of psychological stability in his particular trade or vocation that has so close a correlation with motivation.

The problem of wages in agriculture is an involved one not so much in its structural characteristics as in relation to the mobility of labour. Although there is

TABLE 4—INDEX OF WAGES IN 1950 AND 1966

General Farm Worker = 100

Industry and Trade	1950	1966	% Change 1950—1966
1. Building : Labour ...	115	110	124
2. General Printing : Porters & Packers	112 to 115	124	153
3. Retail Food Trades : Shop Assistants/ Warehouse Workers ...	77 to 106	94	137
4. Confectioners : General Workers ...	99 to 105	85 to 91	113 to 91
5. Road Haulage : Drivers ...	111 to 127	99 to 146	107 to 192
Labour ...	108	97	110
Packers ...	105 to 107	95 to 101	110 to 117
6. Road Transport : Drivers ...	111	112	164
Conductors ...	106	108	136
Unskilled ...	105 to 113	103	126
7. Iron and Steel Scrap : Drivers ...	107 to 114	99	108
Others ...	106	93	102
8. Electrical Contracting : Electricians/ Fitters ...	140	138	127
9. Ship Building : Unskilled ...	98	84 to 85	99
Semi-skilled ...	101 to 109	88 to 99	102 to 112
10. Milk Distribution : General Workers	101 to 106	95	115
11. Brewing : General ...	110	108	128
12. Vehicle Building : Labour ...	110	90	90

SOURCE : DERIVED FROM H.M.S.O., 'TIME RATES, WAGES AND HOURS OF WORK,' 1950 AND 1966.

a minimum wage fixed for workers in most of the industries and occupations, the rates determined by the agreement of various bodies, ogranisations or by statutory regulation differ widely. The probability of "a considerable portion of the workers in many of the industries" receiving "rates in excess of the minima" has been recognised.[5] The excess amounts consist of bonuses, benefits and incentive payments, each depending on, and varying according to, the conditions prevailing in a particular trade or industry, and determine the value of total earnings. Although the difference between the minimum wage and the total earning is important in as much as the movement that takes place in the "gap" between these, since a basic wage is as much subject to change as the excess amount, could be of considerable significance in creating instability in the labour market, a correlation between the general disparity in wages and the trends of mobility is possible of deductive interpretation on the basis of minimum wage.

The disparity is inherent in the differential situations of the two major sectors of the economy. The selection of minimum wage in respect of workers in some

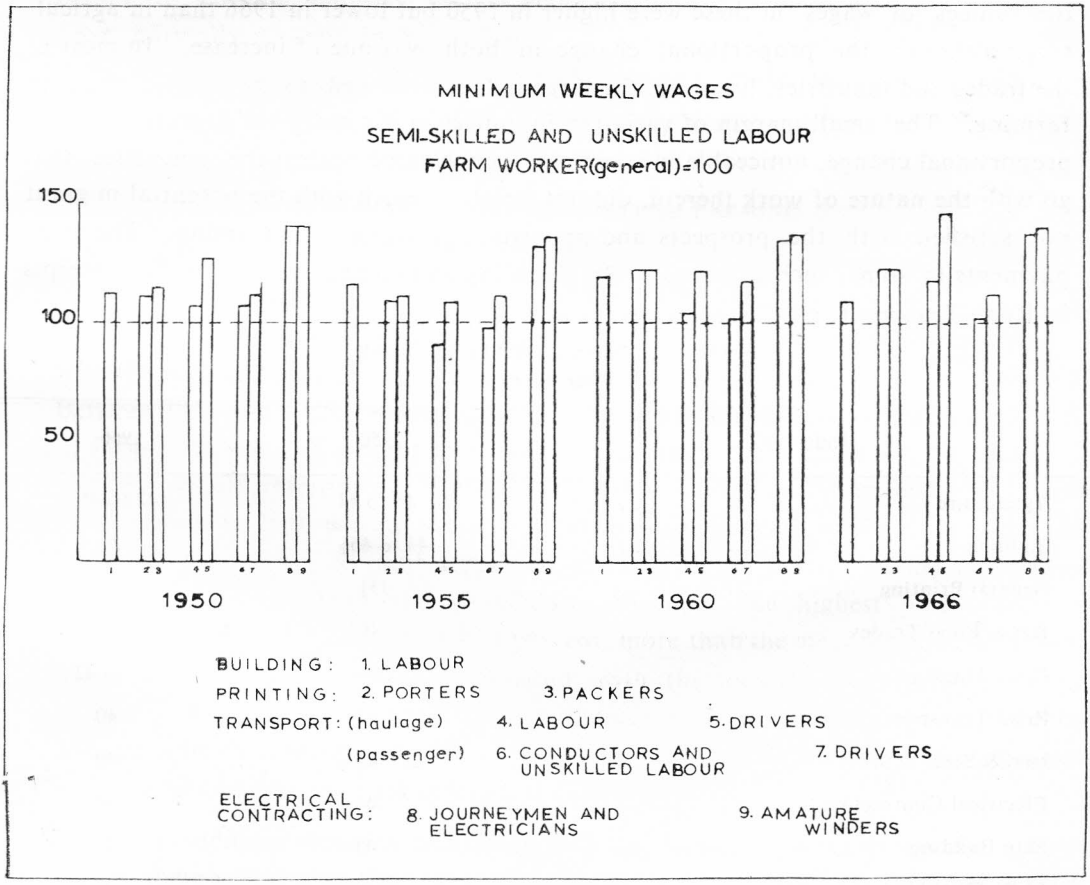

FIGURE 4

[5]H.M.S.O. 'Time Rates, Wages and Hours of Work' 1966. p. ii.

industries as given in Table 4 has been done in the light of the sample surveys of industries and trades. in these, farm workers, unskilled as they are have chances of absorption. The amount of skill needed in some of these, as for example in Electrical Contracting, Shipbuilding and Transport, is imparted in short term courses and apprenticeships to which the farm workers in lower age-groups can adjust themselves in a relatively short period of time.

The wages of workers in the farming and non-farming industries, as Table 4 would indicate, increased by over fifty percent between 1950 and 1966. The differential rise, except in a few cases, exhibited parallel trend. The wide range of variations is reflective of the fluctuations in the 'economics' of each trade and industry. The lower remuneration rates, for example, in Shipbuilding were related to the shrinking market position in the post-war period. On the other hand, the expanding Road Haulage and Road Transport gave a higher index. Iron and Steel scrap and Vehiclebuilding industries were conspicuous for some discordant notes in that the indices of wages in these were higher in 1950 but lower in 1966 than in agriculture, although the proportional change in both was one of increase. In most of the trades and industries, however, the wage index continued to be higher than in farming. The small margin of variation in indices or the marginal depression in the proportional change, noticeable in some cases, considered against the amenities that go with the nature of work therein, did not weigh so much with the potential migrant not satisfied with the prospects and opportunities available in farming. The extra payments in some, such as bonus in Shipbuilding and commission on traffic receipts in Road Transport, reinforced motivation.

TABLE 5—NORMAL HOURS OF WORK
(Per Week)

Industry	1950	1966
Agriculture	48 to 61	42 to 45
Building	44 to 46½	40
General Printing	43½	40
Retail Food Trades	46	42
Road Haulage	44	40 to 42
Road Transport	44	40
Iron & Steel Scrap	44	40
Electrical Contracting	44	40
Ship Building	44	40
Milk Distribution	48	40

SOURCE: AS IN TABLE 1.

TABLE 6—AVERAGE WEEKLY TOTAL EARNING (SHILLINGS)

Category of workers	1953—1955	1960—1962	%Increase 1953—1962
Grieves	176/11	229/-	36.3
Shepherd	157/10	220/-	39.3
Dairy stockmen	171/5	238/-	38.8
Other stockmen	153/6	214/-	39.4
Tractor-men	148/5	204/-	37.4
General worker	136/10	190/6	38.8

SOURCE: AS TABLE 1.

Another factor of motivation, a concomitant of the wage situation, is the normal duration of work. In spite of the improvements in the conditions of work, people in farming industry, besides being exposed to the hazards of outdoor work, have normally to put in more hours of work than in other industries (Table 5). A lower wage and longer duration of work not only make farming less attractive to the new prospective entrants but create psychological instability so that those, particularly the young ones, already in it are not inclined to stay on.

WAGE LEVELS IN SCOTTISH FARMING

The average weekly total earnings in Scottish farming increased considerably in the survey period. In the decade between 1953 and 1962 the earnings of all categories of workers rose by thirty percent. The variations were in consonance with the type and location of farms and with the type of worker, specialist or general. Between 1953 and 1955 the general worker's rate was the lowest earning on all types of farms. It was 6.5 percent to 11 percent less than the average for all classes of workers in all enterprises. For the dairy stockman the excess amount ranged from 10.8 percent to 25.9 percent more than the man for general workers. Between 1960 and 1962 tractormen in some areas were at par with the general worker in the lower grade of earnings. On an average the dairy stockman, the highest paid worker in farming, claimed 9.5 percent to 41.1 percent more than the mean average for general worker. The variations were correlated with the location of farms and the type of enterprise. Dairy and mixed farming in areas situated in proximity to the Central Industrial belt exhibited higher wage levels consequent upon the need of maintaining full-time labour force in such enterprises (Table 6).

In addition, benefits accounted for the value attaching to weekly earnings. Again, these varied with the type of enterprise, the region and the type of worker. Between 1960 and 1962 these ranged for grieves from eleven shillings to twenty-five

shillings and for dairy stockmen up to twenty-seven shillings. The general worker got between eight shillings and twenty-three shillings a week. The rate of benefit depended on, and changed in keeping with the changes in, the market position of a particular enterprise. The extent of variation in wages actually paid was underscored by the fact that, in the period between 1960 and 1965, 6.2 percent full-time workers got the statutory minimum.

The wage position, as explained above, showed that the differences in earnings were the motivating force in the mobility of labour within and outwith farming. The class of workers most vulnerable to the forces of drift would be the least paid, such as the general workers and the tractormen. Levels of earnings fluctuated with the changes in the market position in relation to different enterprises and, consequently, in the need for labour. Other factors, such as housing and social considerations, were subsidiary although these could, singly or combinedly, be significant in altering balance in motivation. Better housing; for instance, could off-set the effect of relatively low earnings especially on workers with families.

Education

Education is a long-range influence in any sociological change. On the rural demography of Scotland, particularly on the mobility of farm labour, its influence has been increasingly perceptible since the regulation of compulsory education (up to the age of fifteen) in the fifties. In the course of field studies it appeared that children's education subjected farming families to a situation of fluidity leading to their migration from areas where the educational facilities of the required standard were not available. This was manifest, in an indirect way, in the attitudes of dissatisfaction that education normally promotes especially among the young in non-urban environments. As Professor Illsley observed, "it divorces young people from local attachments."[6] Certainly, when children grow up in a different environment and after leaving the school, are qualified to do other jobs, they are loath to go back to country life and much less willing to work on land. Tendency of children in small population areas to stay on at school after the age of fifteen being greater than in large population areas, observed in the course of field studies, was a further reflection of the same attitude. The trend was interpretable in terms of the relationship between the scarcity of jobs available locally in the former case and, in consequence, children tending to prolong their stay at school rather than go back to land as against relatively better chances of jobs for school leavers in the latter.

In this attitudinal environment the young (prospective) farm workers are prone to migration from the country-side. This is shown by the high proportion of reduction in the young male workers. Between 1953 and 1965 the number of males

[6]R. Illsley, University of Aberdeen (Scotland).

in 18-19 years age-group and those in 15-17 years age-group decreased by 41.2 percent and 49.1 percent respectively.

Conclusions

Mobility of farm labour in Scotland is a phenomenon rooted in her agrarian history. Need for the hired labour has varied according to changes in the techniques of husbandry. Over the recent decades expansion of mechanisation and improvements in the techniques and management have had the effect of further reducing man-hour requirement in varying degrees. The labour redundancy on land that this situation inevitably led to was worked upon by forces operating outwith and within farming. A higher wage and better conditions of work in non-farming occupations, the varying grades of earnings within the farming industry and attitudes of dissatisfaction engendered by education among the young in isolated rural environs were the influencing variables in the phenomenon of mobility.

GEOGRAPHICAL RECORD

COLONIZATION OF THE SIND SAGAR DOAB

Of the various colonization projects undertaken in the country, the Thal Project stands as unique, because it involved the development of a most formidable tract of land, which covers a vast area where physical conditions and the nature of land was most desolate. Yet constant endeavour, careful planning and its execution has turned it into a promising land. The importance of the Thal project also lies in the fact that this is the first project to be undertaken at the time of Independence and a span of sixteen years has passed through which its destiny has been moulded advantageously.

General Orientation

The word 'Thal' seems to be an abbreviation of the Sanskrit word 'Marus-thai' meaning a vast expanse of sandy tract. The present Thal covers the vast area of the Sind Sagar Doab lying between the Indus on the west and the Jhelum on the east. This triangular tract has a broader base towards the north at the foothills of the Salt Range while it tapers down towards its apex at the confluence of the Indus and the Panjnad River system. Administratively it includes portions of the districts of Sargodha (Khushab Tehsil), Mianwali (Mianwali and Bhakkar Tehsils), Muzaffargarh (Lieah, Kot Adu and Muzaffargarh Tehsils) and the western margin of Jhang district lying to the west of the Jhelum river. This vast area of over fifty lakh acres is an extension of the Great Indian Desert covered with sand dunes of varying nature and dimensions. The Indus once flowed through the middle of this tract. The river now shifted to the west, and the alluvial deposits have been turned into sand by the scorching heat, where strips of hard land intervene the dunes. However, along the margins both in the east and west, the riverain plains are covered with fertile material and are inundated by the river occasionally during floods.

The climate of the Sind Sagar Doab is semi-arid with high temperatures and scanty rainfall. During summer the maximum and minimum temperatures are 115°F and 65°F while the summer mean is 90°F. The nights are however mild. The winds are usually strong which carry particles of sand. June, July and August are the hottest months during which a great number of duststorms is experienced. The winter season is moderate, when maximum and minimum temperatures are 65°F and 41°F respectively while the winter mean is 53°F. The period from December to February is cold during which heavy frost is experienced.

The amount of rainfall varies from less than five inches in the south to about fifteen inches along the foothills of the north. Even this scanty amount of rainfall has a tendency of forty per-cent variation over the year.

The watertable is usually very low and is to be found at a depth varying between 70′ to 100′. Even this water is brakish and mostly unsuitable for domestic purposes. The waterable rises in the riverain strips and the southern reaches of the area where the two river courses are nearer to each other and the quality of water is also good.

With this much deficiency of water, the only hope of the area is the flow of the rivers. There are a number of inundation canals which have supplied water to the thirsty lands on the favourable occasion of increased river flow. Among these six from the Indus and two from the Jhelum which serve some small areas are of importance.

But they have to depend on the annual recurrence of highwater and their head-weirs have to be shifted from place to place due to a shift in the river course. Such inundation canals are not dependable even for short periods and prove expensive due to high cost of maintenance.

Extensive soil surveys have been carried out especially in the areas of promised irrigation facilities. Three broad types of soil have been found which are as under:

1) *Clayey Soils*: There is a narrow belt of hard clayey soil in the northern parts of the Thal which contains as much as forty-six percent of clay. This belt covers the whole expanse of land from one river to the other. This soil is highly impervious and extremely unworkable due to its hardness.

2) *Sandy Loam Soil*: Along the full length of the Indus and for a still narrow part along the course of the Jhelum, strips of sandy loam soils are found. These strips provide quite fertile land which comes under flood irrigation.

3) *Sandy Soil*: The greater expanse of the area is covered with loose sand. The dunes of coarse sand have grown into mounds and small sandhills over the entire landscape of this part. The vast area is not only unattractive but also formidable. The cost of construction as well as maintenance of irrigation channels is very high due to the undulating nature of the surface and widespread wind erosion.

With such physical setting the Sind Sagar Doab attracted little enterprise although its vast empty expanse lured human endeavour quite often. The first idea to develop this Doab was conceived as early as 1870 when the expansion of perennial irrigation was in its infancy. A Plan known as 'Andrews Plan' was drawn in 1873 but which was deferred for a later year. Early in the twentieth century after the execution of the famous Triple Canal Project, rectangulation survey of the Thal area was carried in 1915 and three alternative schemes, together known as 'Middleton's Project' were prepared for execution. These schemes were followed by a still more comprehensive 'Woods Project' formulated in 1919. But the harnessing of the mighty Indus, at a point where it enters the plains and over the area where the river has shifted its course so treacheously, was not easily manageable. Moreover, other areas were found still economical and more beneficial for such undertakings. The scheme to develop the Thal was shelved to give priority to the Sukkur Barrage which was to be the largest canal irrigation project of the world.

In the meantime surveys and schemes continued and the plan was again revived as a result of the Anderson Water Distribution Committee in 1935. It envisaged the construction of a main lined canal from the Indus near Kalabagh with a discharge capacity of 6,000-10,000 cusecs of water. Actual work on the project started in 1939 but its full execution was hindered due to the exigencies of the Second World War. The work had to be abandoned at the stage where it was to be resumed at a later date. At the time of Independence out of the total length of channels hitherto constructed only sixty percent was in working order while the remaining had become choked with sand and was thus out of order. Out of the total commanded area at that time which was about 500,000 acres only 88,000 was under actual irrigation.

The New Emphasis

The independence of Pakistan also brought the influx of millions of uprooted mohajirs from the other side of the border. These helpless people, without any means of subsistence, had entered Pakistan, their cherished homeland, for permanent settlement. The government realised the implications and formulated a policy for their permanent settlement on vacant land which also helped avoidance of over population in the already congested districts of old canal colonies.

The canal headworks of this project on the Indus, situated some four miles downstream of Mari Indus, were named after the Father of the Nation as Jinnah Barrage. On July 29, 1949 the Thal Development Act was passed by the Pakistan Parliament and soon a Thal Development Authority was constituted (TDA.)

The Jinnah Barrage situated at a point where the Indus emerges from the narrow gorge through the Salt Range controls one main canal which

takes off from the left bank of the river. This canal (known as the Main Line Upper) is a lined channel with a capacity of 6,000 to 10,000 cusecs of water. It trifurcates at Kararwala (south of Mianwali town) into three channelsw hich are as under :

Channel	*Discharge capacity*
1) The Main Line ...	4,524 cusecs.
2) The Mohajir Branch ...	1,463 cusecs.
3) The Dullewala Branch ...	613 cusecs.

The Main Line Channel runs mostly from north to south and is almost parallel to the Indus.

Towards the south its water is carried over to wide areas through a number of smaller channels such as Ghulaman, Hayat, Inayat Bhagal, Mahboob and Rajanshah distributaries of Bhakkar, Leiah and Kot Adu *Tahsils*.

The Mohajir Branch takes an easterly course and its distributaries namely Bhonki, Nurpur and Hadali, etc., carry the water to Mianwali and Khushab *Tahsils*.

The third channel which is the smallest has a south-easterly direction and its two distributaries spread over to the parts of Mianwali and Bhakkar *Tahsils*.

The Thal Project

The limits of the approved Thal Development Project extend over a gross area of about 2,200,000 acres out of which nearly sixteen percent was crown land. The breakup of the area under development is given in the Table below.

The plan contemplated that out of 1,238,313 acres of private owned land which is culturable approximately 600,000 acres would be acquired by the TDA. Thus out of the final figure of 1,472,897 acres which is culturable the TDA and private enterprise would develop 834,584 acres and 638,313 acres respectively. The TDA earmarked an area of approximately 207,300 acres for forests, mandies, farms and abadies, etc. The unit of allotment was fixed as fifteen acres per family and it was proposed to rehabilitate about 44,000 refugee families in the area of the project.

Work Started

The Thal Development Authority took the job in hand in the right earnest. Detailed surveys, levelling of land, digging up of distributary channels and the earmarking of different areas was undertaken first. Together with this the actual process of settlement *i.e.* provision of means of communications, construction of residential areas and other community buildings was also taken in hand. During the first year of the undertaking *i.e.* 1949-50, over 3,500 families were settled by making an allotment of about 20,000 acres and some seventy new chaks were established by the TDA.

Conditions for the Grant of Land

The Thal Development Act of 1949 incorporated a number of conditions for the grant of land in the Project Area under its section 30(3). The salient features are :

1) The tenancy is to be granted for the sole purpose of agriculture and no other use shall be

Table 1—The area of the Thal Project by categories

(In acres)

Category	Private owned land	Crown land	Total
Total area within the irrigation boundaries ...	1,824,833	346,871	2,171,704
Gross Commanded Area ...	1,561,694	293,591	1,855,285
Culturable Area ...	1,238,313	234,584	1,472,897
Area to be finally cropped ...	...	...	1,170,000

Source : Thal Development Authority.

made thereof. The price of the land, to be paid in easy instalments, not exceeding seventy in number, shall be charged after ten years of occupancy. The rate of charge shall be as under:

a) For first class land receiving perennial irrigation ... Rs. 150 per acre

b) For second class land receiving perennial irrigation ... 125 per acre

c) For land receiving non-perennial irrigation ... 70 per acre

2) The tenant will have to take permanent residence and construct a house in the estate in which the land is situated within one year.

3) The settler shall have to share the expenditure on surveying, demarcation, levelling, preliminary ploughing, construction of roads, *panchayat ghars* (village assembly houses) and other development activities.

Policy for the Allotment of Land

The policy of the selection of colonists has undergone various changes. Some changes were necessitated by the experiment of the first settlers which had introduced a large element of *moeens* (Kamins) and then the Government confined its selection to peasant proprietors among the refugees. Other changes were introduced in order to compensate those proprietors of the Panjab who had been dispossessed of their lands either by compulsory acquisitions for public purposes or through river action and waterlogging. Some *chaks* (a form of rural settlement) were also reserved for the landless Thal graziers known as *Triniguzars*.

The selection of the would-be settlers is made by the Deputy Commissioner in the case of the civilians and by the General Headquarters in the case of the Army personnel. A unit of fifteen acres is allotted to each family. The village *moeens* are entitled to a piece of five acres and the *lumberdar* (headman) gets additional *lumbardari* grant of fifteen acres. In every *chak* fifteen acres are reserved for the grazing of sheep.

Human Settlements

Apart from providing culturable lands and other facilities for the development of agriculture in the project area the important task before the Authority was to establish settlement areas worthy of the new residential qualities and capable of meeting the day to day demands of the residents and provided with facilities of natural growth of economy. The settlements developed by the T.D.A. are small *chaks* catering small individual communities and some suitable mandi-towns capable of meeting the needs of quite a large area.

Up till now a total number of over 1,100 new *chaks* have been developed in the Project Area. These small villages are well laid out. All of them have a generally standardized appearance with broad streets cutting each other at sharp angles and buildings having similar features. Every *chak* is provided with a mosque, open grassy plots and a metalled road which joins it with the main road. Thus there is no difficulty of taking the produce of the village to the towns for marketing purposes.

The *chaks* are divided among civilian and Army settlers. Houses have been constructed by the T.D.A. in the civilian *chaks* at a nominal cost of Rupees 800 and 900. The first category provides one room, a small verandah and a courtyard while the second category consists of two rooms and a courtyard. The houses in the Army *chaks* have been constructed by the respective units of the settlers.

The mandi-towns have been laid out with special attention and provide all the essential requirements of an urban community. The qualities of these mandi-towns are more precisely summed up in Kazi S. Ahmad's words :

"The Thal towns are a new experiment in urban planning in West Pakistan. The planning in evidence in the Thal town is a physical planning. It covers the several essential aspects of modern town planning, the choice of site, layout of roads and building blocks, determination of population size, provision wthin the town of means of livelihood for a high proportion of dwellers, and the distribution of dwellers, and

the distribution of functional areas in the Urban complex."

"Distribution of the several functional areas in the urban complex is planned. Segregation of functions, whereever necessary, is made perfect by interposing green belts between two functions. The main shopping area is suitably located in the approximate centre of the town. The residential area of the town is divided into several neighbour hoods. Each neighbourhood is provided with the necessary amenities; it has a primary school, a mosque, a central open space used as children's playground, and, in some cases, its own ancillary shopping areas. The acreage of the open recreational area per thousand of population of the Thal towns is over 13 acres which is much higher than that of our towns and cities. It compares favourably with European and American standards."[1]

TABLE 2—POPULATION OF THE MANDI TOWNS ACCORDING TO THE 1961 CENSUS

Mandi Towns		Population 1961
Qaidabad	...	2,659
Liaqatabad	...	3,879
Jauharabad	...	8,189
Leiah	...	19,608
Bhakkar	...	21,749

SOURCE: CENSUS OF POPULATION, 1961.

These mandi-towns have been provided with modern drainage, water and electricity supply and they serve as centres of trade, education and industry in the area.

EMPHASIS ON AGRICULTURAL DEVELOPMENT

Crops like sugarcane, cotton, wheat, maize, toria and gram are being successfully grown over the developed lands. All cultivation is dependent on canal water. The ground has been levelled to a great extent and the water courses now bring water to farther areas. The Machine Tools Organization Section, with ample number of tractors and other dredgeing and levelling implements looks after this aspect. The TDA has advanced *taccavi* loans to the cultivators for the purchase of seeds, bullocks and agricultural implements. Recommended varieties of seed have also been supplied and the Agriculture Section of the Authority has established Demonstration Farms such as at Jauharabad, Nasirwala and Kullur Kot. The Farms arrange demonstration of improved methods of cultivation, green manuring, conservation of farm-manure and the use of chemical fertilizers.

THE COMMONWEALTH LIVESTOCK FARM

An outstanding contribution of the Thal Development Authority is the Commonwealth Livestock Farm established since 1951. Its importance is not only local. It is the only farm in the country where large scale mechanized farming is being carried out successfully. The Farm covers an area of 14,842 acres of land in Rakh Ghulaman. It is equipped with most modern farm equipment which has been provided by the Governments of Canada, Australia and New Zealand under the Colombo Plan. The development of livestock wealth of the country is dependent on the establishment of scientific farms of breeding and rearing the famous species of cattle, sheep and poultry. The various sections of this farm cater for agricultural implements, Cattle breeds, Dairy and Poultry produce, etc.

It has got its own Agricuitural Workshop, Veterinary Hospital, Disease Diagnostic Laboratory and an Agricultural Technical School. Apart from supplying the developed breeds to the settlers of the Thal area the Farm maintains its own stocks. Dairy and poultry produce such as sterilized milk, butter and eggs are supplied even to such far off places as Rawalpindi and Lahore.

DEVELOPMENT OF INDUSTRIES

Although the apparent function of the Thal Development Authority is the colonization of the hitherto unattractive area of the Sind Sagar Doab by bringing more and more of the land under

[1]K. S. Ahmad "Growth of Settlements in West Pakistan," *Pakistan Geographical Review*, Vol. 16, No. 2 (July, 1961), p. 11.

cultivation and thus to provide land to the settlers, refugees or those coming from the much congested dsstricts. Equal emphasis has been laid on the development of industries small scale as well as large, which not only provide employment facilities to the settlers but are also a boon to the national economy. The industries developed in the Thal area mostly use the raw material locally available.

West Pakistan Industrial Development Corporation (WPIDC) has established important factories at Daudkhel, Qaidabad and Jauharabad. Among these Daudkhel stands out prominently. This well planned industrial town has sprung up, some eight miles to the east of the Jinnah Barrage, amidst a beautiful surrounding at the foothills of the Salt Range. The first of the industries to be established were Cement and Fertilizer. The Maple Leaf Cement Factory is a Canadian donation while necessary credit for the Pak-American Fertilizer Factory has been provided by the United States of America. Both these factories utilize limestone, sandstone, gypsum and peat coal as raw material, the rich deposits of which are available nearby. Since 1959 two more factories for the production of Penicillin and Dyestuffs have been added there.

The residential area of Daudkhel conforms to the most modern concepts of settlements. All the basic necessities of life such as modern sanitation, hospital, shopping centre, a high school and a Jamia Masjid besides recreational grounds, have been provided.

The other two important concerns of WPIDC are a Sugar Mill at Jauharabad with its own sugar farm and a Woollen Mill at Qaidabad. One Sugar Mill at Leiah, two Cotton Textile Mills, one at Liaquatabad and the other at Bhakkar are other large industrial concerns which provide employment opportunities to the settlers.

To cater for a greater number of settlers, the TDA has also organized a Cottage Industries Section. It provides employment at individual villages by organizing weaving, carpentry and metal works. At such centres both material and marketing facilities are provided.

Thus the long planned development of the formidable Sind Sagar Doab has now taken a concrete shape. It took over half a century of planmaking and abandoning for this once remote area of the country. Its fuller execution started at the time of Independence and it provided greatly needed opportunities for settling uprooted peasant class of refugees. Many procedural changes in the execution of the actual plan were introduced due to a change in need and policy. But what has to be looked for is the outcome of the human endeavour. The Jinnah Barrage perennial canal irrigation system has steadily brought into existence a vast area of lush green fields. The rainfall factor has been reduced to its minimum as regards agriculture. During past several years over 550,000 acres of land have been colonized and brought under cultivation. Over 1,100 new rural settlements have been established and some 30,000 families have been rehabilitated in this area. And it does not include the benefits brought to private land owners who have gained equally by this process of colonization.

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BOOK REVIEWS

Man and the Land: *A Cultural Geography* (Second Edition), George F., Carter, Holt Rinehart and Winston, New York, 1968, 588 pp., map, tables, photographs, index, etc.

Geographers tend to be particularly sensitive to any accusations that their work having allegiance to both the humanities and sciences, is not objective, factual and scientific. It is surpising, therefore, that *Man and the Land* whatever its other merits, at times falls distinctly short of these criteria, at least for Pakistani geographers and those others interested in the world as it exists today.

Whenever a nation emerges or any territorial changes are made, geographers lead others in being cognizant of the new political patterns of the land. Corresponding changes are made in their maps and books to keep up with the changing world. As such persistent and perhaps deliberate statements by a distinguished geographer that the Indus Valley and other areas well within Pakistan are located in India, would be a matter of surprise.

Generally areas undisputably belonging to Pakistan are said to be located in India, over again and again. For example, see page 55 : 'India : cities (Mohenjo Daro and Harappa) in the Indus Valley (Thar Desert)'; page 73, northwestern India for West Pakistan, and many others. Where unavoidable, East and West Pakistan are mentioned as two subdivisions of India, once with a qualifying statement, which may be seriously questionable (pp. 192-193). The statement is 'that Muslims occupy the dry northwest, although they have an outlying group in the Ganges delta, which became the basis for forming East Pakistan, during the *tragic splitting* of India, at the time it gained its independence in 1947'. This may well be a personal conviction of the author, and may be acceptable only to those who do not wish to know the facts.

A set of maps appearing on page 190 merit special attention, so far as they relate to the international boundaries and territorial extension of Pakistan. West Pakistan has been drastically chopped off at the northwest, and the boundaries of East Pakistan are not consistent on all the maps. We, in Pakistan lament the partial attitude of the British Boundary Commission in evolving a truncated Pakistan by giving many areas to India, which legitimately belonged to Pakistan. In this context, Carter's maps may deserve special notice. He takes the cavalier attitude of not including the northwest section in West Pakistan.

Such a treatment of Pakistan is surprising for the reviewer, and may well be for the readers, in view of the distinguished position of George Carter. Besides his contribution to geography, and recognition by the American Geographical Society, he belongs to the distinguished group of geographers, well known for their penetrating research and scientific treatment of geography.

Man and Land was first written in 1964, primarily to explain the differences in various peoples and areas of the world. Maintaining the same theme, second edition is a largely rewritten and expanded version of the first. Man, Land, and Culture form the principal factors, as constants and variables. Culture is the primary determining factor, being ever dominant in the human societies. The environmental factors are and have always been secondary, in determining the goals of the human societies. Environmental-deterministic controls over human achievements have been challenged and refuted on several counts.

The 558 pages of the book are organized in eleven chapters; in addition to the one as 'introduction'. The Introduction discusses the nature of geography, human geography, and methodology. Chapter 1 deals with the origin of man, and the problem of races. The origin of man is

suggested in Africa, south of Sahara, in the warm and humid land. Once man had emerged and spread in the Old World, there were biological consequences leading to genetic drift and finally to the evolution of varied races. Caucasoid, Mongoloid, and Negroid are recognized as main races, together with a number of sub-races.

It is interesting, that 'Hindu' has been accepted as a sub-race. According to Carter, India was peopled by dark-skinned, curly haired, broad nosed people. There has been an intermittent flow of Caucasoid genes into this group and the result is a mixed group with Caucasoid characteristics strongest in the northwest, and with many large groups of ancient peoples still existing in the central and southern parts of India.

The inhabitants of the northwest (now in Pakistan) are not Hindus, nor all the people of central and south India belong to Hindu religion, and hence may invite forceful dissents both from the Hindus and non-Hindus. Hindu can only be a religious designation, or most liberally be used for someone brought up in a Hindu social milieu who does not specifically adhere to some other faith. The great majority of the South Asians: Hindus, Muslims, Sikhs, Christians and others belong to various Caucasoid sub-races, which until recently were identified as Palaeo-Mediterraneans, Alpine, and others. However, the claassification of race or sub-race remains somewhat arbitrary, and have never been adequately standardized. Perhaps, Carter's Hindu is the group identified by Spate as 'Oriental type' which mainly inhabit the north western hills of the Punjab. (Spate, O.H.K., India and Pakistan, P. 152).

To argue a case that one race and one environment may develop different ways of life, an unreal uniform earth peopled by a uniform race is assumed hypothetically by the author. The three fundamental factors: race, physical environment, and cultural forces are then introduced to explain the complex world of human geography.

With exceptional competence and clarity, the cultural-historical processes are then brought out. This is done by comparing regions of similar climatic types around the world, like the arid lands, the wet tropics, the mediterranean regions, coastal mid-latitude forests and others. Since the climates are similar and so are other factors of physical milieu, the major variations in the landscape of these areas are explained through cultural-historical processes.

The final chapter deals with the role of physical environment and culture. An interesting and highly appropriate discussion of features like invention and diffusion, population and knowledge, location, time, and ideas and others is included. Sixty-four coloured maps, figures and many photographs accompany the text to explain the contents. The maps and illustrations are neat and at no point present any difficulty in comprehension. A section on the map projections, and a few world maps are given in the appendix to help the students.

Barring undue Indianization, and a few personal convictions, the book is a highly successful antidote to the physically conditioned books, still current in many institutions. Historical-cultural processes are discussed thoroughly, with exceptional competence and confidence. The book demonstrates remarkably well the geography of 'Berkeley School' and would be well received by the students of Cultural Geography world over, especially after a more thorough revision.

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The American Cities : Their Social Characteristics, Jaffery K. Hadde and Engar F. Borgatha, Rand McNally & Cto., Chicago, 1965, vi-193 pp, tables, appendices, $6.0.

The American Cities : Their Social Characteristics is an important addition to many books which have so far been published in the field of urban geography. For the past few years increasing attention has been paid to the cities for there has been an increasing influx of population in the urban centres. In this book an attempt has been made to study the cities with the standpoint of human ecology. The authors have endeavoured to describe the social characteristics of man in the city of the twentieth century.

The emphasis is on developing the concepts that can help in describing the characteristic of cities. The amount of data that has been used is enormous which has been manipulated by using high speed electronic computers. Thus there is a large number of tables in this book, covering approximately half of the pages of the book.

The book has been divided into three parts and each part consists of two chapters. Part I is introductory and deals with the nature of the problem and the classifactory systems. Part II examines the structure of American cities. Part III is the lengthiest of all as great number of pages have been covered by the statistical tables.

The introductory part of the book clearly states that the work has been carried out to find a set of variables that describe the characteristic of cities.

The large number of approaches that have been used in the book make the study very technical. However, the authors feel contented in arriving at a set of variables that describe the characteristic of cities more satisfactorily.

There are different ways of developing a classification of cities and a variety of them have been utilized in this work. The main emphasis is on three approaches. They are the historical—evolutionary, economic specialization or functional, and factor analytic. In the second part which deals with the structure or cities the authors have selected city sizes of 25,000 population or more and have put them into eight groupings.

The third and the last part contains the summary. The large number of tables and the appendices at the end gives sufficient statistical information which is of great value for the readers. This is however, strange that the book does not contain a single map or diagram. The exhaustive foot-notes and references bear witness to the depth of readings on the part of the authors. The study is a useful one, particularly for the purposes of research in urban geography. The authors deserve congratulations.

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