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## NEWS AND NOTES



## BOOK REVIEWS

# Pakistan Geographical Review

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## POPULATION, FOOD AND AGRICULTURE IN EAST PAKISTAN[1]

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EAST Pakistan with its predominantely peasant type of subsistence agricultural economy is one of the most densely populated areas of the world. In 1961, it had a population density of 922 persons per square mile and if only the cultivated land is taken into consideration, the density per square mile was still higher—about 1500. Growth of population has been more rapid in the past decade (1951-1961) than in any previous decade and the population increased from forty-two million in 1951 to over fifty million in 1961. The rapid increase in population has been due mainly to a progressive decline in the death rate without a corresponding decline in the birth rate. The growth rate for the decade 1951-61 was more than two per cent per annum and recent population projections indicate a doubling of East Pakistan's population by 1980-85. Unfortunately, food supplies have not been able to keep pace with the growth of population and over the years the shortage of food has tended to become more acute. The gap between food demand and food production is already over 1 million ton per annum. With the expected increase in population and also the progressive rise in the per capita income the gap will become wider unless food production is not stepped up steeply. The growing food shortage has necessitated large imports of foodgrains resulting in a diversion of a considerable amount of scarce foreign exchange from important development sectors, thus adversely affecting the overall economic development of the country. The Government has in recent years tried to meet this problem in two ways—by improving agriculture so as to increase food production and by checking population growth by a widespread birth control programme. It is hoped that the suceessful implementation of these measures will also help in raising the living standards of the people.

### Growth of Population

The growth of population was not very rapid in the period before 1931 and the increase in numbers varied between 2·0—2·5 million per decade, but the last thirty

[1]Presidential Address given at the Twentieth All Pakistan Science Conference, Geography, Geology and Anthropology Section, Dacca, March, 1968.

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years it has increased by fifteen million of which 8 million were added in the last decade alone. This increase in population has been largely due to a lowering of the mortality rates while fertility has remained more or less consistently high. Crude death rates have been reduced by more than half in the last twenty to thirty years and the recent estimates by the Population Growth Estimation Unit places it at sixteen to seventeen per thousand. Better and more effective public health measures with increasing control over malaria, cholera, smallpox and other diseases have considerably reduced mortality. Contributory factors have been the absence of any serious famines like the Great Bengal Famine of 1943, which is estimated to have resulted in three to four million deaths, and also a general improvement in the economic levels of the people.

This decline in the death rate has not been accompanied by any significant decline in the crude birth rates. Fertility has remained constantly high and whereas figures for crude birth rates for East Pakistan vary greately, from about forty per thousand to sixty-five per thousand, it appears that the former figure is more nearer the mark. The age distribution forms a broad base pyramid with about thirty-seven per cent of the population under ten years in 1961, as compared to about thirty per cent in 1951. This large percentage of population under 10 years indicates a constantly high fertility. But an unrestricted growth of population will adversely affect the present attempts of the Government to raise living standards of the people. Rapid population growth in developing countries also hampers industrialisation by its demand for foreign exchange for large food imports and low purchasing power of the population. A reduction in the present rate of growth of population is of overriding importance if the economic development of the country is not to be retarded. Attempts are being made to reduce the birth rate so as to slow down the present rapid growth of population. Positive checks have been introduced on a large scale but it is difficult to assess at this stage how effective the programme is proving. Social customs and traditions favour early marriages and rearing of large families and changes in these social attitudes will take a long time. The low percentage of urban population—five per cent of the total population, is another handicap, as it is mostly in the urban areas that new ideas take root easily. Moreover, the bulk of the present urban population is largely from the rural areas and their social attitudes do not differ very much from the people of the rural areas. It is doubtful if there is at present any significant differences in the fertility between urban and rural areas. Any rapid decline in fertility can, therefore, not reasonably be expected in the near future. Birth control can at best be regarded as a long-term measure to reduce fertility. While reduction in the mortality rates can be effected in a short space of time, reduction in the birth rates requires a much longer time. This time lag in the decline in fertility will continue to allow high growth rates for some time to come.

*Population Projections.* A large number of population projection have been prepared of the population of Pakistan and its provinces. The more important of

these are those by the United Nations, 1959 and 1964, United States Bureau of Census, 1963 and 1965, the Pakistan Planning Commission and by the Central Statistical Officer, Karachi, 1966. The more recent ones are given in Tables 1 and 2.

TABLE 1—PROJECTED POPULATION OF EAST PAKISTAN BUREAU OF CENSUS, U.S.A. 1965
(Figures in Million)

| | A | B | C | D |
|---|---|---|---|---|
| 1965 ... | 65.3 | 63.3 | 63.4 | 63.4 |
| 1970 ... | 75.0 | 73.5 | 75.6 | 74.1 |
| 1975 ... | 89.2 | 83.7 | 90.9 | 85.2 |
| 1980 ... | 106.5 | 96.6 | 110.2 | 99.6 |
| 1985 ... | 127.9 | 112.5 | 134.9 | 118.1 |

Series A : Constant fertility and constant mortality.
,, B : Declining fertility and constant mortality.
,, C : Constant fertility and declining mortality.
,, D : Declining fertility and declining mortality.

SOURCE : ALTERNATIVE POPULATION PROJECTION OF PAKISTAN AND PROVINCES, BY AGE AND SEX FROM MID 1960 TO MID 1985 (PROVISIONAL), CENTRAL STATISTICAL OFFICE, KARACHI, 1966, TABLES 2—3.

TABLE 2—PROJECTED POPULATION OF EAST PAKISTAN CENTRAL STATISTICAL OFFICE, KARACHI, 1966
(Figures in Million)

| | A | B | C | D |
|---|---|---|---|---|
| 1965 ... | 57.0 | 57.0 | 57.0 | 57.0 |
| 1970 ... | 65.8 | 65.2 | 66.2 | 65.6 |
| 1975 ... | 77.2 | 75.2 | 78.7 | 76.7 |
| 1980 ... | 91.8 | 85.2 | 94.7 | 89.9 |
| 1985 ... | 109.9 | 101.0 | 113.4 | 104.1 |

Assumption—A : Normal mortality decline and constant fertility.
,, B : Normal mortality decline and declining fertility by 1 per cent from 1965.
,, C : Rapid mortality decline and constant fertility.
,, D : Rapid mortality decline and declining fertility by 1 per cent from 1965.

NOTE : Two other projections based on :

*a*) Normal mortality decline and fertility declining by 1 per cent from 1965 and 2 per cent from 1970 (1985 population : 95.5 million).

and

*b*) Rapid mortality decline and fertility declining by 1 per cent from 1970 (1985 Population : 98.4 million) are not included in Table 2.

SOURCE : ALTERNATIVE POPULATION OF PAKISTAN AND PROVINCES BY AGE AND SEX FROM MID 1960 TO MID 1985 (PROVISIONAL), CENTRAL STATISTICAL OFFICE, KARACHI, 1966, TABLES 8—13.

The U.S. Bureau of Census projection assumes an under count of about eight per cent in the 1961 Census and has accordingly adjusted the 1961 census population figures. At the present rate of growth with constant fertility and constant mortality a population of 128 million is estimated by 1985, but if mortality remains constant and fertility declines, the 1985 population is estimated to be 112 million. If both fertility and mortality decline it will be 118 million. The assumption about declining fertility visualised changes in the pattern of fertility by 1972 when the Family Planning Programme is expected to be fully implemented. The Central Statistical Office projection accepts the 1961 census figures as correct and therefore shows much lower figures for 1965. It also assumes a slightly lower rate of growth than the U.S. Burean Census projection. The U.S. Bureau Census assuming declining mortality and constant fertility expects the population in 1985 to be 135 million while the Central Statistical Office projection under similar assumption places it at 113 million.

Even if the lowest projected figures are taken, the population of East Pakistan is expected to double itself by 1980 according to the U.S. Bureau of Census and by 1985 according to the Central Statistical Office projection. In either case a growth rate of about three per cent per annum is predicted. This increase in the growth of population is expected to be accompanied by an increase in the life span from thirty to thirty-two years in 1956-61 to about forty-four years in 1980-85. The population of East Pakistan is not only expected to increase twofold by 1980-85 but the number of people in the older age groups is also expected to increase. The expected increase in the demand for foodgrains even at present levels of consumption can, therefore, reasonably be expected to be more than double the present demand.

## Food Supplies

The East Pakistani diet like the diets of most poorer areas of the world consists mainly of cereals. Excessive consumption of cereals in such regions is the most efficient way of meeting the energy requirements of the human body. In East Pakistan cereal consumption constitutes more than three-quarters of the daily per capita caloric intake, far in excess of the requirements of a balanced diet. Rice which is rich in carbohydrates (88 per cent) but poor in proteins (8 per cent) is almost the exclusive cereal consumed, though in recent years due to recurring food shortages the consumption of wheat is rising. The bulk of the people spend about seventy-five per cent of their total income on food and of this two-thirds is on cereals alone. The daily per capita intake of rice is about fourteen to fifteen ounces supplemented by zero to one ounce of wheat. Protein food intake is inadequate, about half an oz. per day per head of population, and is mainly derived from pulses. But if the daily per capita intake of fish (about 2 oz.) is added then the deficiency of proteins in the diet is to some extent reduced. Consumption of meat, poultry and eggs is very low but is increasing parti-

cularly in the urban areas. The per capita fat intake is very small (about half an oz.) and is mainly derived from vegetable oils. Similarly consumption of vegetables, fruits, sugar, milk and milk products are all very low. The total daily per capita caloric intake has recently been estimated at about 2200, but as food supplies are not equitably distributed, a very large section of the population do not even get that amount of calories. For the same reason the per capita figures given above for various foodstuffs are not, strictly speaking, correct.

The supply of rice has not been able to keep pace with the demand. Rice production has continued to show an upward trend, from about seven to eight million tons per annum during 1950-60, to 9.5 million tons per annum in 1960-61 and 1961-62 and over 10.5 million tons in 1963-64 and the subsequent years. But in certain years due to adverse weather conditions, particularly due to drought during the growing season and damage by floods, production was lower. In 1962-63 and also in 1966-67 production of rice was about a million tons lower as compared to the previous years. These fluctuations in production further aggravates the situation. The increase in rice production has however not enabled the province to meet the demand for foodgrains, which because of the rapid increase in population, continues to grow at a faster pace than the supply of foodgrains. To meet the growing deficit of foodgrains, large imports of cereals (wheat and rice) are necessary as Table 3 indicates foodgrains imports have increased from about 200,000 tons, in 1955-56 to over a million tons per annum and in some years (1962-63 and 1966-67) when local production was adversely affected, imports have ranged between 1,300,000-1,400,000 tons.

TABLE 3—IMPORTS OF FOODGRAINS

(Figures in thousand tons)

| Year | Rice | Wheat | Total |
|---|---|---|---|
| 1955-56 | 149 | 21 | 170 |
| 1956-57 | 521 | 69 | 590 |
| 1957-58 | 556 | 118 | 674 |
| 1958-59 | 379 | 87 | 466 |
| 1959-60 | 464 | 148 | 612 |
| 1960-61 | 464 | 234 | 698 |
| 1961-62 | 206 | 202 | 408 |
| 1962-63 | 542 | 894 | 1434 |
| 1963-64 | 346 | 656 | 1002 |
| 1964-65 | 95 | 250 | 345 |
| 1965-66 | 380 | 543 | 923 |
| 1966-67 | 450 | 830 | 1280 |

SOURCE: *Economic Survey of East Pakistan*, 1966, DACCA, TABLE 2.

The estimate likely demand for rice on the basis of U.S. Bureau of Census projection is given in Table 4.

TABLE 4—PROJECTED POPULATION AND LIKELY FOOD REQUIREMENTS

(Figures in million)

| Year | Constant Fertility Declining Mortality | | Declining Fertility Declining Mortality | |
|---|---|---|---|---|
| | Population | Foodgrains (tons) | Population | Foodgrains (tons) |
| 1965 ... | 63.38 | 10.02 | 63.38 | 10.02 |
| 1970 ... | 75.59 | 11.95 | 74.04 | 11.70 |
| 1975 ... | 90.86 | 14.36 | 85.18 | 13.46 |
| 1980 ... | 110.20 | 17.42 | 99.64 | 15.75 |
| 1985 ... | 134.83 | 21.31 | 118.10 | 18.66 |

SOURCE: *Statistical Digest of East Pakistan*, NO. 3, 1965, DACCA, TABLE 3.21,

The requirement for rice is expected to rise from 10.02 million tons in 1965 to 21.31 milion tons in 1985, assuming a constant fertility and declining mortality and on an assumption of declining fertility and declining mortality, the expected rise in requirements is estimated at 18.66 million tons in 1985. Rice production has to be doubled by 1985 if the requirements for it have to be met. The availability of rice and also other foodstuffs can to some extent be increased if the present losses on account of plant diseases and pests are reduced. The Famine Enquiry Commission (1945) estimated annual normal recurring losses to crops from diseases and pests at about ten per cent and losses during storage at about five per cent—a total of fifteen per cent. Even if these total losses are reduced to five per cent the net gain would be about one million tons of rice, almost equal to the present deficit. Increase in the present production of potatoes and also bananas and plantains could help in reducing the demand for cereals, All these crops give high yields per acre and also rank high as calorie foods. Potato production has increased considerably in the last ten years, from about 125,000 tons in 1955-56 to more than 500,000 tons in 1966-67, a fourfold increase. The production of bananas is now more than a million tons per annum. Further increase in the production of these crops can be easily effected in a short time and could, therefore, be of great help in providing immediate relief in the present food shortage. The consumption of wheat also requires to be increased, as not only is this cereal richer in protein than rice but is also more easily available on the world markets.

It is also necessary that the present ill-balanced diet with its almost exclusive cereal intake be changed and the consumption of other foods be encouraged. But

this can only be possible if living standards improve appreciably and when the present grossly inadequate production of pulses, meat, fish, poultry, milk and milk products, vegetables and fruits is greatly stepped up. Protein intake is low and should be increased. The easiest way to increase protein supplies is by increasing the present production of pulses; increase in the supply of animal protein would take a much longer time. It is therefore necessary that the present decline in pulse production be reversed. Production of pulses which had increased from about 250,000 tons in 1947-48 to about 340,000 tons in 1955-56 has in recent years declined to about 225,000 tons and large imports from West Pakistan have become necessary. Other sources of proteins like oilseed, meal and fish meal, both of which are not only cheap sources of proteins but also can easily be produced locally, should be exploited. The present policy of exporting protein foods like fish and eggs (till recently) need to be re-examined. About seventy to eighty million rupees worth of fish is exported annually but the gain in foreign exchange is more offset by the loss of valuable protein foods. The province produces about a third of its requirements of edible oils, and it is only with the help of large imports from West Pakistan (mostly mustard seeds) and from U.S.A. (cotton seed and soyabean oil) that the deficit is partly met. Besides increasing the present production of rape and mustard seeds the cultivation of groundnuts should be further extended. This year it is planned to increase the acreage under groundnuts to about 35,000 acres and production of groundnut oil is expected to be 20,000 tons. The possibilities of growing soyabeans have not yet been explored but it could prove a useful crop. Both groundnut and soyabeans are also high in protein content (25-50 per cent) and their oil cakes could provide rich nutritious cattle feed. Another source of edible oil, not yet fully exploited, is rice bran oil and it has been estimated that it would be possible to obtain about 100,000 tons of oil annually from this source alone. Marine fisheries have as yet not been exploited as the demand for sea fish is very small, but as riverine fisheries alone cannot be expected to meet the increasing demand for fish it is desirable that the taste for sea fish be popularised. The exploitation of marine fisheries would also provide large supplies of edible oils and could also be a source of fertilizers.

The need for attaining self-sufficiency in food supplies, particularly foodgrains, is of urgent importance. The diversion of foreign exchange from industrial and other economic activities for the purchase of foodgrains is bound to adversely affect the economic development of the country. Moreover, the prospect of obtaining supplies from abroad is expected to become more difficult. World population has been increasing at an annual rate of about two per cent while world food production is expected to increase by only one per cent per annum. This galloping increase in world population is expected to reduce considerably the availability of foodgrains

on the world markets by the middle of the seventies. The need for attaining self-sufficiency in food as soon as possible is now strongly felt and the Government has set 1970 as the target date. East Pakistan should not only try to achieve self-sufficiency in foodgrains, but should also attempt at the same time to increase the production of all types of foods, particularly pulses and oilseeds. The increase in the production of pulses and oilseeds would result in a corresponding decrease in the import of these items from West Pakistan thus releasing shipping space in the interwing trade for more essential industrial raw materials and processed goods. As living standards continue to rise, the demand for "protective foods" can also be expected to increase and this will necessitate the development of animal husbandry which will also help in increasing the farmer's earnings.

## Development of Agriculture

In the last few years with the growing demand a far greater emphasis is being laid on agricultural development. In the Second Five Year Plan (1961-65) the growth rate in the agricultural sector was doubled as compared to the previous plan period. In the Third Five Year Plan (1966-70) allocation to the agricultural sector has been further increased so as to attain self-sufficiency In foodgrain production by 1970. As the agricultural potential has as yet not been fully utilised, there is great scope for increasing agricultural production.

Agricultural production can be increased either by increasing the arable land or by raising the output. The scope for increasing the net cultivated area is limited, but it is possible to increase the gross cultivated area appreciably, if irrigation facilities are made available during the day of winter season. Yields of almost all agricultural crops are very low and compare very favourably with most other countries, particularly Japan and China. The total arable land in East Pakistan constitutes about sixty-seven per cent of the total area of the province and it appears that the limits have almost been reached. Since independence (1947) about 2.5 million acres of cultivable waste land has been brought under cultivation and what remains cannot be reclaimed without heavy capital outlay. During the same period there has been an increase of about a million acres of land for non-agricultural purposes. Most of this land has been used for urban and industrial development, roads etc. and it is feared that as the tempo of urbanisation and industrialisation rises, more land will be required for these purposes. Land required for these purposes is generally relatively high and above flood level. Such lands if cultivated are usually double-cropped. The increasing withdrawal of agricultural land for non-agricultural purposes will further reduce the availability of agricultural land. While the demand for land for urbanisation, roads, etc., will have to be met, it is necessary that only the minimum amount of agricultural land be diverted from its present land use.

Land speculation involving large areas on the urban fringes is also partly responsible for withdrawal of some agricultural land from production. There is need to check this unhealthy practice. The greatest economy in the land use of urban areas is called for. The province can ill afford to allow such deversion to continue on a large scale without adversely affecting agricultural production.

Before examing the various steps taken by the Government to effect a rapid increase in agricultural production, it is necessary to consider briefly two solutions frequently put forward to increase agricultural production *i.e.*, mechanisation and co-operative farming. Mechanisation of agriculture, it is claimed, will increase agricultural production, but mechanisation is usually resorted to increase production per man-hour in countries with limited supply of labour. Mechanisation of agriculture will make redundant a large number of people at present engaged in agriculture and with no alternative means of employment available; it will only help in further aggravating the existing problems of large-scale unemployment and under-employment in rural areas. Moreover, it needs to be emphasised that efficient hand cultivation can be as effective as mechanical tillage, it has rightly been said that "the cost of mechanical operations is often underestimated and the machines' performances overestimated." With its small holdings and its predominant rice culture the present labour intensive methods appear to be quite suitable for East Pakistan. It is necessary to point out that agriculture, particularly paddy cultivation, does not require deep ploughing and there is no special need to introduce machines in tillage operation. Instead of mechanisation of field operations improvements in existing tools and equipment would prove perhaps more useful. But there are, however, certain other operations like land reclamation and irrigation which could be done more effectively and economically by mechanical methods and it is in such operations that mechanisation should be introduced to get the best results. With the help of tractors about 100,000 acres of land has been reclaimed. Recently attempts are being made to popularise the use of Japanese tillers. These light machines are more suitable for local conditions and may prove particularly useful on the large farm holdings. In the last ten-fifteen years the use of low-lift pumps for irrigation purposes has increased considerably, from about 50 pumps in 1954 to more than 4,000 in 1966-67. Another operation that can profitably be mechanised is food processing. Many of the present methods are wasteful and the savings in foodstuffs could be considerable.

To meet the difficulties arising from the poverty of the farmers, the small size of the farm holdings, and, also to modernise aricultural practices, co-operative farming, it is felt by some, should be introduced if agricultural production is to be increased. While co-operatives have played an imortant role in the agricultural development of certain countries, its success under present social conditions in East Pakistan does not appear to be necessarily assured. Experience of co-opera-

tives in some other fields in Pakistan is not very reassuring and the system has been frequently abused. To introduce such a system at present might do more harm than good and may have serious repercussions on agricultural production. The idea of co-operative farming has to grow voluntarily if it is to be a success and it will take a long time before the present conservative-minded farming community would accept it. Co-operative farming, it is also believed, will help in overcoming, to some extent the difficulties arising from the fragmentation of farm holdings. At present more than ninety per cent of the total six million farms in East Pakistan are fragmented. Consolidation of farm holdings is desirable but a certain amount of fragmentation is also necessary. Separate farm holdings situated on different types of lands provide diversified cropping patterns thus affording a certain amount of immunity to the cultivator against a fall of prices or damage by natural calamity to any single farm commodity. Moreover, in low land paddy cultivation,, periodical flooding of the paddy fields is necessary, both for supplying water to the plants and also for effective weed control, and this is most effectively done when the fields are small in size, as it is easier to regulate water supply and levels in smaller plots. It is, however, desirable to prevent excessive fragmentation of holdings and the minimum size of holdings should be about 1 bigha (0.3 acre), as a plot of this size can provide the cultivator with sufficient work for a full working day and thus avoid unnecessary travelling from one plot to another on the same day.

Co-operative farming can at best be regarded as a long-term solution but what is urgently required at present is the production of large additional quantities of foodgrains. This can best be achieved by more intensive cropping and improved cultural practices. About a third of the twenty-one million acres of cultivated land is cropped more than once. The remaining two two-thirds of the cultivated area lies fallow for about 6 months (Jan-July), most of it from (Jan-April). With irrigation facilities a sizable percentage of this seasonally fallow land could be made to yield a second crop, and the present cropping intensity of 137 could be considerably increased. This combined with increase yields per acre appears to offer the quickest solution to the present food problem. Yields of almost all crops are amongst the lowest in the world and can be increased two to three times the present output. For higher yields fertilizers and irrigation along with better seeds, plant control measures and improved agricultural techniques are required. To obtain the best results all these inputs should be used in combination. With these measures it should be possible not only to attain self-sufficiency in food supplies but also to double food production by 1980-85. Of all these factors, irrigation is of the most far reaching in importance. Irrigation is necessary not only for increasing the cropping intensely but also (in combination with fertilizers) for increasing yields per acre.

East Pakistan agriculture is largely dependent upon rainfall and periodical inundations. If the rainfall comes at the proper timings in proper quantities, and if the flood waters do not rise too high or too steeply or stay too long, a bumper crop, especially of aman rice is in store. Long dry spells during the monsoon season particularly at the time of the sowing and transplanting of the aman paddy reduces yields considerably and in some years also the acreage under aman paddy. Irrigation can obviate fluctuating yields by supplying water when the crop requires it most. Flood damage to standing crops (rice and jute) can be quite substantial and losses from floods were heavy in 1954, 1955, 1956, 1962 and 1964. In 1962 the damage by floods to standing crops was estimated at 1100 million rupees. Similarly rice production in the 1966-67 growing season fell short of the target by about a million tons, largely due to flood damage. Some flood protection projects are now under execution, of which the Brahmaputra Embankment Project and the Coastal Embankment Project are the more important ones. The Brahmaputra Scheme provides for the building of 135 miles of embankment and will ultimately provide flood protection to about six million acres. In the coastal districts in the southern parts of the province considerable damage is done to crops by saline inundations and a coastal embankment scheme to provide protection to 3.64 million acres of land is now under execution. More than a third of the project consisting of about 1,200 miles of embankments and 23 polders had been completed, providing protection to a total area of 1.2 million acres from ingress of saline water.

Providing comprehensive flood protection to all parts of the province is a stupendous task, well beyond the present available resources. A "Master Plan" prepared by the International Engineering Co. of U.S.A. is now under consideration by the Government. This scheme is expected to cost Rs. 10,000 million and provides for empoldering large parts of East Pakistan into fifty projects providing flood projection and drainage to about twelve million acres and irrigation facilities to about eight million acres mostly by large gravity flow canals. Under the I.E. Co. Plan flood control work will be in the first phase and most of the irrigation works in the second phase. The bulk of the proposed expenditure will be on flood control measures. Rice production with the completion of these measures is expected to increase from 9.5 million tons in 1964 to 1966 million tons in 1985. Ghulam Mohammad in a recent study of this scheme has pleaded for a reversal of the strategy proposed by I.E. Co. He believes that with the execution of the small-scale irrigation schemes[2] in the next five-ten years, together with the growing of high yielding varieties of rice, increasing use of fertilizers and improved agricultural practices it would be possible to reach the target of 19.6 million tons of rice by 1985 without executing the major

[2]Ghulam Mohammad— Development of Irrigated Agriculture in East Pakistan. Some Basic Considerations. *Pakistan Development Review*, Karachi, 1966, No. 3, Vol. 6.

flood control projects included in the I.E. Co. plan. Ghulam Mohammad is, therefore, in favour of giving priority to small irrigation schemes by greatly expanding the use of low lift pumps and small tubewells, instead of waiting for the completion of costly gravity flow canals and large flood control schemes as proposed in the I.E. Co. plan. With such small irrigation works it will be possible to provide supplemental winter irrigation to about eleven million acres including four million acres of boro paddy and seven million acres of winter crops such as fruits, vegetables, potatoes, oil-seeds, pulses, wheat, barley, maize and other fodder crops. As these crops are grown in the dry winter season there is no risk of damage by floods and production can therefore be expected to be uniformly high. Irrigation by low lift pumps and tubewells will also enable a large part of the nine million acres of aus paddy, jute and sugarcane to be sown earlier and thus avoid damage by droughts as well as by floods. Similarly supply of irrigation water at certain critical stages of growth to the 14 million acres of aman paddy will minimise the loss in yields to the main rice crop of the province. Large-scale flood control measures will, however, have to be provided in the long run as with the increase in the production, losses on account of flood damage will also be proportionately higher. In 1954 the low lift pumps scheme came into operation with about 50 pumps and by 1966-67 more than 4000 pumps were being used, irrigating a total area of about 260,000 acres. It is expected by 1969-70 to have 12,500 pumps and the area irrigated will increase to about 750,000 acres. It has been estimated that there are about five million acres of cultivated land lying near perennial streams that can ultimately be irrigated by low lift pumps and with the addition of more pumps the area under irrigation by this method can be considerably increased. In 1966-67 boro paddy cultivation increased by twenty-two per cent largely due to better irrigation facilities. Further expansion of low lift irrigation is possible and should be undertaken. Operating cost of low lift pump irrigation is much more than gravity flow canal irrigation but capital cost is extremely low and there is no period of gestation.

Irrigation by tubewells has in the beginning been introduced in the northern districts of the province where surface water is not so abundant in the dry winter season. Here 380 large capacity tubewells have been installed to irrigate an area of 91,000 acres. The depth of these tubewells ranges from 125-300 feet and they give an average discharge of about 3.0 cusecs each. Ghulam Mohammad's findings are that low lift pumps and small tubewells are highly productive and would repay their cost in a period of about two years. Large gravity flood canals are cheap to operate but costly to construct and also take a long time to complete. Moreover, whereas farmers of East Pakistan have been practising lift irrigation in some form or the other for a long time in the past, canal irrigation is a new idea. Experience of the Ganges-Kobadak Project with its large gravity flow canal irrigation system has not

been encouraging. The canal system has been completed for an area of 94,000 acres, but the farmers who have been used to irrigation by plot flooding have refused to construct the field channels and it has, therefore, not been possible to utilise fully the irrigation facilities available under this project. Small low lift pumps and small tubewells offer the best way of expanding irrigation in the quickest possible time and at very low capital cost. Though operating costs are high the benefit cost ratio is quite favourable and the benefits are obtained almost immediately. Ghulam Mohammad is therefore in favour of a big programme of small low lift pumps and small tubewells and a much smaller programme of large gravity canals and large tubewells.

To avail of the full benefits of irrigation facilities it should be practised in association with fertilizers and better seeds. The soils of East Pakistan are exhausted and but for the annual spread of silt over a major part of the cultivated area it would have been still more impoverished. The shortage of plant nutrients in the soil is one of the major limiting factors in increasing agricultural production. While the rate of disappearance of organic matter in tropical humid soils is rapid, too little of organic matter is being added to the soil largely due to the practice of using cow-dung as fuel. The application of synthetic manures offers the quickest and easiest way to recoup lost fertility and also to replenish the soil. Paddy particularly shows good response to the application of nitrogen. But the use of synthetic fertilizers without the use of bulky manures can be harmful in the case of clayey soils and wasteful in the case of light sandy soils. Organic manures also help in the decomposition of soil minerals, liberation of plant foods and maintenance of good soil structure. Application of chemical fertilizers may also be harmful if it is not applied along with sufficient quantities of water at the proper time. The need, therefore is not only for increasing the use of synthetic fertilizers but also for increasing the production of bulky manures and suitable measures should be taken to conserve and convert the various organic waste materials including compost into manure. Fish-meal, which is rich in nitrogen and phosphates, is a good fertilizer also and with the development of marine fisheries it could prove to be a rich source of organic manure. Large quantities of oilseed cakes and bone and bonemeal are being exported every year. These should be used in the country rather than be exported. The loss of foreign exchange on account of stoppage of exports of these items will be more than offset by the gains in agriculture production. The consumption of synthetic fertilizers has increased greatly within the last ten years it increased from 2700 tons in 1950 to 67,000 tons in 1960. By 1964-65 it rose to 100,000 tons and in 1966-67 it was about 160,000 tons. This year it is expected to reach 280,000 tons and the target for 1970 is half a million ton. This rapid expansion in the use of fertilizers offers vast possibilities for increasing yields of agricultural crops. To meet the demand for fertilizers the existing unit is being expanded and new plants are being

set up in the province. Production of urea is expected to rise from about 80,000 tons at present to about 457,000 tons by 1970 and production of phosphate and superphosphate is expected to rise to 272,000 tons by 1970-71.

Maximum returns from the application of irrigation and fertilizers can only be obtained if improved varieties of seeds are used. As many as sixty improved varieties of boro, aus and aman paddy with higher yields and resistance to salinity have been evolved, but the best possibilities are offered by IR-8, a short statured, quick growing rice plant, that responds favourably to application of fertilizers, and unlike local varieties does not lodge. The plant because of its short stature cannot be grown in areas where inundation is of any great depth and this excludes it from about three quarters of the cultivated area. It has been estimated that about seven million acres of paddy land can ultimately be put under IR-8, five million acres of aman paddy land not subjected to fooding by more than one foot in depth, and one million acres each of aus and boro paddy fields having adequate irrigation facilities. The seeds of this paddy variety are being multiplied rapidly and by the end of 1966 about 25,000 tons of seeds were produced and with further multiplication it is hoped to sow more than a million acres with IR-8 by 1970. As seed multiplication goes on it is proposed to further extent its cultivation. Given good soil, sufficient weeding and fertilizers and irrigation, it is possible to produce three crops a year of IR-8 with yields three times that of the local varieties and twice the yield under similar conditions of the best local variety-Dharial. Highest yields of IR-8 are from aus paddy—8,000-10,000 lbs. per acre, as compared to 4000-6000 lbs. per acre in the case of aman and boro paddy. With widespread cultivation of IR-8 it is possible that yields will not be as high as those attained in the trial plots. The main drawback of IR-8 is its susceptibility to rice blast and insect attacks. Breakage of grain is also greater than local varieties. IR-8 has been called the "miracle rice" and because of its high yields per acre, production of rice can be considerably increased. Most of the area under rice will continue, however, to grow local varieties but because they lodge only limited quantities of fertilizers can be applied. The development of non-lodging varieties would be very useful. Of the local varieties Dharial appears to be the best in response to fertilizers. The supply of better high yielding seeds for the other food crops could in a similar way help in increasing production of such food crops. The introduction of suitable varieties of Mexi-Pak wheats could greatly increase the present annual wheat production of about 40, 000 tons.

The high yields obtained by the application of fertilizers would invite pests of all sorts and yield increases may become more or less ineffective if proper plant protection measures are not taken to safeguard crops from such attacks. Estimates for losses on account of damage by pests varies from about ten to fifteen per cent but in

some years the loss suffered is very extensive. Certain plant diseases also result in heavy losses. This is not only a loss to the farmer but loss to total agricultural production. It is estimated that crops worth about Rupees 250 million are saved annually by plant protection measures. Plant protection facilities are available for about 2,000,000 acres with seed treatment against soil and seed-borne disease for about 4 million acres. Losses can also be heavy on account of lack of weeding or inadequate weeding. Weeding increases rice production by 40-50 per cent over plots not weeded. Moreover, weeding also increases the availability of soil moisture for the standing crops. Effective weed control has to be practised, otherwise the gains in production due to application of different inputs may not be very significant. The use of selective herbicides may be of great help in supplementing hand weeding, which remains, however, the most effective form of weeding. The practice of broadcasting seeds of certain crops also hampers weeding due to close growth of plants. Wherever possible drilling of seeds should be encouraged as frilling makes possible interline culture which permits easy weeding and also results in higher yields. Line sowing of transplanted paddy will give similar advantages in the case of aman paddy. Rotation of crops in the higher paddy and jute lands, particularly the growing of a leguminous crop as one of the rotated crops, would be useful in restoring soil fertility. In the last few years the number of demonstration farms have been considerably increased. At present there are more than 6,000 farms and about 55,000 demonstration plots where improved agricultural techniques, including the use of better seeds and implements and correct methods of applying fertilizers etc. are being demonstrated to the farmers.

## Conclusions

The final success of all the measures adopted by the Government to increase agricultural output will, however, depend on the cultivator, and strong motivation has to be provided to the farmer. In the past high agricultural output has usually meant low and sometimes uneconomic prices for his products, and this has served as a disincentive to higher production. It is, therefore, necessary to remove this fear of the farmer if his active co-operation is to be won. The wide seasonal fluctuations in the prices of farm commodities have to be eliminated. The farmer should be assured of a fair margin of profit and should not be left to the mercy of the grain dealers who are mostly speculators. The Government should introduce a price support scheme so as to stabilise prices and not allow them to fall below a certain minimum fixed price. In determining the minimum price not only the cost of production but also sufficiently high margin of profit should be taken into consideration. The price so determined shall be regarded as that minimum for the particular commodity and the Government will be bound to step in and purchase all quantities of any foodgrains and also jute, if prices fall below the prices fixed under the price support scheme. The compulsory levy on foodgrains, now suspended,

should be abolished as prices fixed under the levy scheme sometimes have been fixed below the prevailing market prices, and this is a positive disincentive to the farmer.

The price support scheme, if introduced, will no doubt have some repercussions on the economy, but it should be realised that the days of the cheap foodgrains policy are over and while industries and commerce have been allowed to enjoy high margins of profit, the agricultural producer has not shared in these high profits to the same extent. Professor Schultz in a symposium organised by the U. S. National Academy of Sciences on "Prospects of the World Food Supply" in 1966 has convincingly argued the case for giving farmers in the food deficit countries a higher price for their agricultural commodities. His contention is that prices of farm products are generally too low, while prices of consumer goods and services that the farmers have to buy are too high. He believes "that in general, farm people in poor countries have come off too badly in what they can buy with their savings." Schultz insists that only when an efficient system of prices exists will the stage be set for farmers to make the best possible use of the resources available to them.

The rise in prices of foodgrains following the introduction of such a policy will affect mainly the non-agricultural section of the population which in any case form a small section of the total population. Some form of food subsidies for such consumers will perhaps be necessary. With higher prices for farm commodities and with higher output it may be possible to progressively reduce the present subsidies allowed to the farmers for hiring low lift irrigation firtilizers pumps, etc. The saving on these accounts could be used in subsiding the supply of foodgrains to the urban population and also to the landless labourers in the rural areas. The successful implementation of the policy of assured profits to the cultivators alone can win the willing co-operation and participation of the farmers and only then can we hope that the inputs available will be fully and efficiently used and only then can food production be substantially increased.

A sound price policy will help in the immediate boosting up of agricultural output but it is only with the increasing application of science to agriculture that agriculture can be pleased on a sound and flourishing basis. A land use survey to determine the productive capabilities of agricultural lands would be an important first step forward. It is necessary that more intensive use be made of the more productive lands so as to obtain the maximum advantage of the application of the various agricultural inputs. There is also need to prevent the diversion of the more productive agricultural lands to non-agricultural uses. The existing agricultural research facilities have to be greatly expanded so as to ensure increasing application

of science to the problems of agriculture. Amongst the more important problems that deserve the attention of agricultural research workers are some of the followiug

1. The development of improved varieties of seeds giving higher yields per acre and greater immunity to plant diseases.
2. The development of early ripening varieties, particularly of aus paddy, so that the subsequent winter crop can make more effective use of the remaining soil moisture.
3. Introduction of new crops which would help in diversifying the present cropping patterns and may also mean higher returns for the farmers.
4. The determination of the water requirements of the different crops and also the response of different soils to the application of plant nutrients so as to obtain optimum returns of agricultural inputs.
5. The designing of more efficient agricultural implements suited to local conditions.
6. The development of animal husbandry which is linked up with the problems of improved breeding, better feeds and greater control of animal diseases.

The results of these researches have to be passed on to the farmer as soon as possible. This will require large increases in the number of seed multiplication farms so that propagation, multiplication and distribution of new varities of seeds can be expedited. To acquaint the farmers with new varieties of seeds and new agricultural implements and also improved agricultural techniques, the present number of demonstration farms and plots require to be further increased. It is when the farmer starts adopting the results of these researches that agriculture will not only be able to meet the challenge of a rising population but also contribute substantially to the raising of living standards of the people.

# THE PHYSICAL EVOLUTION OF THE NORTH-WEST FRONTIER REGION OF WEST PAKISTAN

DAVID DICHTER

ANY understanding of the physical evolution of the Frontier region must begin with an assessment of the part played by the highly folded and metamorphosed pre-Cambrian shield now represented by the greater part of peninsular India : first, as the underlying basement upon which all the geological structures of the Frontier rests, and second because of the effect its rigidity has exerted on newly uplifted sedimentaries throughout later geological history. Whether these ancient rocks outcrop at the surface in the NWF in the guise of the unfossiliferous formations of Chitral, of western Waziristan, and in the Attock Slates near Nowshera, is still not fully established ; yet the importance of the shield can hardly be disputed when the alignments and trends of the frontier ranges are considered[1].

In complete contrast to the sort of physiography encountered on the Frontier, peninsular India today mostly exhibits the gently undulating morphology and many other typical features of an ancient land surface. With a few exceptions the rivers have gentle gradients, the valleys are broad and open, while the hills are essentially the result of the denudation of extensive tablelands, rather than of extensive uplifts as in the NWF.

## Early Geosynclinal Phase

Whether or not one accepts Wegener's theory of Continental Drift[2], together with the more recent interpretations of it for the Asiatic area by Argand[3], as workable hypotheses explaining the present location of the various pre-Cambrian shields, is an academic point in so far as this study is concerned. That the existence of the ancient Indian and northern Asian (Angaraland) massifs are known and that the intervening area between them became a sea in which huge quantities of sediment were deposited, are far more significant to this study than the theories about the drift of these blocks or that their intervening segments were worn out by the ordinary processes of erosion.

Out crops of both pre-Cambrian and early Paleozoic formations are of limited extent in the Frontier region. On the other hand, a continuous sequence of marine

[1]C. S. Middlemiss "The Geology of Hazara" *Memoirs of the Geological Survey of India*, Vol. 26 (1896), p. 84.

[2]A. Wegener, *The Origin of Continents and Oceans*. (London : Methuen & Co., 1924), pp. 190—205.

[3]N. Argand, *La Tectonique de l' Asie*. Paper read before The International Geological Congress at Brussels, 1922.

[4]L. D. Stamp, *Asia*, (London : Methuen & Co., 1929), p.14.

deposits embracing the whole of the Paleozoic era[5] are clearly evident in the northern or Tibetan belt of the Himalayan system, indicating that they were deposited in a sea lying to the north of the Indian shield[6] (Fig. 1). That Cambrian rocks occur infrequently in Hazara and the eastern areas of the Kohat ranges and only possibly as quartzites in the Bara Valley[7], coupled with the complete absence of the Ordovician and Silurian series from the region, could mean that after initial local invasions of the Paleozoic sea, there followed a period in which the enormous and little known Dravidian peninsular land area prevailed in the Frontier[8].

## The Caledonian Orogeny

At the close of the Silurian period the sediments laid down in the early Paleozoic sea were considerably disturbed by the Caledonian orogeny. Although definite evidence of this is known from the areas to the north of the Indian shield—in what today is Central Asia—little data are available on this period for the Frontier area. However, confirmation that the Paleozoic sea did inundate portions of Chitral in the Devonian period is found in the fossiliferous limestones on the right bank of the Chitral River[9]. The possibility exists, too, that the formations known as the Infra-Trias in Hazara might also be of Devonian age[10], as well as certain slates and schists which occur west of Wana near the Afghan-border[11]. Wadia[12] supports or attests to the validity of a hypothesis put forward by Zalessky among other Russian geologists to the effect that some isthmus-like land area lay across the Himalayan (Paleozoic) Sea connecting with the northern continental pre-Cambrian massif of Angara-land. On the basis of field work in Kashmir and adjacent areas in 1934 Wadia concluded that during the greater part of Silurian period and up till the middle Carboniferous, dry land existed in Hazara ; possibly too in the eastern edges of the Kohat Hills; and in some northern reaches of Chitral[13].

The Caledonian disturbances are known to have continued into the Devonian but, though affecting sediments in Chitral and probably Hazara, there is no record that they appreciably influenced any other areas on the Frontier, with the possible exception of S.W. Waziristan.

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[5]F. R. G. Reed, *The Geology of the British Empire* (London: E. Arnold & Co., 1949), p.410.

[6]*Ibid.* p.465.

[7]H. H. Hayden, "On the Geology of the Tirah and the Bazar Valley" (*Mem. Geol. Sur. of India*), Vol. 28 (1900), p. 116.

[8]D. N. Wadia, *An Outline of the Geological History of India* (Calcutta : Indian Science Congress Assoc., Nov. 1937),p.52.

[9]*Imperial Gazetteer of India*, Vol I (Oxford : Clarendon Press, 1907), p.67.

[10]*Ibid.*, p 67.

[11]A. L. Coulson, "General Report for 1936—Northwestern Circle", *Records of the Geological Survey of India*, Vol. 72 (1937), p. 74.

[12]D. N. Wadia, *Progress of Geology and Geography in India during the Past* 25 *years*, (Calcutta ; Indian Science Congress Association, 1938),pp. 94-95.

[13]*Ibid*, p.95.

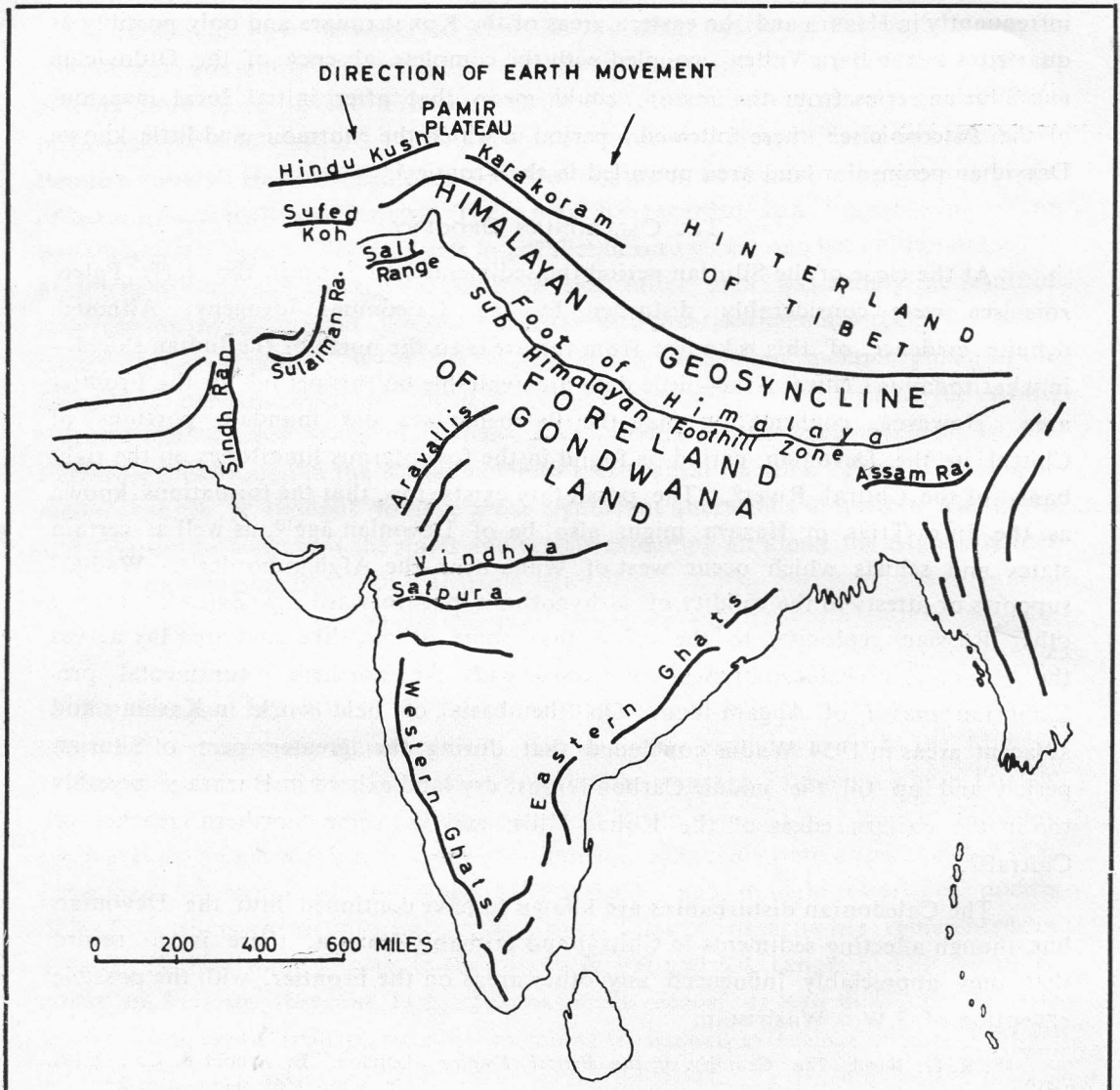
DIRECTION OF EARTH MOVEMENT
PAMIR PLATEAU
Hindu Kush
Karakoram
Sufed Koh
HIMALAYAN GEOSYNCLINE
HINTERLAND OF TIBET
Salt Range
Sulaiman Ra.
Sub Himalayan Foot of Himalaya Foothill Zone
Sindh Ra.
OF FORELAND
GONDWANA LAND
Aravallis
Assam Ra.
Vindhya
Satpura
Eastern Ghats
Western Ghats
0 200 400 600 MILES
From D.N. Wadia "GEOLOGY OF INDIA" 1939 (After Burrard & Mushketov)

FIGURE 1

## The Hercynian Uplift

The Paleozoic era then is largely unrepresented in the NWF. As already acknowledged, a number of geologic periods, including the Lower Carboniferous, pass away without leaving any lithological evidence. The beginning of the Upper Carboniferous, however, is thought to have seen a whole series of tectonic events initiated to some extent by the Hercynian disturbances. These disturbances ultimately gave rise to the highest mountain chain on earth as well as influencing the orogeny of all later fold systems on the Frontier [14].

The relative importance of these Hercynian disturbances in the region is still a greatly disputed subject. Spate, in his monumental work on the sub-continent, takes the view that the Hercynian movements were intensive or large enough to have caused the uplift of the Karakoram, which in his estimation extends to include the ranges of Chitral and Kohistan [15]. Wadia believed that the first impact of the Hercynian disturbances were responsible for the initial lowering of the floor of the Paleozoic sea approximately along the present trend of the site of the Himalayas from Assam to Hazara[16]. Whether or not this deepening of the sea extended to other areas in the Frontier region such as the northern skirting ranges of the Safed Koh [17], Chitral [18], and the eastern Kohat ranges [19], where Upper Carboniferous fossils have been located, awaits confirmation. It is also thought, however, that this deepening paved the pay for some sort of link with a then much larger Mediterranean Sea, thereby instituting what eventually came to be known as the great Sea of Tethys. It was at this stage that the deposition of the Tethyan sediments began.

Another significant event associated with the Upper Carboniferous, especially in terms of local geological inquiry, concerns the beginning of the so-called Gondwana period [20]. This period is important not only for the deposition of fresh-water sediments on the Peninsular horst, but as a period when the whole sub-continental region was probably much more closely linked with Africa and Australia than at present [21].

Permian deposits are usually found in close association with the Upper Carboniferous. In the Frontier region these deposits occur as Tethyan sediments in Bannu, Hazara and the eastern reaches of the Kohat ranges [22]; the latter area being considered structurally a trans-Indus continuation of the Salt Range. One

[14]Wadia, *op. cit*, footnote 8, p. 52
[15]O. H. K. Spate, *India and Pakistan* (London : Methuen 1957), p. 186.
[16]D. N. Wadia, *op. cit*, footnote 8, *p.* 52.
[17]C.L. Griesbach, "The Geologo of the Sufed Koh", *Records of the Geological Survey of India*, Part 2, (May 1892), p. 68.
[18]Reed, *op. cit*, footnote 8, p. 426.
[19]Wadia, *op. cit*, footnote 8, p. 55.
[20]Sir T. H , Holland, "Indian Geological Terminology" *Mem. Geol. Sur. of India*, Vol. 15, Part I (1926), p. 78.
[21]*Imperial Gazetteer of India*, footnote 9, p. 431.
[22]*Ibid*, p. 431.

may note that by the end of the Permian, according to Stamp, that particular part of Central Asia associated with the early Paleozoic pre-Tethyan sea had become a land mass[23].

It should now be observed that in the long course of Paleozoic history a considerable amount of metamorphism, but probably only a limited degree of igneous activity took place in the Frontier region. In the Hindu Kush system igneous intrusions affecting wide areas are known to have occurred in both Devonian and Permian times[24], while the same sort of intrusions are to be found throughout the whole of the northern half of Hazara. They may be regarded as a "great complex of gneissose and schistose rocks laid out in parallel flexure waves one behind the other[25]". Middlemiss believed that metamorphism in this latter area was mainly the result of immense intrusions of acid granitic magmas into older sedimentary rocks[26]. Griesbach[27] takes a similar view of the origin of the large-scale metamorphism in the Safed Koh, particularly in the northern fringe-ranges of this chain, *i.e.*, the Afridi, Cherat, and Khyber Hills. Griesbach also attributes the metamorphism of the Paleozoic rocks found in the Kohat range to these causal factors. Finally Paleozoic metamorphism is thought to have made significant alterations in western Waziristan and Coulson believed that the slates and schists extending all along the Afghan border in this area may possibly be of Paleozoic age[28].

## Main Tethyan Sedimentation

The advent of the Mesozoic era witnessed continued deposition of sediments in the Tethyan Sea which by this time had come to occupy areas not only as far south as the present day Zhob valley[29], but probably extended even to the Mekran coast as well[30]. Included in this transgression were the Sulaimans where Triassic shales and limestones were beginning to be laid down, which also occurs in much the same manner in the Safed Koh region[31]. Triassic sediments were also deposited over large areas of south-east and southern Hazara[32], and though lower and middle Trias formations are absent here[33], the Upper Trias is nevertheless represented as a patchy shallow water deposit in the eastern Kohat and Salt ranges[34]. This last point seems to indicate that the Tethys Sea was much deeper, at least during the Triassic in the Himalayan trough, than it was along its western extensions on the Frontier.

[23]Stamp, *op.cit*, footnote 4, p. 16.
[24]*Imperial Gazetteer of India*, Vol. 13 (Oxford : Clarendon Press, 1908), p. 138.
[25]Middlemiss, *op. cit*, footnote 1, p. 47.
[26]*Ibid*, p. 85.
[27]Griesbach, *op. cit*, footnote 17, p. 105.
[28]Coulson, *op. cit*, footnote. p. 74.
[29]D.N. Wadia, *Geology of India* (London : Macmillan & Co., 1939), p 174.
[30]*Ibid*, p. 182.
[31]T. D. La Touche. "Geology of the Sherani Hills", *Records of the Geological Survey of India*, Vol. 28, Part 3, (1893) p 81.
[32]Middlemiss, *op, cit*, footnote 1, p. 25.
[33]Wadia, *op. cit*, footnote 30, p. 172.
[34]Wadia, *op. cit*, footnote 8, p. 58.

The fact that Triassic sediments are only infrequently found in the Kohat and Wazir Hills while Jurassic material is massively represented in the Sulaimans, also seems to confirm this contention.

The presence of Jurassic deposits over most of the frontier, including Chitral[35], indicates that the Tethyan Sea took on even larger dimensions at this stage. This is indicated by the vast Jurassic deposition in the southern zone, *i.e.*, below the Peshawar Basin, especially in the trans-Indus portion of the Salt Range. Here Jurassic beds, mainly composed of conglomerates, sandstones, clays, shales and limestones attain thicknesses of 500 to 1500[36]. In Waziristan rocks of this age all dip steeply and because of differential weathering have been eroded into a "remarkable succession of knife-edge ridges."[37]

A general rule holding true for both the greater part of Waziristan and the Sulaiman range, is that formations follow each other in a normal sequence with the older being found to the west and the younger to the east. Actually, this entire area may be considered a huge anticline, the main axis of which runs along the Sulaiman range. Further evidence of this is the close resemblance of the black Jurassic limestone occurring in the Takki-Zam area of Waziristan and the massive black limestone of the Sherrani country[38], a hill area between the main Sulaiman range and the plains of the Indus. Vredenburg[39] thought that the fossils of the Janjal plant series gave proof of this link-up even in the case of the huge anticline forming the Takht-i- Sulaiman, which fossils he classed as middle Jurassic. Taking these comparisons one step further, it is even possible to find in the north Himalayan zone rocks similar to the Mesozoics exposed in the "Jura type anticlines and synclines"[40] predominating in the Sulaimans.

It should be noted from the differences observed in the Jurassic fossils over a large area of the Frontier that something like a land bridge existed at this time between the sub-continent with Africa, which separated a more tropical Tethyan sea from a colder ocean to the south[41]. Another characteristic feature of the Jurassic series in the NWF concerns its rather close ties with younger sedimentaries ; in this case it is usually conformably covered by them. This condition, of course, indicates the continuing and paramount role played by the southern extensions of the Sea of Tethys. Associated with these, the synclinal trough had begun to shallow very

[35]D N. Wadia, *op. cit*, footnote 12, p. 106.
[36]Reed, *op. cit*, footnote 5, p. 434.
[37]M. Stuart, "Records of the Takki Zam Valley and the Kaniguram-Makin Area", *Rec. of Geol. Surv. of India*, Vol. 54, Part 1 (1923), p. 89.
[38]*Ibid*, *op. cit*, p. 89
[39]E. Vredenburg, "Janjal Plant Series" *Records of Geological Survey of India*, Vol. 36 (1908), p. 252.
[40]Wadia, *op. cit*, footnote 30, p. 182.
[41]*Imperial Gazetteer of India*, footnote 13, p. 85.

rapidly towards its eastern shore by the time the Cretaceous period had been reached[42]. An indication of this can be gained from the rather patchy appearance of Cretaceous formations in the trans-Indus parts of the Salt range and the S. E. part of Hazara[43]. However, in Waziristan the Neocomian is represented by intensely hard and compact limestone, almost black in colour, reaching an enormous thickness of 4,000′ along the Toi River[44].

The phenomenally large-scale sedimentation in the Tethyan geosyncline from the late Paleozoic and onwards ultimately caused significant structural weakness in this zone. This, in concert with the compressional forces from the north in late Cretaceous times enhanced by the unyielding nature of the Indian shield, produced the initial great disturbances of the Himalayan orogeny. Whether the Himalayan uplift began in the Cretaceous is not universally held, but Spate reasons so on the basis of evidence that no marine Tertiary fossils have as yet been discovered in the Karakoram ranges[45]. One might conclude from his view that the Karakoram was uplifted as a result of these Cretaceous pressures, which in themselves might well have been the forerunners of the main Himalayan uplift.

## The Cretaceous Igneous Activity

Two other events of significant tectonic importance in the physical evaluation of the NWF were initiated in the Cretaceous period: a considerable amount of igneous activity in the southern zone of the Frontier, and the start of the break-up of the old land mass of Gondwana. Contemporaneous with the igneous activity which occurred on the Peninsular shield, in the form of the enormous Deccan traps, was a prodigious outburst of igneous activity which extended into Waziristan. This was also strongly represented in the Safed Koh and its associated ranges of which activity in both areas there are plutonic and volcanic phases in evidence. This activity in the late Cretaceous period, seems explicable as it was antecedent to the disturbances which heralded the upheaval of the Himalayas. Evidence of the igneous activity is the newly discovered vast area of high mineralization found in a zone 20 miles inside the Durand Line immediately west of Razmak and reaching as far north as the Tochi river, with its southern boundary about 10 miles north of Kaniguram. It is thought that this activity carried on into the Eocene period because of the presence of plutonic rocks interbedded with the Nummulitic series in the Tochi Valley[46]. Wadia aptly describes the vulcanism of this region and others further south when he says: "An immense quantity of magma was intruded in the pre-existing strata, as well as ejected over the surface of wide areas.

[42]Coulson, *op. cit*, footnote 11, p. 74.
[43]Middlemiss, *op. cit*, footnote 1, p. 35.
[44]La Toucke, *op. cit*, footnote 32, p. 83.
[45]Spate. *op. cit*, footnote 15, p. 16.
[46]F.H. Smith, "On the Geology of the Tochi Valley", *Record of Geological Survey of India*, Vol. 28, part 2 (1895), p. 110.

Masses of granite, gabros cut through the older rocks in bosses and veins, laccolites and sills, while the products of volcanic action (lava flows and ash beds) are found interstratified in the form of rhyolitic and basaltic lava sheets and tuffs."[47] Further proof of the widescale effect of Eocene igneous activity can be seen in the work of McMahon who first proved that the crystallines making up the central axis zone of the Himalayas were early Tertiaries for the most part rather than entirely Archaean rocks as was earlier assumed.[48]

The Cretaceous disturbances, forecasting as they did the Himalayan upheaval, were also responsible for beginning the break-up of the old Gondwana continent by sinking large segments of it beneath the sea. Until this time the Indian peninsula continued to form an integral part of the great Gondwana continent, which was still a single land mass reaching from Africa to Australia. The end of this period saw the dismemberment of this continent thus ending the isolation of the central Tethyan sea from the seas to the south and east. But it is in the Tertiary era that the most important surface features and configuration of the Frontier area began to shape. Not only was the final severance of Gondwana land completed in this era, but, more importantly, the entire Frontier was convulsed by a series of extensive and intensive lateral earth movements. "Overfolding, faulting, thrusting, contortion, and recumbency— all the accomplishments and causes of mountain building, are to be observed."[49]

## Re-establishment of the Tethys Sea

Although the Tertiary uphealals are held responsible for eventually obliterating the Tethyan sea, the first phase of the Himalayan orogeny which occurred at the end of the Eocene is thought to have had something to do with a temporary re-establishment of it. It seems that geotectonic stresses in the northern and western foreland of the peninsular massif produced a sag or depression which came to be filled by an arm of the Tethys called the Nummultic Gulf. The latter term refers to an immense and almost pure calcium carbonate fossiliferous deposit of the loosely termed Nummilites. This was laid down in the gulf of water to enormous thickness. Being grey or dark coloured, this massive formation is considered to be one of the most noteworthy rock types of the Frontier and the unmistakable feature of its Tertiary history. Most of the authorities, with the exception of Spate, who maintained that it continued to be deposited in the Oligocene, choose to class the end of the Eocene as the period when the last of this series was laid down. This event marked the end of depositions in the great Tethyan sea.

The Nummulitic series is found in a belt-like zone stretching from Hazara

[47]Wadia, *op. cit*, footnote 30, p. 195.
[48]Wadia, footnote 12 (Calcutta : Indian Science, 1938).
[49]P.H. Pascoe, *A Manual of the Geology of India and Burma* (Calcutta : Govt. of India Press, 1950), p. 6.

around the Peshawar Basin to the southern flanks of the Safed Koh and down along the eastern fringes of the Wazir Hills and Sulaiman Mountains. This zonal arrangement is not only indicative of the extent of the trough in which these sediments were deposited, but also illustrates the close-knit depositional sequence of the early Tertiary.

## Development of Siwaliks

It was the middle Miocene disturbances, the second and most intense phase of the Himalayan and Frontier upheavals, which confirmed these close Tertiary links by creating the conditions which eventually led to the development of the Siwaliks, the next of the two great Tertiary groups. This is understandable in view of the changes which took place after the second phase, when the Tethys Sea was finally reduced to a condition of isolated lagoons or else completely elevated into dry land. By the time this stage was reached, the main ranges had achieved enough stature to initiate the evolution of their own distinctive drainage patterns, somewhat similar to that of the present Himalayan rivers as they debouch onto the plains. In this case, however, their courses (of a combined nature) were more or less predetermined for them by the existence of the depressional trough, originally occupied by the Nummulitic Gulf which was at least 30 miles wide. Becoming an ancient river trough this carried the combined drainages of the Ganges, Indus, and Brahmaputra. Its floor deposits consisted essentially of sand, gravels, and conglomerates, obviously all products of the erosion of the rising Himalayas and Frontier land surfaces. These fresh-water deposits (or Siwaliks as they are called in this region) reach an average thickness of 3,000′. Their presence in Hazara, the Kohat area, north and south Waziristan and eastern Sulaimans is mute testimony to the widespread influence of the once great "Indo-Brahm"[50].

The great mountain building movements which took place in the middle of the Tertiary era are thought to be connected with considerable contemporaneous intrusive activity. Not only is the metamorphic backbone of the Himalayas and Safed Koh considered to have originated in this period, but a similar genesis is ascribed to many of the crystallines found in the Mohmand Hills, Dir, Swat, and Bajaur.

The Siwaliks are formed of a series of sub-aerial and fluviatile deposits, mostly alluvial fans or deltas and the gravel sheets of river plains, but occasionally lacustrine in origin. Having already been uplifted by the Upper Miocene disturbances, they were again violently folded by a third phase of Himalayan and Frontier range development which took place in the late Pliocene or early Pleistocene. This constituted the final step in a mountain-building process that began in Paleozoic times. It threw the Siwalik beds into a system of folds which were already conditioned by

[50]Reed, *op. cit*, footnote 5, p. 470.

the location of the old Nummulitic foredeep. Thus today, one is able to trace their position in relation to the margins of the old massif which lies to the south and east. These late movements so disturbed these formations by overthrusts and overfolds coupled with reversed faults, that even the lower Siwalik beds were forced into a tightly folded vertical position. Their relatively soft composition not only enabled the forces of erosion to sharpen their already vertical structures into knife-edge ridges, but afforded already existing drainage patterns the opportunity to gouge out impressive entrenched profiles.

This third and final phase connected with the building of the Himalayas and Frontier ranges is thought by a few geologists to be continuing actively today. A possible explanation of the cause of these movements might rest in the subsidence of the foredeep during the formation of the Siwaliks in much the same manner as the weight of the Paleozoics, Mesozoics, and early Tertiaries in the geosynclinal trough is supposed to have eventually initiated the Himalayan orogeny. Besides causing further isostatic uplifting of the already distorted Siwaliks, these disturbances are responsible for dismembering the huge and ancient parent river of the Siwaliks, *i.e.* the Indo-Brahm, into its three present river systems: the Indus, the Ganges, and the Brahmaputra.[51]

It is interesting to observe the rather close tectonic balance maintained by the peninsular foredeep during the last stage of Himalayan folding. This is evident, in that a new geosynclinal trough was in process of being developed even while the Siwaliks were convulsed in uplift. This is similar to the simultaneous depositions and tectonic uplifts which occurred in the latter part of the Paleozoic (Hercynian) and Mesozoic eras. In this instance the depressed segment was filled in mid-Pleistocene times with huge deposits of alluvium which were carried by the Indus, the Ganges and their associated river systems. Continuing upheavals during this period caused rejuvenations of the erosion cycle thereby prolonging and increasing the extent of these depositions. The magnitude of these alluvial deposits is recognisable from the fact that borings estimate their base to be greater than 1300′ below the surface[52]. Mention might be made too, of the tectonic weaknesses connected with this continuously developing mid-Pleistocene depression. Evidence to this effect can be seen from the recent devastating earthquakes experienced in the foredeep zone at Quetta in Baluchistan and Allahabad in the cenrtal part of the Ganges plain.

## The Present Landscape

Today the area occupied by the Indus Basin represents the largest expanse of plains in the NWF (Fig. 2). It is monotonously flat (the average gradient is some-

[51]Wadia, *op. cit*, footnote 8, p. 65
[52]Wadia, *op. cit*, footnote 30, p. 283

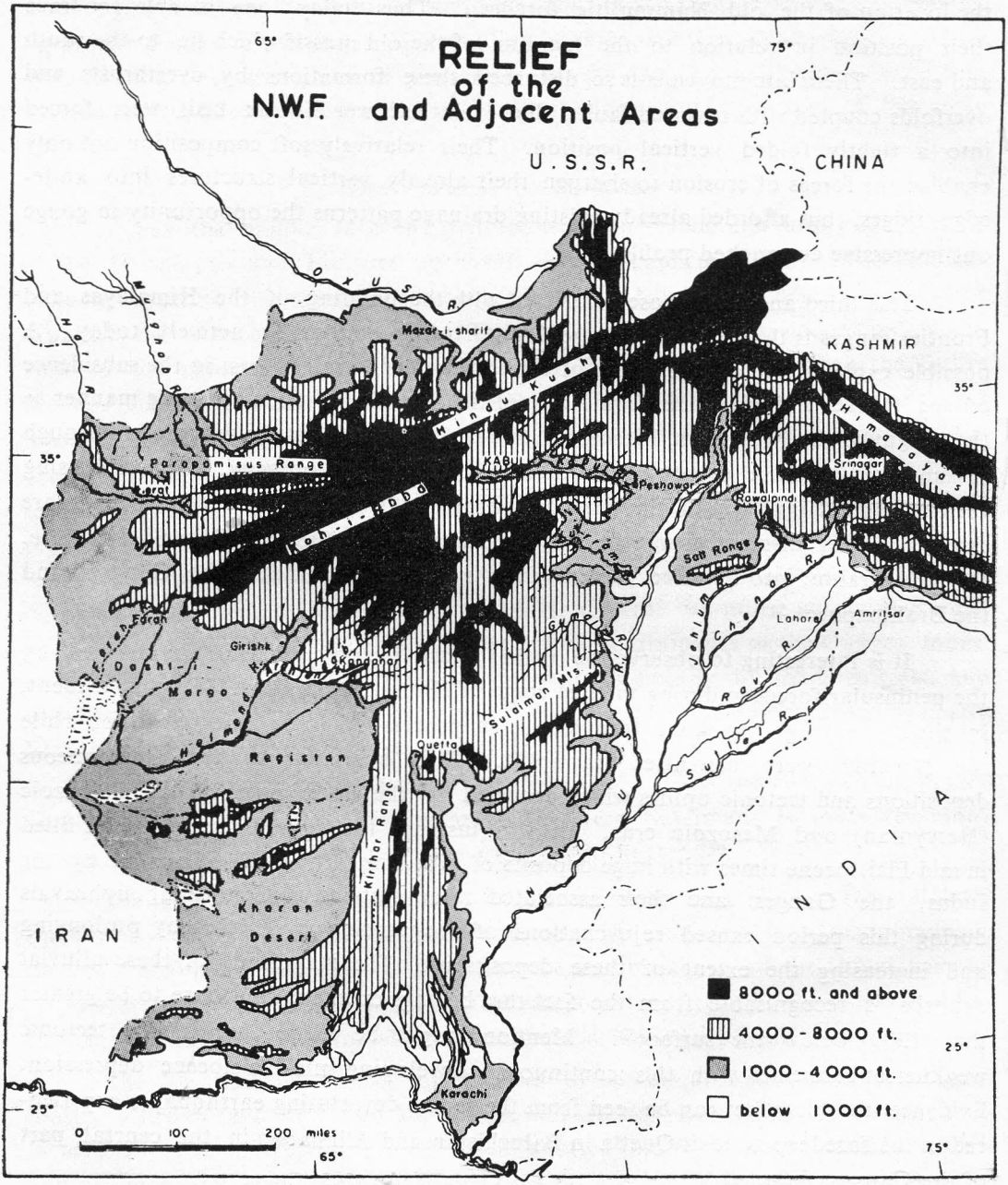
RELIEF
of the
N.W.F. and Adjacent Areas
U.S.S.R.
CHINA
KASHMIR
IRAN
INDIA
Hindu Kush
Paropamisus Range
Koh-i-Baba
Kirthar Range
Sulaiman Mts
Salt Range
Himalayas
Mazar-i-sharif
Kabul
Peshawar
Rawalpindi
Srinagar
Lahore
Amritsar
Quetta
Karachi
Girishk
Kandahar
Herat
Farah
Farah
Deshi-i-Margo
Registan
Kharan Desert
Helmand R.
Murghab R.
Oxus R.
Indus R.
Sutlej R.
Ravi R.
Chenab R.
Jehlum R.
8000 ft. and above
4000 - 8000 ft.
1000 - 4000 ft.
below 1000 ft.
0 100 200 miles
65°
75°
35°
25°

FIGURE 2

thing like 1′ per mile)[53]; a bare and sandy desert region criss-crossed by intermittent streams whose occasional waters scarcely ever reach the Indus. As is the case of similar areas further south and east within the Indus Basin, the Derajat is a potentially fertile area provided that any irrigation water reaching it is handled with such care as to preclude the danger of increased salinity. Whether or not this region has undergone considerable climatic change since the Pleistocene or later times is still a very much debated subject. Sir Aurel Stein assumes that progressive dessication must have taken place at least from time of Alexander the Great's period of conquests; otherwise he believes Alexander and his huge army could never have managed the march through Baluchistan to Persia.[54] The presence of large deposits of wind-blown sand and loess in the southern extremities of the Province could be used to support this argument. However, the consensus of opinion runs in the other direction, with authorities such as Fairservis[55], who is of the opinion that the very proximity of ancient sites to modern villages emphasizes the similar needs between prehistoric and modern times. The argument propounded is that ancient sites were located then, as they are today, on the basis of such elementary requirements as water needs and fertile alluvium; hence there is no need to assume any progressive climatic changes.

Another characteristic feature of present-day surface forms of the Frontier, particularly as they exist in the foothill zone of the Sulaimans where gradients are found to change rapidly, is the presence of rather prominent alluvial fans. Mountain torrents spilling out onto flat plains produce the typical gravel and alluvial fans of semi-arid areas. In the case of the Derajat these are so numerous that they often coalesce throughout the entire length of the Sherani Hills. Alluvial river gravel and boulder drifts also, of a more recent origin that often reach remarkable depths (300′ in the Abbottabad plains) effectively cover much of the Tertiary deposits in lowland areas. This is especially true in all of the important river basins in Hazara, Peshawar, Kohat, and Bannu Districts. These recently deposited sediments account for the remarkably even nature of most of the river basin plains in the Province.

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[53]Canadian Colombo Plan Study of the Indus Valley, 1954.

[54]Sir A. Stein "An Archaeological Tour of Gedrosia" *Memoir of the Archaeological Survey of India*, No. 43.

[55]Fairservis, "Excavations in the Quetta Valley", *Anthropological Papers of the American Museum of Natural History* (1956), p. 194.

## SEQUENCE OF GEOLOGICAL EVENTS IN THE PHYSICAL EVOLUTION OF THE N.W.F.

| | | |
|---|---|---|
| 1. Pre-Cambrian | | Regionally only the ancient Indian Massif and its possible extensions were in existence : thought to be an integral part of an old continental block known as Gondwanaland. This undisturbed horst is not only the basement upon which all Frontier geology is built, but it has also determined by its rigidity the alignment and basic form of the existing physiography of the entire frontier. |
| 2. Cambrian | Paleozoic era | According to Wegener's widely accepted continental drift theory it was in this period after sections of Gondwanaland split up and the fragments drifted apart that huge quantities of sediments began being deposited in a vast sea that lay to the N. and W. of the Indian platform. |
| 3. Ordovician | | A period of continued Paleozoic deposition : not found represented in N.W.F.P. possibly a result of erosion after Caledonian folding and uplift or presence of Dravidian-Land Mass. |
| 4. Silurian | | Further sedimentation occurred in the Paleozoic sea : Towards close of period first great earth movements of Paleozoic era Caledonian, folded up sections of the Paleozoic sea. |
| 5. Devonian | | End of Caledonian orogenesis; deposition continues in those parts of Paleozoic sea still submerged which included areas in Chitral, the Pamirs W. Waziristan, and possibly Hazara. |
| 6. L. Carboniferous | | Known inundation of Paleozoic sea takes place in Chitral and possibly in Hazara. |
| 7. U. Carboniferous | | Orogenesis (probably hercynian) responible for a deepening of Paleozoic sea floor followed by heavy sedimentation at present site of Himalayas and frontier ranges ; connection established between deepened zone and a great mediterranean sea (forerunner sea of Tethys) ; folding also uplifted Hindu Kush and areas of W. Waziristan ; start of Gondwana period Indian massif joined Africa. |
| 8. Permian | | Deposition in Tethys geosyncilne continues. Aside from Tethys most of Paleozoic sea had become land. |
| 9. Triassic | Mesozoic era | Tethys now covers Hazara as well as most of the N.W.F.P; Tethys shallower in N.W.F.P. than Himalayan area. |
| 10. Jurassic | | Sedimentation goes on over most of N.W.F.P. including Chitral ; tethys was a much warmer sea in contrast to the ocean lying to the S. of the India-Africa land bridge. |
| 11. Cretaceous | | Depositions in Tethys shallowed rapidly E. and N.; movements heralding Himalayan and frontier Mts. uplift begins; large-scale volcanic activity especially in Waziristan, Hazara, and Safed Koh region; breakup of Gondwanaland begins. |

| | | |
|---|---|---|
| 12. Eocene | Tertiary era | First phase of Himalayan orogeny begins driving back Tethys and uplifting older strata first; possible intrusion thought to give granitic core to main Hazara and Chitral Mts. tectonic stresses produced sag N. and W. of Indian horst occupied by an arm of Tythes (Nummulitic sea) extending down to Sind; submergence of large segments of Gondwanaland; possible volcanism. |
| 13. Oligocene | | Himalayan orogenesis continues, central crystalline axis buckled up. |
| 14. Miocene | | Retreat of Tethys and its extension from geosynclinal troughs; superseded by Indo-Brahm (Siwalik deposition begins); 2nd (main) phase of Himalayan uplift acting against 'Punjab Wedge' (begun in Eocene) produced present characteristic alignment of Himalayan and frontier ranges. |
| 15. Pliocene | | Last Himalayan orogenic movements threw Siwaliks into a complex system of folds directed by margins of Indian Massif; dismemberment of 'Indo-Brahm' into near present drainage pattern begins. |
| 16. Pleistocene | Quaternary | Siwalik uplift terminates early Pleistocene; most dominant physical features acquired; depressions produced after Siwalik uplift obliterated Indo-Brahm, were filled with alluvium by new drainage system restricted movement of local glaciers down to about 6,000. |

# SOME ASPECTS OF THE CHANGING PATTERN OF INDUSTRIAL LAND USE IN KARACHI

ZAFAR AHMAD KHAN

UNTIL recently industrial activity in Karachi was on a very small scale. The few concerns which existed were servicing workshops and small manufacturing establishments of the handicraft type. The machinery was normally operated either by animals or by men and the products catered for the immediate needs of the city dwellers. A new order has emerged since 1947, the year of the creation of Pakistan. In addition to the establishment of many more concerns of the old type, there have come into being hundreds of large factories with new machinery and complex manufacturing processes. They have started to use electricity and natural gas on a large scale. A large number of workers are employed and goods are produced both for home consumption and for foreign markets.

In 1963 there were about 2,750 small factories in the city[1]. They employ over 49,700 workers and cover a total floor space of nearly 6,150 acres. On account of the inability of the owners to pay the rents of the proper buildings or to secure convenient sites on which to build, the majority are located in converted houses and sheds built on the sites of derelict domestic property. As a result, areas of mixed housing and industry have been produced (Fig. 1).

The larger factories, on the other hand, are located in three specific planned areas on the urban fringe. These are: the West Wharf-Keamari Industrial Area, the Sind Industrial Trading Estate (SITE), and the Landi Industrial Trading Estate (LITE). The West Wharf-Keamari Industrial Area is in the west, the Sind Industrial Estate in the north, and the Landi Industrial Estate in the east (Fig 2). These areas comprise nearly 5,500 acres of land and contain 504 factories, employing about 99,350 workers.

The analysis of the distribution of industrial land of all types and of workers reveals an interesting pattern (Table 1). The gross acreage of industrial space increases from the centre outwards and so also does the number of workers. But the density of workers per unit area decreases from the centre outwards. In other

[1]Karachi Development Authority, Report No. MP—22, 1963, p. 7.

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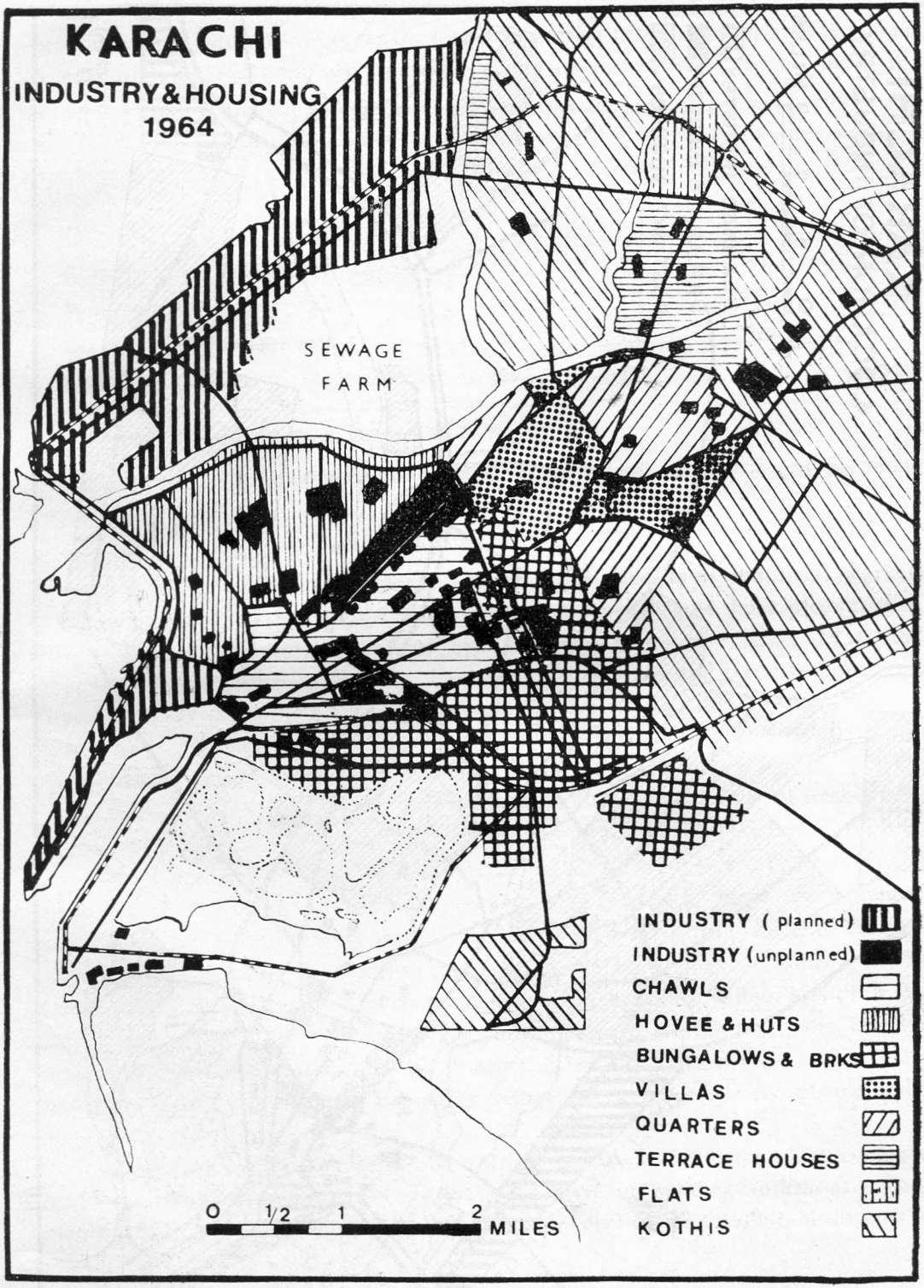
KARACHI
INDUSTRY & HOUSING
1964
SEWAGE
FARM
INDUSTRY ( planned)
INDUSTRY (unplanned)
CHAWLS
HOVEE & HUTS
BUNGALOWS & BRKS
VILLAS
QUARTERS
TERRACE HOUSES
FLATS
KOTHIS
0 1/2 1 2 MILES

FIGURE 1

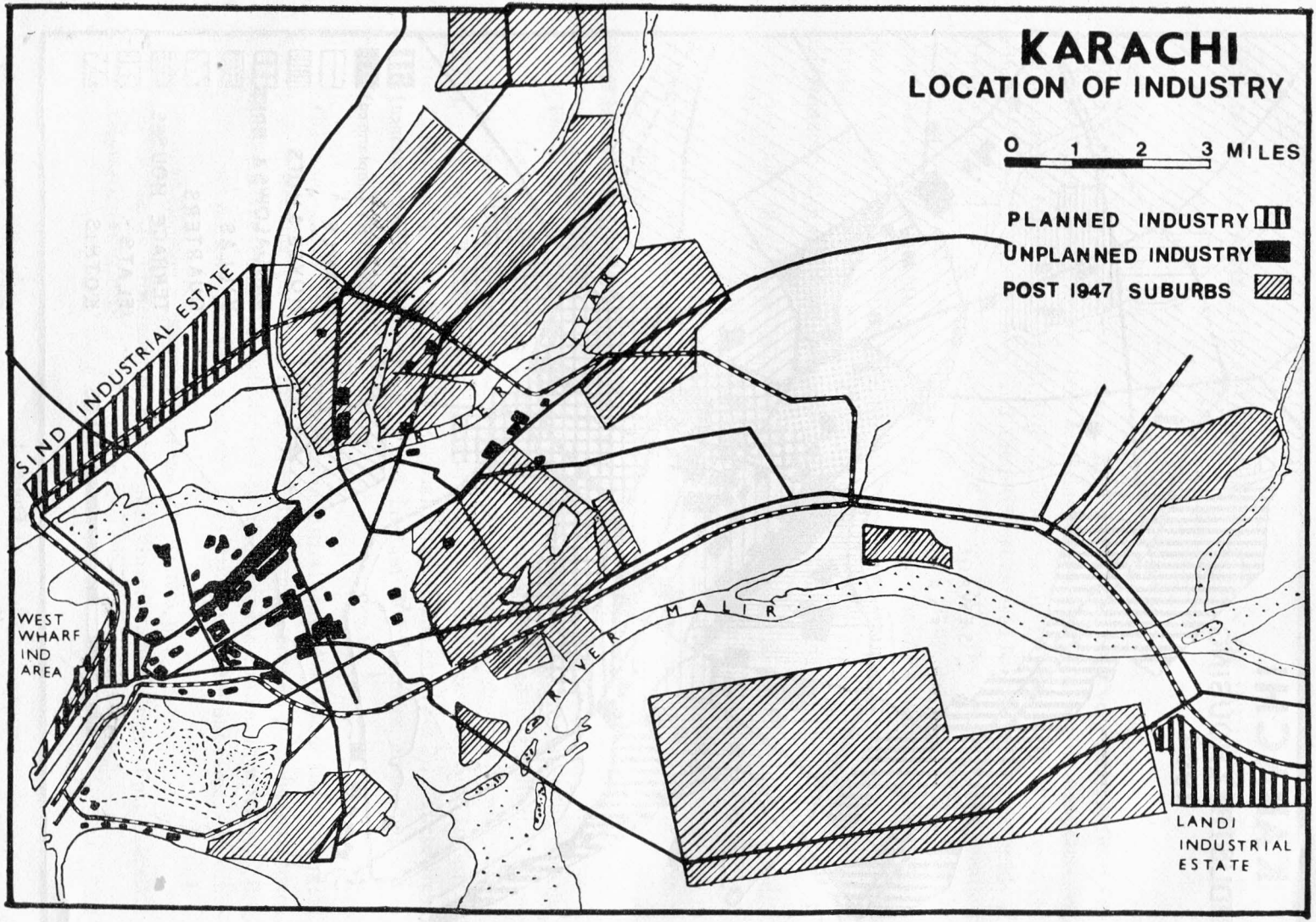
KARACHI
LOCATION OF INDUSTRY
0 1 2 3 MILES
PLANNED INDUSTRY
UNPLANNED INDUSTRY
POST 1947 SUBURBS
SIND INDUSTRIAL ESTATE
WEST WHARF IND AREA
RIVER MALIR
LANDI INDUSTRIAL ESTATE

FIGURE 2

words, the floor space per worker increases. This pattern may become more pronounced in future for whereas the inner zone offers little scope for expansion and is only suitable for small scale industries, there are vast tracts of vacant land in the

TABLE 1—DISTRIBUTION AND DENSITY OF INDUSTRIAL LAND AND WORKERS

| (1) | Total Karachi (2) | Centre (3) | Inner Zone (4) | Outer Zone (5) |
|---|---|---|---|---|
| 1. Gross Industrial land in acres ... | 6,150 | 2% | 9% | 89% |
| 2. Workers ... ... ... | 9,067 | 8% | 25% | 67% |
| 3. Density of Employees per acre ... | 24 | 130 | 62 | 18 |
| 4. Floor Space per worker ... ... | 198 | 333 | 702 | 2340 |

SOURCE : BASED ON K. D. A. REPORT M. P. NO. 22, 1963.

outer zone where single storeyed buildings are common and automation is becoming increasingly important.

## THE LAWRENCE ROAD-LYARI DISTRICT

The greatest number of factories and the highest density of industrial workers are found in the Lawrence Road-Lyari district, where hovels and huts predominate. The area is approximately bounded by Lawrence Road, the River Lyari and Mauripur Road and includes Lyari, Lawrence, Ramaswami and Harchand quarters. It contains 136 acres of industrial space in which 1,025 factories and 19,895 industrial workers are concentrated. The density of workers per acre comes to 146.8 and the number of industrial workers per factory 19.4.

This is the oldest industrial section of the city. Availability of fresh water, cheap land, refuse disposal facilities and proximity to the city center have been the main attractions. These factors played a significant role in the development of a number of industries especially wool-washing factories, tanneries, potteries, and fish-curing establishments during the third quarter of the nineteenth century. With the boost given to the export of grain and seeds by the establishment of the Indus Valley Railway in 1877, there came into being a number of flour and oil mills. During World War II several engineering workshops were established. The impetus came from the ship-repairing establishments in nearby harbour area. After 1947, Lawrence Road-Lyari District became a centre for a large variety of industrial activities.

Today, the most important industries are the metal works which comprise iron foundries, engineering works and turning, casting and welding workshops. They number 267, which is roughly twenty-seven per cent of the total establishments in

the area. The textile and footwear industries come second. With 128 concerns they constitute about twelve per cent of the total. Food and beverage factories are third (11.5%). Next in order of importance are wood and furniture factories (11%), leather and rubber factories (6.1%) and chemical and petroleum factories (6%). The printing, transport and construction industries are relatively unimportant.

The factories are haphazardly distributed. They normally occupy one or two rooms in residential buildings. The highest concentration is found along Lawrence Road where the ground floors of the old buildings have been converted into foundries, workshops, repairshops and warehouses. Factories with independent premises are very few. They are normally concerned with processes which are obnoxious in character. They existed in isolation along the River Lyari upto 1947 and became engulfed by later extensions. The tanneries, wool-washing and fish-curing factories found along Tannery and Chakiwara Roads are the main examples.

Since the area is the biggest sector of mixed housing and industry, its salient features will be examined in order to shed some light on the physical and social environment of the industrial workers living in Karachi. Conditions are both substandard and deteriorating and these are the criteria for a 'blighted' district. Being situated close to the sea in the low-lying delta of the River Lyari, a large part is often flooded during high tides. There are numerous depressions in which rain and sewage water collects and stagnates. Mosquitoes and flies breed here and spread diseases. A stench prevails everywhere which is often added to by the fumes released from factories. The houses are affected by dampness. About twenty-five per cent of them are merely shacks, fifty-five per cent are semi-pucca and only twenty per cent pucca[2]. About sixty-two per cent of the houses consist of only one room, sixteen per cent of two, six per cent of three and the remaining twelve per cent of four to five rooms ; whereas the average family consists of five members. Ninety-five per cent of the families have no water tap of their own ; they use the public tap in the street. Only twenty-three per cent of the families have latrines inside the dwelling ; fifty-three per cent have latrines outside and fourteen per cent have none at all. Fifty-six per cent of the families have no bathing facilities and thirty-four per cent have no proper kitchen. There is a great lack of civic facilities such as schools, parks, play grounds and hospitals. Well-off residents and those not working in the region are gradually moving out. Some of the vacated houses are being converted for industrial use and others are being rented by poor families, particularly

[2]Karachi Development Authority, *Lyari Re-development Scheme : Survey of Existing Conditions*, (Karachi, 1961).

factory workers and labourers. The percentage of houses sublet to tenants has increased from 41.2 in 1959 to 58.7 in 1966[3].

## The Central District

The second largest area containing houses intermingled with industrial concerns is the *chawls*[4] district which coincides roughly with the city's central area. It has 913 industrial establishments in which 15,684 persons are employed. The establishments may be grouped into three categories 1) the servicing industries such as electricity; local transport, motor repairs, turning, casting, welding and radio and watch repairing ; 2) the manufacturing industries whose products are frequently needed by every family for example bakeries, furniture and footwear factories ; and 3) specialized industries such as printing and clothing manufacture.

The industrial sites of the *chawls* district fall into four easily distinguishable groups, one along Macleod Road, the second along Bundar Road, the third in Sadar Bazar and the fourth in the Old Town. The Macleod area has a very long tradition for industry. In early 1860s a few cotton presses and iron works were established there. Although these establishments were forced to move out on account of rising rents, a number of small firms subsequently established themselves on the narrow belt of land situated between Macleod Road and Frere Road. At the present moment the area contains 284 establishments. Fifty-seven per cent of them are paper and printing and paper works, 6.4 per cent bakeries and aerated water manufacturing concerns, six per cent welders and turners, and 4.9 per cent furniture makers. The remaining 14.8 per cent are repair shops and electrical and chemical manufacturing concerns. Unlike the Macleod Road area, the incursion of industries into the Bundar Road, Sadar Bazar and Old Town areas is quite recent. But the pattern is similar. The Bundar Road area has 253 establishments. Fifty-four (21.4 %) of them are engaged in casting, turning and welding, thirty-six (14 %) in transport, thirty-three (13 %) in printing, thirty-one (12 %) in manufacturing food stuffs and beverages. Similarly, of the 263 establishments in Sadar Bazar, 30.8 per cent are engaged in the repairing and servicing of motor vehicles, 12.9 per cent in furniture, 11 per cent in hand-looms and hosiery. The remaining 25.9 per cent are turning, casting, construction gas blowing and shoe making establishments. In the Old Town there are 113 establishments. 25.7 per cent are associated with hand-looms, textiles, hosiery and footwear, 16.8 per cent food and beverages, 15 per cent printing, 5.3 per cent furniture and 3.7 per cent leather, rubber and chemicals.

An interesting feature in all the centers is the grouping together of some of the establishments on the basis of trade. Examples include the paper and printing

[3]Karachi Municipal Corporation, Taxation Department.
[4]A kind of large linament, with a number of dwellings on each floor.

trade along Offendi Road in the Macleod Road area, the furniture trade around Arambagh, recreational ground in the Bundar Road area, the automobile works along Akbar Road and Frere Street in the Sadar and the jewellery trade in Sarrafa in the old Town.

Another important aspect is the multiple use of industrial premises. They serve as factories, offices, show room, stores and selling spaces. The owner and his employees do not concentrate upon any particular job but perform almost all the duties connected with the trade. A worker may be found unloading raw materials from vans and storing them in the shop, repairing his machinery, manufacturing certain items and selling the products to the customers. Such multifarious activity makes the establishment a very busy and noisy place. Sometimes this is a source of great nuisance to the neighbourers.

It is learnt that the authorities are considering the shifting of some of the industries to new areas which would be planned on the fringe of the developing townships in outer Karachi. But many of the factory proprietors told the author that they did not want to move out of the area. They have developed certain ties with the locality and have become known as a part of it. Since the area is densily populated, they enjoy proximity to their clientile and at the same time derive their labour force from it. The area has a well-developed transport system and is easily accessible from all parts of the city. Wholesale markets, retail bazaars and Government offices with which close contact is necessary are all located in the district. Moreover, several of the establishments are of the most economical size for their particular trade and would not be able to bear the incovenience and cost that would occur as a result of moving. The authorities will need to take these factors into consideration before making any final decisions in matters of industrial re-planning. Unless special facilities are provided to these small enterprises, there is every possibility that many of them will be 'planned out of existence', to the great loss of the city and of the country at large.

## The Shershah-Mango Pir Area

Two miles north of the *chawls* district is the third sector which shows a mixture of industrial and residential land use. This is the Sher Shah-Mango Pir area, which includes the Sher Shah Colony and the *Kachi Abadis*[5] near the Sewage farm. The area has developed since 1947 around the Sher Shah village. Being close to the Sind Industrial Estate it attracted mill workers in large numbers. Several refugee families with limited means also settled here. They built their makeshift houses with wood, mud, cement blocks and sheets of tin and iron. The Sind Industrial Estate with its numerous textile mills provided the impetus for the establishment of dyeing, printing, calandering, baling and hand-loom factories. An added advantage was the presence

[5]Unplanned settlements.

of a vast labour market and vacant land at cheap rates. Here factories requiring large amount of space but not needing direct contact with clients were also established. Pottery, glass works, leather works and metal works may be quoted as examples. The area contains a total of 254 establishments which employ 3,758 workers; 141 (37.6 %) of the establishments are associated with textiles, 46 (18 %) with metal works, 13 (9.2 %) with chemicals, 10 (7.1 %) with wood and furniture, 9 (6.4 %) with leather, 8 (5.7 %) with printing and the remaining 20 (16 %) with pottery, glass and electrical works.

### Jail-Country Club Road Area

The fourth highest concentration of unplanned industries is found in the Jail-Country Club Road area which includes a strip of land between Nai Numaish and the Jail, the terraced housing area of Pir Ilahi Bakhsh Colony and the quarter district[6] along Martin and Jamshed Roads. There are eighty-nine factories in this sector, thirty-eight (42.7 %) of them are handloom and dyeing works. The others in order of importance are glass and pottery works (15), bakeries (9), furniture (4), electrical (4), and printing works (3). They are followed by footwear and construction works. The majority of the establishments have been set up during the last decade and a half. The impetus was given by several factors. The area had an old tradition for industries. About half a dozen factories were established during the inter war years. Important among them were a handloom factory and a glass factory. The area was connected by a direct road with the city centre. There were vast tracts of Government waste land all around. Several low income colonies were established in the vicinity which provided a labour market.

In the rest of the housing areas, the factories are very few and widely scattered. They are normally located on main roads in association with shopping centres. They are small radio, cycle and motor repair shops, welding and turning workshops, footwear and furniture, and garment manufacturing establishments.

A few unplanned factories are also found in the urban fringe. There are in Keamari some oil company installations with subsidiary activities and a number of mechanical workshops which serve the ships. A huge oil refinery is located in Gizri, a cement factory north of Drigh Road and a number of salt works at Mauripur.

### The Planned Estates

In contrast to the confused intermingling of housing and industry in the areas discussed earlier, the planned estates on the urban fringe represent a purely industrial environment. These estates have developed in the last two decades owing to the

[6]Quarters are two-room single storey small houses.

lack of space within the city and are similar to the so-called 'trading estates' of England. They are owned by companies which have planned the areas and have equipped them with gas, electricity, water, railway sidings and other facilities. The system has great advantages in a city like Karachi where capital is not lacking but the capitalists do not have any experience of planning. The industrial proprietor now receives assistance from the companies in planning and starting his activities. All the necessary utilities are well organized so that the industrialists can easily plan their costs, which are far less than if they had begun in a completely undeveloped area.

The Sind Industrial Estate is the largest and the oldest of the estates. It was developed about three miles north west of the city centre. The Lyari River skirts the estate on the south and Orangi Nala on the east. In the north and west are three distinct ridges known as the the Orangi, Chora Lakhu and Mango Pir Hills.

The area is linked with the city centre by the Karachi-Mango Pir Road. It is connected with the Karachi docks by rail and road. It is also directly connected with the main railway system of West Pakistan.

The total area of the estate is nearly 4,000 acres, of which about 1500 acres are occupied by factories. An interesting feature is the division of the area into a number of zones each having its own type of industries. These zones cater for the following trades :

1) Textiles : handloom, power loom, cotton mills, wool, rayon and silk mills.

2) Food : edible oils, biscuits, confectionery, bakery, flour mills, ice, canning of fruit.

3) Engineering : Steel rolling, electrical fans, hardwares, foundry, iron, furniture, conduit pipes, cycle parts.

4) Chemicals : soap, glue.

5) Pharmaceutical : medicine.

6) Special Projected Industries such as cigarettes, rubber tyres, tubes, assembling.

7) Obnoxious : Leather, bone-crushing.

8) General Trade : Matches, rubber articles, prints, oil mills.

There are 500 factory sites in the estate. 398 factories are in production, while 102 are still unbuilt. The existing factories employ 51,379 workers or nearly 46 per cent of the total industrial labour force in Karachi. With 144 establishments, the textile factories form the largest group (36.2 %) of the industries. Next in order

of importance are metals (14.9 %), chemicals (10.8) %), food and beverage works (8 %). The remaining 30.1 % of the factories come under the categories of chemicals, pharmaceuticals, general trades, obnoxious industries and others such as cigarette manufacture, assembling of machinery.

The second industrial area has been developed around Karachi harbour. It includes sections of the West Wharf and Keamari. The area has been designed to accommodate marine trades connected with the port and those industries whose raw material mainly arrives by sea. There are at present 40 factories in it which employ 11,457 workers. Of these, automobile assembling and boat and ship building form the highest percentage (20). Food and beverages constitute 17.5 per cent, chemicals and pharmaceuticals 15 per cent, metals 12.5 per cent, building construction 15 per-cent and machinery industries 10 per cent. The remaining 10 per cent of the establishments are engaged in wood work, printing and other miscellaneous activities.

The third area is the Landi Industrial Trading Estate (LITE). It has been established sixteen miles east of the city on the main railway line and the Karachi-Hyderabad highway. The estate has been primarily designed for industries whose raw materials originate in the hinterland.

It embraces 890 acres of land, out of which 666 acres are used as factory sites and the remaining 224 acres for amenities. The space under factories is divided into 66 industrial plots ranging from 2.5 acres to 50 acres. The total number of workers employed in the estate is approximately 36,500.

Textile industries form the largest group (20.5 %). They are followed by metal industries (17.1 %), food and beverages (9.3 %) and transport (8.2 %).

In addition to the existing areas, about 3,400 more acres of industrial land are being developed in Karachi. It consists of a number of industrial pockets at the margins of some of the developing townships. Korangi will have 1,507 acres, North Karachi 529, Malir and Malir Extension 118, K.D.A. Scheme No. 1 (Lyari) 161, Federal B Area 201 and the Country Club Scheme 154 acres.

## Conclusion

With the present rate of industrial growth and decentralization of industry, the whole of the projected land will have been utilized within less than a decade[7]. But the importance of industry as an occupation is likely to increase for many years to come. A far greater number of secondary industries will be required

[7]At present there is an average density in the outer zone of about 18 employed persons per acre. On this basis one can calculate that the projected 3,400 acres of industrial land will provide working place for approximately 61,200 employees. The average increase in the number of industrial workers during the last decade has been 10,000 per annum. With this rate of increase, the total working places should be filled in within 6-7 years time.

to satisfy the needs of the large population which is increasing at an average rate of six per cent per year. On account of its growing prominence as the main port and centre of commerce, private organizations and administration, Karachi will attract those special undertakings which these activities require. During all the phases of national planning Karachi will be given priority for the location of those heavy industries whose raw material must arrive by sea or whose finished products must be exported to foreign countries.

As a result one can make out a strong case for the revision of the existing Master Plan for Karachi which has not reserved enough land for industrial growth. In a city like Karachi where land is being rapidly covered by new housing, there is a danger that good sites will become scarce very soon, and the new industries will be forced to move farther and farther out. This would mean additional movement of goods, longer journeys to work, unnecessary cross traffic and uneconomic storage. "This displacement of industry is costly to the community, to industry, to the worker, and of course, to the consumer. It wastes physical resources and human energy, and it jeopardizes community well being."[8]

Since most of the raw materials are not available in and around Karachi but are brought by sea, railway and road, it appears that new industrial districts would best be developed on the waste land by the harbour and along the national highway and rail-roads in the Landi-Pipri region. Any plan must ensure that the defects of the existing industrial estates are removed in the new areas. The facilities for employees should be expanded to include not only the usual cafeterias, locker-rooms and dispensaries but also large hospitals, libraries, auditoriums and recreational areas, both indoor and outdoor. Contiguous with the industrial districts should be developed well-planned residential areas to provide accommodation for those who desire to live close to their place of work. This will increase efficiency and render the urban environment more varied and interesting.

[8]Muncy, A Dorothy. Land for industry—a neglected problem, in Harold M Mayer and Clyde, F. Kohn (Ed) *Reading in Urban Geography*, University of Chicago Press, 1965, pp. 467.

# SOME OBSERVATIONS ON 1961 CENSUS DATA PERTAINING TO URBAN AREAS

QAZI S. AHMAD

IT is a common knowledge that at the time of decennial censuses all statistical information is collected on the basis of population agglomerations *i.e.* villages and towns. However, due to considerations of economy, and the specific requirements of the country, the detailed statistical information is compiled and tabulated only for agglomerations of larger size, *i.e.*, towns and cities, or for administrative divisions, such as Districts, Divisions, etc. The statistical information compiled for rural areas (villages)[1] is extremely sketchy. This paper, therefore, is restricted to a review of data provided by the 1961 census of population and housing pertaining to urban areas *i.e.* towns and cities.

The first major consideration is the very definition of an urban area as adopted for the 1961 census. To qualify for an urban area a place should have these attributes :[2]

1) Municipalities, Civil Lines, Cantonments not included within the municipal limits, and all areas having Town Committees under the Basic Democracies Order.

2) Other continuous collection of houses inhabited by not less than 5,000 persons designated by the Provincial Directors of Census as urban.

3) Certain other areas with less than 5,000 persons designated by the Provincial Directors of Census as having urban characteristics such as common utilities, roads, sanitations, schools, centres of trade and commerce with a population substantially non-agricultural or having non-agricultural labour concentration, and those possessing a markedly high literacy rate or which are Civil Stations.

It would thus appear that accordihg to 1961 census the basis for distinguishing urban areas from rural areas was the size of population or the administrative status of

[1] There is one important point to be noted in connection with rural areas designated as village in the cenus. To a student of Settlement Geography the word, 'village' generally connotes the smallest agglomesrated settlement. However, the census definition of a village is quite different. A village, as defined in the 1961 census, is the smallest Revenue Estate, which often consists of more than one population agglomeration commonly known as village Goth or Abadi. These smallest administrative units or Revenue Estates (census villages) are termed as Dehs or Mouzas ..... according to the usage in different regions. See A. Rashid, *Census of Pakistan Population, 1961*, Vol. I, Pakistan, Tables and Report (Karachi, Manager of Publications, Govt. of Pakistan), P. 1-49.

[2] See *Census of Pakistan Population, 1961*, Vol. I, P. 11-16.

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a place or both. In addition, a few areas with less than 5,000 persons but having pronounced urban characteristics were also treated as urban.[3]

It may be added that for purposes of Census a 'city' is defined as an urban area with a population of 100,000 or more persons. Those with less than 100,000 persons are designated as 'towns'. Furthermore, a census city can be just a municipal city or it may have several additional constituent units *e.g.* Cantonment area, Civil lines, other urban areas such as suburbs and satellites, industrial area, university town, etc.

## Type of Statistical Information provided by 1951 Census

The 1961 Census of Population and Housing provides a wide variety of statistical information about places designated as urban, more particularly those classed as "cities". The basic organization of the census publications containing data on urban areas centres around six volumes. Of these, Volumes 2 and 3 provide a wide range of statistical information on urban areas of East and West Pakistan.[4] Each volume consists of four sections :

1) Growth, composition, and distribution of population.
2) Age, sex and marital status.
3) Literacy, school attendance and education.
4) Economic activity.

The details of statistical information as listed below are in fact titles of various tables included in each section. The order in which they are mentioned, therefore, conforms to the sequence of these tables in that section. This list also mentions, wherever necessary, whether data in respect of a particular item have been compiled for all urban areas, cities only, cities and selected towns,[5] or for any other combination of urban centres.

*Growth, composition and distribution of the population* ;

Tables 3, 3A & 4 are included in this section. They show population of cities by sex and area, 1951 and 1961 (this table contains data on male/female population, 1951 and 1961, increase/decrease in population, 1951—61, approximate area, persons per square mile, 1961, females per 1000 males, 1951 and 1961, position in size order in 1951) ; population of towns of less than 100,000 inhabitants, 1951 and 1961

[3] It is highly desirable that in future censuses urban areas should be defined on the basis of a number of empirical tests such as a fixed density threshold and a fixed proportion of working population engaged in non-agricultural activity. For example, it can be decided that a place in order to be designated as urban should have a density of not less than 1000 persons per square mile, and at least three-fourths of its working population should be outside of agriculture.

[4] Volume 2 deals with East Pakistan while volume 3 contains data on areas included in West Pakistan.

[5] The term, 'selected towns', as used in the census means towns having a population of 50,000 or more.

(the type of information contained in this table is the same as that in the preceding table); decennial variation in population, 1901—1961 (absolute figures and percentages).[6]

*Age, Sex and Marital Status* :

This section excludes Tables 6 and 6-A on population of cities by sex and religion, 1951 and 1961; population of towns of less than 100,000 inhabitants by religion and sex, 1961; percentage distribution of population by sex and 5-year are groups[7]; marital status distribution per 1000 persons each sex group.[8]

*Literacy, School Attendance and Education* :

Under this section are included the Tables 18, 19, 21, 23, 29-A, 36, 37, 38, 39 and 40. These tables contain information about literate persons by sex; literate persons by religion and sex; persons able to read and write, read only and illiterate, by age and sex; percentage distribution of students by grades passed[9]; students by highest grades already passed; percentage distribution of literate persons by grades passed[10]; educated persons by broad age-groups; educated persons (Muslims) by highest grade passed by age-groups and sex; holders of certificates, diplomas and professional degrees; persons who commonly speak one or more of the main languages of Pakistan, 1951 and 1961, languages of literacy-number of persons able to read and write and number of persons able to read with understanding but not write.

*Economic Activity* :

This section refers to Tables 43-A and 45 which show percentage distribution of population by economic activity and sex, 1968;[11] population (12 years and over) by economic status, 1951 and 1961; population by economic status, age groups and sex, 1961.[12]

*Non-Agricultural Labour Force : vols.* 5 *and* 6 (Tables 2-10)

Information regarding these aspects is provided in Volumes 5 and 6 (Tables 2-10).

Volumes 5 and 6 consist of data for urban areas of East and West Pakistan according to detailed occupation and industry categories. Each volume consists of the following tables containing data on urban areas.[13]

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[6]Implies all urban areas, and stands for cities and selected towns.

[7]*Op. cit.* footnote 2, Census Bulletin No. 3, p. 283—315.

[8] *Ibid.*, vol. 2, p. III-12 & vol. 3, p. III-24

[9] *Ibid.*, vol. 2, p. IV.11 & vol. 3, p. IV-24 & 25.

[10] *Ibid.*, vol. 2, p. IV-14 & vol. IV-30-33.

[11]For absolute figures see *Ibid.*, Economic Characteristics, Census Bulletin No. 5, Table 4, pp. 35—38.

[12]*Ibid.*, Economic Characteristics, Census Bulletin No. 5, Table 4, pp. 110—125.

[13] The data on non-agricultural labour force have been compiled for all cities and 'selected towns' of East Pakistan, but in the case of West Pakistan this information has been tabulated for cities only.

Non-agricultural labour force (10 years and over) by occupation (main and sub-groups), sex and religion, 1961 ; non-agricultural labour force (10 years and over) by employment status, age groups and sex, 1961 ; non-agricultural labour force (10 years and over) by occupation (main and sub-groups), employment status, age: marital status and educational level, 1961 ; non-agricultural labour force (12 years and over) by occupation (main and sub groups), sex, employment status and educational levels, 1961 ; non-agrcultural labour force (10 years and over) by detailed occupations (main, sub and minor groups) and sex, 1961 ; civilian labour force) (10 years and over) in each industry (main and selected sub-groups) by occupation (main groups), and sex, 1961 ; civilian labour force (10 years and over) by detailed industry (main, sub-and minor groups and sex, 1961 ; non-agricultural labour force (10 years and over) by industry (main and sub-groups), sex, age, educational level and employment status, 1961 ; unemployed persons including first job seekers (aged 10 years and over), by occupation (main and sub groups), age, educational level, marital status, employment status and sex, 1961. *Housing Characteristics : Vols 9 and 10* (Tables 1-9).

Volumes 9 and 10 contain data on housing characteristics of urban centres of East and West Pakistan respectively.[14] The tables embodying statistical information on urban areas are as follows :

Houses, households and persons in the households by sex, 1960 ; Houses by state of occupancy and construction, 1960 ; households by number of persons and tenure of premises occupied, 1960 ; households by tenure of premises occupied and number of rooms, 1960 ; households by tenure of premises occupied showing number of persons per room, 1960 ; occupied houses by tenure showing principal materials used in walls and roofs, 1960 ; occupied houses according to structural type, 1960 ; families by size and type, 1960 ; families by number of persons, 1960.

## Comments

Even a cursory glance over the preceding section is enough to reveal that so far as urban centres are concerned the 1961 Population Census of Pakistan leaves much to be desired.[15] An attempt has been made to point out some of the more obvious defects in the 1961 Census of Pakistan.

1) A study of published data reveals that most of statistical information has been compiled for urban centres having a population of 50,000 or more.

[14] The data on housing characteristics have been compiled and tabulated for all urban areas irrespective of size of population.

[15] There is no denying the fact that the 1961 Population census of Pakistan provides a much greater variety of statistical information than the first Census of Pakistan held in 1951. In addition, there is the 1961 Housing Census of Pakistan which was held for the first time in the country.

However, in the case of non-agricultural labour force the data have been compiled for all towns of East Pakistan which had a population of 50,000 or more but so far as West Pakistan is concerned the data compiled pertain to cities only. This is by far the most serious omission so far as statistics on urban centres are concerned.[16] The result is that we can have no idea of the occupational structure of even major towns of West Pakistan.

2) It is a legitimate question as to why most of the census information has been compiled for major towns (census calls them selected towns) only. Why not for all the towns irrespective of size of population ? In regional planning, particularly, this omission can prove to be a serious constraint as a number of very small towns may form part of an urban region. In addition some of the minor towns (*i.e.*, those with less than 50,000 persons) occupy very important place in the administrative hierarchy of the country. These are also important centres of trade, transport and education. These towns, therefore, deserve as detailed a treatment as major towns and cities, at the stage of compilation of census data.

3) Furthermore, in the case of cities, the data refer to a city as one unit ; no data are given for the component parts of a city[17]. This is yet another serious omission which certainly reduces the value of statistical information pertaining to cities.

4) Although the 1961 Census of Pakistan records, in all respects, a definite improvement over the previous decennial censuses, the range of statistical information is by no means full and complete. To date, practically no information exists on internal migration. Data on the age structure of urban population are inadequate. The list can be further extended, and a number of other weak points can be spotted easily.

5) Just as it is important that the decennial census should make available information on every town irrespective of size of population it is equally important that census data should be compiled and tabulated for sub-areas (wards or union committee areas) of all cities and major towns[18]. Cities and major towns are relatively large

[16] This writer fails to understand the reason for leaving out even major towns (*i.e.* those with a population of 50,000 or more) of West Pakistan while compiling data on non-agricultural labour force—a very valuable set of information on the occupational structure of Pakistan towns.

[17] As mentioned before, the census definition of a city includes, in addition to the city proper (*i.e.*, central city or municipal city) such other areas as a Cantonment, an industrial estate, other suburban areas, and satellite towns, etc. It is thus analogous to a "town-group" as used in the 1961 Census of India.

[18] It may be mentioned that only in the case of East Pakistan data pertaining to total population, number of houses, and households, number of literates, and the number of males and females have been given for sub-areas (wards) of all the four cities. See District Census Reports of Dacca, Khulna and Chittagong, village statistics.

agglomerations of population in which each sub-area like a ward or even a union committee area is often times as big as, some times even bigger than, a small town. The statistical information on sub-areas of major urban centres is greatly needed in the study of intra-urban transportation, spatial arrangement of land uses, density gradients, social area analysis, functional structure, residential structure, etc. The census data for sub-areas can prove to be of fundamental importance in connection with planning of our towns and eities.

## RECOMMENDATIONS

In the light of the observations made in the preceding section it is now possible to make a few suggestions which might be of help to census organizers in improving census statistics pertaining to urban centres at the time of the next decennial census.

Firstly, in future, the list of census publications should include at least one volume exclusively devoted to urban areas. The volume should contain the whole range of census data on every town and city including their constituent units such as municipal area, Cantonment, and such other areas as a university town, industrial estate, and other suburban and satellite areas not included in the municipal area.

Secondly, in the case of all cities and major towns, the census data of all types should be compiled and tabulated for their sub-areas (*i.e.*, wards preferably union committee areas) as well[19].

Thirdly, each District Census Report should contain at least one map of every city and major town included in the district[20]. These maps drawn to a scale, in addition to important topographical features and street layout, should indicate the precise limits of different constituent units (*i.e.* municipal area, cantonment limits, etc.) of a city or town as well as their sub-areas *i.e.* wards or union committee areas. It should be the responsibility of local governments of urban areas to make these maps, as well as the large-scale maps of sub-areas available to the census organization well in advance of each decennial census. At present, such maps simply do not exist. However, they can be made available if the task of preparing

[19]In subsequent censuses, for example at the time of 1981 census, it might in fact be necessary to compile certain, if not all, information on cities and major towns by still smaller sub-areas, down to a "census block', as is the practice in a number of advanced countries.

[20]In his Introduction to 1961 Census of Pakistan, Mr. A. Rashid, C.S.P., Census Commissioner, Pakistan, gives clear indication of the fact that the census organization had in its possession "valuable urban area maps" (see vol. 1, p.I-30). In fact, every census enumerator in urban locality had been supplied with a map of the block in which he was to operate (see vol. 1, p. I-II). Again in his Foreward to the District Census Reports, the learned Census Commisssioner significantly remarks, "I quite realize that the inclusion of urban area maps would have enriched these volumes but due to the overriding considerations of economy and time these had to be left out. Maps are, however, an integral part of any report that claims to present a comprehensive picture of the district". *See District Census Reports, p. (iii).*

them is assigned to Survey of Pakistan. To begin with, and as suggested above, these maps will be required for urban centres having population of 50,000 or more. According to the 1961 census the number of such urban centres in Pakistan was only thirty one. This number may increase to 40 or 45 at the time of 1971 census. Still, it would be relatively a small number. and, so the preparation of maps for 45 towns and cities during the course of next five years, before the publication of 1971 census results actually start, should not be very difficult. Once these maps are available they will form the prized possession of the concerned municipalities or town committees. The base maps of urban areas are needed by a number of agencies other than the census organization for a variety of purposes—town-planning, water supply, drainage, building construction. telephone and telegraph departments, industry, education, and research work. The department of tourism can utilize these maps with advantage in preparing guide maps of different cities and towns. The guide maps form an integral part of tourist industry, and to-date such maps simply do not exist[21].

Fourthly, the range of statistical information as provided by the census needs to be further widened. Of particular importance is the data on cityward migration without which it would be difficult to acquire an understanding of the processes of urban growth. Detailed statistical information is needed about the demographic and occupational attributes of in-migrants. It should be the primary concern of the census organization to collect and compile such information at the time of the next census.

Then there is the problem of missing data. For instance in the 1961 census reports one finds that there are quite a few urban centres for which area figures have not been recorded. Area figures for urban localities and also for their constituent units should be fully recorded as without area statistics it is not possible to compute different types of densities—population, housing, etc.

Finally, a few words about census terminology. At present all urban centres which have a population of 100,000 and over are designated as "cities" irrespective of the fact whether these form single administrative organization like municipality (*e.g.* Lyallpur city) or a group of localities under different administration (*e.g.* Karachi city which consists of Municipal Corporation and Port Trust areas, Cantonment area (civil), other cantonment areas, and Karachi Taluka (urban). To have the same designation (*i.e.*city) for these two apparently quite different types of agglomerations, since both satisfy minimum population requirements, does not seem

[21]The guide maps of a few cities and towns at present available for supply to the tourists can hardly be called as "maps"; they are at best sketch maps of a very poor quality. and extremely deficient in information.

to be proper. If the first type of urban centre (*i.e.* Lyallpur) is a city, the other type (Karachi) should be differently designated in order to give a more realistic picture of the way these two agglomerations are organized, both spatially and administratively.

Furthermore, it is of utmost importance to evolve concepts analogous to "urbanized area" and "Metropolitan area" for purposes of the next decennial census. Suitable criteria will have to be devised to define limits of urbanized areas and metropolitan areas or such other similar areas which census authorities may decide to use as a basis for a more exact separation of urban population from rural population near our larger cities.[22]

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[22]It may appear to be a debatable point whether we have reached that stage of urbanization when it becomes necessary to evolve more elaborate definitions (such as urbanized area or metropolitan area) which provide a basis for a more exact separation of urban population from rural population. In the opinion of this writer, the larger cities of Pakistan, though their number is small, present a situation which calls for devising new definitions, for delimiting areas that should form part of a Metropolis.

# NEWS AND NOTES

## TWENTIETH ANNUAL ALL PAKISTAN SCIENCE CONFERENCE, DACCA, MARCH 3 to 8, 1968.

The Twentieth Annual All Pakistan Science Conference was held in Dacca from March 3 to 8, 1968 under the auspices of the Pakistan Association for the Advancement of Science. The University of Dacca played the host. The venue of the Conference was the University Campus. Dr. Q.M. Hossain, S.I., formerly Professor of Statistics, Dacca University, was the General President. The six-day long Science Conference was well organized. The General Presidential Address on "The Growth of Scientific Ideas", presentation of research papers and the sectional presidential addresses were all well attended. Meetings of the section on Geology, Geography and Anthropology were held in the Department of Geology of the Dacca University. Apart from academic activities of the Conference it provided some light entertainment programmes including a cultural show and a local excursion to the nearby countryside.

In the section on Geology, Geography and Authropology twenty-one papers were presented. The meeting of the section was presided over by Prof. A.M. Patel, Head of the Department of Geography, University of Rajshahi. Mr. M.A. Latif, Reader, Department of Geology, University of the Punjab acted as Secretary. A number of geographers had gathered from foreign countries and from universities of West Pakistan. Eight papers related to different geographical problems were read. The presidential Address on Population, Food and Agriculture in East Pakistan was delivered on March 6 by Prof. A.M. Patel.

The annual meeting of the Pakistan Geographical Association was held on March 7, 1969 at 11.00 a.m. in the Department of Geology, Dacca University. The following members attended the meeting :

Prof. A.M. Patel
Prof. M.M.Memon
Dr. A.I.H.Rizvi
Mr. H.H.Naqvi
Dr. Jehan Ara Malik
Dr. Miss M.K. Elahi—Secretary-Treasurer

The following were elected to various offices of the Association excepting that of the president's which is held by Prof. Kazi S. Ahmad since the birth of the Association.

*Vice-Presidents*

Prof. A.M. Patel
Prof. K.U.Kureshy
Dr. A.I.H.Rizvi

*Members of the Executive Committee*

Prof. A.M. Patel
Dr. S.I. Siddiqi
Dr. I.H. Zaidi
Dr. Fazal-e-Karim
Dr. Munir Zaman
Dr. Jehan Ara Malik
Dr. Miss M.K. Elahi--Secretary-Treasurer.

The Symposium on the Cottage Industries in Pakistan could not be held on account of shortage of time. It was proposed that proposals in this connection be sent to the Secretary. It was also observed that no coordination exists in researches done in various fields of geography and it was resolved that in future geographers to make the research fruitful through meetings, should discuss the trends of research in geography.

It was also considered that geographers need to study geography in applied from specially in the field of geomorphology and economic geography. It was resolved that a volume of publication on geography of Pakistan be compiled.

*University of the Punjab*

M.K. ELAHI

# ARID MOUNTAIN AGRICULTURE IN NORTHERN WEST PAKISTAN

## A GEOGRAPHICAL STUDY

*Elizabeth Staley*

(ABSTRACT OF PH.D. THESIS, UNIVERSITY OF THE PUNJAB, 1968)

The region studied, here called the arid mountain region, is in the extreme north of West Pakistan, and comprises the administrative areas of the Gilgit Agency, Chitral State, and northern Swat State. It is the region of the 'inner' mountains, distinguished from that of the 'outer' mountains to the south by greater aridity and need for irrigation, more extreme relief, and also by ethnic divisions. It is characterised by mixed subsistence agriculture, that incorporates intensive irrigated cultivation and transhumant livestock husbandry.

The setting of the region's agriculture is dominated by the extreme relief: the great height of the mountains and their deep dissection gives altitudinal ranges of up to 20,000 ft. from the summits to the valley bottoms. Under such conditions variations in the relief that affect the occurrence of cultivable land and other resources are of prime importance. It is the relief that also accounts for the very low precipitation, especially in the valleys, because the southern mountains exclude the summer monsoon and, to a large extent, the winter western disturbances. Temperatures and most significantly, the length of the growing season vary greately with altitude; and so also does the surface cover of the mountains, from extensive snow and ice above 17,000 ft. through meadow and woodland zones to semi-desert in the valley bottoms.

Under these mountain conditions only about 1% of the total area is cultivated; and so, although the population—about 300,000—is small in relation to the total area of 24,000 square miles, the density per cultivated square mile is very high. Within this generally high density there is some variation, which is reflected in many aspects of the agriculture. Average holdings vary between districts from less than 2 to more than 5 acres. Most holdings are cultivated by their owners.

The population is concentrated in small villages located below 10,500 ft. in the valleys on the rare patches of gently-sloping irrigable land. Each village, containing perhaps 50-100 households, is a discrete physical unit; and each typically has its own area for summer grazing and the collection of wood. Communications between villages are often difficult, and those with areas outside the region are even more so; and therefore, in spite of recent improvements, transport remains expensive. Trade is limited, and although it is now increasing, the essential subsistence nature of the agriculture has been little affected.

Land is cultivable only if it has a comparatively gentle gradient, sufficient soil and a suitable altitude; and the distribution of cultivation reflects these requirements. Irrigation also is essential to cultivation: unirrigated crops are only sometimes attempted in the extreme southwest. The system of irrigation is to divert water from the melt-water streams into small gravity-flow channels. Difficulties may arise if the stream discharge is uncontrolably large or very variable, or if it carries a heavy suspended load; but the major problem is of insufficient water. Where water requirements are high, and more especially where the supply is limited because the catchment area or channel capacity is small, the water shortage may seriously curtail the area under crops and the yields. there are several ways in which the shortage of water may locally be overcome.

The resources of suitable land and irrigation water are utilized for the cultivation primarily of grain crops, since grain is the principal requirement in such a subsistance economy. There is intricate variation in the types and combinations of grains grown, with altitude and other conditions. Subsidiary crops include fruit, pulses, fodder crops and *charas*. Cultivation is by simple methods that use the labour of the farmer's household and his cattle. Methods are similar throughout the region, but the intensity with which they are applied and also the extension of the cultivated area towards the

'technological limit' vary conspicuously, principally with the pressure of population. The intensity of cultivation is one of the major factors affecting crop yields; others are the amount of manure and of water and the soil conditions. But although crop yields are varied, their averages are high compared with those for the whole of West Pakistan. The production's of grain is generally just, or almost, sufficient for the population's requirements. However some districts have small surpluses or deficits, apparently associated not only with the physical resources but also with economic and social conditions such as alternative sources of income and the desire for cash.

All farmers who own land, and also some tenants, own livestock, typically 1-5 cows and bullocks, and 10-40 goats and sheep. Transhumance is practised, the animals grazing the pastures at 11—15,000 ft. in summer, and in winter being stall-fed in the villages. The use of straw and lucerne as winter fodder (together with certain wild plants) and the use of the dung that accumulates in the sheds as the essential fertiliser for the fields demonstrate the interdependence of the livestock husbandry and the cultivation.

Within this general system of livestock husbandry, there are differences between the central and northern districts and the southern districts. In the central and northern districts livestock holdings are generally smaller because pasture is scarce and opportunities for growing or collecting winter fodder are limited, and also apparently because, in the allocation of land and labour, cultivation of grain crops is given precedence over livestock husbandry. In the southern districts both physical conditions and the farmer's propensities seem more favourable to livestock husbandry; and livestock holdings are larger, a greater proportion of the population takes part in transhumance, the social importance of the ownership and consumption of livestock appears greater, and some villages rely on the sale of livestock produce for the purchase of grain.

In a few areas, both in the north and south, there is 'spare' pasture, not used by the local farmers. Groups of pastoralists have immigrated, originally to use these areas for grazing, although most of them now practise some cultivation.

During the present century agricultural production has been gradually increasing as more land is brought under cultivation, as the intensity of cropping is raised and as new types of crops are grown. However, within the last one or two decades this increase has failed to keep pace with the growth of population. There have been larger and more rapid changes outside fieid of agriculture—in communications, in the consumption of goods imported into the region, and in non-agricultural employment. These are having a considerable effect on the economy as a whole and certain repercussions on the agriculture.

Almost all the features described in this dissertation can be seen, above all, as those of a mountain agriculture; and also in common with other mountain regions are the growing problems of population pressure, extremely limited scope for economic development, and the first stage of the consequent emigration.

# ARTHUR GEDDES, 1897—1968

Dr. Arthur Geddes, former Senior Lecturer in Geography at Edinburgh University, is known to us by his extensive work on the region of the Pak-Indian Sub-continent, and by his close association with the renowned Indian poet, Rabindranath Tagore. His deep understanding of the Indian way of life, and the problems of the people of this part of the world have resulted in the originality of his work in its "fusion of the European and the oriental spirit". He was working on a book on India, Pakistan and Ceylon, at the time of his death, and Pakistani geographers keenly await its publication.

Arthur Geddes, a Scotsman by birth, was the son of the late Sir Patrick Geddes, a pioneer in town and country planning. He was educated initially at the Dundee High School. Later, he attended Dundee and Aberdeen Universities, but due to the claims of his father and World War I interfering with his academic pursuits, he was not able to obtain any degree. His only claims to an orthodox academic career was the French degree awarded to him as a result of his doctorate thesis.

His first visit to India was in 1921, as an assistant to his father, then Professor of Sociology at the Bombay University. In this capacity, he took part in a town planning survey carried through by his father.

Till 1924, he repeatedly visited Santi-Niketan—"the home of peace"—and it was there that his friendship with Rabindranath Tagore developed. Tagore asked him to translate and note in European notation some of his songs, and so from 1923 to 1924, Arthur Geddes taught and studied at Santi-Niketan, under the guidance of Tagore.

On his return to Europe, he continued to help his father, then an old man settled in Montpellier in the south of France due to reasons of ill-health. Here his father founded Scots College and Arthur Geddes used this opportunity to get his doctorate degree in Geography in 1928 from Montpellier, making the subject of his thesis the knowledge he had acquired of Santi-Niketan and Siri-Niketan and its Rural Reconstruction Centre.

In 1929 he joined the staff of the Geography Department, Edinburgh University.

He revisited India in 1938-39, which continued to be his main interest, and in fact for many years his regional geography courses were on the East, with an emphasis on India.

During World War II, Arthur Geddes was attached to the Town and Country Planning Section of St. Andrew House (the Scottish "home office") and after his appointment ended, he returned to the Geography Department, Edinburgh University.

He again visited the sub-continent during 1955-56, and extensively travelled both India and

Pakistan. An extract from his diary written during this period, tells us that on his previous visit of 1938-39, he had left India disillusioned by the discouragement that prevailed there. This time, he felt there was "a new spirit of confidence, of endeavour, of effort, in the Indian Union", and as Professor A. Demongeon says in the preface to "Au Pays deTagore" by Arthur Geddes, he "realised the depth of the moral problem which arises from the works of colonisation of the great Occidental nations".

On this same visit, Dr. Geddes visited Karachi for the first time and gives us his professional impressions of the city as "overwhelmingly expanded, under-housed and under-employed."

Dr. Arthur Geddes retired in 1967, after having been on the staff of the Edinburgh University for thirty-eight years.

In the geographical field Dr. Geddes had two main interests the Sub-continent of India and Pakistan, and his own country Scotland. Numerous papers on problems of the sub-continent—population, planning, river problems, etc. have been written by Dr. Geddes, and at the time of his death he was in the process of completing a book on 'The Sub-continent of India, Pakistan, Ceylon, Land-Work-People". Professor A. T. A. Learmouth of Canberra University, Australia, an old friend and collaborator of Dr. Geddes, is hoping to put together this book for publication. From a draft of the book dated June, 1967, it appears to be a detailed regional, functional and cultural study of the Sub-continent, and when published should form a valuable hand-book particularly for all students of geography.

On Scotland, Dr. Geddes has written *Islands of Lewis and Harris : A Study in British Community* (1955), and several other regional studies. His interest in regional planning led to his being a frequent contributor to the letter columns of "The Scotsman" as well as the authorship of "*Studies in Regional Planning*" edited by G.H.J. Daysh (1949).

Dr. Geddes close association and friendship with Rabindranath Tagore was responsible for his sympathetic understanding of the Indian mind, which was projected both in his geographical studies and his non-geographical interests. He published two books, containing melodies composed by Tagore for his verses ; these were partly Dr. Gedde's own translations.

By virtue of his being an authority on Tagore, Dr. Geddes was appointed Chairman of the Tagore Centenary Celebration Scottish Committee. At the centenary exhibition of Tagore held in Edinburgh during the international Festival he translated the works of Tagore's songs into English.

We have lost in Dr. Arthur Geddes, a geographer whose close link with the land and people of India and Pakistan, his honest interest in their problems and development, made him a sensitive advocate of their wishes and ideas.

He died at the age of 71, at his home in Edinburgh.

(Miss) Fareeha Rahman

*Private Redevelopment of the Central City: Spatial Processes of Structural Change in the city of Toronto.* Larry S. Bourne, University of Chicago, Department of Geography, Research Paper No. 112, Chicago, Illinois, (1967) xii and 199 pp.; maps, diagrams, tables, and appendixes. $4.00 9x6 inches.

Private Redevelopment of the Central City adds notably to our knowledge concerning the processes of urban growth and change. No wonder, it belongs to the Research series of the Department of Geogragphy of the University of Chicago which during the past eight years has produced about two dozen such research papers which have helped in extending the frontiers of geographical knowledge.

This study is concerned with one aspect of the process of structural change, the location and impact of private redevelopment within the central city of the Toronto Metropolitan area. Private redevelopment is defined as a continuous process of replacement in the structure or building inventory of the city. It thus includes all new construction and structural modifications generated in the private sector of the urban economy. The detailed empirical analysis covers a period of eleven years, from 1952 to 1962, for which the required statistical information was available.

The book consists of eight chapters, two of which following the Introducation are devoted to a review and evaluation of the relevant theories which provide useful insight into the nature and location of urban redevelopment. The third chapter specifically introduces the concept of redevelopment as a spatial process of urban structural growth. Together the two chapters covers 33 pages or about one-sixth of the book. This is a reasonable coverage of the theoretical discussion of the problem of redevelopment.

The next chapter outlines the Toronto study and describes the data, analysis, and measurement procedures. The various procedures used in compiling the original data source are explained in Appendix A. The reason for restricting the study area to the central city of Toronto is the availability of data for the central city area only. This restriction is certainly more serious than the time restriction (*i.e.* 11 years, from 1952 to 1962) as mentioned above. The author's contention that the disadvantages of this restriction have been overcome as the general analysis is set within a metropolitan context is not corroborated from what follows in the text.

In the following chapter Bourne attempts to establish hypotheses to be tested in the context of structural change in Toronto. For example, variation in redevelopment activity among subareas of the city is hypothesized to be related to the social and physical amenities of these areas, relative accessibility to the urban population and distance from the city centre, and size and cost of individual parcels.

The next two chapters deal with the private redevelopment of the central city of Toronto during the period, 1952 to 1962. Of particular interest to the reviewer is Chapter VI which presents the descriptive statisics on structural change in Toronto, and suggests major trends and implications. The spatial pattern of structural change is well brought out through a series of extremely useful maps. In the first section of this chapter Bourne notes that the largest increases in floor area were recorded by apartments and offices which also represent the most intensive uses. At the other end of the intensity scale, automobile commercial and parking uses registered the largest increases in floor area. About the dominance of these uses the author rightly remarks "that in many cases such uses simply represent a transition period between demolition and new construction. Even where no new structures are involved, particularly is a complementary function to the higher intensity uses in the central area." The second section of this chapter is devoted to an examination of the spatial pattern of the major types of redevelopment activity. The findings of this enquiry should be of great interest to an urban geographer. These are (1)"...the major (land) uses involved are tending toward even greater

locational concentration; (2) the degree of concentration is also apparent among major areas of growth in the city; (3) the scale of redevelopment construction outside the central area suggests a strong trend toward functional and spatial *decentralization*; (4) the magnitude of new construction exhibits a *discontinuous gradient* with distance from the city centre. It drops off rapidly from its peak in the Downtown area, and then rises abruptly at major outlying foci; (5) detailed analyses indicate a strong tendency toward clustering in small areas. This is particularly true of high density construction, which appears concentrated at distinct nodes usually within the higher income sector of the city. Such nodal points or areas offer a combination of location, access, and environmental advantages not present in other areas." The closing section of this chapter is devoted to a discussion of processes involved in redevelopment. This discussion leads the author to conclude that "redevelopment is a function of some composite form of these factors." To assess the combined influences of these factors Bourne resorts to multiple regression analysis. For this purpose two categories, office and residential redevelopment, are selected. The inclusion of only two factors, the author contends, does not affect usefulness of this analysis, as these two uses account for some seventy per cent of all redevelopment activity. Commenting on the results of this analysis the author points out a number of factors which render the analysis only of limited value. (See pages 150 and 151)

The concluding portion of this study relates to the replacement process in individual properties. Each property is examined before and after redevelopment to establish the nature of *land use succession* that results. As far as this reviewer is concerned this last phase of the study of redevelopment appears to be far more interesting and revealing than the preceding section that deals with multiple regression analysis. Of special interest are the Tables 21 to 26 which portray land use conversion in the central city of Toronto during the period, 1951 to 1962. Equally useful are the Tables 27 and 28, together with the two maps (Figs. 31 and 32) given at the ned.

Finally, Bourne points out the weak points of this study, as well as the directions in which this research can be further extended.

In a work of this nature *i.e.* a doctoral dissertation, one can always expect a few typographical and other errors. However, in this particular case the list of such errors unfortunately is pretty long. A few of the more serious ones are mentioned here : Page 7 line 15: "The unifying these is .....example;" Page 18 line 7 : "Principal" should read "principle". Page 89, third para, lines 3 and 4 "valued" should read "values"; and "ration" should read "ratio". Page 120, Para 5, line 2: "(see figures 10 and 15)" Fig. 10 has no relevance here as it is a map showing zones of analysis : census tracts and planning districts; page 134, last para', line 4: "land users" should read "land uses"; page 141, first para., line 4: "likely reduced" should be "slightly reduced"; page 152, last para, line 1 : "extend" should read "extent"; page 160, line 1. "mixes residential" should read "mixed residential"; page 177, line 9: "what is needed than....."should read "what is needed then;....." page 178, footnotes 2 and 3 should be numbered 1 and 2.

*University of Sind* QAZI S. AHMED

*Geography of Production* : Oswald Hull, Macmillan St. Martin Press, Melbourne, Toronto, London (1968); XV+344 pp., maps, diagrams, charts, photographs, bibliography, index. 40s net.

The book is divided into twenty one chapters, of which fourteen Chapters deal with the production and distribution of various products including regional analysis of the United States, Soviet Union, India, East and West Africa, Brazil and Latin America with special reference to production and economic history. The remaining two chapters emphasize on transport and trade.

This book, although the author claims and perhaps rightly so, is the first book on geography of production, but, certainly, like many other economic geographies. This book also presents more of an inventory of economic productions and their distributions rather than analysing them by employing more sophisticated techniques.

The author gives special importance to energy and transports. However, he has not been able to deal satisfactorily with these items.

How far has the author succeeded in his objective? This has been stated as examining geographically the elements of production and is indeed a question which needs to be considered. In the opinion of this reviewer he has not been able to clearly talk about the production in terms of their areal variation. The approach followed has been stated to be by way of (*i*) food and raw material output, (*ii*) the organization of production on the land, in mining, and in manufacturing, (*iii*) selected industries, including some of the more recent developments in the fields such as electronics and chemicals; (*iv*) the varied economic scene, as represented by large regions: The United States, the Soviet Union, India, East and West Africa and Brazil. This seems to be a desirable ambition; but again the information regarding various countries is sketchy and does not clearly bring out the points. He has tried to build his major theme, that is, the role of energy and transport by way of indicating the impact of technology (*a*) on agriculture and (*b*) in industry. The whole theme has been developed against the background of Britain, as a competing and developing industrial power. The intention as stated is, to picture Britain's position in the world economy in a world situation.

There may be enough justification for Prof. Hull to use Britain as a model country for the purpose of his study but when viewed against the presence of two joint nations like the United States of America and Soviet Union and also in the presence of Japan and China (which has been taking great leads so far as the production is concerned) it seems rather being narrow and unmindful of a variety of situations in which production takes place.

It is indeed true that we should not expect highly sophisticated treatment of the subject matter in this book. The author himself states that the book under review is primarily meant for lower level courses in the colleges of education and for business geography, courses in polytechniques and technical colleges, but I am afraid that even at that level this book will hardly satisfy the curiosity of some of the bright students. It is, however, a good attempt and must be appreciated.

GHAZI SULTAN ALI KHAN

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