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THE SPATIAL PATTERN OF PANJABI CULTURE IN WEST PAKISTAN

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THE Panjabi culture in West Pakistan is generally thought to be represented by the middle Indus plain covering an area extending from Indus river in the west to Sutlej in the east, and from the present Kashmir border in the north down to the line running approximately across the confluence of Indus and Sutlej rivers in the south, presenting roughly a quardilateral look and coinciding with the present province of the Panjab. This may be termed as the mental map or perception of the Panjabi culture area. This is the area where most people speak Panjabi as mother tongue;[1] where lies the main abode of the population of Indoscythian origin or mixing, the original Panjabis, such as the Jats, the Awans and the Gujjars;[2] and where Heer-Ranjha, Sohni-Mahiwal and Mirza-Sahiban are the popular folklores.[3] But to say that the intensity of the characteristics of Panjabi culture is uniformly distributed throughout the area as described above would certainly be a hasty generalization. As Meinig observes "such cultures are geographic growths : localized in origin, expanding selectively and with gradation in content, establishing special pattern of contact with other cultures."[4] Therefore, it is logical to expect that there exist important spatial variations in the

[1]The term Panjabi is applied to all the dialects of Lahnda including Eastern Panjabi, as explained else where in this paper. The Panjabi culture area is defined as that part of West Pakistan where the characteristics of the Panjabi culture are predominant.

[2]For a comprehensive discussion refer to V.D. Mahajan, *et al*, *Political and Cultural History of Ancient India* (Delhi; 1962); pp. 58-59; S.M. Latif, *History of the Panjab* (Lahore : 1891), pp. 55-57; Sir D. Ibbetson, *Panjab Castes* (Lahore : 1916), pp. 97-164 and 169, 182; A. Cunningham, *The Archeological Survey of India*, Vol, 2,17 ff.

[3]The Folklores, Heer-Ranjha, Sohni-Mahiwal and Mirza-Sahiban are associated with the places now in Jhang, Gujrat and Lyallpur districts respectively. Interestingly enough they also depict pastoralism, pottery industry and trade, and agriculture, respectively. The more popular folklores and perhaps the oldest, namely, Heer-Ranjha represents the pastoral culture, as its heroine happens to be the daughter of a pastoralist.

[4]D. W. Meinig, "Towards a Geographical Morphology of Cultures," *Abstracts of the papers*, 20th International Geographical Congress (London : 1964), p. 150.

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intensity of the characteristics of the Panjabi culture; and that it is possible to distinguish the principal areas of relatively high intensity of Panjabi culture from the peripheries. It is on this assumption that the objectives of this paper have been formulated. More specifically, the purpose of this study is to grade and thus to differentiate areas according to the intensity of Panjabi culture in West Pakistan.

To accomplish the stated goal of this research it is useful to employ some of the generic concepts as presented by Meinig in his model of geographical morphology of cultures; namely, the core, the domain, the sphere of influence and the demographic front.[5] Meanings and measures of these features in the special context of Panjabi culture have been fully explained in appropriate sections. It must however, be stated here that in the absence of any other emperically derived reliable measure it has been considered proper to use language as the basic criterion for defining the Panjabi culture. It is needless to stress that language plays an enormously important role in social behaviour and culture building. It is a vehicle of bond among people; it is a means of transmitting ideas and thoughts to others and sharing the mental processes of other fellowmen; and above all it serves as the means of recreating the past experiences and communicating them to others, a process so essential in culture building.[6] The use of a single criterion namely, language, in depicting the spatial pattern of Panjabi culture should, therefore, not be construed as a serious limitation. It provides amply for both synchronic as well as diachronic interpretation of the achievements of human society.

The paper will make a definite contribution to the existing state of knowledge and understanding of the Panjabi culture.[7] Such a study has scarcely been attempted : Pakistani scholars in other disciplines have yet to appreciate the academic and practical importance of a geographic point of view; whereas geographhers generally fail to recognize cultural geography as a field which equips them with proper working hypotheses. Perhaps, it is because of their long and continued adherence to a naive and out-dated philosophy rooted in physical environmental determinism (which is now as dead as dodo); and thus most geographers in this country find it hard to focus on such great florescences of human creation. Results of this investigation, therefore, will not only provide a meaningful interpretation of the Panjabi

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[5] *Ibid.*

[6] For an elaborate discussion see H. Hoijer, "Language and Writing", in H. L. Shapiro (Ed.) *Man, Culture and Society* (New York : 1960, Galexy book), pp. 196-223, M. F. Herskovits, *Cultural Anthropology* (New York : 1963), pp. 287-304.

[7] A preliminary work which is related to the present theme is by S. Aziz, "Geographical Morphology of Panjabi Culture" (M.A. Thesis, University of the Panjab, Lahore, 1967).

culture in West Pakistan; but it will also be of great practical value, particularly from the standpoint of political-areal functional organization which continues to constitute an important question in the national as well as subnational politics of Pakistan ever since independence.

The Core

Core depicts that part of a culture area where intensity of the charcteristics of that culture is greatest. It must however be emphasised that no living culture is static. Assimilation of new ideas, experiences and equipment is an on going process in every culture. What is noteworthy in this context is that the degree of cultural change varies both spatially as well as temporally and is inversely associated with conservatism.[8] It is therefore useful that two types of cores are identified : 1) a core reflecting the highest degree of conservatism; and 2) a core representing greatest degree of assimilation, measured in terms of modernization.

How to identify the cores of the Panjabi culture is certainly a difficult question. The problem must be resolved in terms of such basic characteristics of the Panjabi culture as are emperically measureable, can be graded, and can be employed to distinguish the Punjabi culture from rest of the cultures in West Pakistan. Of all the possible indices language is the one which can offer most satisfactory results. There are several mutually intelligible variants of the Panjabi language reflecting degree of change in the "root-language." This attribute of Panjabi language makes it possible to measure the intensity of the characteristics of the Panjabi culture, depicting both the conservative as well as the modernized cores.

For further refinement of the boundaries of core area it is thought useful to employ the distribution of dairy animals as an additional indicator. It must however, be kept in mind that keeping of dairy animals is not a distinctive characteristic of the Panjabi culture; nor is it possible, in view of the limited observation, to establish emperically that the dietary use of a greater amount of milk and milk product by the Panjabis is the speciality of the Panjabis alone. The use of *lasi* (butter milk) at breakfast, however, appears to be a more common food habit in Panjabi villages. The use of distributional pattern of dairy animals, as a criterion, is therefore confined within the Panjabi culture area : and what it depicts is the 'pastoral root' of the Panjabi culture, a way of life associated with Indoscythians. This provides an important emperically derived criterion, particularly in view of the assumption that conservatism in Panjabi culture is positively associated with pas-

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[8]For a detailed discussion see J. J. Honigman, *The World of Man* (New York : 1959), p 256: M. F. Herskovits, *op. cit.*, footnote 6, pp. 305-315; E. A. Hoebel, "The Nature of Culture," in Shapiro, *op. cit.* footnote 6, pp. 168-181.

toralism. Keeping dairy animals signifies early form of livelihood of the Panjabis in which these animals served as important source of food supply and as an index of wealth and social prestige.[9]

The Conservative Core

Conservative core represents the maximum degree of conservatism. With reference to Panjabi culture the conservative core is identified as that part of the culture area where the oldest form of Panjabi language is spoken and where the greatest degree of pastoralism exists.

The Panjabi language belongs to the central group of Indo-Aryan family, and has several variants (Fig. 1). Grierson has grouped them into two major types namely, Lahnda (or Western Panjabi) and Eastern Panjabi. On the basis of the phonetic conditions it can be established that Lahnda was once spoken over the whole undivided Panjab extending even upto Saraswati river, and thus claiming a sway over the entire *Supta Sindhu*, the land of seven rivers. Thus, Lahnda is treated as the foundation of all the variants of Panjabi language. The rise of this language is believed to date back to the eighth century A.D. It is derived from Sanskrit, Arabic, Pishachi, and certain other western Himalayan dialects, and for about six hundred years Lahnda is supposed to have enjoyed full sway over not only the undivided Panjab and North Western Frontier Province but also farther east and farther west. In the East Lahnda has been influenced and superseded by a language hailing from the Gangetic doab, which accounts for the growth and development of the Eastern Panjabi. This dialect represents the greatest degree of change in Lahnda and is mainly spoken in the eastern margins of the area under study (Fig.1). In the area west of the Eastern Panjabi Lahnda is divided into a number of dialects which are grouped into seven main divisions : namely, Northwestern dialect, Northeastern dialect (Pothwari), Standard Lahnda, Multani, Hindki (Derawarli), Reyasati (Bahawalpuri). Standard proper as illustrated in Sir James Wilson's Grammar and Dictionary of Western of Panjabi, represents the oldest form of Lahnda and is spread over a large area including the present districts of Sargodha (East of Jhelum), Jhang, Lyallpur, and parts of Sahiwal, Gujranwala and Gujrat districts. The main

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[9]See O. H. K. Spate, *India and Pakistan* (London : 1957), p. 145; Mahajan, *op. cit.*, footnote 1, p. 74.

area is thought to be, however, confined within the Chaj doab (the doab formed by Chenab and Jhelum rivers).[10]

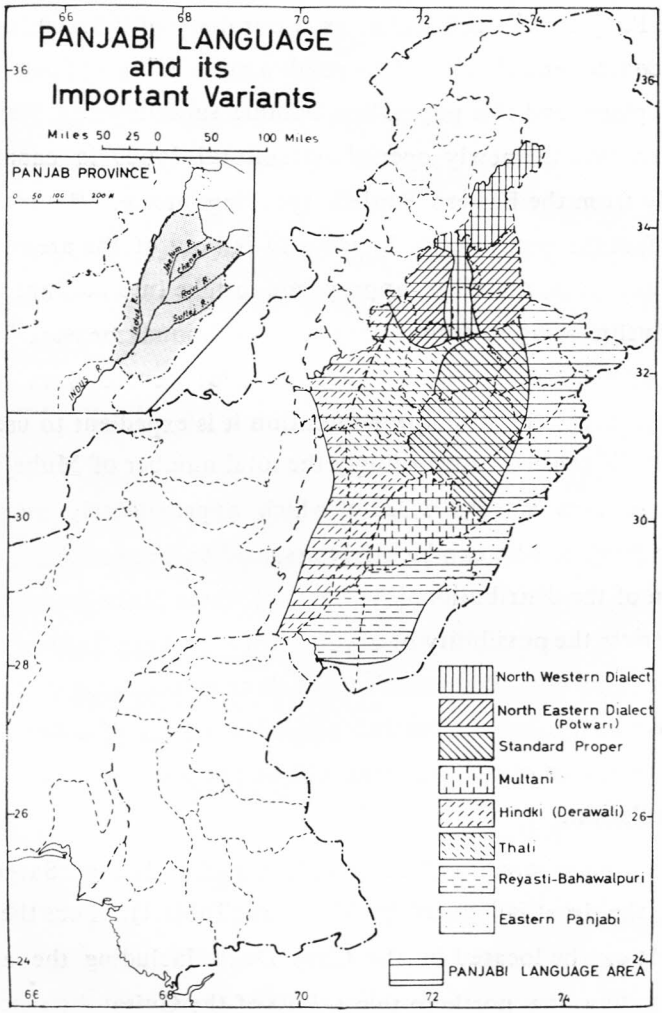

FIG. 1. The map depicts the spatial extent of each of the important variants of the Panjabi Language as presented by G.A. Grierson, *Linguistic Survey of India*, Vol. 8, Part I (Calcutta : 1921.)

However, it is about five decades ago when this pattern of linguistic variation was established by Grierson. Obviously, the question must be raised : Will it produce desirable results in the context of contemporary situation? It must be noted that since

[10]Refer to G. A. Grierson, *Linguistic Survey of India* (Calcutta : 1921), Vol. 8, Part I, pp. 233-241; also see M. Singh, *Origin and Growth of Panjabi* (Lahore : 1930), p. 6.

the completion of the *Linguistic Survey of India* in 1921 significant changes in population composition of the area under study have taken place.

Of the events that have caused migration into areas of Western Panjabi dialects partition of the Panjab of British India, as a corollary of independent Pakistan, has played a more consequential role. As a result a mass influx of Eastern Panjabi speaking people took place; and this population became superimposed over all the previous immigrant settlers into the newly opened agricultural lands in canal colonies, who were also mostly from the Eastern Panjabi speaking group. Recent development of Thal will not affect the result as this happens to fall out of the areas where Standard Lahnda is spoken. It is, therefore, appropriate to take into account the distribution of Muhajirs (Muslim refugees from India) as an additional measure for portraying the present pattern of Panjabi language. Since the 1961 census does not provide any information regarding the Muhajir population it is expedient to use the statistics as given in the 1951 census. Accordingly the total number of Muhajirs entering the Panjabi language area was 4,908,328 of which approximately ninety-eight percent came from East Panjab, who can be safely assumed to be speaking Eastern Panjabi.[11] An examination of the distributional pattern of these Muhajirs would reveal that in none of the districts the possibility of acculturation between Eastern Panjabi and local language can be ruled out. What needs to be done is to assume that the areas where Eastern Panjabi was spoken before independence will gain further strength, whereas in other areas the degree of acculturation will be positively related with the proportion of Muhajir population.

Of the districts where Standard Lahnda is spoken Jhang, Sargodha and Gujrat happen to be the least influenced by Muhajirs (Table 1). Thus the core area of the standard Lahnda can be located in the Chaj Doab including the entire district of Jhang and excluding the northern two *tahsils* of the Gujrat district. A definition of the boundaries of the Standard Lahnda along the administrative areas (district and *tahsils*) is more or less an arbitrary decision for convenience of handling data which are generally based on administrative areas. The result, however, represents the closest approximation of the area where the speakers of standard Lahnda predominate. Further refinement of these boundaries will require extensive field work.

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[11] *Census of Pakistan, 1951*, Vol. 5, Panjab and Bahawalpur State; for population change before independence refer to R. A. Malik, 'Irrigation Development and Land Occupation in the Upper Indus Basin" (Ph. D. dissertation, Indiana University, Bloomington, 1963), pp. 138-143.

TABLE 1—DISTRIBUTION OF MUHAJIR POPULATION BY DISTRICTS OF THE PRESENT PROVINCE OF PANJAB, 1951.

District	Population in thousands		Percentage
	Total	Muhajirs	
All Districts	20,651	5,260	25
Lyallpur	2,153	986	46
Lahore	1.895	745	39
Sahiwal	1,816	713	39
Sheikhupura	923	310	34
Bahawalnagar*	617	210	34
Multan	2,108	646	31
Gujranwala	1,047	299	29
Sialkot	1,474	369	25
Sargodha	1,163	207	18
Jhang	877	139	16
Bahawalpur*	541	79	13
Rawalpindi	876	106	12
Gujrat	1,159	136	12
Muzaffargarh	751	79	11
Rahimyarkhan*	665	63	10
Mianwali	551	47	9
Jhelum	682	52	8
Dera Ghazi Khan	631	36	6
Campbellpur	723	38	5

*At the time of 1951 census there were only two districts in Bahawalpur State out of which a third district of Bahawalnagar was created later on. Population data, therefore, have been adjusted accordingly. It was found expedient to divide the data for the *tahsil* of Chishtian which was divided into two, namely, Chishtian and Hasilpur *tahsils* equally.

SOURCE : *Census of Pakistan, 1951*, VOL. 5, PUNJAB AND BAHAWALPUR STATE.

Distribution of dairy animals is used as an index of pastoralism. Since traditonally the Panjabis are more fond of buffallo and cow milk it would be more helpful to locate the conservative core in terms of the distribution of these animals. Hence by definition in this study dairy animals include buffaloes and cows. For obvious reasons the number of dairy animals per hundred persons in each *tahsil* of the Panjabi culture area will be a superior measure as compared to the simple distribution of these animals.[12] Larger the number of dairy animals per hundred persons

[12]Government of Pakistan, Ministry of Agriculture and Works, *Pakistan Census of Agriculture, 1960*, Vol. 2 (Karachi : 1964), pp. 849-887. The number of cows and buffaloes includes those of the dairy farms as well. But since the number of such animals is small, and most of the milk plants collect milk from individuals it is assumed that the dairy farms (an index to modernization) will not affect the result adversely.

greater the degree of pastoralism. An examination of the spatial pattern of the man-dairy animal ratio, as used in this study, would show that a large number of *tahsils* fall in the top category, representing thirty or more dairy animals per hundred persons (Fig. 2). The highest ratio is found in Rajanpur *tahsil* of Dera Ghazi Khan district, namely, 75.3 percent. But this area is not so much known for its milk production as it is known for bull breeding. Here more than eighty-five percent of the dairy animals are cows. Also for similar reasons in the Pothwar plateau area the number of cows predominates.[13]

To locate the conservative core what has been done is to superimpose the pattern of linguistic variation over the distribution of dairy animals. The areas where the oldest form of Lahnda, namely, Standard Lahnda, predominates and also where the man-dairy animal ratio is high have been demarcated as the core (*of.* Figs. 1 and 2). Thus the conservative core of Panjabi culture includes the districts of Jhang, Sargodha (excluding Khushab *tahsil*), and Phalia *tahsil* of Gujrat district (Fig. 3).

The Modernized Core

Modernized core of a culture depicts that type of culture area where assimilation of new ideas, language, behaviour pattern and technology has attained the highest degree. It represents the peak of dynamism. In the case of Panjabi culture the modernized core is defined as that part of the culture area where greatest degree of change in language and pastoral characteristics has taken place. The language designated as Eastern Panjabi reflects greatest degree of change in the original linguistic traits of Lahnda especially under the influence of western Hindi.[14] However, its position in the past as an official language during the hay days of Sikh political power, and its closer proximity to modern urdu, which is a national language of Pakistan, amply justify that the status of Eastern Panjabi be accepted as the most modern form of Lahnda.[15] Official languages are generally the vehicles of the introduction of new ideas, experiences and equipments. Eastern Panjabi occupies the eastern marginal areas of the Panjabi culture which include, in specific terms, the whole of Lahore and Sialkot districts and major parts of the districts of Bahawalnagar, Sahiwal, Sheikhupura, Gujranwala and Gujrat (Fig. 1).

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[13]*Ibid.*

[14]Grierson, *op. cit.*, footnote 10, p. 237.

[15]Singh, *op. cit.*, footnote 10, p. 6.

It is interesting to note that there is only one area, namely, the *tahsil* of Lahore which falls in the lowest category of man-dairy animal ratio (Fig. 2). This indicates that in this area greatest transformation of pastoral activities has taken

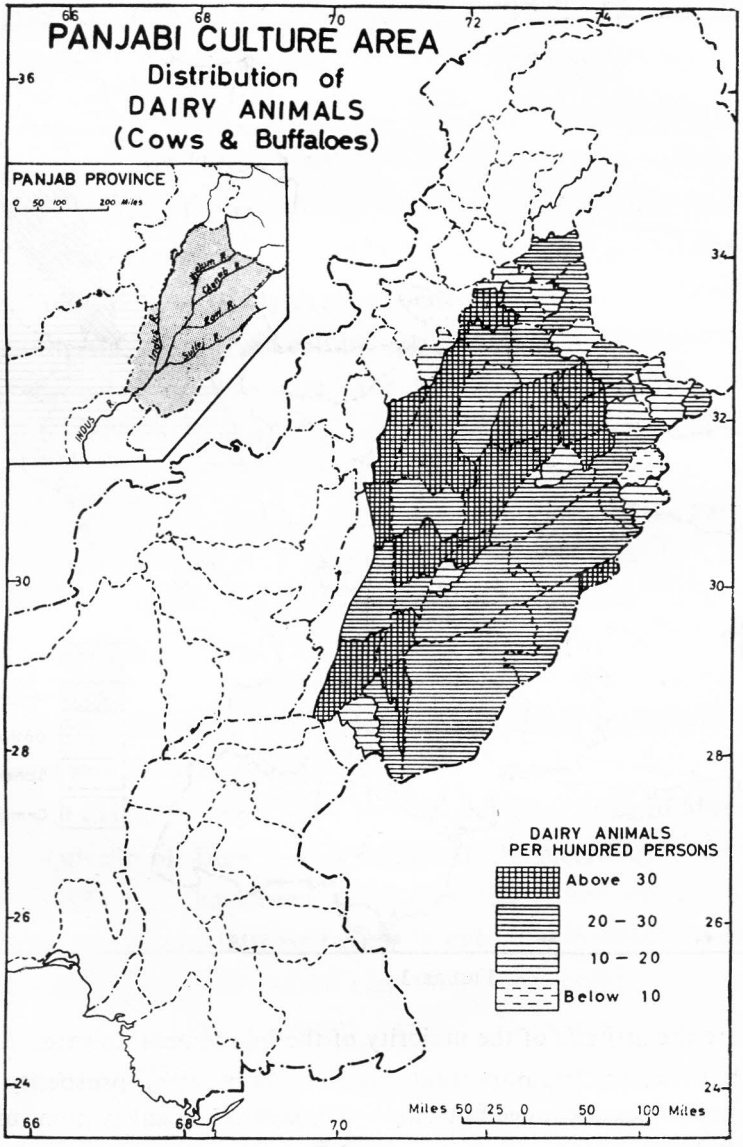

FIG. 2. Distribution of dairy animals is shown only in those *Tahsils* which fall within the Panjabi culture area as defined by language. Data have been extracted from *Pakistan Census of Agriculture, 1960.*

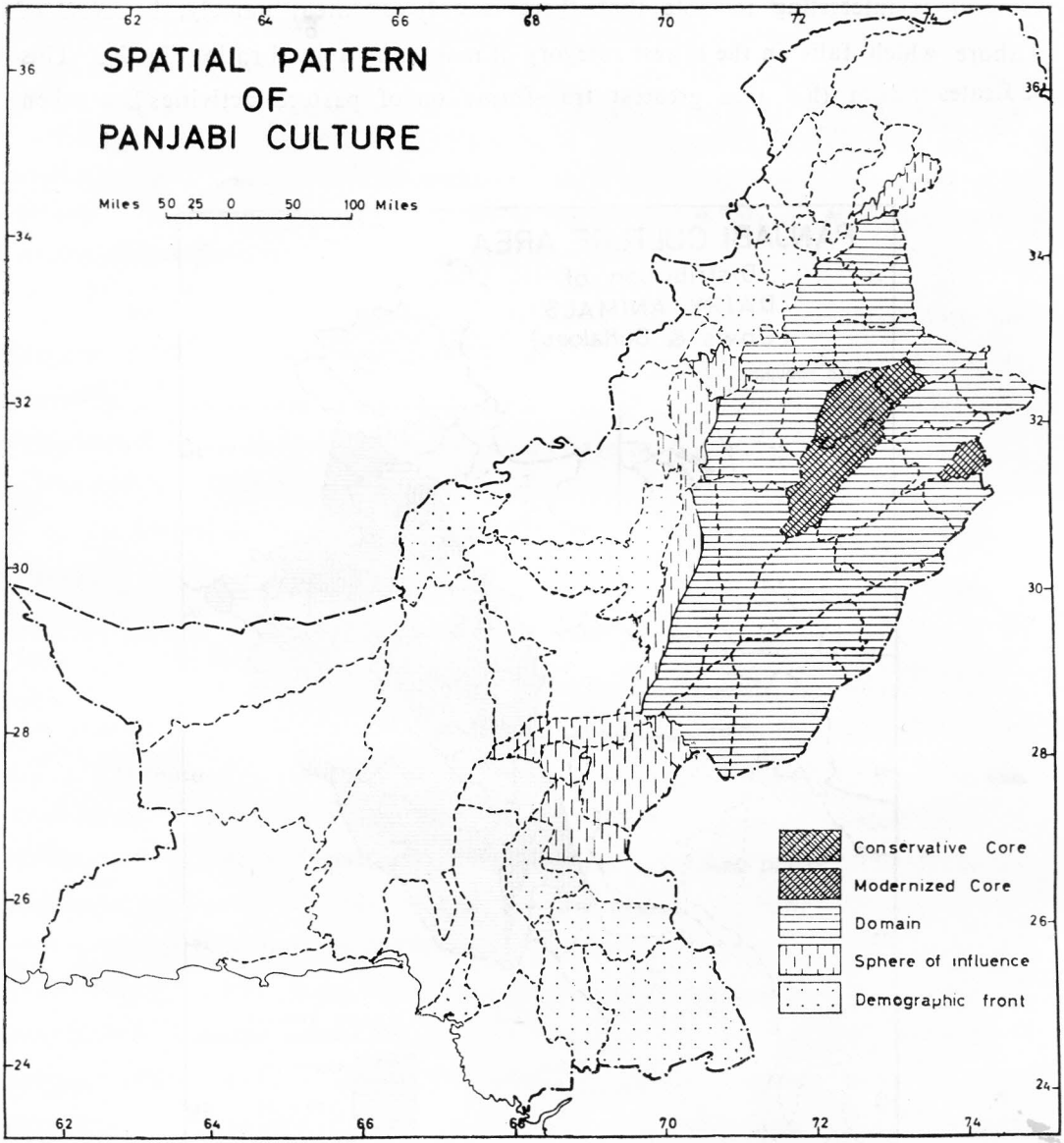

FIGURE 3

place, and there the attitude of the majority of the inhabitants towards dairy animals seems to be that they are less important symbols of wealth, prosperity and social prestige. This signifies a change not only from pastoral to cultivation of crops but also to a high degree of industrialization and urbanism.[16] Also the *tahsil* of Lahore

[16]See I.H. Zaidi, "Toward a Measure of the Functional Effectiveness of a State" *Annals*, Association of American Geographers, Vol. 56 (1966), pp. 64-67.

lies in the area of Eastern Panjabi, the most modern form of the Panjabi languages. The modernized core of the Panjabi culture can therefore be identified with the *Tahsil* of Lahore (Fig. 3). The result is realistic indeed. It is the city of Lahore, which constitutes culturally the most developed part and which serves as the source of inspiration for all the cultural activities in modern Panjab. This is the most urbanized, most commercialized, and most industrialized city which is the capital of the province of Panjab and where the complexity of administrative function is greatest.

The Domain

Domain indicates that part of the culture area where the intensity of the characteristics of a culture is relatively less as compared to the core area, but its complexity, uniformity and regional peculiarities are clearly evident.[17] Put in other words the domain of a given culture signifies that area where the characteristic features of that culture predominate. The domain of the Panjabi culture is defined as that part of West Pakistan where any form of the several variants of Panjabi language is mother tongue of the overwhelming majority of the inhabitants. Thus the domain of the Panjabi culture must concide with the spatial extent of the Panjabi language as presented by Grierson (Fig. 1).[18] However, keeping in view the number of speakers and for the sake of convenience in presentation the boundaries of the Panjabi dialects have been adjusted to conform with the administrative boundaries (Fig. 3).

It is noteworthy that the domain of the Panjabi culture extends even beyond the traditional provincial boundary of the Panjab into the districts of Hazara and Dera Ismail Khan of the North West Frontier Province. The *tahsils* of Mansehra of Hazara district and Kulachi of Dera Ismail Khan, which according to Griereon's map will fall within the domain, have been excluded. The author suspects that the characteristics of Panjabi culture in these *tahsils* do not remain predominant. This is felt because of their relative remoteness and their long political association with the Pashto speaking North West Frontier areas. The *tahsils* of Baluch Trans Frontier Tract of Dera Ghazi Khan district in the southeast and Sadiqabad in Rahimyar Khan in the extreme south fall out of this domain (Fig. 3). About ninety-seven percent of

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[17]Meinig, *op. cit.*, footnote 4, p. 150.

[18]Grierson, *op. cit.*, footnote 10.

the total population speaking Panjabi as mother tongue lives in the domain and the Panjabis constitute the overwhelming majority in each of the administrative units within it, namely, districts and *tahsils* (Table 2).

TABLE 2—PERCENTAGE COMPOSITION OF LINGUISTIC GROUPS IN THE PANJABI CULTURE AREA BY DISTRICTS, 1961.

Locality	Panjabi	Pashto	Sindhi	Urdu	Baluchi Brauchi	Others
Hazara ...	86.30	9.16	—	4.39	—	0.13
D.I. Khan ...	73.92	23.65	—	2.26	—	0.17
Campbellpur ...	94.26	4.30	—	1.15	—	0.29
Rawalpindi ...	92.42	1.14	0.01	5.11	0.01	1.31
Jhelum ...	97.22	0.35	—	1.43	—	1.00
Gujrat ...	96.97	0.18	—	2.03	—	0.82
Sargodha ...	93.13	0.44	—	6.37	—	0.05
Mianwali ...	90.33	5.17	0.02	4.46	—	0.02
Lyallpur ...	98.22	0.17	—	1.59	0.01	0.02
Jhang ...	95.95	0.15	—	3.89	0.01	—
Lahore ...	89.08	0.77	0.01	8.97	0.01	1.15
Gujranwala ...	95.04	0.16	0.02	4.52	0.01	0.24
Sialkot ...	97.47	0.09	—	1.89	—	0.55
Sheikhupura ...	98.24	0.07	—	1.61	—	0.07
D.G. Khan ...	94.52	0.30	6.02	2.83	—	0.02
Muzaffargarh ...	95.32	0.17	0.01	4.47	0.02	—
Multan ...	90.16	0.44	0.01	9.33	0.01	1.05
Sahiwal ...	96.44	0.12	0.01	3.36	0.03	0.05
Bahawalpur ...	94.42	0.16	0.21	4.88	0.05	0.09
Bahawalnagar ...	96.22	0.27	—	3.46	0.02	0.02
Rahimyar Khan ...	93.76	0.55	2.42	2.00	0.59	0.67

*Of the districts, Hazara and Dera Ismail Khan, the *tahsils* of Mansehra of the former and Kulachi and Tank of the latter have been excluded from the domain, demarcating the boundaries of Panjabi culture area. Since such data on *tahsil* basis are not available the percentages for entire districts are shown; most of the Panjabis, it is assumed, would be in those *tahsils* which have been included in the domain.

SOURCE : *Census of Pakistan Population*, VOL. 3, WEST PAKISTAN, 1961.

THE SPHERE

Culture sphere is defined as areas of outer influence and peripheral acculturation, where only certain elements of culture or the minorities exist in a locally viable culture.[19] In locating the sphere of Panjabi culture the main task is to identify the areas where, through acculturation, the characteristics of the Panjabi culture have been reduced into a subordinate position by other cultures in West Pakistan. More

[19]Meinig, *op. cit.* footnote 4, p. 150.

specifically the sphere of Panjabi culture refers to the peripheral areas which are represented by mixed dialects of Panjabi showing dominant influence of some other language. The most important of these dialects are: Siriki Hindki, Jafari and Khetrani.

The term Siriki is derived from the word *Siro* which is the local name of upper Sind. The dialect Siriki Hindki implies Sindhi mixed with Lahnda and resembles Jatki and Derawali, the variants of Lahnda. This is spoken in the upper part of the lower Indus plain including Sadiqabad *tahsil* of Rahimyar Khan district (Fig.3). The culture sphere includes the areas where Panjabi culture is in constant contact with that of Sindhi and the dialects spoken by the independent tribes of Dera Ismail Khan district, are mixed showing greater influence of Pashto and Baluchi. The basic structure of these mixed dialects resembles the Hindki of Dera Ghazi Khan district, but also shows certain connections with the Dardic languages spoken far to the north below Hindukush.[20]

The Demographic Front

One of the essential characteristics of a human population is its mobility. However, migration of population, generally caused under the stress of economic, social or/and political pressure, is a form of mobility which plays a more consequential role in the context of geographical morphology of a culture. The areas serving as principal foci of such movements are conceptualized here as "demographic front".[21] This discussion will provide an insight into the main regional focus of the movement of Panjabi population.

According to the population census of 1961 there were about three percent of the total number of persons speaking Panjabi as mother tongue who lived out of their culture area as well as the culture sphere. The percentage of Panjabi population in the various districts ranges from less than 0.01 in Makran to 35.3 in Karachi.[22] In view of such a wide range of disparities in the distributional pattern of Panjabi population in these districts it is proper to distinguish principal areas of concentration from the less important ones. To provide for a relatively wider choice of areas it has been considered convenient to take median of the distribution as the separating value. Thus those districts of West Pakistan where the percentage of

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[20] Grierson, *op. cit.* footnote 10, 648-649, present districts of Larkana and Kachi have also been included in the Siriki language area by Grierson. The present author, however, has excluded these districts from the sphere of Panjabi culture. It is thought that these districts, because of their relative remoteness and less resources, have little attraction for the Panjabis and hence little chances for continuous acculturation. This is evident from the fact that in 1961 there were less than one percent Panjabis in each of the districts of Larkana and Kachi; *Census of Pakistan Population,* 1961, Vol. 3.

[21] Meinig, *op. cit.*, footnote 4, pp. 150-51.

[22] *Census of Pakistan Population,* 1961, vol. 3.

Panjabi population is above median have been separated as the principal foci of movement. It is interesting to note that the demographic front of the Panjabi culture exists in all the culture areas: namely, Sind, Baluchistan and North West Frontier Province (Fig. 3). For obvious reasons the largest concentration occurs in the district of Karachi whereas Mardan district has the lowest (Table 3). In terms of their significance in relation to the total population of each district the Panjabis stand out in Loralai and Quetta, recording 26.1 and 17.6 percent respectively.

TABLE 3—DISTRIBUTION OF PANJABIS IN THE DISTRICTS OF WEST PAKISTAN FALLING IN DEMOGHAPHIC FRONT, 1961.

Districts	Panjabi Population (000)	Percent of total Panjabi emigrants	Percent emigrants of total population
Karachi	261	35.3	12.7
Peshawar	131	17.1	10.1
Nawab Shah	72	9.4	11.5
Hyderabad	55	7.1	4.3
Quetta	47	6.1	17.6
Sanghar	42	5.5	9.9
Tharparkar	37	4.9	5.1
Loralai	29	3.7	26.1
Kohat	28	3.7	4.4
Mardan	16	2.1	1.9
All Panjabis	718	94.9	—
Median	15,000	—	—

SOURCE : *Census of Pakistan Population*, VOL. 3, WEST PAKISTAN. 1961.

CONCLUSIONS

As a result the study provides a useful conceptual framework which can be applied in comprehending the spatial pattern of a culture. The application of the concepts of cultural core, domain, sphere and demographic front has been verified with reference to Panjabi culture. The study is based on single indicator, except in the case of identification of the core area in which case two criteria have been used, namely, Panjabi language and the dairy animals. The paradox that a culture is simultaneously stable as well dynamic has also been resolved by identifying conservative and modernized cores. The spatial pattern of Panjabi culture as depicted by this study is useful not only as a theoretical construct. Its practical utility particularly in the organization of various levels of administrative areas cannot be exaggerated. By making similar studies of other cultures in West Pakistan a useful pattern of the degree of acculturation between various cultural groups can be identified which can provide a good basis for the development of more effective measures of national or regional integration—so important a question in the current affairs of Pakistan.

MORPHOLOGY OF LYALLPUR CITY[1]

M. H. BOKHARI

LYALLPUR is a specimen of British town planning. Initially it was designed on the "cob web" pattern with the provision of open land for further expansion on all sides. During the British period the major expansion in the city took place to the north-west and south-west. Possible expansion in the east and south was checked by the presence of the railroad and canal distributary. However, the city has now expanded beyond these limits. What morphological patterns have developed in this third largest city of West Pakistan? This is the main question which the present paper attempts to answer.

THE GENERAL ASPECT OF TOWNSCAPE

The city was established primarily to serve as a main grain market for the agricultural produce of the Rechna Doab Colony. Since it was expected to attract the traffic from the nearby villages a radio-centric pattern of roads in the city centre was adopted because it is the ideal solution for traffic problems, both in the building of towns denovo, and in adaptation of old plan to modern needs.[2]

This radial pattern has been planned within an area covering 110 acres of land. The Kutchery Bazar, Aminpur Bazar, Jhang Bazar, and Karkhana Bazar are each sixty feet wide, whereas the Chiniot Bazar, Bhowana Bazar, Montgomery Bazar and Rail Bazar are only forty feet wide. Along both sides of these metalled roads, there are concrete pedestrian footpaths (five feet wide). The radial roads are interconnected by the inner and outer circular roads, sixty feet, and 110 feet wide respectively. There is no footpath facility by the side of the inner circular road, whereas six feet wide concrete pedestrian pathways are provided throughout the outer ring road. These are also joined from all parts of the city by the local through roads (Fig. 1).

Apart from these radial and ring roads, there are a number of back streets through the residential quarters. These indigenous roads are dark, narrow and

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[1]The paper is a portion of author's Ph.D. thesis *Lyallpur : A study in Urban Geography* (University of London, 1968). The author is indebted to Professor A. E. Smailes under whose able guidance the thesis was prepared.

[2]R.E. Dickinson, *The West European City* (London, 1962), P. 275.

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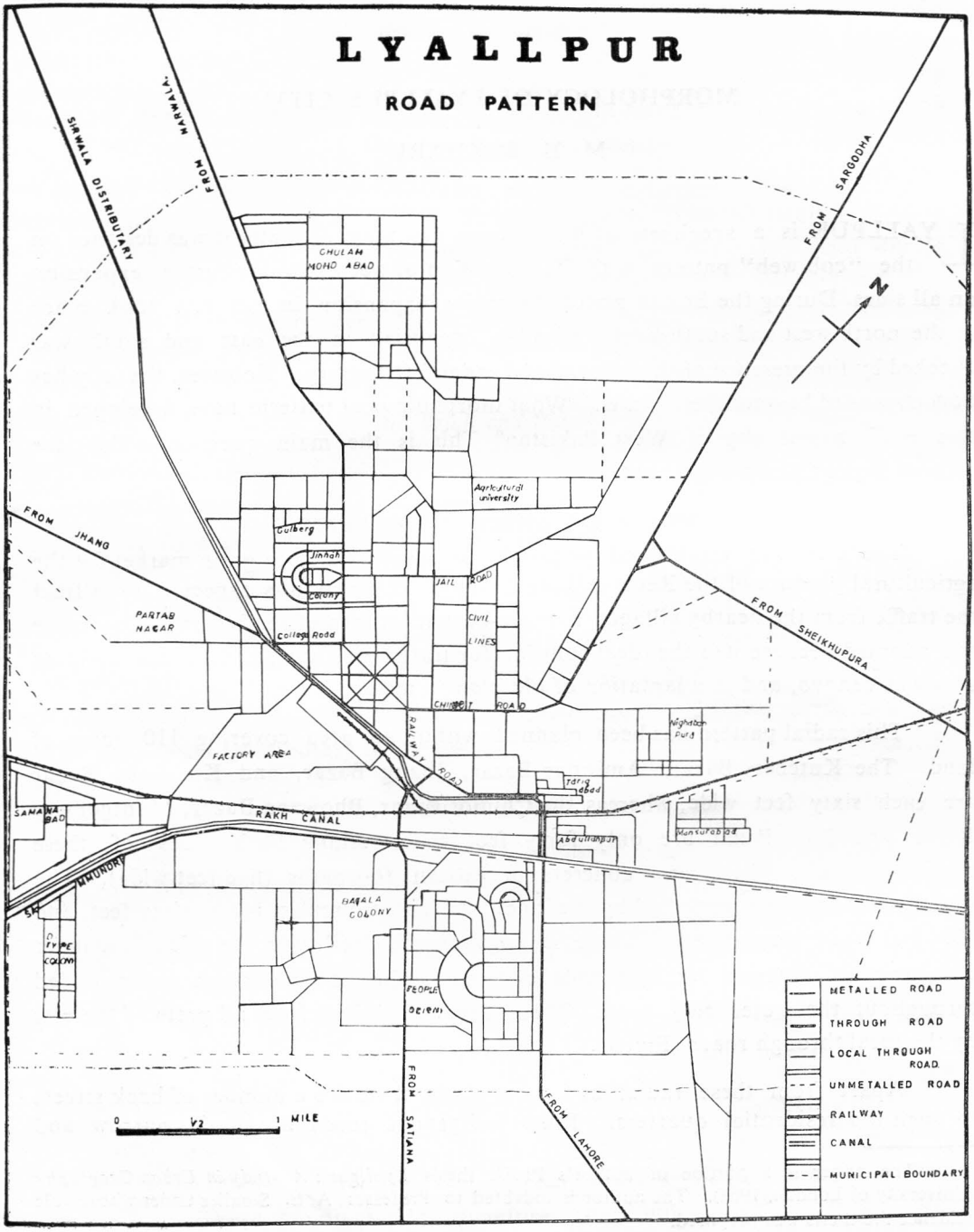
LYALLPUR
ROAD PATTERN
SIRWALA DISTRIBUTARY
FROM HARIPUR
FROM SARGODHA
FROM JHANG
FROM SHEIKHUPURA
FROM SATIANA
FROM LAHORE
GHULAM MOHD ABAD
Agricultural university
Gulberg
Jinnah Colony
College Road
PARTAB NAGAR
JAIL ROAD
CIVIL LINES
CHINIOT ROAD
RAILWAY ROAD
FACTORY AREA
Nishatabad
Faqirabad
Mansurabad
Abdullahpur
SAMANA ROAD
RAKH CANAL
SHORKOT
HARIALA COLONY
D TYPE COLONY
PEOPLE'S COLONY
N
0 1/2 1 MILE
METALLED ROAD
THROUGH ROAD
LOCAL THROUGH ROAD
UNMETALLED ROAD
RAILWAY
CANAL
MUNICIPAL BOUNDARY

FIGURE 1

constructed with baked bricks. In spite of British planning, these streets have remained narrow, especially within the residential parts of the city. They are adapted to the local climate in that they are shady, cool and also minimize the effect of *loh* (hot wind) and provide a check against the regularly blowing duststorms during the summer season. Such streets are a typical feature of most Punjab towns.

The concentric layout of the city has been surrounded by a number of localities laid out on a grid pattern, with roads intersecting at right angles. Laid out before the Partition the Civil Lines is such a locality, situated on the eastern flank of the Circular Road. This area represents the British planning with metalled roads of 110 feet width, invariably well provided with cement pavements and lined on both sides by thick shady trees. Similar layouts are found in other pre-partition residential mohallas such as Dauglaspura, Santpura, Gurunanakpura in the west, Tariqabad, Abdullahpur and Jhalkhanuwana to the east of the Circular Road; but in these localities streets are narrow and dark. Their widths range from ten to fifteen feet, but in some places are even less, creating difficulties for wheeled traffic, so that it is only with the greatest difficulty that vehicles are able to pass each other and turn off such roads.

Rich vegetation, both in the form of trees and also agricultural crops throughout the region not only reduces the intensity of the summer heat, but also greatly helps to diminish the number of duststorms. For this reason since the establishment of Pakistan all new developments in the city have adopted the rectangular pattern which is also easy in its planning on the undisturbed plan surface (Fig. 2). The new

FIG. 2. A view of the rectangular pattern of the Roads in the semi-detached bungalows of the Peoples Colony.

townships in the city have been provided with wide metalled roads and pedestrian footpaths. A similar pattern of roads and streets characterises the Model Town, Jinnah Colony, Gulberg, Ghulam Mohammad Abad, in the west, Samanabad, D-type colony in the south, People's and Batala colonies in the east (Fig. 3).

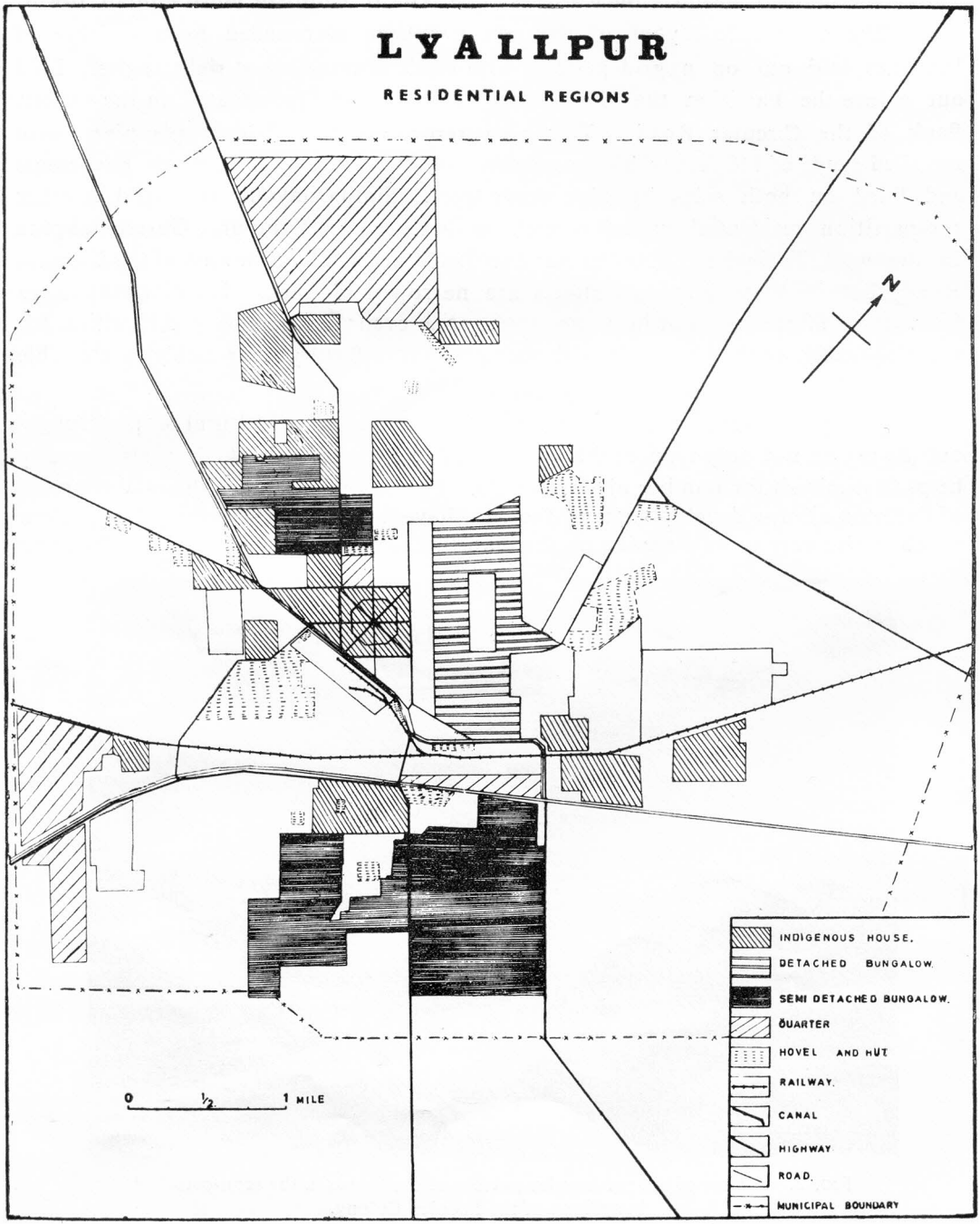

FIGURE 3

In the city's Kachchi Abadi areas, however, the streets and lanes are Kachcha (unmetalled), lack any form of planning, and are extremely narrow, dark and crooked. This is such an impediment to vehicles that the only effective means of transport is by bicycle (Fig. 4). To complicate the situation, running along

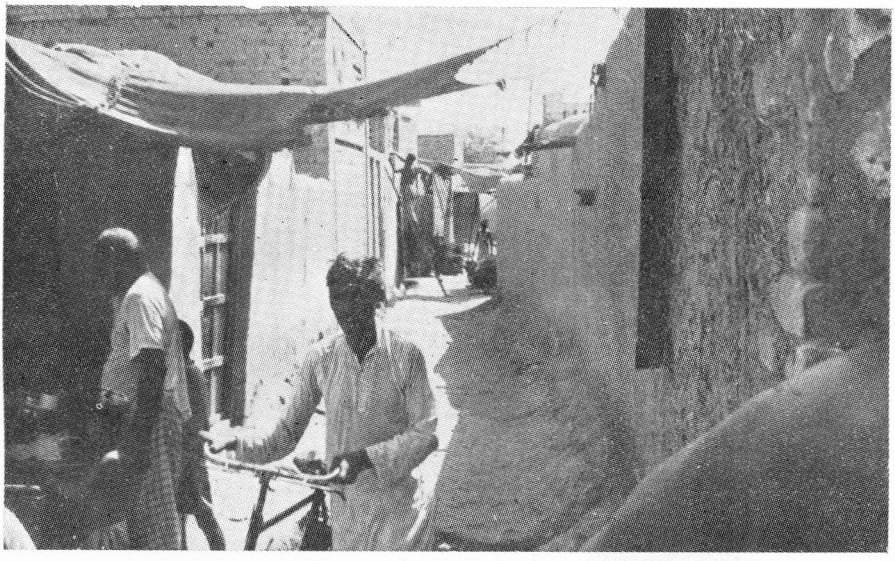

FIG. 4. One of the crooked lanes in the Kachchi Abadi area.

the middle of many of these streets, there are sewerage drains, which are both a considerable inconvenience to pedestrians and bicycles, and a danger to health. Moreover, there are no proper sewerage centres provided to dispose of the stagnant water in those localities by the city Municipality, so that water accumulates within the low-lying areas of the locality throughout the year. Such places increase dampness, and provide an opportunity for mosquitoes and flies to breed, so promoting the epidemic diseases in the city. These centres should be checked immediately by the Municipality or Improvement Trust from those areas.

THE URBAN PROFILE

It has been pointed out that "urban morphology is not merely two dimensional in scope. On the contrary, it is through the special importance which the third dimension assumes in the urban scene that much of its distinctiveness and variety arises". In reality, "the town is not merely a street pattern or disposition of filled and open spaces in two dimensions, but is first and foremost an arrangement of structures that arise from the ground in different shapes".[3]

[3]A. E. Smailes, "Some reflections on geographical description and analysis of townscapes" *Transaction and Papers*, Institute of British Geographers (1955), P. 101.

But Lyallpur is a city in '*bas relief*' with few salient landmarks. A view from one of the few high points of the city such as the Clock Tower presents a monotonous scene of a low horizontal nature (Fig. 5), which may be likened to a honeycomb.

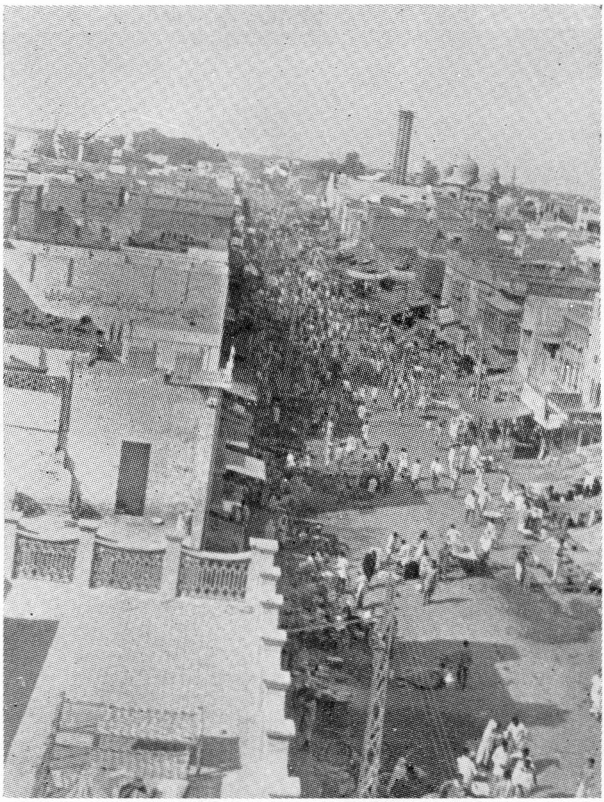

FIG. 5. A section of the city from the Central Clock Tower.

During the pre-partition period (1947) Lyallpur was not well provided with transport facilities. Indeed, animal propelled vehicles such as carts and tongas were the only available facilities. Therefore, people were unwilling to live far away from the city centre. Consequently double storey houses were constructed within the central part of the city, and in almost all the pre-independent residential localities. In those areas most of the houses were built by the Hindus, Sikhs, and often a couple of families could live together in one house.

After the birth of Pakistan a mass influx of Muslim refugees came across the border to replace the Hindu and Sikh emigrants. They were homeless and were looking for a settled residence somewhere in Pakistan. Lyallpur, as one of the most important marketing centres and agricultural produce in the region, presented an opportunity for the local as well as for the refugee capitalists to establish businesses

in this city; previously commerce had been entirely in the hands of non-Muslims. Therefore, a large number of refugees and indeed local inhabitants decided to make their homes in the city, and many residential townships grew around the nucleus of the original planned city. The number of existing houses vacated by the non-Muslims were insufficient to meet this heavy demand for housing. It was at this time that the city acquired its first local bus services and in fact this establishment provided an stimulus for the growth of these new residential areas.

The majority of the Muslim inhabitants in the city preferred to live in small secluded houses rather than to share with another family as the Hindus and Sikhs did, simply for the sanctity of their women observing *purdah*.[4] It is mainly for this reason that in all the new residential townships the houses were entirely built on a single storey structure such as Ghulam Mohammad Abad, Raza Abad, Afghan Abad and Faizabad in the west, Samanabad, Aziz Abad and D-Type colonies in the east, Mai-de-Jhuggi, Negahbanpura, Boli-de-Jhuggi in the north (Fig. 6).

As a result of this rapid extension of the built-up area, there is a preponderance of single storey houses, which gives an impression of a low flat city. Indeed there is not a single multi-storeyed building in the entire city of Lyallpur. The central Clock Tower is the tallest structure in the city. The general height of buildings is no more than two storeys, and Lyallpur has not yet begun to built upward in any real sense of the word. Its skyline pattern is flat and monotonous, only occasionally broken by triple-storey buildings, minarets of mosques, temples, gurdwaras and churches along with a number of chimneys of the mills which stand prominently, and in Professor Eugene Van Cleaf's terminology constitute "the upper horizon line".[5] The areas of single storey structures in the north are the Civil Lines and the staff bungalows of the Agricultural University. To the west of the city centre are the Ghulam Mohammad Abad, Raza Abad and Gulberg colonies, and in the south are the Old Factory Area, Samanabad, D-Type colonies whereas to the east are the People's and its extension areas along with a number of old mohallas (Fig. 6).

Building Material

A number of inter-related factors have determined the selection of building materials in Lyallpur. As the city was established on the plain of loam soils these provided local material for brick production. Besides the abundance of such suitable material for brick making, the limited availability of stone made it natural that bricks

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[4]Purdah : Seclusion of women from public observation.

[5]E.V. Cleaf, "The Urban Profile" *Annals*, Association of American Geographers, Vol. 22 (1932), P. 237.

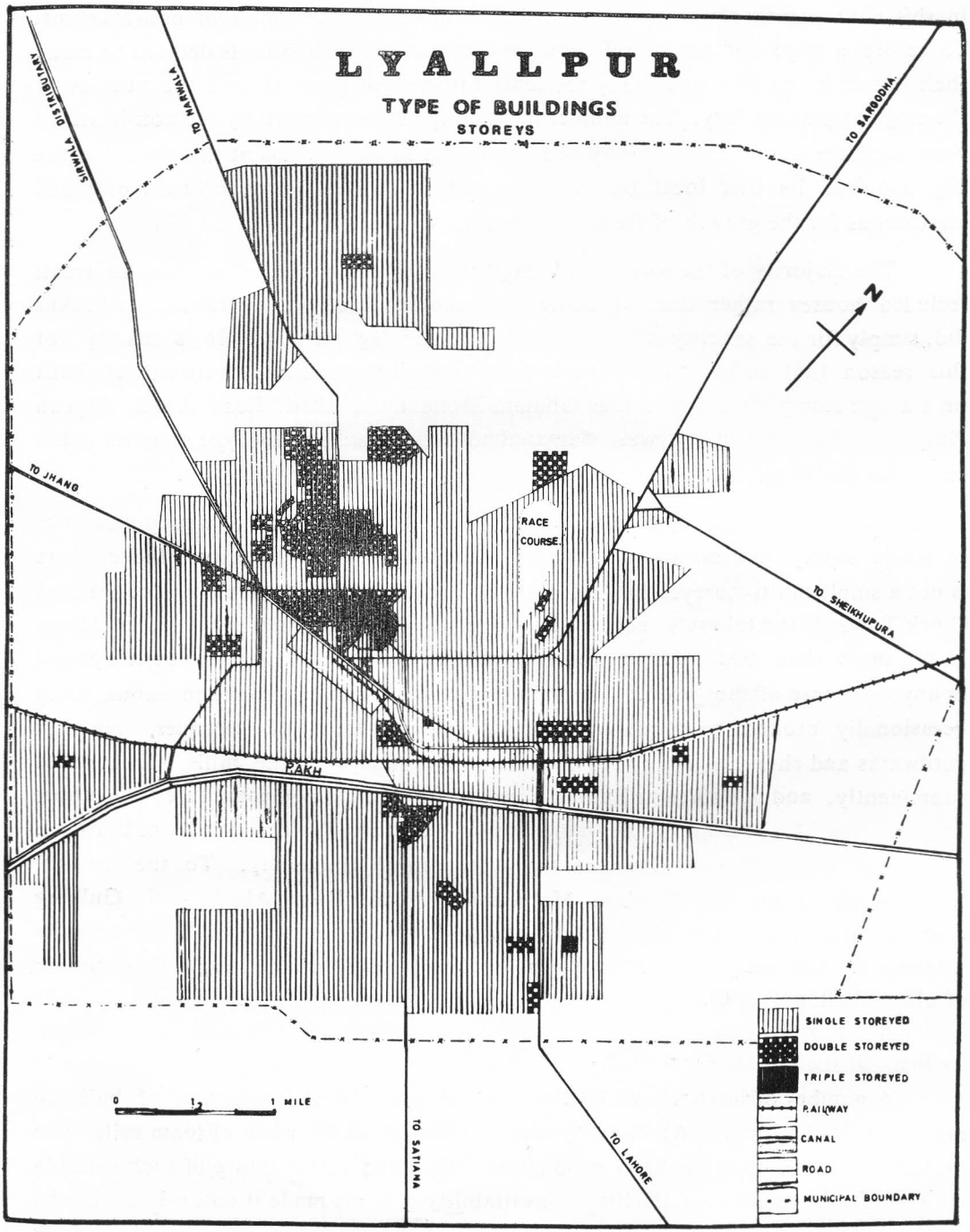
LYALLPUR
TYPE OF BUILDINGS
STOREYS
SIALKOT DISTRICT
TO NARWALA
TO SARGODHA
TO JHANG
RACE COURSE
TO SHEIKHUPURA
PAKH
TO SATIANA
TO LAHORE
N
0 1/2 1 MILE
SINGLE STOREYED
DOUBLE STOREYED
TRIPLE STOREYED
RAILWAY
CANAL
ROAD
MUNICIPAL BOUNDARY

FIGURE 6

should be predominant building material throughout the city. Only a few special buildings of monumental character, such as the Clock Tower and the Qaisri Gate, were built of stone, brought from Agra.

In terms of fabric, there are three types of buildings :

1) Brick and cement.
2) Brick and mortar.
3) Mud, brick and wood.

Their distribution is shown in Figure 6.

Brick and Cement

Most of the post-partition Government and private buildings are constructed with baked bricks, which are stuck together with cement. The width of such walls ranges from nine to thirteen inches and usually both sides are plastered with this cement. The roofs are built of a cement and concrete mixture, and the ceilings too are mostly plastered with cement. These buildings are found especially in the residential bungalow areas of Jinnah, Gulberg, People's and Batala Colonies and are built in European style (Fig.7).

FIG. 7. A bungalow in the Batala Colony.

The roofs of the quarter housing are usually provided with a covering layer of clay, between four and six inches thick, in an attempt to provide effective insulation against the scorching summer sun. These buildings are located mostly on the western and southern parts of the city.

Brick and Mortar

During the pre-partition period the shortage of cement was compensated by the use of mortar, a mixture of lime and sand. In those structures baked bricks are joind together with mortar. Their walls are thirteen to eighteen inches thick and are coated on the outside either with cement or mortar pointing. Internally, such walls are covered with one inch thick mortar plaster. This particularly applies to the pre-partition bungalows. Such internal walls are comparatively cool during the summer season. Roofs are made of burnt clay tiles which are covered with five to seven inches thick mud plaster. Their ceilings support all the roof materials with wooden beams along a central iron girder.

Mud Brick and Wood

Unplanned *juggies* (mud houses) have been built with a combination of unbaked bricks, mud and wood. The bricks are joined together by a mud paste and the walls, hardly nine inches thick, are mostly covered on both the sides with mud plaster. The roofs of such houses are provided with a layer of clay nine to twelve inches thick supported by a few wooden beams. The height of the walls usually ranges from eight to ten feet. Most of these hovels and huts are found in the city Factory Area in the south, along the Jhang Road kachchi abadies in the west, Mai-de-jhuggi, Boli-de-jhuggi, Negahbanpura, kachchi abadies in the north and the huts of the Sirwala Distributary in the east (Fig. 8).

COLOUR TONE

Throughout the entire built-up area of Lyallpur, a combination of white and reddish grey colour tones prevails. The pre-partition section of the city contains mostly double-storeyed houses of a masonry construction, with few plaster-walled buildings. This gives the townscape a light reddish tone which has been subjected to discolouration owing to the action of the elements. Most of these houses are old and have now become dilapidated, and many have now been replaced by the new triple storeyed structures which are conspicuous by their whitish or creamy colour tone (Fig. 9).

The post-partition sections of the city are very different in their appearance from the pre-independence portions. During this period the dwelling houses are erected, mostly double-storeyed and their outer walls are entirely cemented or white-washed. These buildings are, therefore, of a uniform whitish tone. But their monotony is quite often broken by the presence of pre-partition Government and private buildings, such as Municipal, hospitals, mosques, temples, etc. mainly because of their single storeyed structure or their conspicuous baked brick exterior which presents a reddish tone to those buildings.

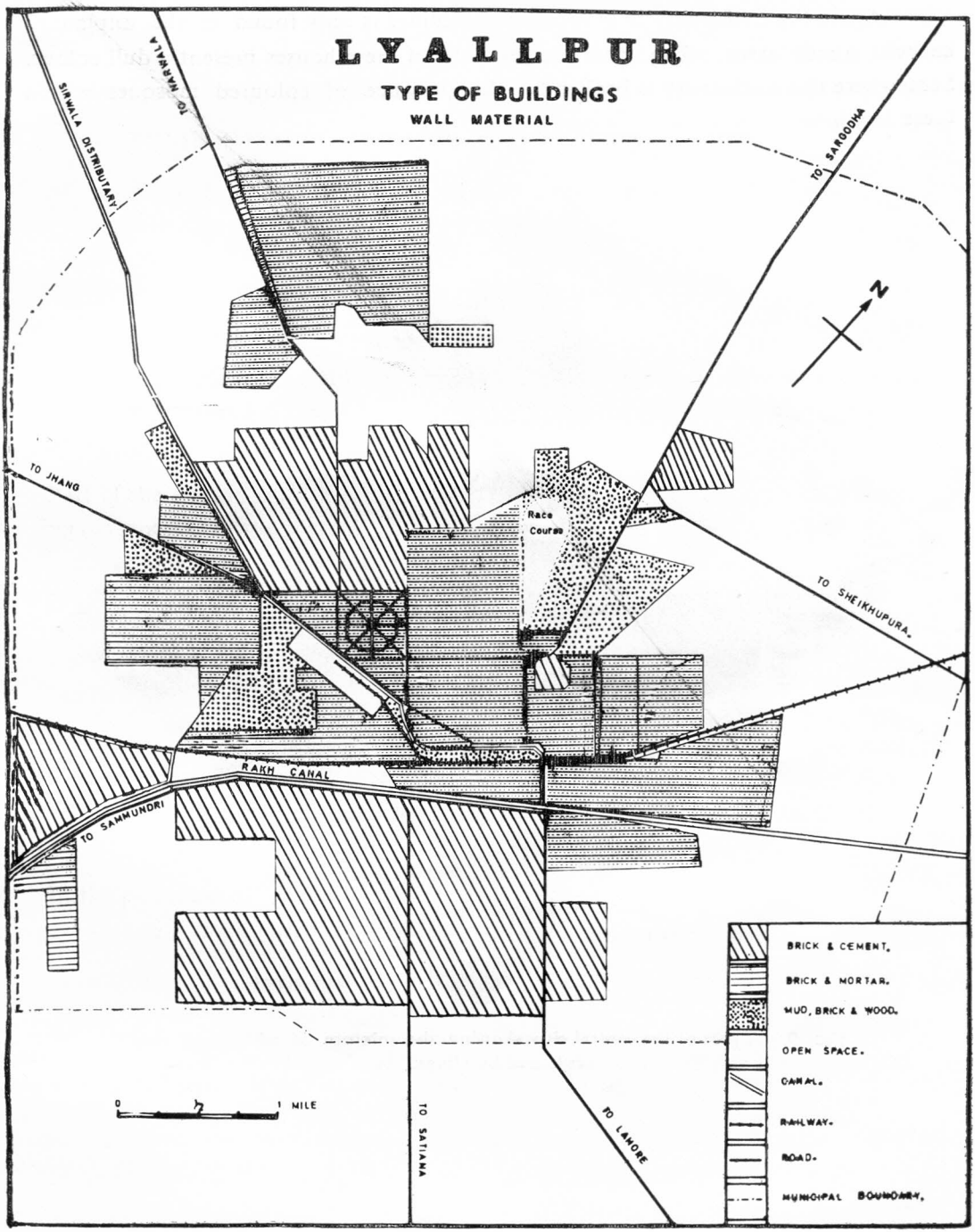
LYALLPUR
TYPE OF BUILDINGS
WALL MATERIAL
SIRWALA DISTRIBUTARY
TO NIRWALA
TO SARGODHA
N
TO JHANG
Race Course
TO SHEIKHUPURA
RAKH CANAL
TO SAMMUNDRI
0
1 MILE
TO SATIANA
TO LAHORE
BRICK & CEMENT.
BRICK & MORTAR.
MUD, BRICK & WOOD.
OPEN SPACE.
CANAL.
RAILWAY.
ROAD.
MUNICIPAL BOUNDARY.

FIGURE 8

Again the uniformity in grey colour buildings is only found in the unplanned kachchi abadi areas. The mud plaster walls of these houses present a dull colour. Somewhere this uniformity is broken by the presence of coloured mosques within these localities.

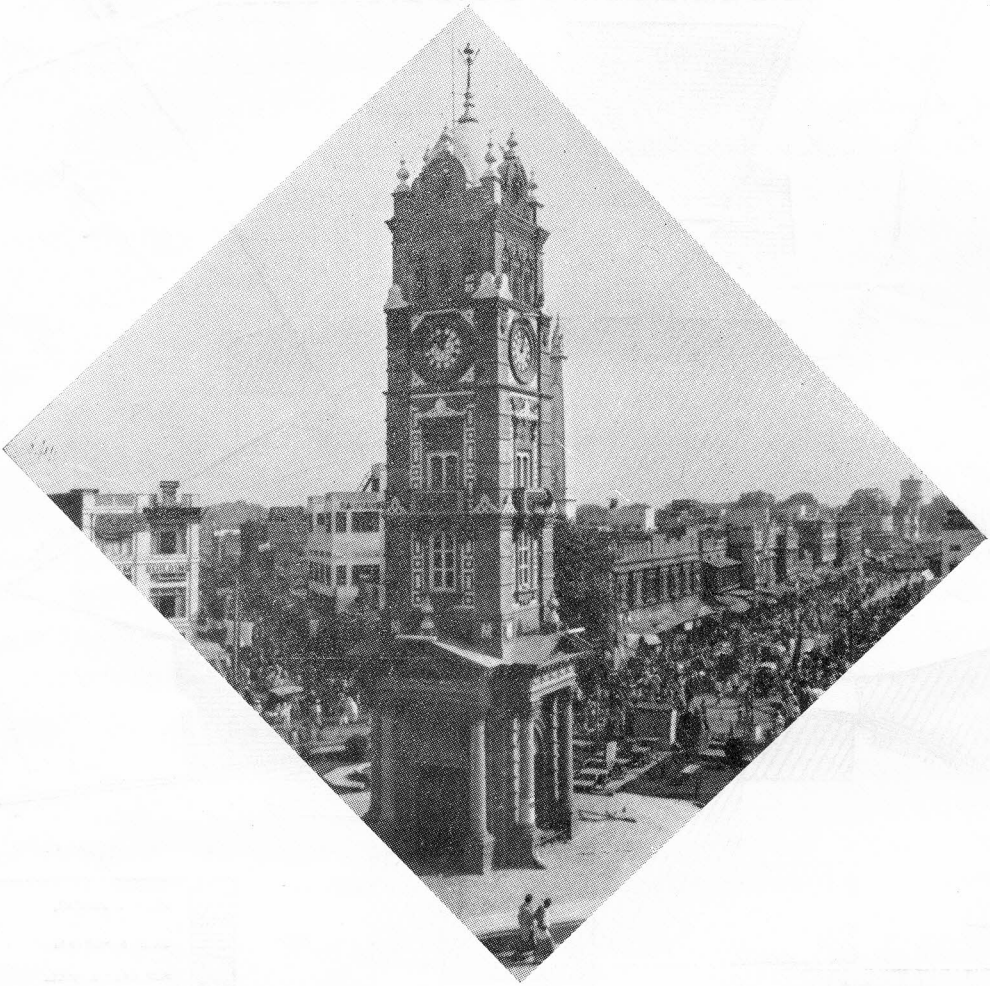

FIG. 9. A part of the central city showing the mixture of white and red coloured buildings.

SOILS OF THE INDUS DELTA: THEIR NATURE, GENESIS AND CLASSIFICATION

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

THE soils of the Indus delta are markedly different from the soils of the Indus river floodplain, as shown by results of reconnaissance surveys in areas of Thatta and Hyderabad Districts on both sides of the Indus river.[1] The landforms of the Indus delta were described in a previous issue of the same journal.[2]

Part of the estuary soils, especially the silty ones of extensive level spill flats, have hygroscopic salinity, virtual absence of porosity, extremely low content of organic matter and an unstable soil mass. The substratum has mainly clay or very fine sandy loam texture. The ground water is strongly saline and the water-table depths generally vary within four to eight feet. Some of these soils have no free water-table even within ten feet but are saturated throughout the profile. Other main estuary soils include saline and non-saline silty clays and clays of basins.

Soils of the coastal belt are mainly laminated silty clays occurring as tidal flats, with some laminated silty soils on ridges, and some deeply homogenized clays and silty clays in tidal basins. Most of the clayey soils are subject to regular flooding by sea water.

In the past most of the delta either was lying unused or provided some poor grazing only, and a small part was irrigated by inundation canals. Recently, canals

[1]The survey west of the Indus river was exploratory, not of standard intensity as east of the river.

Acknowledgement : Besides the persons acknowledged in a previous paper (in this Journal January 1970), the authors thank Professor Dr. R. Tavernier for his critical comments on the soil classification, and Dr. Amjad Husain and Asghar Ali for the analytical data supplied.

[2]Full description of each soil series as well as analytical data are available in mimeographed form from the Directorate of Soil Survey, West Pakistan, Lahore. Refer also Jalal-ud-Din, Brinkman and Rafiq, "Landforms of the Indus Delta," *Pakistan Geographical Review*, Vol. 25, No. 1 (1970), pp. 12-22.

Messers Jalal-ud-Din, Brinkman and Rafiq are, respectively, Soil Survey Research Officer, Technical Officer, Soil Survey Interpretation (FAO) and Deputy Director, Soil Survey Project of Pakistan.

from the Ghulam Mohammad Barrage started supplying irrigation water to this area on a large scale. Within a few years the water-table rose and caused extensive water-logging. In much of the delta, the water-table is within a few feet depth and the ground water is extremely saline. Soil salinity which was already wide spread became more severe. Although there is no alkali hazard, part of the soils do not respond well to reclamation. Especially the silty soils (which are generally easy to reclaim in the normal river floodplain) pose very severe reclamation problems. It is therefore important to present an analysis, genesis and classification of soils of Indus delta.

The following sections contain short descriptions of the soils of the Indus delta. arranged by landforms.[2] The genesis of some of the less familiar features described below is explained in the next section.

Estuary spill areas, bars and levees

Gujo series

The Gujo series occurs in extensive spill flats. It is developed in silty subrecent estuarine Indus floodplain deposits. The series has a brown/dark brown, very fine sandy loam, platy, calcareous surface horizon underlain by a greyish brown silt loam or very fine sandy loam, stratified, moderately calcareous subsoil. The substratum usually is greyish brown, calcareous, stratified silt loam or very fine sandy loam.

The pH ranges from 8.0 to 8.4. The soil contains gypsum specks and crystals, and has strong hygroscopic surface salinity. It is very deep and imperfectly drained. The soil mass has a low organic matter content and no tubular (biological) porosity, and is unstable. It tends to remain saturated after irrigation. The hydraulic conductivity of the soil is very low, of the order of two centimeter per day.

The soil is uncultivated. It supports *lani* (*Salsola foetida*), *pilchhi* (*Tamarix dioica*) and *wan* (*Salvadora oleoides*) which are used for poor grazing. Locally some reclamation efforts were made but the crops failed after two to three years.

Dari series

The Dari series occurs mainly in the spill heads, part in narrow strips through spill flats and some in high meander bars of the subrecent estuarine Indus floodplain. The series has a greyish brown, very friable, calcareous, platy loamy very fine sand surface underlain by a greyish brown, massive, very friable, moderately calcareous loamy very fine sand subsoil. The substratum consists of layers of various textures.

The pH is about 8.2. The series is non-saline. The soil mass has a very low organic matter content and is unstable. The soil material tends to remain too dry when not irrigated and becomes saturated under irrigation. The soil supports some *pilchhi, lani and khabbal* (*Cynodon dactylon*) which provide some grazing for camels and goats.

Bulri series

The Bulri series occurs on nearly level meander bars and levees. The series has developed in subrecent estuarine Indus floodplain deposits. The series has a brown to dark brown, friable, calcareous, massive silt loam topsoil. The B horizon consists of a brown to dark brown, friable, moderately calcareous silt loam or very fine sandy loam with weak coarse subangular blocky structure. The substratum is stratified with different textures of dark brown to dark greyish brown or greyish brown colours and is moderately calcareous.

The pH is about 8.2. The series has strong hygroscopic surface salinity and gypsum specks mainly in the surface. The soil is moderately deep to deep and is moderately well drained. The tubular (biological) porosity is low and the soil mass is unstable. The soil tends to remain saturated after irrigation. These conditions are less severe than in Gujo series. The hydraulic conductivity is of the order of twenty centimeters per day.

The series is generally uncultivated. It supports *wan, kikar* (*Capparis aphylla*), *pilchhi* and some salt bush (*Saueda fructicosa*) which are used for poor grazing. At places the soil is under reclamation and used for growing rice, sugarcane and wheat, with generally moderate results.

Sultanpur series

The Sultanpur series does not strictly belong to the estuary plain, but is a soil of the Indus river plain. It intrudes into the estuary plain in the form of long, narrow, nearly level to very gently sloping levees of former distributary channels, traditionally used as inundation channels. The series has developed in mixed calcareous subrecent Indus alluvium in the normal river plain. The series has a dark brown silt loam, massive, moderately calcareous surface horizon underlain by a dark brown silt loam, weak coarse subangular blocky, moderately calcareous B horizon to about seventy-five centimeter. The substratum has a greyish brown very fine sandy loam, laminated, moderately calcareous Chorizon.

The pH is about 8.2. The series is non-saline. The soil is porous, permeable and humified down to about sixty centimeter. It is well drained and stable under irrigation.

The series is used for irrigated general cropping. Common crops are sugarcane, wheat and some clovers.

Shahdara series

The Shahdara series, like Sultanpur, is a soil of the Indus river plain and occurs in a similar position. The soil is dominant only in the narrow strip of non-saline bars and levees indicated west of the main Indus channel. The series has a dark brown silt loam, massive surface horizon underlain by stratified silt loam and very fine sandy loam.

The pH is about 8.2. The series is non-saline and moderately calcareous. The soil is porous and permeable. It has a moderate organic matter content only in the topsoil. It is well drained and stable under irrigation. The series is used for orchards, mainly of bananas, and some summer pulses.

ESTUARY BASINS

Daro series

The Daro series occupies extensive nearly level basins and has developed in subrecent estuarine Indus floodplain deposits.

It has a dark greyish brown silty clay, massive to weak coarse subangular blocky, calcareous surface horizon. The B horizon is brown to dark brown, mottled clay with weak coarse subangular blocky structure with thin nearly continuous cutans (not argillans) to about eighty centimeters. The substratum is light olive-brown, massive to weak platy, calcareous silty clay.

The pH is about 8.3. The series is non-saline. The soil is moderately well but seasonally imperfectly drained. It has a fairly high organic matter content and its natural fertility is higher than the silty soils. It is porous and permeable. The hydraulic conductivity generally ranges from ten to twenty centimeters per day. The series is mostly seasonally irrigated and used mainly for rice, wheat and some oil-seeds.

Dhand series

The Dhand series occupies mainly level basin depressions and has developed in the subrecent estuarine Indus floodplain deposits. It has a dark greyish brown clay, cloddy, moderately calcareous surface horizon. The B horizon consists of very dark greyish brown heavy clay with weak to moderate coarse subangular blocky structure with thin nearly continuous cutans (not argillans), moderately calcareous, distinctly mottled to about ninety centimeters. The substratum is generally massive silty clay.

The pH ranges from about 8.0 to about 8.3. The series is non-saline. It is imperfectly and seasonally poorly drained. The soil has a much higher organic matter content and natural fertility than the silty soils. The soil is mainly used for poor grazing. Water reed, sedges, *pilchhi* and some *wan* are the natural vegetation. Seasonally, the area gets ponded by excess irrigation water from the adjacent canals. Higher parts are used for rice and oil-seeds. Drainage and use for irrigated agriculture gives good results.

Gungro series

The Gungro series occurs in higher parts of nearly level estuary basins and margins of basins. The series has developed in subrecent estuarine Indus floodplain deposits. The series has a dark greyish brown, massive, moderately calcareous, silty clay surface horizon over a dark greyish brown silty clay B horizon with weak coarse subangular blocky structure and nearly continuous thin cutans (not argillans), moderately calcareous, extending to about ninety centimeters. The substratum is usually stratified and silty but may have a buried soil, generally silty clay.

The pH is about 8.3. The series has a strong hygroscopic surface salinity and gypsum specks mainly in the surface and scattered gypsum crystals in the subsoil. Generally the silty clay basin soil overlies buried silty spill material at moderate depth. The soil has relatively good porosity and stable subsoil structure due to a fair amount of organic matter. It is moderately well (seasonally imperfectly) drained. Hydraulic conductivities are of the order of twenty centimeters per day in the subsoil but much lower (4 cm/day) in the stratified silty substratum. The series is mainly uncultivated. The natural vegetation comprises *wan, lani* and *khabbal* which are used for poor grazing. Parts are under reclamation, with moderate to good results.

Badin series

The Badin series occupies mainly level to nearly level basin margins in the subrecent estuary plain. It has developed in the lower slope of a former spill or levee now overlain by a thin cover of estuary basins material.

The series has a dark greyish brown, calcareous, massive silty clay loam surface soil. The B horizon consists of dark greyish brown, moderately calcareous silt loam/very fine sandy loam with weak coarse subangular blocky structure. The substratum usually has stratified silt loam/very fine sandy loam or locally a buried clayey soil.

The pH ranges from 8.2 to 8.3. The series is non-saline. The soil has been under irrigation ever since traditional irrigation started. The shallow ground water is sweet. The water-table fluctuates between four to six feet. It is moderately well drained. It has a good biological porosity and the soil mass is stable under irrigation.

The series has been used for general cropping under seasonal canal irrigation. Recently some parts have been provided with perennial canal irrigation. Common crops are sugarcane, wheat and some fodders.

Katiar series

The Katiar series has a relatively small extent. It occurs on relatively high, slightly convex sites in basins and basin margins. It has been subject to occasional short-term flooding during deposition but has been flooded very little thereafter. This stratified silty clay generally overlies buried silty spill material at moderate depth.

It has brown/dark brown platy, moderately calcareous, dense, surface horizon underlain by dark brown, dense, moderately calcareous, stratified silty clay subsoil to about 100 centimeters. The substratum usually is stratified silt loam.

The pH is about 7.4. The series has a strong hygroscopic surface salinity and gypsum specks mainly in the surface and clusters of gypsum crystals scattered in the profile. The soil is deep to very deep and imperfecty drained. The biological porosity is low and the soil mass is dense and unstable. The series is mostly barren and agriculturally unproductive.

COASTAL BELT

Boriun series

The Boriun series occupies large areas of nearly level tidal flats in the coastal belt of the Indus delta and has formed in mixed recent salt-water tidal deposits. The series has a dark greyish brown, firm, calcareous, silty clay surface horizon that is mainly platy, part homogenized by crabs ; underlain by a brown to dark brown, firm, calcareous, stratified, silty clay subsoil. The substratum is stratified.

The pH is about 8.1. The series is strongly saline with sodium chloride as the dominant salt and contains little or no gypsum concentration. The soil is deep, very poorly drained and subject to regular flooding by sea water, the flooding frequency ranging from twice each day to a few times per month in different parts. The soil is completely barren and agriculturally unproductive.

Nangin series

The Nangin series occurs in narrow, nearly level tidal ridges (swash bars) in the coastal belt of the Indus delta and has formed in mixed Recent coastal deposits.

The series has a dark greyish brown, friable, calcareous, loamy very fine sand underlain by dark greyish brown, calcareous, laminated silt loam subsoil. The substratum is stratified.

The pH is about 7.3. The series is strongly saline with sodium chloride as the dominant salt. The soil is moderately deep to deep and poorly drained. It is subject to occasional flooding by sea water during very high tide. The series is mostly barren but there are sparsely scattered bushes of *wan* (thick-leaved : Salvadora persica), generally small but larger in the northern part. The soil has no potential for agriculture.

Jati series

The Jati series occupies some nearly level tidal basins in the coastal belt of the Indus delta and has developed in mixed subrecent Indus estuary basins subsequently invaded by coastal tides (sea water). It has a very dark greyish brown, friable, calcareous, laminated (part homogenized by crabs) very fine sandy loam surface. The B horizon consists of dark brown, friable, calcareous silty clay with moderate subangular blocky structure. The substratum is laminated and distinctly mottled.

The pH is about 8.3. The series is strongly saline with sodium chloride as the dominant salt. The soil is deep, very poorly drained and subject to tidal flooding by sea water. The series is barren and agriculturally unproductive.

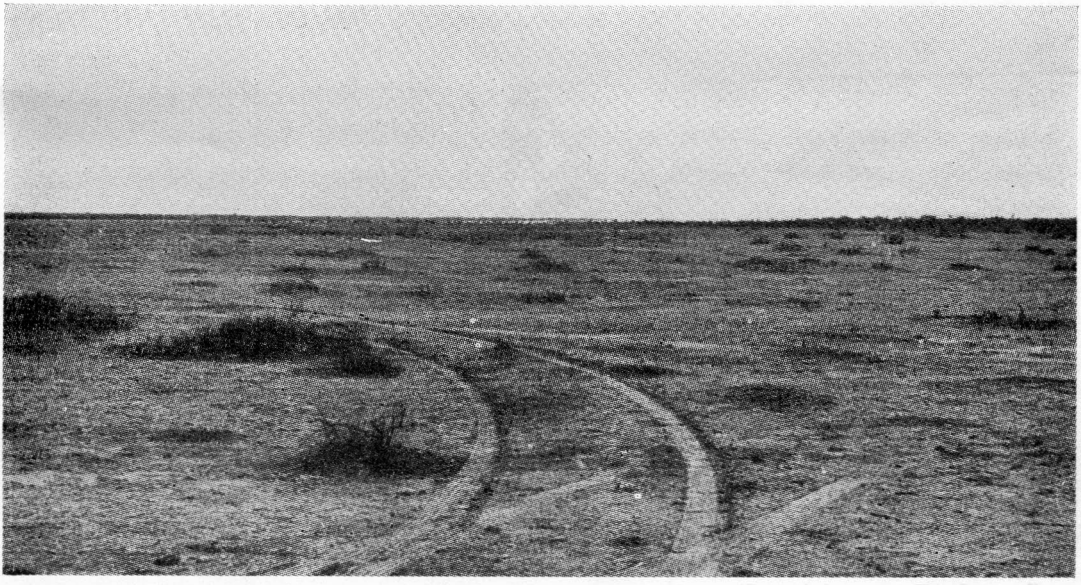

PLATE 1. Estuary plain. Level nearly barren, silty spill flat (mainly Gujo series).

PLATE 2. Estuary plain. Foreground clayey basin margin (Gungro series). Background very fine sandy meander bar (Dari series) with vegetation mounds.

PLATE 3. Estuary plain. Clayey basin centre (Dhand series), ploughed for rice. Foreground small rice seed-bed.

PLATE 4. Coastal belt. Foreground silty tidal ridge (Nangin series). Background barren, clayey tidal flat (Borium 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.

HOMOGENIZATION

Homogenization is probably the most important soil forming process in West Pakistan. Through homogenization, an originally stratified or massive sediment, with little estability against disturbance, is progressively transformed into a porous, stable, uniform soil material with well-distributed organic matter.

As long as temperatures are favourable (which is the case almost throughout the year in most plains areas of West Pakistan), and as long as moisture is available (from rain, runoff, river flooding or irrigation), plants grow and send their roots throughout the upper soil, and in lesser quantity throughout the subsoil. Plants die, and soil animals and micro-organisms feed on the dead roots, converting the material to humus. Tubular pores are created either by the passage of animals or by decay of roots. Disturbance by roots and mixing by soil animals gradually destroys any stratification.

The rate of sedimentation can profoundly influence the kind and depth of homogenization. In a stratified sediment that has been deposited rapidly, the speed and degree of homogenization is dependent upon root distribution, and the degree of homogenization decreases with depth. Between the completely homogenized horizons and the stratified or massive substratum, there is a partially homogenised zone where ped interiors remain at least partly stratified, as for example in Sultanpur series.

In the case of a sediment that is slowly deposited, as for example in many flood-plain basins, homogenization keep pace with sedimentation, and the whole soil consists of progressively buried A horizon material. Where this horizon itself has colours not too different from the common brown/dark brown or dark greyish brown hues of many B horizons it is difficult at first sight to distinguish these "accumulative B" horizons from others. They have less change in colour or structure with depth than normal developed B horizons and often are uncommonly deep in spite of their relatively weak degree of development. Examples are Daro and Dhand series.

It should be noted that in the presence of gypsum, calcium carbonate is virtually insoluble so that there is little lime redistribution in saline gypsiferous soils. The small amount of secondary lime in such soils therefore cannot be taken as evidence for lack of development, and the degree of homogenization is probably a better criterion for soil development.

A special case of homogenization is the burrowing activity of a multitude of small crabs in the intertidal saline or brackish coastal area. Even in the absence of vegetation, the crabs intensively mix the topsoil as long as the surface is kept wet by daily tidal flooding, as in parts of Boriun series.

Sources of Salts in Soil and Ground Water

The salts in the estuary plain and in the coastal belt have two different origins. The salts in the soils and in at least the shallow ground water of the estuary plain have been brought in from the north by slow ground water flow through the aquifer. The shallow ground water and part of the soils are strongly saline, with relatively high chloride and magnesium contents and in equilibrium with solid gypsum, due to concurrent concentration by evaporation, some precipitation of calcium salts, and cation exchange of soil calcium and magnesium against dissolved sodium. This accounts for the hygroscopic salinity and the gypsum concentrations in saline soils of the estuary plain.

The salts in the coastal belt (and perhaps also in the deep ground water below the estuary plain) are of marine origin. The sediments were deposited in the presence of sea water and regularly flooded by sea water thereafter. Hence, the predominant salt is sodium chloride, magnesium contents are lower, and there are, at most, few fine gypsum crystals in the soils of the coastal belt.

High Ground Water-Table and Salinity

The gradient of the estuary plain is less than that of the river plain. There is probably a more or less continuous horizontal layer of mainly clayey salt-water tidal flat deposits extending from the present coastal belt northward underneath

the present estuary plain. This would reduce the effective aquifer depth under the estuary plain to some ten metres at the most—very much less than under the Indus river plain. The proportion of silty and clayey sediment in the aquifer is relatively high. Due to these factors, the seaward flow of the ground water is slowed down and the water-table brought nearer the soil surface. Evaporation from the shallow water-table maintains equilibrium between inflow and outflow of ground water in the area. Due to this evaporation from the saline ground water there is widespread and strong soil salinity in the estuary plain.

The presence of one or more relatively widespread layers of relatively low permeability may also explain the very small effect of tubewell drainage in the area. Only horizontal drainage would have any appreciable effect, provided the soils themselves are drainable like Daro, Dhand or Gungro series.

Organic matter

The silty and very fine sandy soils of the extensive spill flats (and some patches of clayey, laminated soil on shedding sites) have extremely low organic matter contents. During sedimentation of these soil materials, the floods were of very short duration as described in a previous paper, and the soil mass remained dry almost constantly. In the short flooding periods, little moisture entered the soil mass, and presumably only the top ten inches or so were wetted. Most of this was rapidly lost again by evaporation. This extreme aridity of the soil virtually inhibited the growth of plants. Later, strong salinization by evaporation from highly saline ground water took place in part of these soils. Under these conditions, too, few plants could establish themselves. Due to this scanty natural vegetation combined with the high soil temperatures these soils have very low organic matter contents.

In contrast, the soils of the basins have been subject to flooding for much longer periods, so that there was time for considerable infiltration of fresh water. The same, to a lesser extent, is the case for the non-saline distributary levees that have been traditionally irrigated. In these conditions, a relatively dense vegetation was present, varying from bushes with some grasses in the higher places to dense sedges and reed in permanently wet depressions. The relatively lower soil temperature (due to presence of moisture and vegetation) and the better vegetation have resulted in moderate organic matter contents.

Soil denseness, instability and water-saturation

The very low organic matter content of the silty spill soils (and some clayey, laminated soils) combined with aridity causes a very low level of activity of soil animals, resulting in the virtual absence of tabular (biological) porosity in the soil

mass. The low organic matter content, and relatively low clay content of the silty soils, are the main causes for the instability of the soil structure and for the collapse of the few tabular pores under irrigation.

The main stable pores in the silty soils of spill areas are interstitial and of very uniform, microscopic size (of the order of 20 microns). This peculiar pore size distribution causes the soil to become completely water-saturated and devoid of all air by capillarity from irrigation water or from a relatively shallow water-table. This inhibits almost all plant growth. The water contained in these micro-pores does not drain under the influence of gravity, and moves only under capillary tension, mainly due to evaporation at the soil surface. The silty soils of the spill areas are thus undrainable for all practical purposes.

The basin soils of the estuary plain have relatively more organic matter and are stable under irrigation. These soils have common tubular pores allowing drainage of excess water, and less microscopic interstitial pores than the silty soils of the spill areas, with consequently far less rapid salinization. Even where the water-table is only a few feet below the surface, these soils are not water-saturated in the topsoil and upper subsoil.

Topsoil Alluvion

Most of the homogenized clayey soils of the estuary basins have thick nearly continuous coatings of non-oriented material on vertical and horizontal ped faces and in pores. Most of these soils have been under irrigated cultivation for centuries and some of them remained submerged for most of the year ever since traditional irrigation started. Flood water or irrigation water with suspended total topsoil material moves down into the subsoil through cracks or pores, coating the ped surfaces with thick rather irregular non-oriented material ('flood coatings'). In the field, flood coatings can be confused with argillans (cutans of oriented clay), but they are generally thicker, darker and of the colour of the topsoil. In the Indus delta such coatings have been frequently observed in Dhand, Daro and Gungro series.

Reduction, oxidation and mottling

Presence of grey colours and mottles are among the identifying characteristics of Dhand and Daro series. These soils occupy basin positions and remain saturated with stagnant (Dhand series) or very slowly moving water (Daro series) for most of the year. These soils have a fair amount of organic matter as well. Under such conditions bacterial respiration removes essentially all dissolved oxygen in generally less than two weeks. With longer periods of water saturation, reduction of free manganese and iron compounds provides the oxygen for continued bacterial

respiration. The iron and manganese oxides are thus reduced and brought into a more soluble form. When the soil next dries out, pores are once more air-filled and free oxygen is available again. Evaporation concentrates the iron and manganese compounds in the walls of pores and voids, where they are oxidized and become insoluble again. This results in a loss of these compounds throughout most of the soil mass, with consequently greyer colours, and concentration of iron and manganese into mottles. Dhand series is relatively more reduced and has greyer colours than Daro.

Slickensiding

Few dull, non-intersecting slickensides are present from near the surface to a shallow depth in the subsoil of Dhand series. The series occurs in closed basin depressions in the estuary plain and consists of dark grey, homogenized heavy clays. The soil material remains saturated with water for most of the year and becomes dry for a short but significant period. The slickensiding is due to alternate swelling and shrinking of soil material under alternate wetting and drying conditions.

In dry periods, topsoil material falls down the deep shrinkage cracks. The next wetting occurs first along the cracks to quite a great depth and then, slowly, towards the interiors of the blocks. Swelling of the soil material first closes the cracks, and then with continuing wetting, starts to exert considerable horizontal pressure. This pressure is relieved and translated into vertical (upward) movement by faulting of the soil mass along inclined planes. These slip planes are grooved and polished by the sliding movement. With time, many such slickensides are formed, intersecting in different directions, the most recent of which can be traced from near the surface to deep in the subsoil.

Soil Correlation and Classification

Most of the soil series described are peculiar to the Indus delta and cannot be correlated with soil elsewhere in West Pakistan. A soil very closely similar to Dari series occurs in the Indus river plain in Sind (Sarhad series), and differs only in its parent material which is Indus river alluvium.

Sultanpur and Shahdara series are not soils of the Indus delta proper, but occur as narrow levees from the river plain intruding in the Indus delta. They are very extensive throughout the Indus river plain.

The soils of the Indus delta have been classified in two international classification systems : the FAO Soil Units[3] and the U.S.D.A. soil classification, 7th

[3]Dudal Definition of soil units for the soil map of the world. World Soil Resources Report No. 33, FAO, Rome (1967).

approximation.[4] The series and their classification have been listed in tabular form below. The classifications are tentative since not all required analytical data are available yet and because the classification systems themselves are still subject to change.

TABLE 1—TENTATIVE SOIL CLASSIFICATION

Soil series	FAO Soil Units	U.S.D.A. soil classification (7th approximation) Subgroup 'if not irrigated'
Dari	Calcaric Fluvisols	Typic Torrifluvents
Boriun, Gujo, Katiar, Nangin (stratified)	Orthic Solonchaks	Typic Salorthids
Bulri, Gungro, Jati (developed)	Orthic Solonchaks	Typic *Salorthids
Badin	Haplic Yermosols	Aquic** Camborthids
Sultanpur	Haplic Yermosols	Typic Camborthids
Daro	Haplic Xerosols	Aquic** Camborthids
Dhand	Haplic Xerosols	Ustertic Camborthids

*Part of the basin soils are mollic, not typic. However, the high chloride contents of the soils cause spuriously high organic carbon figures in some cases if samples are not pre-leached.

** Part may be aquic mollic.

Soil series descriptions for all soils mentioned were made during reconnaissance soil surveys of the Soil Survey Project.[5] The meaning of the terms used in the descriptions is in accordance with the conventions of the Soil Survey Manual[6] with supplement 1962, and the FAO Guidelines for Soil Description.[7] Colour notations are according to Munsell.[8] , 1954

[4]Soil Survey Staff (U.S.D.A.), Soil classification, A comprehensive system, 7th approximation 1960, with March 1967 supplement. U.S. Department of Agriculture, Washington D.C.

[5]Jalal-un-Din, Ch. *et al*, Reconnaissance Soil Survey, Thatta East (1969), A.H. Ansari, *et al*, Reconnaissance Soil Survey Badin (1970); Mushtaq Ahmed *et al*, Exploratory Soil Survey Thatta West, Soil Survey Project of Pakistan, (Lahore; 1970).

[6]Soil Survey Staff (U.S.D.A.), *Soil Survey Manual*, Agriculture Hand Book No. 18, with supplement 1962, pp. 173-188, Soil Conservation Service U.S. Department of Agriculture Washington D.C.

[7]FAO undated Guidelines for soil profile description. Soil Survey and Fertility Branch, FAO (Rome 1966).

[8]Munsell Colour Co., *Munsell Soil Colour Charts*. (Baltimore, *Md.* USA: 1954).

Analytical data were provided by the Laboratory, Directorate of Soil Survey, West Pakistan. Methods were according to Hesse,[9] except for the data on hydraulic conductivity, listed in tabular form below, which were obtained by the method described in Huizing.[10]

Suitability for Irrigated Agriculture

The relative suitabilities for irrigation of the different soils are discussed at length in the reconnaissance soil surveys in Pakistan Soils Bullutin No. 5.[11]

Table 2—Hydraulic Conductivity of some Estuary Soils*

Soil series	Hydraulic conductivity of undisturbed soils, cm/day	
	Subsoil	*Substratum*
Bulri	13,20	20,
Daro	5, 11,	20,
Gujo	2,	3,
Gungro	20, 25,	4,0,

*Figures are results on individual cores. They should be taken as indicative only for the order of magnitude to be expected.

[9]P. R. Hesse, undated, *Methods of Soil Analysis*, Project Technical guide (Laboratory) No. 2, Soil Survey Project of Pakistan (1963).

[10]H. G. J. Huizing, *Laboratory Methods of Soil Moisture Analysis*, Technical guide No.18, Soil Survey Project of Pakistan (1970).

[11]Issued by the Directors of Soil Survey, West Pakistan, Lahore.

Soil Moisture Analysis (Methods and Interpretation, Technical Guide No. 20, Soil Survey Project of Pakistan, (1970).

GEOGRAPHICAL RECORD

LAND-USE PATTERN IN PAKISTAN[1]

LAND is used for many purposes such as agriculture, forestry, mining, transportation and other essential uses. Agriculture is by far the largest and the most important of the major uses of land. Efficient utilization of agricultural land is necessary to meet the food and fibre requirements of a rapidly growing population in Pakistan.

The objective of this paper is to examine the utilization of agricultural land in Pakistan. It will be based on the 1960 Agricultural Census data which pertains to operational farms. Definitions and explanations of the terms used in this paper are given at the end.

The total farm area in Pakistan is 70.66 million acres, of which 56.39 million acres (80%) are cultivated and 14.27 million acres (20%) are uncultivated.[1] Of the area under cultivation, 50.86 million acres are not sown and 5.53 million acres are current fallow which represent seventy-two percent and eight percent of the total farm area respectively. The uncultivated farm area includes forest area, culturable waste, land area not available for cultivation. The forest area is 1.04 million acres, or one percent of the total farm area. The culturable waste land, i e. the uncultivated farm area which can be brought under cultivation, amounts to 7.56 million acres or eleven percent of the total acreage in farms. The area not available for cultivation is 5.67 million acres, or eight percent of the total farm area (Table 1).

It may be seen that the total culturable area which includes 56.39 million acres of cultivated area and 7.56 million acres of culturable waste amounts to 63.95 million acres for all farms in Pakistan. Out of the total culturable area of 63.95 million acres the net sown area is only 50.86 million acres. Accordingly, the intensity of land-use, i.e., the ratio in which the net sown area stands to the total culturable area works out to be eighty percent for all farms in the country. The land-use intensity of eighty percent implies that twenty percent of the total culturable area of the farms is not used for production. It is, thus obvious that the physically adapted land resources on operational farms are not utilized to the fullest possible extent. The utilization of land is, however, a complex problem since it is affected by physical, social and economic factors in any given region. The physical factors such as climate, soil and topography determine the absolute limits of physical productivity. Within the limits set by physical factors, social and economic forces such as state of technology, size of labour force, size and distribution of farms, system of land tenure, etc., influence the type and intensity of land-use in a region. But since the influence of the diverse factors on land utilization would not be uniform in various regions, the type and intensity of land-use would differ from region to region. This would particularly be so between East and West Pakistan which represent near extremes in climatic conditions and dissimilarity in land configuration and soil characteristics. We may, therefore, examine land-use position in East and West Pakistan separately.

Land-use Position in West Pakistan

The total farm area in West Pakistan is 48.93 million acres, of which 37.25 million acres (76%) are cultivated and 11.68 million acres (24%) are uncultivated. The area under cultivation includes 32.01 million acres of net sown area and 5.24

[1] *Pakistan Census of Agriculture, 1960* (Government of Pakistan, Karachi, 1964).

million acres of current fallow which are sixty-five percent and eleven percent of the total farm area respectively. Of the uncultivated farm area the culturable waste land is 7.09 million acres, or fifteen percent of the total farm area while the forest area is only 531,000 acres, or one percent of the total farm land. The area not available for cultivation is 4.06 million acres, or eight percent of the total farm area (Table 2).

The total culturable area in West Pakistan amounts to 44.34 million acres of which 32.01 million acres are net sown. Accordingly, the intensity of land-use works out to be seventy-two percent for all farms in West Pakistan. The low level of land-use intensity may be attributed, among others to rugged land, scarcity of water for irrigation, excessive salinity, water logging, soil erosion and other natural factors. The scarcity of irrigation water is however a major factor limiting the utilization of land in the province. West Pakistan is mostly an arid region. The average annual rainfall is less than twenty inches and temperature extremes range from sub-zero to as much as 140°F. The distribution of rainfall is markedly uneven. The sub-mountainous tracts in the North and North East of the Indus Plain receive on the average thirty to forty inches of rainfall annually, but more than half of the Indus Plain receives less than ten inches of rainfall. Seasonal distribution of rainfall is also markedly uneven as most of the rainfall is concentrated during the period from June to September. It is, thus, obvious that the amount of rainfall in the greater part of West Pakistan is inadequate to support agriculture under the climatic conditions of the region. The inadequacy of rainfall has necessitated irrigation through artificial means such as canals, wells, pumps, tube-wells, karezes etc. (The irrigated area is only 25.27 million acres, or fifty seven percent of the total culturable area in West Pakistan) The major source of artificial irrigation is the canals taken out from the rivers of the Indus system. However, the supply of water in the canals shows wide fluctuations due to seasonal variation in the discharge of the rivers. River discharges during the period April to September averages five to ten times the minimum winter discharge. and high flood discharge may be one hundred times greater. In the absence of storage dams, the large surpluses of water during the summer period are not available for irrigation throughout the year. Consequently, the supply of water in the canals is limited during the Rabi and critical periods of Kharif season. The surface configuration in the Indus basin further reduce the effectiveness of the available water supply in the canals. Between the rivers there are usually flat, alluvial irrigated plains, but where the land rises even a ittle (as between the Indus and Jhelum-Chenab) irrigation is rendered difficult and a scrub covered waste takes the place of fertile fields.

Because of the variation in rainfall, irrigation facilities and relief conditions, the utilization of land shows a wide variation in the various regions of West Pakistan. In the predominantly irrigated areas comprising Sargodha, Lahore, Multan, Bahawalpur, Khairpur and Hyderabad divisions, the intensity of land-use is high varying from seventy-two percent in Hyderabad division to eighty-two percent in Khairpur division. On the other hand, the intensity of land-use in D.I.Khan division is only forty-one percent because of low rainfall, limited irrigation facilities, and undulating topography; the average annual rainfall in D.I. Khan division is 8.3 inches and the irrigated area is only fifteen percent of the total culturable area.

Land-use Position in East Pakistan

The total farm area in East Pakistan is 21.73 million acres, of which 19.14 million acres (88%) are cultivated and 2.59 million acres (12%) are uncultivated. The cultivated area includes 18.85 million acres of net sown area and 290,000 acres of current fallow representing eighty-seven percent and one percent of the total farm area respectively. The uncultivated farm area is distributed as 471,000 acres of culturable waste, 504,000 acres of forest and 1.61 million acres of area not available for cultivation. The culturable waste land and forest area is two percent each of the total farm area while the area not available for cultivation is eight percent of the total (Table 3).

The total culturable area which includes 19.14 million acres of cultivated area and 471,000 acres of culturable waste amounts to 19.61 million acres for all farms in East Pakistan. Of the total culturable area, 18.85 million acres are net sown. Accordingly, the intensity of land-use works out to be ninety-six percent which means that only four percent of the total culturable area is not used for production. The high intensity of land-use may be attributed, among others, to climate, soil type and land configuration which are favourable for cultivation. The climate in East Pakistan is typically monsoon. Rainfall is fairly heavy averaging about sixty-seven to eighty-one inches for the province. The soil formed by the alluvial deposits of the rivers is extremely fertile. In addition to above factors, the heavy pressure of population also contributes to extensive cultivation of land in East Pakistan. Since the physical factors affecting land-use are more or less similar all over the province, the intensity of land-use is nearly equal in all the divisions. It is ninety-five percent in Chittagong, ninety-six percent in Dacca and ninety-seven percent in Rajshahi and Khulna each.

Land-use in relation to size of farm

In the preceding section, we examined land-use in relation to physical factors such as climate, soil and land-configuration. It may now be argued that farm size and tenure status of the cultivators also condition the utilization of land. Land-use in relation to farm size will be examined in this section and tenure aspects of land utilization will be considered in the next section.

Tables 4 and 5 give land-use in East and West Pakistan, classified by three size groups of farms, i. e., small, medium and large farms.[2] It may be seen that the pattern of land-use shows considerable variation among different size classes of farms. For example, net sown area is seventy-seven percent of the total farm area for small farms, seventy-eight percent for medium farms and only forty-nine percent for large farms in West Pakistan. Likewise the ratio of current fallow to total farm area is nine percent each for small and medium farms and thirteen percent for large farms. The variation in the proportion of total area under culturable waste is more pronounced; the proportion is seven percent for small farms, eight percent for medium farms and twenty-three percent for large farms. It is, thus, obvious that the level of land-use efficiency is relatively higher on small and medium farms than large farms. The higher level of land-use efficiency on small and medium farms is also reflected in higher level of land-use intensity. It is eighty-three percent for small farms, eighty-two percent for medium farms and only fifty-eight percent for large farms.

Land-use in relation to type of tenure

We may now examine the utilization of land as conditioned by type of tenure. Tables 6 and 7 give land-use in East and West Pakistan, classified by three types of tenure of farms, i.e., owner-farms, owner-cum-tenant farms and tenant farms. The pattern of land-use shows considerable variation of farms of different types of tenure. The net sown area is fifty-two percent of the total farm area for owner farms, sixty-nine percent for owner-cum-tenant farms and seventy-seven percent for tenant farms in West Pakistan. The current fallow is twelve percent for owner farms as against ten percent each for owner-cum-tenant and tenant farms. Likewise, culturable waste amounts to twenty percent for owner farms, thirteen percent for owner cum tenant farms and ten percent for tenant farms. Thus the level of land-use efficiency is lower on owner farms as compared to owner-cum-tenant and tenant farms. This is also evident by the magnitude of land-use intensity which is sixty-two percent for owner farms, seventy-five percent for owner-cum-tenant farms and seventy-nine percent for tenant farms.

Summary and Conclusions

Land resources on operational farms are not fully utilized in Pakistan. The pattern and efficiency of land-use shows considerable regional variation. The various land-use categories such as net sown area, current fallow, culturable waste land etc., represent markedly different propor-

[2]See foot-notes on Table 4 and 5 for the definitions of size groups of farms in East and West Pakistan respectively.

tions of the total farm area in East and West Pakistan. The net sown area and current fallow censtitute eighty-seven percent and one percent of the total farm area in East Pakistan as against sixty-five percent and eleven percent of the total in West Pakistan respectively. Likewise the proportion of the total farm area classed as culturable waste is fifteen percent in West Pakistan and only two percent in East Pakistan. The index of land-use efficiency i.e. the intensity of land-use is ninety-six percent in East Pakistan compared with seventy-two percent in West Pakistan. This indicates that the scope for bringing more land under cultivation is greater in West Pakistan than in East Pakistan. The utilization of land is also conditioned by farm size and tenure status of the farmer. The efficiency of land-use is higher on small and medium farms as against large farms. It is also higher on tenant and owner-cum-tenant farms as compared with owner farms.

DEFINITIONS AND EXPLANATIONS

According to the Agricultural Census of Pakistan, 1960 the terms used in this study are defined as follows :

TOTAL FARM AREA includes total culturable and unculturable area contained in the farms but it DOES NOT INCLUDE area outside the farms such as area under Goverment forests, roads, railways, schools, play-grounds, canals, rivers, abadi deh, built-up urban areas, undistributed Government lands, etc.

CULTIVATED AREA includes net sown area and current fallow.

NET SOWN AREA means the cultivated farm area actually cropped during the Census Year regardless of the number of crops raised, and it includes area under fruit and tree crops for the same year.

CURRENT FALLOW means the cultivated farm area which was not cropped during Census Year, but was cropped during the preceding year.

UNCULTIVATED AREA includes culturable waste area not available for cultivation and Forest area.

CULTURABLE WASTE is the farm area which is fit for cultivation but which was not cropped during the Census Year nor in the year before that.

AREA NOT AVAILABLE FOR CULTIVATION means unculturable area of the farm and the area used for home-steads, farm roads, or other connected purposes and, therefore, is not available for cultivation.

FOREST means the farm area under forest.

TOTAL CULTURABLE AREA includes cultivated area and culturable waste.

INTENSITY OF LAND USE represents the ratio in which the net sown area stands to the culturable area of the farm. It indicates the extent to which the culturable land has been used for production. Thus the percent Intensity of Land Use in a farm would be determined as follows :—

$$\frac{\text{Net Sown Area} \times 100}{\text{Culturable Area}}$$

RIAZ AHMAD KHAN

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TABLE 1—LAND UTILIZATION IN PAKISTAN, 1960

(Area in thousand acres)

Province	Total Farm Area	Cultivated Area						Uncultivated Area								Intensity of Land use (percent)
		Total	% of Total Farm Area	*Net Sown*		*Current Fallow*		Total	% of Total Farm Area	*Culturable Waste*		*Forest*		*Not available for cultivation*		
				Area	% of Total Farm Area	Area	% of Total Farm Area			Area	% of Total Farm Area	Area	% of Total Farm Area	Area	% of Total Farm Area	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pakistan	70,656	56,388	80	50,859	72	5,529	8	14,268	20	7,564	11	1,035	1	5,669	8	80
West Pakistan	48,930	37,250	76	32,011	65	5,239	11	11,680	24	7,093	15	531	1	4,056	8	72
East Pakistan	21,726	19,138	88	18,848	87	290	1	2,588	12	471	2	504	2	1,613	8	96

SOURCE: GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME III, REPORT 1.

TABLE 2—LAND UTILIZATION IN WEST PAKISTAN, 1960

(Area in thousand acres)

Divisions	Total Farm Area	Cultivated Area						Uncultivated Area								Intensity of Land use (percent)
		Total	% of Total Farm Area	*Net Sown* Area	% of Total Farm Area	*Current Fallow* Area	% of Total Farm Area	Total	% of Total Farm Area	*Culturable Waste* Area	% of Total Farm Area	*Forest* Area	% of Total Farm Area	*Not available for cultivation* Area	% of Total Farm Area	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Peshawar	3,021	1,779	59	1,630	54	149	5	1,242	41	245	8	405	13	592	20	81
D. I. Khan	2,442	1,094	45	903	37	191	8	1,348	55	1,081	44	1	*	266	11	41
Rawalpindi	5,502	3,497	64	3,160	58	337	6	2,005	36	492	9	4	*	1,509	27	79
Sargodha	7,797	6,503	83	5,821	74	682	9	1,294	17	924	12	2	*	368	5	78
Lahore	4,274	3,772	88	3,296	77	476	11	502	12	400	10	1	*	101	2	79
Multan	8,208	6,555	80	5,648	69	907	11	1,653	20	1,228	15	5	*	420	5	73
Bahawalpur	3,432	3,027	88	2,605	76	422	12	405	12	281	8	1	*	123	4	79
Khairpur	3,897	3,256	84	3,073	79	183	5	641	16	484	12	75	2	82	2	82
Hyderabad	5,726	4,524	79	4,061	71	463	8	1,202	21	1,110	19	30	1	62	1	72
Quetta	2,001	1,462	73	790	39	672	34	539	27	309	16	2	*	228	11	45
Kalat	2,061	1,484	72	779	38	705	34	577	28	420	20	3	*	154	8	41
Karachi	567	297	52	245	43	52	9	270	48	117	21	1	*	152	27	59
Total West Pakistan	48,930	37,250	76	32,011	65	5,239	11	11,680	24	7,093	15	531	1	4,056	8	72

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME II, REPORT 2.
*Less than 0.5 percent.

TABLE 3—LAND UTILIZATION IN EAST PAKISTAN, 1960

(Area in thousand acres)

Division	Total Farm Area	Cultivated Area						Uncultivated Area								Intensity of Land use (percent)
		Total	% of Total Farm Area	*Net Sown*		*Current Fallow*		Total	% of Total Farm Area	*Culturable Waste*		*Forest*		*Not available for cultivation*		
				Area	% of Total Farm Area	Area	% of Total Farm Area			Area	% of Total Farm Area	Area	% of Total Farm Area	Area	% of Total Farm Area	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Rajshahi	6,692	5,878	88	5,792	87	86	1	814	12	114	2	165	2	535	8	97
Khulna	4,956	4,499	91	4,429	89	70	2	457	9	83	2	66	1	308	6	97
Dacca	5,830	5,142	88	5,060	87	82	1	688	12	156	3	130	2	402	7	96
Chittagong	4,249	3,620	85	3,567	84	53	1	629	15	118	3	142	3	369	9	95
Total East Pakistan	21,726	19,138	88	18,848	87	290	1	2,588	12	471	2	504	2	1,613	8	96

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME I, REPORT 2.

TABLE 4—LAND UTILIZATION CLASSIFIED BY SIZE OF FARM IN EAST PAKISTAN, 1960

(Area in thousand acres)

Size of Farm*	Total Farm Area	CULTIVATED AREA				UNCULTIVATED AREA						Intensity of Land use (percent)
		Net Sown		*Current Fallow*		*Culturable Waste*		*Forest*		*Not available for cultivation*		
		Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	
1	2	3	4	5	6	7	8	9	10	11	12	13
Total	21,726	18,848	87	290	1	470	2	504	2	1,613	8	96
Small	5,330	2,987	84	22	1	49	1	65	2	406	12	98
Medium	14,087	12,476	89	172	1	266	2	268	2	904	6	97
Large	4,109	3,385	83	96	2	155	4	171	4	303	7	93

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME I, REPORT 2.

*Small Farms (under 2.5 acres).
Medium Farms (2.5 to under 12.5 acres).
Large Farms (12.5 acres & over).

TABLE 5—LAND UTILIZATION CLASSIFIED BY SIZE OF FARM IN WEST PAKISTAN, 1960

(Area in thousand acres)

Size of Farm*	Total Farm Area	CULTIVATED AREA				UNCULTIVATED AREA						Intensity of Land use (percent)
		Net Sown		*Current Fallow*		*Culturable Waste*		*Forest*		*Not available for cultivation*		
		Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	Total	% of Total Farm Area	
1	2	3	4	5	6	7	8	9	10	11	12	13
Total	48,930	32,011	65	5,238	11	7,093	15	531	1	4,057	8	72
Small	4,591	3,551	77	405	9	343	7	36	1	256	6	83
Medium	23,436	18,188	78	2,138	9	1,967	8	164	1	978	4	82
Large	20,903	10,272	49	2,695	13	4,783	23	331	2	2,823	13	58

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME II, REPORT 2.

*Small Farms (under 5.0 acres).

Medium Farms (5.0 to under 25.0 acres).

Large Farms (25.0 acres & over).

TABLE 6—LAND UTILIZATION BY TYPE OF TENURE IN EAST PAKISTAN, 1960

(Area in thousand acres)

Type of Tenure	Total Farm Area	CULTIVATED AREA				CULTURABLE WASTE		Intensity of Land use (percent)
		Net Sown		*Current Fallow*		Total	% of Total Farm Area	
		Total	% of Total Farm Area	Total	% of Total Farm Area			
1	2	3	4	5	6	7	8	9
Total	21,726	18,847	96	290	3	470	2	97
Owner Farms	11,654	9,821	84	171	1	300	3	95
Owner-cum-Tenant Farms	9,830	8,798	90	116	1	168	2	97
Tenant Farms	242	228	94	3	1	2	1	99

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME I, REPORT 2.

TABLE 7—LAND UTILIZATION BY TYPE OF TENURE IN WEST PAKISTAN, 1960

(Area in thousand acres)

Type of Tenure	Total Farm Area	Cultivated Area				Culturable Waste		Intensity of Land use (percent)
		Net Sown		*Current Fallow*		Total	% of Total Farm Area	
		Total	% of Total Farm Area	Total	% of Total Farm Area			
1	2	3	4	5	6	7	8	9
Total	48,930	32,011	65	5,238	11	7,092	15	72
Owner Farms	18,723	9,760	52	2,234	12	3,710	20	62
Owner-cum-Tenant Farms	11,012	7,549	69	1,108	10	1,381	13	75
Tenant Farms	19,195	14,702	77	1,896	10	2,001	10	79

SOURCE—GOVERNMENT OF PAKISTAN, *1960 Census of Agriculture*, VOLUME II, REPORT 2.

BOOK REVIEWS

A Geography of Mankind. Jan O. M. Broek, John W. Webb. McGraw-Hill Book Company, 1968, XV and 527 PP, maps, diagrams, tables.

Many books dealing with human aspects of geography have been written, but time and again they have approached the subject from a narrow and biased point of view. This has resulted in the subject being dealt with either in a systematic or a regional fashion, both being based on the concept of environmental determinism. The repeated division of the world into regions which smack of deterministic origin and terminology and the construction of these regions on the basis of climatic and vegetative schemes has presented a somewhat confused pattern of socio-cultural differences, the basic theme of human geography. It is for the first time that in *A Geography of Mankind* a concise and comprehensive textbook for the students of human geography can be found. In the words of the authors, the book emphasises "the socio-cultural diversity of mankind as an essential requisite to geographic understanding."

A Geography of Mankind treats this topic from a refreshingly fascinating and yet thematic angle. Although the general content of the study remains the same as presented by earlier authors, the approach can be termed revolutionary. Time and space form the basic elements of this approach. All problems, local, regional, national, or for that matter international, are tackled in their historical perspective and the implications can as a result be projected, if somewhat arbitrarily, into the future. The blending of past and present gives the reader a depth of understanding which enables him to visualise the broad framework in which he can study the distribution and dispersion of a host of human aspects. The construction of this work is in five parts including an epilogue.

Part I presents fundamental geographic concepts particularly those of distribution and dispersion with illustrations through time and space. Part II examines dominant cultural traits such as race, religion, language, and concludes by forming cultural regions. Part III deals with economic diversity in time and space and the emergent economic patterns appear as correlates of the cultural regions. Part IV views the settlement patterns evolved at different times and stages of civilisation with emphasis on the growth of modern metropolitan regions. Part V studies the dynamism of population growth and movement against the diversity of the cultural background. The epilogue revises briefly the cultural regions in the light of modern forces of change. In a work of this magnitude it is inevitable that details must be sacrificed to highlight the main theme. To counteract any resulting overgeneralisations, a number of case studies have been given which not only provide a closer look at areas, but can also be used as guidelines for local studies and comparisons.

The only regretable aspect of the book is in Part III, which presents a biased viewpoint with regard to the practicality of different economic sytems. This can be best expressed by quoting two passages from the book itself. "By insisting on doctrinal policies the Soviet Union and other self-styled socialist republics have increased the cost of economic development especially if one considers the human cost." And, "American and West European experiences, though by no means a perfect model suggests ways and means toward greater abundance for everyone." Such statements especially when unsupported by emperical facts reflect superficial generalisations. A ssatement which appears to be even more sweeping is the comment on the economic development of Communist China, i.e , "eventually the peasants will find that the basic problem of land hunger remains unsolved." Although prediction is part of every systematic field of learning its basis must be scientific and not emotional. What is more surprising is the attempt of the authors to disguise the exploitary motives of European colonial rule by focussing on their positive and useful aspects only. They choose to dismiss the question of its negative impact by using lame arguments and comparing it with Babylonian, Arab, and Chinese exploits. Such analogous comparisons are certainly uncalled for, and reflect a subjective

approach with regard to the problems of the developing nations.

As a basic handbook for the human geographer, however, the value of *A Geography of Mankind* cannot be overestimated. The clarity and simplicity of language combined with excellent illustrations, maps, and diagrams, leave little room for improvement.

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Cities of the Soviet Union: Studies in their functions, size, density and growth. Chauncy D. Harris, Rand Macnally and Company, Association of American Geographers, Chicago (1970). XXVIII, 484 pp., Maps, Graphs, tables and bibliography. $19.95.

Cities of the Soviet Union is one of the several works of Chauncy D. Harris, an American geographer, who has been taking keen interest in the geography of U.S.S.R. eversince the World War II, and has been able to produce studies both on economic as well as urban aspects.

The monograph presented by Harris is an impressive and original analysis which deals with 1247 cities and towns, with a threshhold population of 10,000, according to the 1959 census. The study of the functions, size, density and growth of the large number of cities reveals the degree and nature of the shift of the Soviet society from the rural to an urban one. This orientation, being a part of the world phenomenon of urbanization and economic development is a result of several five years plans, executed by the Soviet Government.

Harris has organised his book into nine chapters. The arrangement of the available material under suitably headed chapters is indeed admirable. The first two chapters fully introduce us to the cities of the U.S.S.R. The third chapter gives a functional classification of Soviet cities, followed by chapters dealing with a large amount of statistical data on the various aspects of the cities. Although the study has entailed an exhaustive amount of bibliographic research the author has never lost sight of the necessity of supplementing these data with original enquiry and information from the Soviet publications, namely, population census, encyclopedias and gazetteers, atlases and maps, administration handbooks and general newspapers and serials.

The work is not merely a description of the individual cities. The author has successfully merged painstaking research with broad, yet penetrating analyses to produce highly competent study of the functions, size, density and growth of the cities of the Soviet Union. The text is enriched by maps and tables which have been impressively executed. To describe these ninety six maps and thirty four tables is almost to outline the contents of the work. The author has put his findings and conclusions into an intelligent and informative language and has given his book a special appeal to geographers concerned with the study of cities. Through this book Harris has made a useful effort to bring to the attention of his English speaking colleagues the extensive amount of literature produced by the Soviet Geographers in Russian language.

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