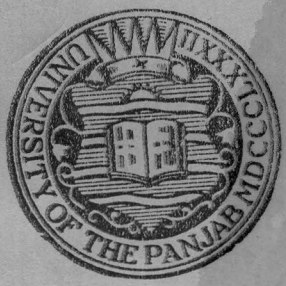
PAKISTAN GEOGRAPHICAL REVIEW



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Agricultural Development
OF
West Pakistan

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Agriculture has been the main occupation of the people in West Pakistan since times immemorial. Excavations in Mohenjodaro which date back to 3000 B.C. bear evidence of cultivation. Even today it is not only the chief means of livlihood but is the foundation of Pakistan's economy. It provides food for her growing population and is the source of raw materials for her industries. The two most important industries, cotton textile in West-Pakistan and jute in East Pakistan are based on the local produce of the soil. About 95% of our export are the products of arable and pastoral farming and to it cotton, the principal cash crop of West Pakistan, contributes about 40%. The agrarian character of the economy is further emphasised by the fact that it is the principal source of national wealth and accounts for 60-61% of the national income in the four years from 1949-53. Trade, next in importance, accounts for 10% only.

Agriculture provides employment to the largest number of people. According to the Census of 1951, 68.7% of the population consists of dependents. Of the remaining 31.3%, 20.1% are employed in agriculture. This constitutes 63.3% or a little less than two-thirds of the working population. These percentages will be further improved if we add the number of persons who are partly dependent upon Agriculture. This is reflected in the distribution of population between the towns and villages. In Pakistan 90% of the population is rural but in West Pakistan alone the rural population is 81.8%. Although their general economic level is low, the people are hard-working and strong.

Out of the total area of 198,806000 acres in West Pakistan only about 27,506,000 acres are sown which is only 13.8% of the total area. In addition there are 10,625,000 acres of fallow land. This brings the total cultivated area to 38,131,000 acres or 20% of the total.

With such a small proportion of land under cultivation in a province of about 33.8 million people mainly depending upon agriculture the pressure of population on land is very high. There is only .7 acre of cultivated land per capita in West Pakistan. According to the standards in U.S.A. the minimum area required to be cropped for an emergency restricted diet is 1.2 acres and for adequate diet 1.8 to 2.3 acres per head of population. The pressure is increasing with the growth of the population. To promote the general prosperity of the country and improve the standard of living the production is to be increased not only by extension of land under cultivation and increase of yield per acre but also by increasing the out-put per capita of the agricultural worker.

Inspite of the great importance which agriculture occupies in our economy, the methods of cultivation that are generally in vogue, are primitive. There is deficiency of manuring. Irrigation is available for only 58% of the cultivated land. The yields are therefore low. There is lack of organisation and indifferent use of land. Holdings are small and scattered and they are getting smaller and smaller and more and more uneconomic by perpetual division resulting from laws of inheritance. The land has lost much of its fertility on account of long use. There is heavy indebtedness and widespread ignorance and lack of general and agricultural education. Crops unsuitable for the land or the season are cultivated and proper rotation not followed. There is only a limited use of best seeds except where they are available at cheap subsidised rates. Subsidiary occupations are practically absent. Water-supply over about 40% of the area is inadequate. Means of communication between the villages and market towns are not well-developed and there is little attention for proper marketing of the produce. There are very few persons in the rural areas who can provide necessary guidance. After the partition many lands have deteriorated for want of proper settlement of refugees. Many of the refugee farmers coming from dry barani lands have settled in irrigated lands and *vice versa*. Lack of expenience of cultivation in new lands is bound to affect the yields. In general Land is not being put to its optimum use.

Predominantly agrarian in economy it was but natural that the development of agriculture should receive the primary consideration. When Pakistan came into existence larger-scale industry was more or less non-existent and consumers' goods were in great shortage. On account of exchange difficulties in imports the government directed its resources to the development of industry. Agriculture did not get proper attention. The

result was shortage in food-supply even in a region known as the granary of the sub-continent. It was a mistaken policy to develop industry without paying corresponding attention to agriculture. The development of the two should have gone hand in hand together. The mistake was soon realised and agricultural projects were given high priority in the development programmes, which aimed both at increasing the area under cultivation and the yield of crops.

A number of steps were taken by the government to promote agriculture. On the recommendation of All Pakistan Food and Agricultural Conference, held in October, 1947, a food and Agricultural Committee was set up. It was replaced by Food and Agricultural Council in 1951 to deal with various aspects of agricultural development. In 1952-53 crops fell short of requirements by 12.5 lakh tons on account of continued drought in the autmn of 1952, locust infestation and low level of water in rivers and canals. The deficit was also partly due to the diversion of some of the area under food to cash crops. For example the area under cotton went up from 3,375,000 acres in 1951-52 to 74,67,000 acres in 1952-53, more than double the acreage of the previous year. An agricultural Enquiry Committee was set up under the chairmanship of Lord Boyd to examine the whole question of agricultural production to avoid a recurrence of such a situation. The Committee analysed the various causes of low standards in agricultural production and made numerous rocommendations to improve it. On its advice a central "Grow More Food Emergency Committee" was set up. When the emergency was over in 1954, it was converted into Agricultural Development Committee to consider the development of Agriculture. Cotton and Jute being the two chief cash crops of Pakistan and principal earners of foreign exchange, to promote their cultivation Pakistan Central Cotton Committee was set up in January 1949 and Pakistan Central Jute Committee in August 1950. The Central Cotton Committee has set up a number of research stations and sub-stations in West Pakistan and has established an institute of Cotton Research and Technology at Karachi.

Six-Year development plan

When the six-year development Plan of Pakistan, which forms part of the Colombo Plan was formulated in 1950, out of the total estimated expenditure of 2600 million rupees, 820 million rupees were provided for the development of agriculture to be spent mainly on irrigation, land-settlement, anti-waterlogging measures, introduction of improved varieties of seeds, subsidisation of fertilisers and manures and mechanisation of farming in certain areas. As a result of this it is expected that the total production of food crops will increase from 20 million tons to 26.9 million tons during the

period of the plan or an increase of 31%. Out of this 4.9 million tons will be due to extension of the area under cultivation and the remaining 2 million tons on account of increased yield obtained from the area already under cultivation. As regards the cash crops (including cotton, Jute and tobacco) their production of 1.23 million tons will be increased to 1.6 million tons, an increase of 14%. Of this .12 million tons will be due to increased acreage and .06 million tons to increase in yield from the present area.

One hunderd and fifty nine agricultural schemes estimated to cost 1382. 8 million rupees have so far been sanctioned which are expected to increase the area under cultivation by 10.88 million acres and production of Cereals by 1.04 lakh tons, besides considerable increase in the production of pulses, oilseeds and sugarcane etc. Out of these forty three schemes have already been completed resulting in an increase in the production of cereals by 155,000 tons.

Grow More Food Scheme

Besides the schemes mentioned under the plan, the central Government also sanctioned 51 schemes for West Pakistan under "Grow More Food Programme at an estimated cost of 20.25 million rupees. On the completion of these, food production is expected to be increased by 146,000 tons. Twelve of these schemes have so far been completed in West Pakistan, increasing food production by 14,000 tons.

Irrigation And Land Settlement

The provincial governments have launched a number of irrigation schemes which are largely financed from loans obtained from the Central government. They are estimated to cost 165,57 lakh rupees in West Pakistan. They cover an area of 10,819,000 acres with an estimated increase of more than 22000 tons of food grains. The more important of these projects include :—

Project	*Esimated cost (lakh rupees)*	*Area to be covered ooo, acres*	*Foodgrain yield ooo, tons,*
Thal	1545	1167	343
Taunsa Barrage	1014	710	197
Mangla Dam	7300	3000	——
Merala Ravi Link	852	260	21
Kurram Garhi Weir	268	270	50
Ghulam Mohammad Barrage	2400	2750	825
Guddu Barrage	2830	2294	666

Of these the Thal deserves special mention as a desert reclamation Project and a remarkable example of integrated regional development, under an independent statutory body, T.D.A. This body is vested with powers to level land and make it fit for cultivation, build houses for the colonists and generally develop the Thal area to an extent of 2 million out of 5 million acres of land.

Waterlogging and salinity.—Reclamation of water logged and salt encrusted lands are two of the chief problems of the canal irrigated areas through out the valley. The water-table in a large sector of the area covered by our irrigation system has risen to levels disasterous to agriculture because our canals, being unlined and gravity fed, allow continuous seepage of water to the sub-soil making it water-logged. In some parts extensive surface evaporation of this water raised by capillary action leaves a layer of salt behind. The two menaces have been putting out of cultivation about 50,000 acres, specially in the districts of Sheikhupura, Gujranwala, Lyallpur Montgomery, Gujrat Shahpur, Khairpur Mirs and Sukkur. It has been estimated that about 500,000 acres are waterlogged and about 2 million acres have been suffering from salinity. Water-table has to be lowered in these areas by pumping out water. It is proposed to reclaim these areas by the construction of tube-wells and operating them with the help of electricity, generated under various hydel projects. The canal reclamation schemes launched by the former Punjab Government with F.A's cooperation are, it is understood, already accounting for the recovery of 40,000 acres per annum. Anti-waterlogging measures when completed are expected ultimately to yield over one lakh tons of grain.

A survey was undertaken by F.A.O. sometime back to study the water-logged areas and suggest remedial measures.

Soil Erosion.—Much vaster than the menace of waterlogging and salinity is that of soil-erosion which has already rendered unfit 8 million acres of agricultural land in the Punjab region alone and several million more in the N.W. uplands. Large areas dissected from gully erosion can be seen as one travels by road from Jhelum to Campbellpur. These can be reclaimed only through mechanical means.

It has been pointed out by Lord Boyd Orr that in the districts of Attock, Rawalpindi, Jhelum, Gujrat, Sialkot (sub-montane Himalayan region), Shahpur and Mianwali there is an area of 14.7 million acres requiring reclamation. 7.26 million of the above area is cultivated but 41% of it

requires attention. There are 1.17 million acres under forest, 60% of which requires flood control work. Total uncultivated area is 6.2 million acres of which 60% is reclaimable. A capital expenditure of Rs. 85 crores would be required for reclaiming this land. It is estimated that the reconditioned land will yield 6 maunds per acre extra wheat and this and the new land reclaimed would produce 3.2 million tons of wheat per annum which, valued at Rs. 6 per maund will be worth 56 crores of rupees. There are other areas also requiring attention in the Dera Ismail Khan, Bahawalpur and Kalat divisions.

Soil conservation and relcamation.—By the improper use of land and unscientific methods of farming, soil in many areas has either suffered loss in fertility or even rendered unfit for cultivation. For the conservation of soil from deterioration and erosion and reclamation of such lands a Central Soil Conservation Organisation was set up in April 1951, with head quarters at Quetta. It is estimated that 30 lakh acres can be reconditioned, 40 lakh acres reclaimed and another 30 lakh made to grow bush and forest.

The soil conservation Organisation has been conducting soil and land classification survey. It has also cooperated with the Photographic Survey Corporation of Canada in a reconnaissance soil and land classification survey of the Indus Valley. Experiments are also in progress for the stabilization of sand-dunes, development of affore-station technique in arid areas and utilization of surplus Karez water for pasture development and afforestation.

Soil fertility.—Many of our soils are deficient in organic matter and manuring is necessary to increase the yield. At present greater proportion of the cattle dung continues to be used as village fuel. In other countries this want is met by the return of farm yard manure to the land or by the use of compost made from crop residues and similar organic materials. In China all latrines are taken on lease by manufacturers of manure. Even in villages arrangements are made for the the collection of urine because of its greater manurial value.

Compost-making and green-manuring are being developed in many areas. The cultivation of green manure crops is making headway specially in irrigated areas under concessions. Conservation of farm yard manure, preparation of compost and production of green manure should receive high priority. The farmers should be properly educated about their use and importance.

Until about 3 years ago the use of chemical fertilizers was almost negligible, not more than three thousand tons in West Pakistan. As a quick

and affective means of over-coming the low yield of crops the government decided in 1952 to popularise the use of commercial fetilizers. Since then the Central government has imported over 1,74,000 tons of fertilizers mainly through F.A.O. They consisted of ammonium sulphate. It has been found that one maund of fertilizers increases the average yield of wheat by about 2 to 3 maunds per acre and that of paddy by 3 to 4 maunds. The distribution of fertilizers was preceded by an intensive propaganda. The fertilizers were sold at a heavy subsidiary (2/3 in the 1st and ½ in the next year). The response has been quite encouraging. This has helped in making the cultivators fertilizer-minded, ready to make use of the fertilizers to be produced at Daud Khel when our own factory there comes into production sometimes this year. This factory is to produce annually 50,000 tons of ammonium sulphate. Another factory with like capacity is to be installed by P.I.D.C.

It is hoped that the use of commercial fertilizers will occupy a normal place in our agriculture as more and more fertilizer factories are established. There is no dearth of raw material for the purpose. Gypsum is available in unlimited quantities.

Plant protection.—Our climate encourages a large variety of pests and diseases and on account of lack of proper protection our crops suffer far heavier losses than those occurring in progressive countries like U.S.A. The world's losses of food-grains from pest and diseases have been estimated by F.A.O. to be 33 million tons in a year which is nearly 5.5% of the total produced. For Pakistan it is estimated that about 10% of food grains are lost to us before we reap the crops and another 5% are lost in storage. This country thus loses through pests and diseases about 1.8 million tons of food grains, valued at approximately 52 crores of rupees.

Locust is the greatest enemy of our standing crops, its potential breeding ground extends from Rajasthan desert of India, across West Pakistan, Iran Afghanistan, Arabia, and the middle east, to Africa. Locust is a far greater meanace to West Pakistan than to any other country in the belt as it lies on the route of migrating swarms both from the east and the west. The government of Pakistan called an international anti-locust conference of experts at Karachi in October 1949 and an international fund was established for anti-locust measures. In early 1951 West Pakistan was severely affected by it. A locust control committee was consequently established in June the same year. It has taken necessary steps for the effective control of extensive breeding including aerial dusting and spraying. It is now estimated that present locust cycle has outlived its normal life which is a testimony of the measures adopted.

The control of general crop pests and diseases unlike locust, is the direct responsibility of the provinces. The department of plant Protection has, however, been assisting the units in initiating and organising large-scale compaign against important pests and diseases.

Owing to appreciable rise in the price of grains during recent years there is a great desire among farmers for the protection of their grains from wastage from pests during storage. For this purpose large scale demonstrations have been organised for the use of fumigants and more suitable cement concrete bins for grain storage. But whatever has been done so far touches only a fringe of the problem. Not only plants but also seeds yield extra ($\frac{1}{2}$ to 2 maunds of grain per acre,) while the cost of treatment works out only two annas per acre.

Improvement of seeds.—The yield and production to a very great extent depends upon the quality of seeds. The quantity of various kinds of improved seeds available fall much short of the total requirements. Great work in the improvement of seeds has been done in Russia, U K., U.S.A. Netherlands and other agriculturally advanced countries. Benefit of their experience should be obtained, seed-producing and demonstration farms should be established throughout the country and proper arrangement should be made for the distribution of seeds. It should be supplied at cheap subsidised rates till the farmers come to realise their importance.

It is estimated that by improving the seeds the production of our food can be raised by 10%. The area cultivated with improved seeds has been steadily increasing. Exact figures are however not available for all the crops.

Agricultural implements.—Our agricultural implements are mostly still primitive. A comparison of our plough in general use with the models seen at Taxila and other old museums shows that there has been very little progress in it.

Machanisation of agriculture will be a long process. Our ploughs and bullocks will be the chief means of cultivation for a long time to come. It is therefore, necessary to concentrate on their improvement. This will bring the largest benefit to the greatest numbers. Demonstration parties should be arranged to impress the utility of improved implements upon our conservative peasants. In some farms it has been observed that by using better agricultural implements the yield of crops can be increased by 5%. The conservation and development of the cattle which work these implements is equally important.

Conservation of water and dry farming.—In most of the area of West Pakistan rainfall is deficient, variable, irregular and uncertain and concentrated in a small period. After the rains the regulation of run-off and provision of surface drainage is very important for the conservation of water and soil. The need for the conservation of water is at once apparent from the short period, July to September during which most of the rainfall from the S.W. monsoon is received in the Indus plain. It is a great advantage to make the best use of rainfall for it practically costs nothing. Bunding of fields is practised in the sub-montane tracts. Much can be done by regulating the drainage lines by providing embankments and spillways. Increased absorption of water in the fields by controlling the run-off would lead to better crops, raise the spring level and maintain the wells in action. Rapid cultivation and sowing of land after the rains would secure a better crop. Very little has been done so far in educating the farmers in this aspect of agronomy.

Cooperation.— Cooperation has greatly advanced agricultural development specially in the old province of Punjab. It has been an important factor in raising the productivity of the land and the standard of living of the rural masses. In 1950 there were 16605 cooperative societies in West Pakistan with a working capital of 31.06 crores.

Cooperative farming was introduced after the partition both on government and private land and it has now made a considerable progress. About 203 cooperative farming societies had been formed in old Punjab covering an area of 20,000 acres. The number of cooperative farming societies has been steadily increasing. In the Thal area many societies have been established which have taken up mechanical farming. The greatest need of cooperative farming societies is in the old densely settled districts where the holdings are small and fragmented.

Schemes for the sinking of 1000 tube-wells through cooperative effort are well in hand and 56 tube-well societies have been registered.

Agricultural credit societies have been the backbone of agricultural finance. Most of the cooperative societies belong to this category. Their significance has considerably increased since the migration of Hindu and Sikh money lenders to India and the virtual elimination of the money-lending class from the rural areas of West Pakistan. But so far credit facilities are available to about 12% of the rural population. The rest have to depend upon other sources. Agricultural Development Finance Cooperation was established in 1952 with a view to provide long-term credit facilities to individual agriculturists and corporate bodies for agricultural purposes. A

number of Cooperative marketing Societies were established during and after the 2nd World War to provide facilities to agriculturists for marketing their produce. In addition to these there has been a great development of multipurpose cooperative societies including ginning and pressing factories, consolidation of holding societies, irrigation societies, Welfare Societies which are all contributing to the progress of agriculture.

Mechanisation.—Hitherto the use of power machinery in agriculture has been confined to individual larger estates and in a few cases the government experimental stations whose area was sufficiently large to justify its use. Recently there has been a greater use of them in the new area which are being opened like Thal. In 1947 there were about 500 tractors in West Pakistan. Their number increased to 3886 till October 1953. and is now estimated to be more than 4500.

Agriculturally more progressive countries have taken to mechanisation not merely to increase the yield per acre but mainly also to increase the yield per capita of agricultural workers and to release the draft animals for human consumption. Labour was getting more and more expensive while mechanised implements and mineral oil were easily available to meet the growing demand of the land.

In West Pakistan, however, the conditions are different. While the advantage accruing from mechanisation cannot be denied there is justification for going slow. Most of our holdings in the old settled districts are small and the farmers poor. Even if these holdings are consolidated mechanisation will create unemployment in those districts as it would displace two of three labourers. Mechanisation, however, could run parallel with industrialisation which could absorb the displaced persons.

Introduction of machanisation in new canal areas like those of Thal and lower and upper Sind Barrage would however provide employment and expedite the reclamation to about half the time required in the case of bullocks. Lack of mineral oil is another limiting factor in our case and points to the need of confining mechanisation for the present to certain specific areas-culturable wastes and eroded and weed-infested lands.

Extension of cultivation.—There are about 23 million acres of culturable land in West Pakistan which is at present lying waste. This represents 12.1% of the total area. It extends from Karachi north-eastwards for about 600 miles. Here the average rainfall is round about 6". Most of these lands could be easily sown after the rains if it could be quickly done mecha-

nically. Apart from the deficiency of water our plough is too small or the power obtained from our bullocks is much too insufficient to cultivate the land properly. We have, therefore, to adopt means like tractors and bull-dozers to reclaim them.

In several parts of West Pakistan, as in Thal and Makhi Dhand, with the help of heavy tractors and earth-moving equipment waste-lands are being reclaimed for normal cultivation The governments of the old provinces of Sind and Baluchistan were maintaining fleets of tractors which were hired out to cultivators on reasonable charges.

Irrigation facilities are also being extended to these culturable wastes and it is hoped that by 1960 another 10 million acres will be brought under cultivation. Even without irrigation and with the average rainfall of only 5" many of these desert tracts carry useful bushes and grasses like Wan, Karil and Jand. It is possible that a plant like akra which produces a useful fiber or some other suitable imported desert plant may be grown on large areas now lying vacant.

Crop Yields.—Besides the extension of the cultivated area production can be increased by increasing the yields of our crops through irrigation and better methods of farming. Agricultural production in our country is very low. Comparing our yields with those of other countries with somewhat similar crop conditions we find that the yield of wheat, the principal food crop of West Pakistan, has averaged 9.6 maunds per acre during the quinquennium 1947-51. Over the same period the wheat yield in Egypt was 20.1 maunds, in Japan 18.4 maunds and in Italy 15.6 maunds per acre. Turkey with practically no irrigation but with winter rainfall had a yield of 10.3 maunds per acre. It is only in Bharat that the yield of 6.8 maunds falls below that of Pakistan. In U.S A. the yield per acre is 12.3 mds. With cotton, the cash crop of West Pakistan, the position is slightly better. Pakistan produced 6.6 maunds of seed cotton per acre against 3.5 maunds of Bharat, 5.3 maunds of Brazil and 6.3 maunds of China. But Turkey with 50% of its cotton grown on irrigated land produced 8.9 maunds, and U.S.A. with a small amount of irrigation 10.2 maunds per acre. In Egypt the yield is 17.4 maunds of seed cotton per acre or a little less than three times that of Pakistan. A comparison of the average yield of other crops shows even more disappointing results. Unless production per manpower is increased, any substantial improvement in the living standard of our population is not possible. In U.S.A. where 354.7 million acres are under cultivation only 5% of the population is employed in agriculture. In Australia where 58 million acres are under cultivation only 15% are employed as such.

Increase in Acreage and yields Since 1947-48.—As a result of various measures adopted by the government since independence both acreage and yield of crops in West Pakistan has shown appreciable increase between 1947-48 and 1953-54.

Table I *a* ACREAGE AND YIELD OF PRINCIPAL CROPS (WEST PAKISTAN)

	1947-48		1953-54	
FOOD GRAINS	Acreage 000 acres	Yield 000 tons	Acreage 000 acres	Yield 000 tons
Rice ...	1955	649	2518.2	896.9
Bajra ...	1997	296	2582.0	453.3
Jowar ...	1047	203	1489.9	274.2
Maize ...	899	353	1059.6	435.3
Wheat ...	9770	3301	10522.3	3654.9
Gram ...	2174	477	2564.0	591.4
Barley ...	415	111	525.1	138.7
Total ...	18257	5379	21261.1	6444.7
COMMERCIAL CROPS				
Sesamum ...	64	7	67.1	6.3
Rope Mustard ...	1058	172	1141.5	173.1
Sugarcane ...	466	560	698.8	866.2
Tobacco ...	36	23	61.4	40.9
Cotton ...	3055	195	2872.8	248.7
Total ...	3479	957	4841.6	1335.2

Table I *b* CHANGE IN THE ACREAGE AND PRODUCTION OF PRINCIPAL CROPS (WEST PAKISTAN)

	Increase or Decrease		Increase or Decrease	
	acres (000)	percentage	Production (000 tons)	percentage
Rice ...	+563	+28.8	+247.9	+38.2
Bajra ...	+585	+29.3	+157.3	+53.2
Jowar ...	+442.9	+42.3	+ 71.2	+35.08
Maize ...	+160.6	+17.87	+ 82.3	+23.3
Wheat ...	+752.3	+77.00	+353.9	+10.7
Gram ...	+391.0	+18.00	+125.4	+26.9
Barley ...	+110	+26.52	+ 27.7	+24.88
Total ...	3004	16.48	+1065	19.8

COMMERCIAL CROPS				
Sesamum ...	+ 3.1	+ 4.85	(−) 0.7	(−) 10
Rape and Mustard	+ 83.5	+ 7.9	+ 1.1	0.64
Sugarcane ...	+232.8	+49.9	+306.2	+54.6
Tobacce ...	+ 25.4	+70.6	+17.9	+77.8
Cotton ...	+182.2	+ 5.961	+53.0	+27.2
Total ...	162	3.48	378.2	854
Grand Total ...	3166	13.8	1443.2	38 6

It is evident from the table above that the total area under principal crops rose from 22,936,000 acres in 1947-48 to 26,102,700 acres in 1953-54 or by 13.8% since partition. The largest increase in acreage is in the food grains, by 3,004,000 acres or 16.48%.

Though in normal years the production of food-grains may be adequate to meet our requirements even with a small surplus, these figures are no index to our real requirements. As the general standard of living is very low a large section of the population is living on or below the margin of sustenance. There are many persons who live just on one meal a day. The cheapening of food-grains at the time of the harvest is marked by an increase in their consumption. It shows that more grains would be needed for the same population if the prices go down or the purchasing power of the poorer classes is increased. The position is, however, much better than at the time of partition. Assuming the normal rate of increase, 1¼% per year, the population would have increased by 7½% between 1947-48 and 1953-54. But the increase of acreage is more than double the increase of population.

The position is still better when calculated on the basis of production which has increased by 19.8%.

The development is remarkable in the case of commercial crops. Their acreage has increased from 3479,000 in 1947-48 to 4,841,600 acres in 1953-54 or by 3.48% but the production has increased by 38.4%. Sugarcane and tobaco record the greatest increase both in acreage and production. The acreage under sugarcane has increased by 49.9% and production by 54.6% which implies the use of better methods of farming. Tobacco has shown the largest percentage incrcase in acreage (70.6%) owing to the extension of cultivation of Virginia tobacco.

According to the figures in the table the acreage under cotton has fallen by 5.96% but the production has increased by 27.2% owing to great attention paid to the yield of this crop, being one of the principal earners of foreign exchange. Even as regards acreage, it fell to 2,649,000 in 1948-49 and after that it has shown a progressive increase.

An increase in the acreage of commercial crops indicates that a section of our cultivators is getting more and more business minded and is rising above subsistence farming.

Future Development.—The main object of agriculture in Pakistan so far has been to produce grain for food and fibre for clothing. At present there is no regulation of the cultivated area under different crops and this leads to a lack of balance in the output, some crops far exceeding the demand and others falling short of it. This disturbs the economic equilibrium and causes fluctuations of prices from year to year. There is need for the proper planning of the area under different crops according to the country's requirements and exports.

With the increased attempt of the industrial activity in the country there is a need for change in our agricultural planning for the future. There should be a happy balance between food and commercial crops. Production should be increased to meet the demand for food-grains of the growing population as well as for raw materials for industry. Cotton is the principal cash crop which feeds not only the growing textile industry but is also one of the principal articles of export. A target of a minimum of 2.5 million bales fixed for it for the next two or three years is to be attained without affecting the acreage under food crops. Other cash crops like sugarcane, tobacco, fruits and vegetables are to be encouraged. They contribute to the improvement of dietary conditions as well as the standard of life. Fodder crops form an important part of our economy on account of the role which cattle play in our agriculture. The Agricultural Commission have pointed out that the real solution of the cattle problem lies in the extension of fodder crops. More and more arid areas are to be put under drought resisting grasses.

Provision should be made for agricultural education on a much wider scale than at present. It should no longer be the concern of only illiterate or half-illiterate people. It is necessary that not only those persons who are directly connected with agriculture should have obtained some agricultural education but also that more and more educated persons be introduced into this profession by the grant of special facilities. Demonstration and propaganda should be organised on a very large scale. Research facilities should be

greatly extended. All this will greatly help in the change over to scientific methods of farming which should be progressively introduced.

Subsidiary industries dependent upon local agricultural products be encouraged. This will create a greater market for the produce of the soil and divert some agricultural labour to industry and thus relieve the pressure on land.

It is also necessary that the cultivator should be able to follow some other occupation to add to his income when he has leisure and is no longer required on the field. Proper roads should be made to connect the villages to market towns.

No plan for agricultural development would be complete without a change in the agrarian system. We have a large class of land—less labourers then there are tenants who have little interest in the improvement of the land they cultivate, except to drive the maximum benefit from it irrespective of the damage done to it. On the other hand there are landlords who are also indifferent to the use of land. Peasant proprietorship should be our aim with limitations on the division of holdings beyond a certain level.

As summing up in the end it may be emphasised that agriculture being the centre of our economic activity, its development should be taken as a part of one whole and that it should be properly coordinated with otner aspects of our national economy.

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BANANA CULTIVATION

IN

Munshiganj Subdivision (Dacca District)

BY

SHAMSUL HAQ KHAN.

Banana cultivation is an age old industry. It is quite impossible to say with assurance just where it originated, but Greek conqueror Alexander was impressed by tasting the banana in the Indus Valley in 377 A.D. The Arabs seem to have introduced the banana from India into Palestine and Egypt in the 7th Century A.D. It was unknown to most of the people of Western World prior to 1870*.

In East Bengal banana is cultivated in almost all the districts specially in Dacca, Mymensingh, Rangpur Rajshahi and Pebna. Dacca is the most important of all both in respect of concentration of cultivation and production of most important varieties of banana. Its cultivation at a commercial basis is done only at Munshiganj Subdivision in Dacca district, particularly at Rampal Union of Munshiganj It grows some special varieties of banana *e.g.* Amritsagar, Dudsagar and Agnisagar which are famous for their sweetness and flavour. This place has a monopoly in producing these varieties.

70 or 80 years earlier the cultivators began the cultivation of Sabri and Champa varieties at Rampal in orchards. Because these were demanded by the Hindus during the *pujas*. At that time the cultivation was not so extensively done. After the first World War in the 30's the cultivation of Amritsagar variety was taken up. But none can say where from this plant had been originated. This variety of banana was in great demand for its sweet taste and flavour. So its cutivation increased and now it occupies about 80% of the total banana acreage in Munshiganj.

*Ref. Fruit Growing in India—W.B. Hayes.

IMPORTANCE OF BANANA AND ITS PLACE AMONG THE FRIUTS OF EAST BENGAL

One reason for the great importance of banana is the amount of food produced per acre. It has been estimated that if the yields of all crops under most favourable condition are considered, banana stands first in the number of calories produced per acre. 24 bananas with milk would provide a balanced diet for an adult[1]. Banana contains reasonable amount of vitamins A, B_1 B_2 and small amount of D and E and a larger percentage of potash phosphorus, calcium and iron than the apple or orange. Since banana is highly digestabe and palatable its food value is obvious. In East Bengal it has a greater acreage than any other fruits

Comparative acreage, production and value of East Bengal's fruits.

Fruit	*acreage*		*Production*			*Value.*
Banana ...	87,130	acres.	4,35,65000	mds.	Rs.	43,56,50000
Mango ...	74,943	,,	128,90,196	,,	,,	10,31,20000
Lichi ...	2,134	,,	266,750	,,	,,	40,00000
Papaya ...	2,092	,,	349,364	,,	,,	26,20000
Pineapple ...	4,335	,,	217,750	,,	,,	121,90,000

VARIETIES OF BANANA

(1) *Amritsager.*—It is the most important variety of banana of East Bengal and it is mostly grown at Rampal of Munshiganj Subdivision Dacca. Its colour is yellow., rind is thick and it is slightly bow-shaped. It has a very good aroma and sweet taste The length of the banana varies from 6 to 8 inches and circumference from 2 to 3 inches.

(2) *Dedsagar.*—It is another important variety exclusively grown at Rampal, Munshiganj. It is called Dudsagar because it is as white as milk when ripe. It is sweet to the taste and the flavour is nice. Its average length is 6 to 8 inches and circumference 2 to $3\frac{1}{2}$ inches. There is another type of this variety which is called Agnisager because of its red colour.

These two varieties are grown extensively at Rampal and some other than as of Munshiganj. There are other varieties too. Such as—

Sabri.—It is grown more or less in all the districts of East Bengal. It is usually green to yellow with smooth rind. It is seedless and slightly acid in taste. Its length varies from 4 to 6 inches and circumference from $1\frac{1}{2}$ to 3 inches.

*Fruit Growing in India—W.B. Hayes.

Champa.—It is a smaller variety than Sabri. It has yellow skin and somewhat sour in taste—

One of the most characteristic feature of Rampal's banana is that even if it is over matured, it does not fall from the bunch and does not decompose very quickly.

AGRICULTURAL PRACTICES

The cultivation of banana in orchards on commercial basis is found only in Munshiganj Subdivision. In the other parts of the Province cultivation is mainly scattered in and around the homesteads.

Banana is cultivated on a raised platform (which is called "vita" in Bengali) so that it may not be flooded in the rainy season and water may not stand at its foot in case of incessant rain fall. The best type of soil for the cultivation of banana is clayey loam. It is also grown in Sandy-loams.

It is extremely necessary to prepare the land excellently for the cultivation of banana. At first the land must be dug with a spade twice or thrice and this should be 1 to 1½ feet deep. Then after some days the big pieces of soil are to be pulverised and then the land is levelled. At this time the cultivators mix the decomposed cowdung with the soil.

Out of the main plant four or five off-shoots grow. When these become 2 to 4 feet long they are detached from the main body. The cultivators then cut the long roots and keep it in water or in muddy soil for 3 or 4 days so that new roots may come out of the sapling. The cultivators then make holes 8 to 9 inches deep and the sapling is planted. Before planting they give some cowdung into the holes. Planting is usually done 6 to 8 feet apart in every direction giving full space for a healthy growth of the plant.

At the time of planting the cut-off side of the off-shoot are kept in one direction, to the north. One most interesting result of this is that the trees generate bunches in the opposite direction facing the south. As the bunches grow towards the south they get proper sunshine and air as a result of which banana becomes very plump and its quality becomes good.

Banana is generally planted in the month of February, and March. After planting the sapling, the bottom of the plant is kapt surrounded with water hyacinth and water is poured into it to keep it wet.

Manuring System.—After one month of the plantation when the new leaf grows, the manuring begins. It is a continuous and prodigal process. First they give one to two basketfuls of old cowdung and decomposed leaves

(green manure) at the foot of each tree. Then after 15 or 20 days in the month of April or May they apply ½ to 3/4 seers of powdered oil-cake per tree. (*i.e.* 5 to 8 mds. per acre as 400 trees are planted per acre). They mix three month's old decomposed cowdung with cow-urine and apply it at the foot of the tree after 15 or 20 days. Once again they give oil-cake as a manure in every tree if the growth is slow. In the month of July some cultivators give Ammonium sulphate 1½ to 2 chattak per plant according to the fertility of the land. Henceforth no manuring is done.

They spread 200 to 300 basketfuls *i.e.* 100 to 150 mds. 'peri' clayey loam from bhils, ponds, on the orchard of an acre.

When the 'vita' or the plot of land is wet, the cultivators, do not allow anybody to enter it for it may harm to the soft roots of the trees as a result of which the tree becomes reddish and the quality of the fruit degrades.

The plantain flower comes out of the plant in the month of August and at this time the cultivators prop the tree with a bamboo so that it may not be destroyed by storm or rainfall and the tree may not fall due to heavy load of the bunch. Banana takes two months to mature. In the month of October to November it is ready for plucking.

Once planted an orchard is kept for 3 to 4 years. One plantain tree gives birth to 5 to 6 off-shoots. When the bunches are full grown, the cultivators cut the main tree and keep only one of the off-shoorts from the clump and transplant or sell others. In the second and third year of the plantation, the process of manuring goes in the same way as in the first year. The quality of the banana depends upon good manuring and soil condition of the plot. So in the subsequent years of cultivation if the manuring is good the production is also large. After planting of banana for three years in one plot, they necessarily cultivate cauliflowers, potatoes and other vegetables. After 1 to 2 years banana is again cultivated in the same plot.

Disease.—When the banana comes out of the plantain flower, a kind of insects attack the small fruits. It is called "Jain" in the local term. It makes small black spots in the body of the banana and thus it does not look nice as such it fatches less price. There is no available medicine for this. Only when the banana comes out of the flower, the cultivators cover it with hessians or plantain leaves, the insect than can not attack the fruit.

ACREAGE AND PRODUCTION

400 plants are planted in an acre of land.

Each plant bears a bunch, each bunch originally gives off 7 to 9 hands (Fana in Bengali) but the cultivators keep only 6-7 hands for its proper growth

and each hand possesses 12 to 15 figures *i.e.* banana. So each bunch contains 70 to 100 bananas.

Like all other agricultural produces the yield of banana is governed by several factors, like fertility of soil, climatic conditions, manuring etc. Even under normal conditions yield varies from garden to garden in the same area as well as plant to plant in the same garden because of differences of soil, manuring, age, etc The weight of a bunch varies from 8 to 10 seers. The weight of the different varieties of banana varies from one another as does the number of fruits required for a maund.

The acreage of banana in Munshiganj in 1954 was 1750 acres and in 1955, 1920 acres and production 4,1,75000 and 1,92000 mds respectively.

ACREAGE, TREES AND PRODUCTION OF BANANA IN THANAS OF MUNSHIGANJ IN 1954-55

	ACREAGE		TREES		PRODUCTION	
Thanas	1954	1955	1954	1955	1954	1955.
1. Munshi-ganj.	1200	1300	480000	520000	120000 mds.	130000mds.
2. Tungibari.	400	500	160000	200000	4000 ,,	50000 ,,
3. Serajdikha.	100	100	40000	40000	10000 ,,	10000 ,,
4. Lohajang.	25	8	100	32	2500 ,,	800 ,,
5. Sreenagar.	25	12	100	48	2500 ,,	1200 ,,
Total	1750	1920	680200	760080	175000 ,,	192000

Average number of plants per acre is 400 and average yield per acre is 100 mds.

5% of the total land of Munshiganj is under the cultivation of banana. Out of this 1/4 of the land belongs to Rampal Union. Though the floods of 1954 and 1955 have damaged about 80% of the plants yet cultivation in Munshiganj and Tungibari is increasing day by day.

Cost of Production.—The cultivation of banana is a very long process requiring much labour, continuous manuring and keen observation. Generally the cultivators themselves do all the work. Only at the time of tilling and planting, they higher labourers the cost of which is Rs. 1/8/- to Rs. 2/- per man per day. Five persons can dig an acre of land with spade in 4 days. In all from tilling the land to plucking a cultivator spends Rs. 1/8/- to Rs. 2/8 per plant. So the total cost of production for an acre of land is Rs. 600/- to Rs. 1000/-.

MARKETING

Bananas are sold in three ways. Growers sell their standing crops to the pre-harvest contractors or sell their fruits either in the village to the Beparies or the wholesalers who visit the producing areas during the seasons or in the nearly market on the hat days. Growers do not necessarily despatch the fruits directly to the consuming markets.

There exist no systematic grading of this fruit. A sort of classification is done by the producer and dealers by eye-estimation according to their individual way. In a garden all the bunches are not of the same size and quality. Accordingly the price also varies a bunch consisting of 70 to 100 bananas costs Rs. 4 to Rs. 6/- and the price of 100 bunches is Rs. 400 to 600. So in an acre of land there are 400 trees *i.e.* 400 bunches, the total price of which varies from 1200 to 1800. So the cultivators get a net profit of Rs. 600 to 1000 yearly under normal conditions.

There are no publications, official or non-officiate about the prices of fruits in East Bengal. The growers are generally ignorant of the prices of consuming markets. The only sources of getting information about the demand aud prices in the market are local "aratdars" who are in touch with the consuming markets or agents from the consuming markets. So authentic news of the prices are not available and they vary from season to season and place to place.

Comsumption.—About 70—80% is comsumed by the growers excluding Rampal thana and the remaining 20 to 30% are sold in the local markets or hats. At Rampal the retention by the growers has been estimated to be only 8 to 10%. Before partition 4 to 6 thousand maunds of bananas were exported to Calcutta and the neighbouring areas. 80% of those bananas were supplied from Munshiganj Subdivision. There is no export of bananas since 1949.

East Bengal has a suitable climate and soil for the production of banana.

Cultivation of banana on a scientific line, *i.e.* methodical spacing, based on soil, climate conditions as well as proper scientific research have given a much better qualitative and quantitative yield in other countries and no doubt similar results in the area could be expected. Although banana occupies a most important place among the fruits of East Bengal, no step has yet been taken for its improvement. Agricultural department is paying some attention for carrying out research in order to improve the production and marketing of the fruits specially banana.

Its large scale production will also be encouraged with the expension of of the market within the province and the creation of one without the province. In this respect transport facilities, modern canning and packing industry have yet a great part to play.

Countering Desiccation
IN
West Pakistan

BY

KHANZADA MUBASHIR LALL KHAN

" With every throb of climate the centres of civilizations have moved this way or that. Each throb sent pain and decay to those whose day was done, life, and vigor to those whose day was yet to be". Said Ellesworth Huttington, Yales' world famous enthusiastic climatologist.

The relation of climate and man with all its consequent reactions is not a recent proposition in the catalogue of human experience. Of all the elements of environment, climate is the most potent and powerful. It is an influence that none can escape on land or sea, plain or mountain savagery or civilization, man must meet the climate virtually on its own terms. These terms are some times kind and megnanimous and sometimes harsh and rigorous. The sorry spectacle of the dust-laiden cities of Susa and Kasrjamdet, the forgotton glories of Babylon and Ninevah and the grim groaning graves of Pyramids spread over the wilderness of limitless sands, speak much of the treachery of climate. The same sad story is repeated by the long-buried cities of Harappa and Mohenjodaro, the two well known centres of Indus Valley Civilization. The abundant evidence furnished by the following facts implies less exacting climatic conditions in the past than at present.

1. In a geological age very close to ours, West Pakistan including the areas which are now deserts were criss-crossed by a hydrographical net work. Its rivers had a considerable flow of water compared with what they have to-day. All of them except the Indus and its main tributaries Sutlej, Ravi, Chenab and Jhelum have become non-perennial due to constant drying up of land.

2. The existence of innumerable hot and sulpher springs in the hills of Baluchistan and Sind indicate the unexpected cases of lush tropical vegetation, in the past.

3. The semi-nomadism is the most marked feature throughout Baluchistan under the present day climatic conditions but such a seasonal migration can hardly be attached with the formation of 'Tell' and therefore it is an impressive testament of permanent settlement. In the pre-historic past what ever population did exist it must have been able to live a prosperous life through successful agriculture in the same valleys which to-day support only sparse and nomadic population under very poor conditions.

4. The traces of impressive irrigation works such as the massive dams and terraces, locally known as "Gabarbands" designed to check the force of devastating floods rolling down the valleys and directing the flood water into the fields, reflect not only milder climatic conditions but also large population, needed to provide the necessary labour for their construction. Such dams are to be found near the Lakorian pass and in the Mashkai valley in Baluchistan.

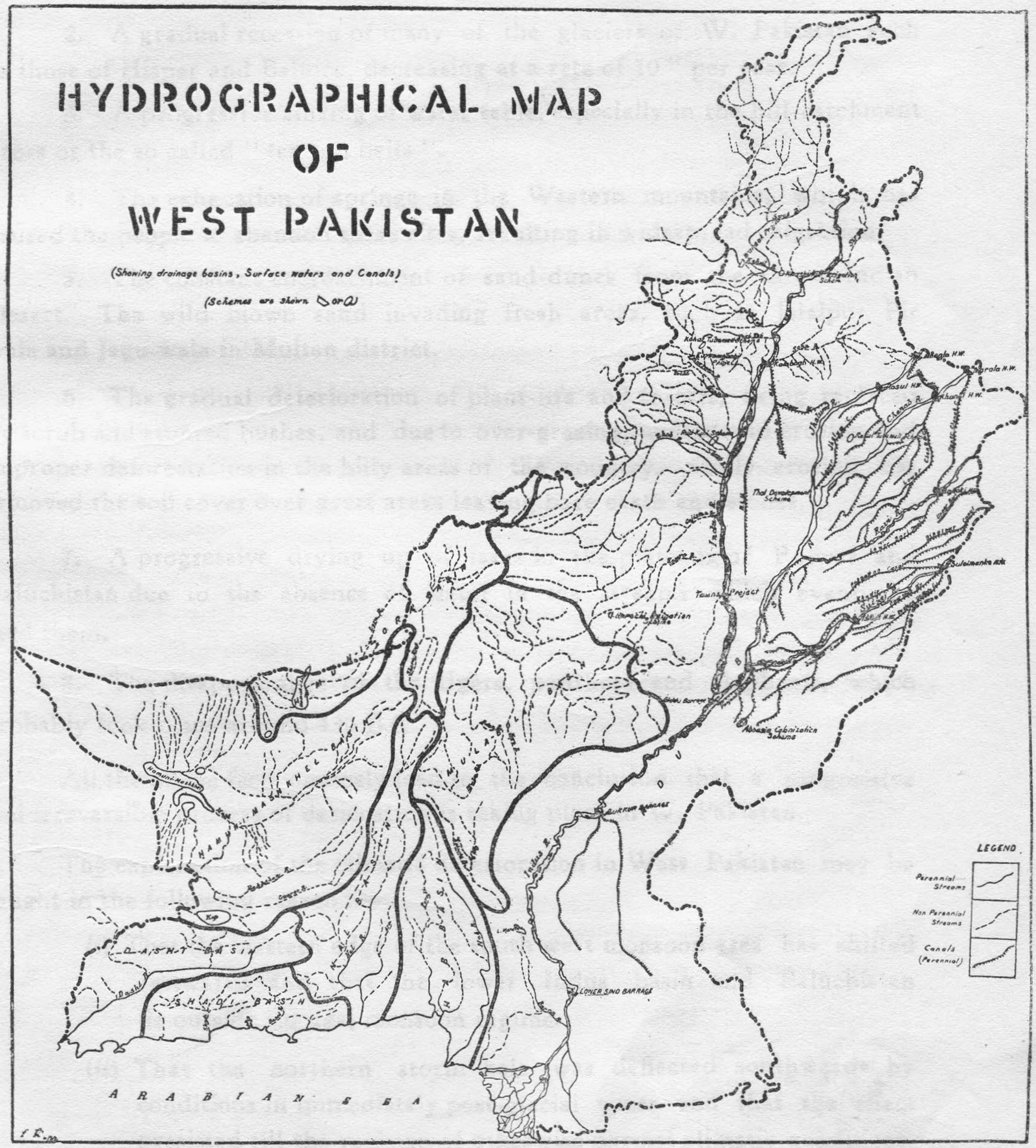
5. The fact that Kiln-burnt bricks were used so lavishly in the Harappa culture, shows that an almost unlimited quantity of fuel must have been made available for the operation of kilns and that would naturally account for greater rainfall around the 3rd millenium B.C.

6. The very use of baked bricks as building material instead of the sun dried bricks common to contemporary civilizations implies a preference given to a material much more durable under conditions of considerable rainfall.

7. The existence of elaborate net wotk of drains in Harappa and Mohenjodaro may also be accounted for a greater volume of water.

8. According to E.J.H. Mackey, culverts were specially constructed to carry away storm water and between 2750 and 2300 B.C. the site of Mohenjodaro was abandoned because of serious flooding from the east. The traces of a protective embankment on the west of the city, also indicate heavy floods rolling down the valleys of Kirthar Range.

9. Fortunately Harappa art displays a variety of paintings concerning largely with the animal-forms of rhinoceros and the tiger, the water-buffalo and the elephant, none of which survives at present in this region. From these we can easily imagine that the climatic conditions must have been very mild so as to favour a suitable habitat for the above animals.


HYDROGRAPHICAL MAP
OF
WEST PAKISTAN
(Showing drainage basins, Surface waters and Canals)
(Schemes are shown)
LEGEND
Perennial Streams
Non Perennial Streams
Canals (Perennial)
Thal Development Scheme
Taunsa Project
Abbasia Colonization Scheme
Sukkur Barrage
Lower Sind Barrage
Indus R.
Jhelum R.
Chenab R.
Ravi R.
Sutlej R.
Kaj
ARABIAN SEA

10. The works of Diodorus who was one of the Chroniclers of Alexander the Great, and accompanied him during his invasion on India; reveal that in 4th century B.C. the climatic conditions were milder than now and the same holds good even upto the time of the coming of the Moghuls.

And that the aridity is intensifying over the country is shown by the following facts :—

1. A remarkable decrease of rainfall since the pre-historic times.

2. A gradual recession of many of the glaciers of W. Pakistan such as those of Hisper and Baltoro, decreasing at a rate of 10 " per year.

3. A progressive sinking of water table, especially in the hill-catchment areas or the so called " tension belts ".

4. The exhaustion of springs in the Western mountains, which has caused the people to abandon these sites, resulting in widespread migration.

5. The constant encroachment of sand-dunes from the Great Indian Desert. The wild blown sand invading fresh areas, such as Jalalpur Pir wala and Jagu wala in Multan district.

6. The gradual deterioration of plant-life and forests, being replaced by scrub and stunted bushes, and due to over-grazing, widespread erosion and improper deforestation in the hilly areas of the country. Gully erosion has removed the soil cover over great areas leaving bare earth and stones.

7. A progressive drying up of lakes in the plateaux of Potwar and Baluchistan due to the absence of water in the streams which eventually feed them.

8. The disappearance of the tigers, panthers and elephants, which probably took place around 430 B.C.

All the above facts obviusly lead to the conclusion that a progressive and irreversible process of desiccation is taking place in W. Pakistan.

The explanation of the climatic deterioration in West Pakistan may be sought in the following reason :—

(i) That the wastern edge of the south west monsoon area has shifted eastwards and that the lower Indus basin and Baluchistan lie outside the real monsoon regime.

(ii) That the northern storm belt was deflected southwards by conditions in immediately post-glacial times and that the effect presisted till the revision of otherwise normal climatic conditions.

(*iii*) That since the first rainfall maximum in the sub-continent falls about 2750 to 2500 B.C. which comes in the middle of the long dry period in Europe and N. Asia, it would mean that the variation of rainfall is related to changes in the zonal circulation of the atmosphere. And so, he monsoonal rainfall is heaviest when the general circulation is weakest.

(*iv*) If we bear in mind the fact that the last Apsis-node coincidence occurred in 1433 A.D. with the end of the second cycle of 5550 years. The next is due to take place about 3280 A.D. (1850 years cycle). This means that we are at present in the beginning of the third cycle of 5550 years, which will end in 6680 A D.

At the same time we know that the last maximum regression of ice-cap took place around 530 B.C., the next which continues at present would therefore culminate in 2380 A.D. (1850 years cycle). It naturally means that the next 434 years (1956-2380) shall witness a general increase of temperatures, advancement of deserts and worldwide intensification of aridity.

Pakistan is primarily an agrarian country and will remain so for many years to come. Except China and India no other country in the world has so many people engaged in agriculture as Pakistan. About 80% of the total population of the country subsists on agriculture as the only means of livelihood. Yet, in spite of it the present day agriculture is backward and unscientific so that the Pakistani farmer is among the poorest in the world.

The pressure on land is increasing tremendously and the only way to reduce this tension is to bring under cultivation vast areas of waste lands in the country. To achieve this purpose large irrigation schemes are being executed. Two of them Thal and Kotri shall alone command about 4.8 million which are almost completed.

A brief survey of all such schemes, included in the " Six Year Development programme of Pakistan is given below to show the gigantic activities launched by the Govt. with the object of countering desiccation in the country.

Thal Development scheme.

The idea of developing the Thal tract is as old as 1870 but the implementation was postponed from time to time in favour of more urgent schemes. In 1939 work was actually commenced on the project but was suspended in 1942 on account of the difficulties created by war-time conditions. Due to heavy influx of refugees from Bharat in 1947 the pressure on land

increased tremendously. It thus became essential to parcel out a part of population from the more congested districts to the sparsely populated areas of Thal and to settle the refugees on a permanent basis.

The project was assigned to Thal Develoment Authority which came into being in 1949. The project consists of one main canal called the Main Line Upper taking off from river Indus near Kala Bagh. This is a lined channel with a capaciey of 6000 cusecs capable of being increased to 100, 00 cusecs if necessary This canal trifurcates near Kararwala into three channels with capacities of 4524, 1463 and 615 cusecs respectively.

The irrigation facilities have been made available for approximately half a million acres and are being extended rapidly. The total area covered by the Thal irrigation project is nearly 2,000,000 acres of which 1½ million is commanded. Leaving aside part of this area to be developed on local enterprise, the statutory authority proposes to deal with nine million acres, acquiring about 6,00,000 acres of land, constructing 1000 new villages and 38000 houses. This work will be completed in 1957. The Thal development authority has also to provide suitable forests which have been planted at Jauharabad, at Kilurkot and various other places.

Karachi Irrigation scheme.

Under this scheme it is proposed to construct a weir and an unlined channel to connect it with an old channel for perennial irrigation for a part of the district of Loralai in Quetta division. It will bring 32,00 acrea under plough and so increase the output of foodgrains by thousand tons per annum approximately. The project will cost about 211,00 rupees.

Taunsa Multipurpose Project.

Though the idea of constructing a barrage across the Indus in this area goes back to 1936 but due to more urgent schemes the work was not started until a detailed project was sanctioned in 1952 after the inception of Pakistan. The dam will be constructed about twelve miles down-stream of the confluence of Sanghar torrent with the Indus and will command the whole area irrigated by inundation canals at present. It will bring also an additional areas of about 700,000 acres under cultivation. Besides this the N.W.R. is preparing to connect Kashmore and Quetta with Taunsa and thus provide a short cut between Lahore and Quetta.

The barrage will provide controlled supply to the canals thus ensuring regular level and control the flooding of areas in these districts. It is also

proposed to have a hydro-electric plant from the canal off taking on the left side. The installed capacity of this power house will be one lakh k.w.

The whole project shall cost crores of rupees. The work is in full swing these days and it is hoped that dam will be completed by the end of 1957. The weir will cost about Rs. 10,000,000.

Lower Sind Barrage.

Formerly Lower Sind areas were irrigated by a number of inundational canals which entirely depended on the level in the river which is always uncertain. The supplies had become more precarious owing to the divertion of a large part of the Sutlej water into canals by Bharat which mainly fed indus below Panjnad. In order to ensure adequate supplies to the areas already under irrigation and to expand cultivation further, a barrage has been constructed across the Indus at Kotri with the name of Lower Sind Barrage consisting of 44 spans of 60 feet each carrying a 28 feet road bridge. The project has been completed in 1955 with a cost of about 200 million. The canals associated with this scheme will irrigate about 3 million acres of land. It is expected that it will increase the present production of food grains in the area (171,498 mds.) to 1,335,224 mds. thus making about 556, 473 mds. available for exports.

Bhambanwala Ravi Bedian link.

The project aims at the construction of a canal for augmenting the supply of Sutlej Valley project. The project is under construction and will be completed by the end of 1957, with an estimated cost of about Rs. 60 million.

Khaski Lift Irrigation Scheme.

The scheme aims at irrigating an area of about 12,000 acres between Risalpur and Khaski by life irrigation from the Kabul river. The scheme was completed in 1953 with an expenditure of about Rs. 1 million.

RodKohi Scheme.

The purpose of the project is to irrigate the submontane and riverine tracts of Dera Ismael Khan by constructing a number of spill wares on the hill torrents for the storage of water. The work was completed in 1953 with a cost of about Rs. 600,000.

Kurram garhi Project.

The project aims at constructing a pucca ware across the Kurram river at Kurramgarhi. The scheme shall improve the irrigation of 133,000 acres

of land and will also bring an additional acreage of 120,000 under cultivation. The additional land thus made available for cultivation will be used for the settlement of Waziri tribes.

Abbasia Colonisation Scheme.

The scheme aims at irrigating about 260,000 acres of land in the Bahawalpur division by opening up of about 112,00 acres on the Abbasia Canal and its dist ibutaries and covering an area of about 150,000 acres on the main abbasia Canal. The project has been completed in 1955 with a total cost of about 18 million.

Warsak Multipurpose Project

The Warsak Dam Project on Kabul river in the Peshawar Division when completed will generate 150,000 k.w. of electric energy and will also irrigate 93,000 acres of land in the tribal areas.

Schemes of modifying Canals in the Lower Indus Basin

There are about 2004 miles of inundation canals in Lower Indus Basin. All of them depend on the water level of Indus river which is unfortunately going down day by day, and with the completion of irrigation schemes now under construction in Bharat, it is bound to go further down considerabley. The scheme calls for a considerable modification of the inundation canals in the Lower Indus Basin to ensure an adequate flow of water in canals. In addition to this about 320 million c.ft. of earth will be moved for the construction of bunds etc. The scheme is nearing completion after a total average cost of about Rs. 21,000,000.

Construction of Tube-wells in Kohat District.

It has been found by trial borings that in plains of Kohat Toi and Teri Toi the water table exists at depths varying from 30 t 60 ft. The scheme aims at installing 50 tube-wells to irrigate 20,000 acres of land with an estimated cost of Rs. 1 million. The electricity, to run the machinery has been made available from the Malakand hydroelectric station. It is expected that the scheme which is nearing completion will increase the production of grains by about 7,000 tons per annum.

Construction of Tube-wells in the Pishin District.

The scheme aims at constructing a power plant in Pishin town to supply energy for irrigational and industrial purposes. The available energy will replace the camel-driven persian wheels with a most scientific type of well irrigation. The total installed capacity of the plant is 1,000 k.w.

As soon as the above schemes are completed, about 10 million acres of waste lands will be brought under cultivation, which shall prove a great asset to the economy of West Pakistan.

A large surplus of food grains will be available for export. The climatic handicaps will be subdued and the uninviting regions of ever shifting sand-dunes, will blossom like roses. Nation looks forward to a great era of economic stability and an alround prosperity. It is better to inspire hope and conviction. Time is the hero of the plot. Time shall itself perform the miracles.

Refugee Population and Prospects of its Resettlement

IN

Urban and Suburban Areas of Karachi.

BY

MISS RIFFAT SULTANA HASAN M.A.,

Introduction.

The Migration of population is an age-old phenomenon. Time and again, human beings have left their homelands in search of food, shelter and better prospects and also due to political disturbances. But never before in history has the world witnessed a mass-migration of terror-striken people on such a large scale as that which took place in 1947 between India and Pakistan after Partition. It involved millions of people in both countries and has created a number of economic and administrative problems.

According to the Census Report of 1951, Pakistan has a little more than 7 million refugees from Bharat. Out of these, West Pakistan has 6.5 million, of which 9.4% are in Karachi.

The following table shows that no other part of the country has such a large number of refugees living in such a limited space, as is the case with Karachi.

TABLE NO. I

MUHAJIR POPULATION AND ITS PERCENTAGE TO TOTAL POPULATION.

Provinces and States	Total population (1000) s	Muhajir population (1000) s	% of Muhajirs to the total population.
Baluchistan and Baluchistan States Union. ...	11,54	28	2.4
East Bengal ..	4,19,32	699	1.7
Federal Capital Area Karachi. ...	11,22	617	55.0
N.W.F.P. ...	32,22	51	1.6
Punjab and Bahawalpur State. ...	2,06,36	52,81	25.6
Sind and Khairpur State. ...	49,25	5,50	11,2

(From Census Report 1951, Vol. I p.31)

Excluding the Punjab and Bhawalpur State, Karachi alone has nearly the same number of refugees as the N.W.F.P, Baluchistan and States Union, Sind and Khairpur State, combined, and approximately the same number as the whole of East Pakistan. Another fact which emerges is that Karachi has the highest percentage of Muhajirs to the total population in comparison with other regions of West Pakistan. More than half of the city's population consists of refugees and Karachi today is faced with a special refugee problem, which after the lapse of eight years still looms large on the horizon. To have a full understanding of the problem, we must look for the reasons which have made Karachi the biggest nucleus of the refugee population in pakistan, and in order to assess the changes brought about by the refugee immigration in social, economic and demographic patterns, an analysis of the geographical factors, which have in general controlled the city's growth, is essential.

Geographical Control. Geographical factors and human response in any habitation generally show a close relation-ship, and Karachi also reflects this. The city has risen from a small fishing village in the space of nearly two and a half centuries to the status of the federal capital of Pakistan. Its geographic location, and a semi-natural harbour are the basic factors that have made this possible. Gentle relief of the land, and a tolerable climate are other contributing factors. But nature has imposed certain limitations also. Its meagre and unstable rainfall, the general nature of the rocks, mostly limestone of marine origin, have generally resulted in a low water table and saline water, thus restricting the sources of water supply to the alluvial beds of the Lyari and Malir rivers[1]. These sources are not sufficient, even the water supply from the Indus falls short of the city's growing needs. This is a very significant disadvantage for the further growth of the city. Moreover, the low lying areas along the sea-coast are subject to flooding and create difficulties in the way of drainage.

Pre-Partition Conditions.—Karachi's past history shows a continuous increase in the population, but in spite of the constant growth, Karachi had only 3½ lakhs of people, and a Hindu majority. Partition has radically altered the communal pattern, and the Hindus (excluding the Scheduled castes) now form only 4% of the total population. In pre-Partition days, low-lying parts near the harbour were over-crowded, while the Cantonment and areas lying beyond the Lyari River had a scanty population. The following table gives the population figures for Karachi for 1941, by Municipal quarters:—

*Maneck B. Pithawalla "Geography and Geology of Karachi and its Neighbourhood" Part II, P.8.

TABEE No. II.

POPULATION AND DENSITY ACCORDING TO CENSUS OF 1941 BY CITY QUARTERS.

Name of Quarter		Persons	Persons per acre.
Old Town	...	11,794	393
Lea	...	1,431	23
Napier	...	12,025	301
Market	...	8,416	255
Bunder	...	5,371	215
Ghulam Hussain Kasim	...	14,838	256
Queen's Road	...	238	2
Railway	...	847	7
Serai	...	16,256	100
Rambagh	...	14,858	78
Wadhumal Udharam	...	13,788	152
Runchore	...	37,172	177
Ramswami	...	11,134	278
Harchandrai Vishnidas	...	2,917	38
Soldier Bazar	...	2,755	172
Preedy	...	6,264	88
Saddar Bazar	...	13,305	151
Civil Lines	...	5,103	25
New Jail	...	1,201	3
Frere Town and Bath Island	...	2,466	16
Clifton	...	753	6
Ghizri	...	1,390	49
Garden West	...	3,522	10
Garden East	...	7,729	10
Tahilram	...	5,784	193
Lawrence	...	17,259	164
Lyari	...	81,768	62
Jamshed	...	10,306	24
Artillery Maidan	...	11,699	55
Trans-Lyarl	...	8,397	2
Karachi Cantonement	...	5,854	1

(From Census of India 1941, Vo;. XII, by H.T. Lambrick p. 93)

According to this table, the Lyari quarters contained the highest number of persons and accounted for 22% of the toal population of the city, while the density per acre was highest in the old town quarters. The outer quarters of the city like the Trans-Lyari, Jamshed, New Jail, Garden East, Garden West, Clifton all had a low density, compared to the heart of the city. The lowest density was registered in the Trans-Lyari, and Karachi Civil Cantonment areas with 2 and I person per acre respectively. This indicates that in the outer quarters of the city, much land was lying vacant, and the scope for further development was considerable. Suburban centres like Drigh Road, Malir, Landhi, Mauripur etc. were also thinly populated and under-developed.

Post-Partition Conditions.—The Partition of the Indian sub-continent was immediately followed by communal disturbances. The Punjab, where the riots began was the first province to receive immigrants. Later on, the disturbances shifted to Delhi, the U.P., Bihar and Hyderabad State, mostly in urban centres. Refugees coming from three urban areas took shelter in various cities, Karachi being the federal capital naturally attracted a large number of them.

In the beginning, refugees came to Karachi from East Punjab and Delhi, but with the outbreak of fresh riots in India in February, 1950, a further influx of refugees, mostly from Rajasthan started coming into Pakistan *via* Khokhropar. They came in waves and since February, 1950, more than 5 lakhs have entered Pakistan through this route, According to the booklet, "Pakistan 1953-54" about 70% of the new refugees coming into West Pakistan *via* Khokhropar on the Sind-Jodhpur border gravitate to the capi al. Another route taken by the immigrants was *via* Bombay and most of the people living in Bombay and the adjoining regions came to Karachi by this route.

The largest number of Muhajirs have come to Karachi from the North-Western regions of Bharat, *i.e.* Delhi, Rajasthan, East Punjab, and P.E.P.S.U. as is shown in map No. I and in the following table :—

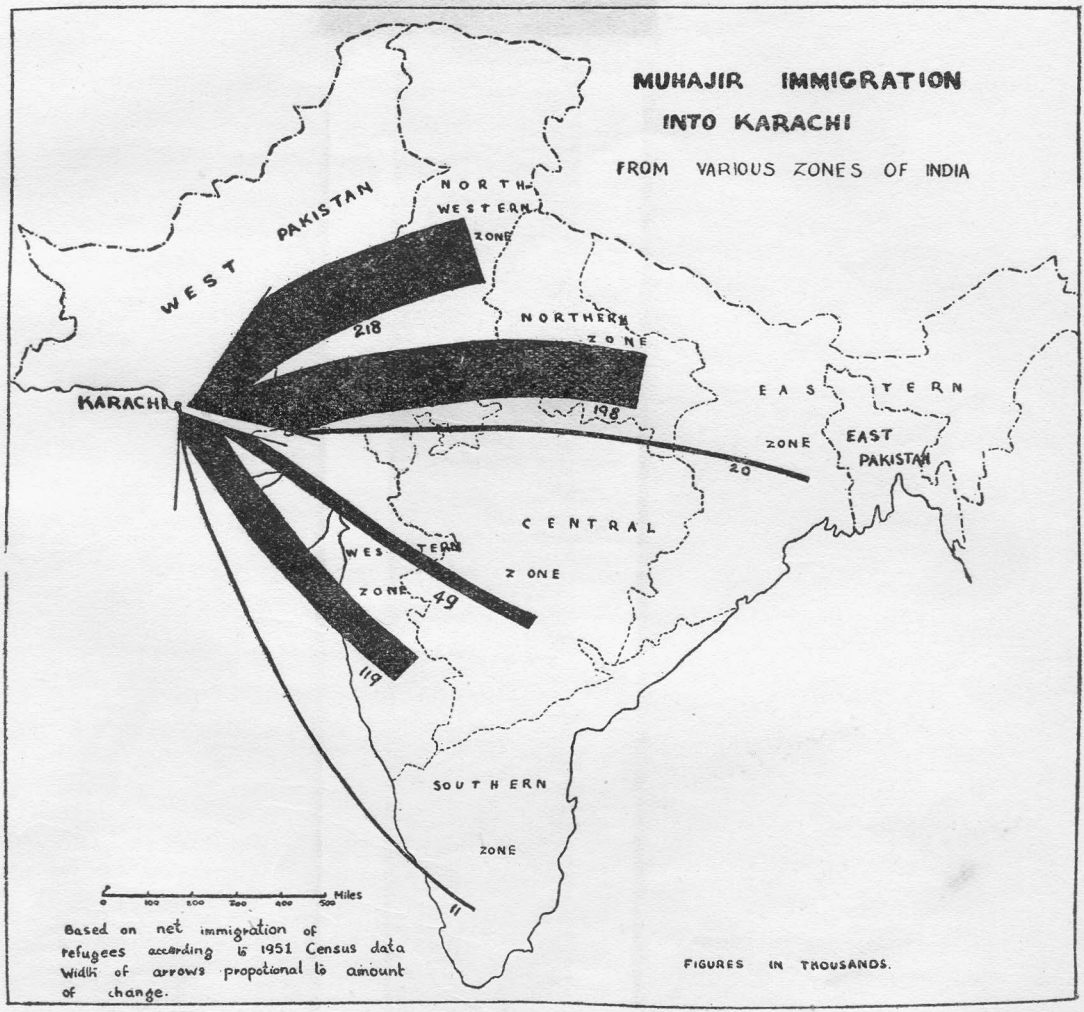

MUHAJIR IMMIGRATION
INTO KARACHI
FROM VARIOUS ZONES OF INDIA
WEST PAKISTAN
NORTH WESTERN ZONE
NORTHERN ZONE
EASTERN ZONE
EAST PAKISTAN
CENTRAL ZONE
WESTERN ZONE
SOUTHERN ZONE
KARACHI
218
198
20
49
119
11
0 100 200 300 400 500 Miles
Based on net immigration of refugees according to 1951 Census data Width of arrows propotional to amount of change.
FIGURES IN THOUSANDS.

TABLE NO. III—MUHAJIRS—THEIR ORIGINAL HOME (THOUSANDS)

Province and State	Total Muhajirs	Chief zones of previous residence in India.				
		North West	Central	North	West	East
Pakistan	72,26.6	5785.1	95.2	464,2	160.4	701.3
Baluchistan and States Union	28.0	16.5	3.0	6.3	1.3	0.3
East Bengal	699.1	2.0	2.7	20.8	1.9	670.7
Karachi	616.9	217.6	49.6	179.6	119.2	19.9
N.W.F.P. and Frontier Regions	51.1	31.4	1.7	17.1	0.4	0.5
Punjab and Bahawalpur State	5281.2	5146.7	17.2	105.5	5.4	5 6
Sind and Khairpur	550.3	370.9	21.0	116.9	32.1	4.3

(From Census Report 1951 Vol, 1 p.31)

The reasons are not far to seek. Most of the rioting took place in these regions. Moreover, nearly all the refugees (excluding those from East Punjab and PEPSU) entered Pakistan by the Khokhropar route, on which Karachi has been the major attraction.

The next largest number of the refugees in Karachi (nearly 2 lakhs) have come from the North zone, *i.e.* from Utter Pradesh. 42.5% of the total number of Muhajirs, coming from this region to Pakistan are in Karachi.

From the Western Zone, *i.e.* from the Bombay Province and Surashtra, some 1 lakh refugees have come to Karachi, forming 74.3% of the total number of the refugee immigrants into Pakistan from these regions. Most of them are businessmen and industrialists. They have not only replaced the Hindu businessmen in the purely commercial field, but have proved themselves to be a valuable asset by taking on active part in industrializing the city. It is difficult to think that any place other than Karachi could have been more suitable for the rehabilitation of this class of refugees.

A comparatively insignificant number of refugees have come from the Central Zone *i.e.*, Madhya Bharat, Madhya Pradesh and Hyderabad State,

while very few came from the Eastern Zone *i.e.*, Bihar Orissa and West Bengal.

The causes of this concentration of the refugee population in Karachi are to be found primarily in its geographic location. The land, sea and air routes, taken by the refugees, with the exception of the Amritsar route, all focussed on Karachi. Moreover being the federal capital and a flourshing trade centre, it could provide, better opportunities for employment. Another reason may be that due to contrasts of living habits and customs between West Pakistan regions and their original homes, Karachi seemed to them to be the most appropriate place for residence because of its cosmopoliton nature. With the refugee influx from all parts of Bharat, Karachi has become an amalgam of various immigrant groups.

PROSPECTS OF RESETTLEMENT

(*a*) *Urban Area.*—The Census Report of 1951 shows that Karach's population has increased by leaps and bounds within a decade. In 1941, the city had only 3½ lakhs of people while in 1951, its population rose to 11 lakhs. 55% of the total population consisted of refugees. The refugee population has considerably increased since 1951, as the influx has continued unchecked from the Jodhpur side. The total refugee population is now estimated at 9 lakhs, while in 1951, it was 6 lakhs. The increase has further aggravated the already difficult problem of resettlement.

The mass movement of refugees was so chaotic and disorderly that the administration found it difficut to cope with it. Moreover, the majority of the refugees arrived at Karachi in an utterly destitute condition, creating economic and social problems of an unprecedented character. Apart from those, who were resettled on evacuee property, left by some 2½ lakh non-muslim emigrants, the refugees encamped wherever empty space was available by the roadside, on the pavements, in less frequented side-streets and lanes and in the vicinity of all kinds of buildings. Many are still living inhuman conditions, in the already congested parts of the city. Quite a large number of them occupy low-lying tracts along the Lyari River, there are others living in mud flats near the high water line along the coast. A few have been able to build houses for themselves, wherever they could find an open space but the majority are living in 'jhuggis' (local word referring to hutments made by the refugees from bamboo and matting within a tin roof) The refugees are reluctant to live at a distance from their place of work. As a result, the already over crowded quarters of the city have become more densely populated, badly affected health sanitation, drainage system and water

supply. Nearly all the city quarters showed an abnormal, increase in population according to the census of 1951, the Lyari quarter registered an increase of 175% and had the largest number of refugees. Nearly all the outer quarters of the city increased as much as five-fold in population, because much open space was available here for buliding purposes, the Trans-Lyari quarter, Jamshed, Garden West, Garden East, all increased by more than 500%. Here Government have set up many refugee colonies like Aurangabad, Nazimabad, Lalukhet, etc and allotted land to those refugees who can afford to build for themselve.

The following table shows the variation of population in the decennium 1941-1951 in the city quarters, and the Muhajir proportion therein :—

TABLE No. IV

Total Population, Variation between 1941-1951,[1] and Muhajir population according to the Wards[2] and Quarters.

Name of Ward or quarter.	Total population		Variation		No. of Muhajirs.	percentage of the total population of Ward or quarter.
	1941	1951	Net increase	percentage increase		
1. Ghulam Hussain Kasim and Bunder quarters.	20,209	28,989	8,780	43.44	13,919	48
2. Old Town and Napier Qrs.	23,819	42,326	18,507	77.69	17,911	42.3
3. Lyari and Lea Qrs.	83,199	228,932	145,733	175.13	90,247	39.4
4. Runchor Lines	37,172	69,320	32,152	86.49	29,743	42.9
5. Lawrence and Tahil Ram Qrts.	23,043	41,695	18,652	80,95	16,433	39.4
6. Ramswami and Har-Chandrai Qrts.	14,051	42,187	28,136	200.24	28,207	66.8
7. Preedy and Saddar Qrts.	19,569	34,988	15,419	78.28	18,410	52.6

1. According to the Ministry of Refugees and Rehabilitation.

1. 1951 Census figures were adjusted according to the New K.M.C. wards formed after the Census operation.

TABLE No. IV—*Contd.*

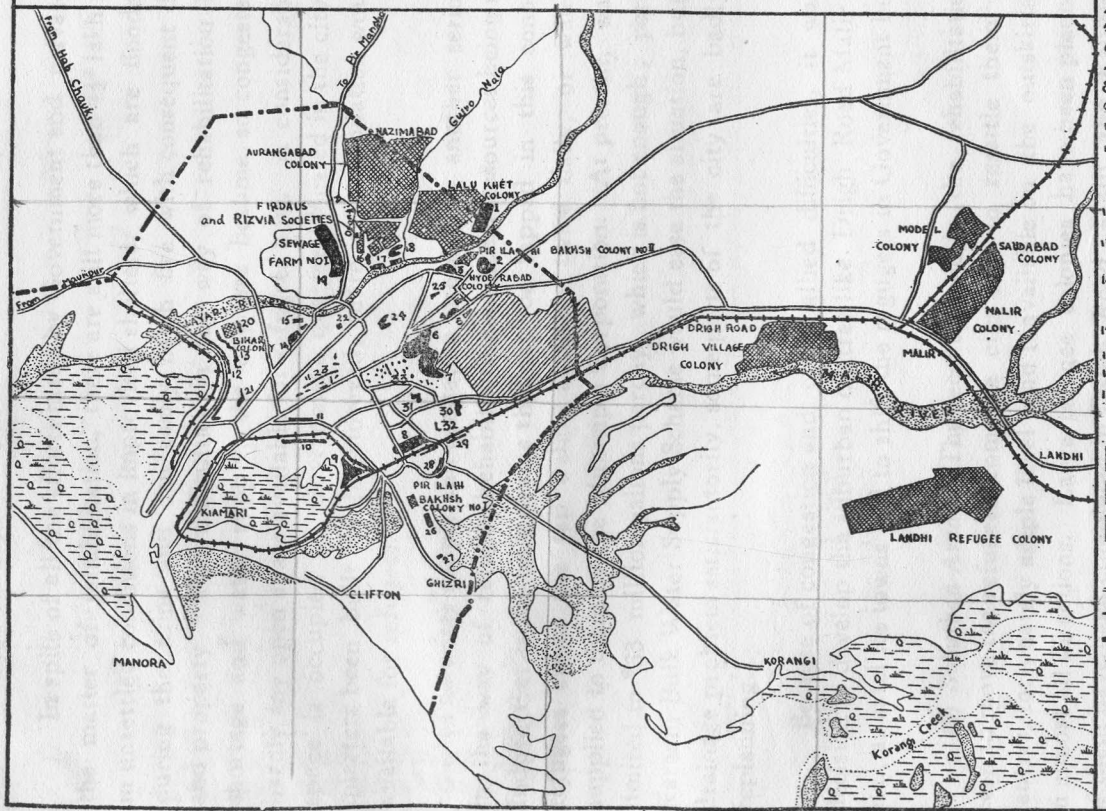
Total Population, Variation between 1948-1951,[1] and Muhajir population according to the Wards[2] and Quarters.

	Name of Ward or quarter.	Total population 1941	1951	Variation Net increase	Variation percent increase	No. of Muhajirs.	percent of the total population of Ward or quarter.
8.	Rambagh	14,858	32,128	17,270	116.23	27,080	84.3
9.	Artillery Maidan	11,699	33,368	21,699	185.47	25,740	77.1
10.	Wadhumal Udharam and Market Qrts.	22,204	35,843	13,639	61.42	29,344	81.8
11.	Serai	16,256	28,854	12,598	77.49	21,877	75.8
12.	Soldier Bazar and Garden East Qrts.	10,484	41,233	30,749	293.29	26,179	63.4
13.	Garden West.	3,522	22,868	19,346	549.29	18,645	81.5
14.	Jamshed	11,507	69,181	57,674	501.20	55,820	80.7
15.	Trans-Lyari	8,397	63,162	54,765	652.19	45,441	71.9
16.	Civil Lines and Frere Town Clifton and Ghizri.	9,712	27,036	17,326	178.37	10,415	38.5
17.	Keamari and Queens (K.P.T.)	4,480	37,160	22,680	156.69	12,900	34.7
18.	Railway area and Railway Qrts.	7,388	36,501	29,213	396.76	16,764	43.1
19.	Quaidabad and Khudadad colonies	...	41,558	...	...	34,778	83.7
20.	Jacob Lines.	...	30,377	...	...	18,727	61.6
21.	Karachi Cantonment Civil.	5,854	103,657	97,803	1,670.70	85,496	82.4

(prepared from data supplied by Census Officer).

The Muhajir ratio has considerably changed since 1951, as Government have been shifting the unsettled refugees to the newly built colonies in the

SKETCH MAP OF KARACHI — SHOWING THE LOCATION OF REFUGEE COLONIES IN URBAN AND SUBURBAN AREAS



INDEX

SOME OF THE MAIN REFUGEE CLUSTERS

1. SIKANDRABAD
2. LIAQUAT BASTI
3. NAFISABAD
4. NEW HAJI CAMP
5. ISLAMABAD
6. QUAIDABAD
7. JACOB LINES
8. GOLF GROUND
9. RETI LINES
10. RAILWAY COLONY
11. REFUGEE CLUSTERS ON McLEOD ROAD AND SIDE ROADS
12. ANJAM COLONY AND NEW KULRI
13. AGRA TAJ COLONY, KHADDA AND KULRI
14. OLD HAJI CAMP AND JINNAHABAD
15. USMANABAD
16. PIRABAD
17. GOLIMAR
18. RIZVIA AND FIRDAUS COLONIES.
19. ASIF COLONY, JOHAR COLONY VILAYATABAD AND GOBOLE COLONY
20. REFUGEE CLUSTER NEAR BIHAR COLONY
21. TAHAL RAM MUSAFIR KHANA
22. GANDHI NAGAR
23. RANCHORE LINES CLUSTERS (NANAKWARA, NEAR KARACHI UNIVERSITY, URDU COLLEGE, BORA PIR, NEAR JUBLI CINEMA JOHAR STREET, etc.)
24. SOLDIER BAZAR CLUSTER
25. PATEL KA BARA
26. DELHI COLONY
27. GHIZRI COLONY
28. TRANSIT CAMP CLUSTER
29. NEAR CANTONMENT RAILWAY STATION.
30. ABYSSINIA LINES CLUSTER
31. FOWLER LINES CLUSTER
32. NEAR JINNAH HOSPITAL
33. JUTLAND LINES AND JACOB LINES CLUSTERS

RESETTLED REFUGEE COLONIES.

SOME OF THE MAIN AGGREGATIONS OF UNSETTLED REFUGEES

HOUSING SOCIETIES AREA DRIGH ROAD (here also refugees have been resettled)

MAIN ROADS

RAILWAYS

MUNICIPAL BOUNDARY

MANGROVE SWAMPS

SCALE I INCH TO TWO MILES

0 1 2 3 4 5 MILES

outer quarters, probably now the trans-Lyari quarter contains the largest number of the Muhajirs.

In spite of all the efforts made by Government and private agencies, in the matter of rehabilitation, there are still more than $4\frac{1}{2}$[3] lakh refugees living in unsettled conditions in improvised shelters, which are flooded with water during the rains and can easily catch fire with consequent damage to lives and property The difficulties in the way of rehabilitation being housing shortage and water supply, the city has become so congested that there is hardly any open space available for refugees now. A considerable amount of space is occupied by Government quarters located in the city. Had these quarters been built double-storeyed, more accommodation would have been available for refugees.

The water supply and sanitation problem is another serious hindrance in the way of refugee rehabilitation. Local resources being negligible, the Indus River is the only source that can be tapped in this connection. The refugees either use tap water, available twice daily, or water trucks are supplied to them by the Municipal Corporation. At present, water supply is limited to *33 million gallons perday, which is not enough; perhaps Greater Karachi Bulk Water Supply Scheme would ease the situation, but to solve the drainage problem satisfactorily, some parts of the city are badly in need of replanning.

Because of congestion and other allied difficulties, it was a welcome decision to develop the suburban centres like Drigh Road Malir and Landhi etc., as satellite towns and to shift the regugees in Government built colonies.

(*b*) *Suburban Areas.*—The recent trend in the rehabilitation work has been to move the refugees from the city and to resettle them in suburban centres, fortunately ample level land is available on the outskirts of Karachi in almost all directions. Large refugee colonies have been planned and some of them have been completed in Drigh Road, Malir and Landhi. Approximately one lakh refugees have been shifted to these colonies. There is however much more still to be done. The latest census of the refugees carried by the Rehabilitation Department in March 1955 shows that there are more than $4\frac{1}{2}$ lakh of shelter-less refugees still to be resettled.

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2. Wards and quaters have been grouped to compare the 1951 Census figures with thos of 1941, hence the wards do not coincide with the official K.M.C. ward list. Pakistan 1954-55 p. 208.

*Pakistan 1954-1955 p. 202.

While the decentralization and dispersal of refugees towards the satellite town is a desirable move, the economic difficulties faced by the refugees living in suburban centres should not be overlooked. Most of the refugees settled in suburban colonies work in the city. The time and expense involved in reaching the place of work is considerable. Satellite towns should have provided the refugees with residence as well as employment. There is some scope for industrial development in some of the suburban centres *e.g.* in Landhi, so that the refugees shifted there can be locally absorbed in industries and consequently an improvement can be achieved in the standard of living.

LOCATION OF VARIOUS COLONIES.

It has been noted that Government built colonies are mostly located in the suburban areas, but refugees have settled in temporary shelters wherever they could find an empty plot of land. These 'unauthorised' settlers are now being shifted to the suburban areas. Many of the colonies occupied by the unsettled refugees are located in undesirable places like the Sewage Farm No. 1 and the colonies near the Layari River. In some cases the refugees may have chosen suitable places and if they have already built their houses by their own funds, they should, if possible, be permanently settled there.

Map No. 2[1] shows the location of :—

1. Colonies where the refugees have been permanently resettled, *viz.*

		Estimated Population[2]
1. Landhi Refugee Colony	..	6000 (65,000 are to be resettled in all)
2. Drigh village colony	...	45,000
3. Malir Colony	...	31,500
4. Nazimabad	...	30,000
5. Aurangabad	...	20,000
6. Lalukhet	...	1,00,000
7. Pir Elahi Bakhsh Colony No. II	...	20,00
8. Firdus and Rizvia Societies.	...	3,500
9. Hyderabad Colony	...	3,000
10. Model Colony	...	1,500

II. Some of the main aggregations of unsettled refugees. Most of these colonies have more than 1,000 families *vis.*

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1. I am indebted to the Deputy Rehabilitation Commission Karachi (No. I) and the Karachi Improvement Trust for this map.

2. Data Supplied by the Ministry of Refugees and Rehabilitation and Karachi Improvement Trust.

		No. of Families[3]
Sikandrabad	...	1,601
Liaquat Basti	...	1,033
New Haji Camp	...	1,726
Islamabad	...	2,398
Quaidabad and Lacob Line	...	9,576 and 5788
Golf Ground	...	1,299
Reti Line	...	2,921
Railway Colony.	...	1,025
Old Haji Camp	...	3,910
Pirabad	...	1,326
Golimar	...	2,971

III. Drigh Road Housing Societies area, which are not purely refugee colonies. A large number of upper class refugees have however resettled there.

SOME SUGGESTIONS

1. Some of the urban and suburban refugee colonies have been built up, within the green belt of the Layari and the Malir River valleys, *e.g.* Aurangabad, Nazimabad, Drigh village and Malir colonies. Keeping in view the facts that there are very few cultivable areas within the city itself and on its fringes and that other wastelands are available for resettlement purposes, settling up of refugee colonies on cultivable land should have been avoided. This is a misuse* of land in the Federal Capital and measures should be taken to check it.

2. Most of the refugee immigrants are artisans and craftsmen. While the setting up of artisan colonies is undoubtedly hopeful, they could have been rehabilitated with more benefit in such centres as Khairpur, Shikarpur, and Hala, where local industries already exist on a small scale and there is scope for their further expansion and absorption of refugee workmen.

3. Karachi received urban as well as non-urban refugees. Most of these have turned to urban activities and they may not like to abandon them, but there may be many who are at present forced by circumstances to take up some other vocation and who would welcome a return to their previous

3. Data supplied by the Deputy Rehabilitation Commissioner Karachi (No. 1)

* 'Use and Misuse of Land in Karachi' Reprinted from the YGUNG ENGINEER 1953 by Dr. M.B. Pithawalla.

occupation *i.e.* tilling the land. These can be resettled in the Kotri Barrage area, and those familiar with the dry farming can be given land in the interior of Sind.

CONCLUSION

What is needed is proper planning and a comprehensive social and economic uplift scheme. Stress should be laid upon the economic rehabilitation of refugees and not merely on providing them with housing facilities, so that the refugees could stand on their feet once again, and become an integral part of the city's social and economic life.

Land use Survey of Sanda Kalan and Sanda Khurd

By

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About two miles up the Sanda road from the District Courts Lahore, are located the twin settlements of Sanda Kalan and Sanda Khurd. The villages lie in the flood plain of the river Ravi which is at a distance of a few furlongs from these villages. The area is included in the Khadir assessment circle of Lahore tehsil and covers about 1204 acres of land or a little less than two square miles. It provides a specimen study of the economy of land-use in the suburbs of a large urban centre.

The physiography of the area is quite simple. Generally the area comprises of level plain with extremely gradual slope to the south west. It is built of the alluvial deposits brought by the river Ravi. River Ravi is quite a mature river with braided channels all along its course in the plain area. It brings huge amounts of silts and loams of which the entire plain area of the doab is built. This silty loam and silt spread by the river Ravi is entirely free from Kankar. The depth of the alluvial deposits is immense. The constructional work of the river has been going on for ages and the natural fertility of the soil has been retained in this area as the renewal of the soil by natural floodings of the river is a frequent occurrence. The presence of the river has a very healthy effect on the quality of the underground water. In the Manja Khara tract of the doab between the River Ravi and Sutlej in many places the underground water is brine and untill the construction of the upper Bari Doab much of the area suffered from general aridity. The only patches of land where the underground water has been used for irrigation or for drinking at all times are those which lie near the rivers or near the Kasur and Patti Nala. The canal irrigation has however effected the quality of water in all parts of the doab.

In the two Sandas all the land is very fertile with plenty of sweet underground water as the water table is near the surface. Its height varies

form 5 to 20 ft. below the surface. During winters when the river registers minimum discharges the water-table in the wells goes down from 12 to 15 ft. below the surface. During the hot dry season in May or June it further goes down to 20 ft. while in the monsoon period the water is only at an arms depth the water-table varying from 5 to 7 ft. below the surface. The changes in the water table used to effect a great deal the quantity of water available from the wells but now the variation in the water table has very little bearing on the quantity obtained as most of the wells are fitted with electric pumps which lift plenty of water from the deeper strata within a short time. On the other hand the problem of high water table has taken a serious form in many parts of the village lands which suffer from too much of moisture.

CLASSIFICATION OF THE AREA

The classification of the land is according to the one adopted during the first settlement in 1916-17, but the area under each class has been varying from time to time in accordance with the changes in the soil, fertility and the mode of irrigation. According to the first settlement reports of 1916-17 the total area of the villages was 1183 acres, 21 acres less than it is now. This addition had been due to the new land attached to Sanda Kalan The table I shows the cultivated land of these villages as classified under four major heads, Chahi, Abi. Sailabi and Barani. At the time of the first settlement chahi lands comprised 42% of the total cultivated area of the villages which amounted to 731 acres or 28% of the total area. Chahi land is the well irrigated land or land regularly watered by Jhallars. It occupied 33% of the cultivated area in Sanda Kalan and 88% of the cultivated land in Sanda Khurd. Abi land irrigated by the Gandi Nali formed 32% of the total area of the villages being 40% in Sanda Kalan and none in Sanda Khurd. Sailabi land amounted to 165 acres which formed 23% of the total cultivated area, 23% in Sanda Kalan and 10% in Sanda Khurd. The Sailabi land is regularly flooded by the river Ravi and it includes land which contains plenty of moisture for the crops to grow at all seasons without the aid of irrigation. Barani land or the rainfed area in the villages only formed 3% of the total area covering an area of 20 acres. *See* table I.

The extent of the cultivated land under various types has changed a great deal. Chahi land, irrigated by wells has been reduced to 12.5% of

TABLE I.

CLASIFICATION OF LAND SANDA KALAN AND SANDA KHURD.

	Total area in acres.	Uncultivated Land			Cultivated Land.								
		Not available for cultivation	Banjar	Total Uncultivated	Chahi	Chahi Abi	Abi	Sailabi	Chahi Sailabi	Abi Sailabi	Barani	Chahi Abi Sailabi	Total cultivated
SANDA KALAN													
1st Settlement 1915—17 ...	1035	235	191	426	207	...	238	148	...	...	16	...	609
Average 1945—50 ..	1055	364	25	389	70	38	478	93	25	...	...	...	666
Average 1950—55 ...	...	362	40	402	99	44	187	195	6	114	4	4	653
SANDA KHURD													
1st Settlement 1916—17 ...	148	5	21	26	101	...	...	17	...	...	4	...	122
Average 1945—50 ...	149	...	17	17	...	...	12	118	2	..	...	...	132
Average 1950—55 ...	149	14	1	15	...	5	38	51	3	37	...	...	134
SANDA KALAN AND KHURD													
1st Settlement 1916—17 ...	—1183	240	212	452	308	...	238	165	...	...	20	...	731
Average 1945—50 ...	—1204	364	42	406	75	38	490	211	27	...	...	...	798
Average 1950—55 ...	1204	376	41	417	99	49	225	246	9	251	4	4	787

the total cultivated area, from an acreage of 308 to 99 only. Since 1916-17 there has been 100% decrease in the chahi land in Sanda Khurd and 72% decrease of the same in Sanda Kalan. Abi land, which is classed as the land irrigated by the city drainage amounted to 238 acres in 1916-17 all of it was in Sanda Kalan. It more than doubled itself by 1945-50 from 238 acres to 490 acres. Some of the chahi land had been brought under irrigation from the Mozang Nala and many wells went out of use. Now Abi land occupies an area of 225 acres only, which forms 28.5% of the total cultivated area, amounting to 29% in Sanda Khurd and 28% in Sanda Kalan, This decrease in the Abi land during the last five years has been in favour of Abi-Sailabi and Sailabi land. Sailabi land which formed 23% of the total cultivated area at the time of the first settlement now forms 30% of the total cultivated area and this increase has been well marked in Sanda Kalan, where Sailabi land has increased from 148 to 195 acres, where as in Sanda Khurd it has increased from 17 to 51 acres almost three time the previous acreage. Abi-Sailabi land did not exist in either of these villages prior to 1950. The last five years averages from 1950-55 show a considerable area of 251 acres under this head, 114 acres in Sanda Kalan and 37 acres in Sanda Khurd. This classification has come into existence with the change in the character land and the under ground water-table. As the frequent floods have raised the water-table in the areas which were formerly supplied irrigation water by the city drainage lines and formerly classed as Abi, is now known as sailabi. It contains enough moisture for double cropping without the aid of irrigation. A year to year study of the last five years figures confirms the general conclusions drawn from a comparison of the statistics at the time of first settlement with the present statistics. Due to the changing course of the river Ravi the flood waters are directed more to the village lands than before. There has been therefore a great increase in the Sailabi and Abi Sailabi land. In Sanda Kalan, there has occured a great change in the Abi Sailabi land since 1953-54. In this year 286 acres were classed as Abi-Sailabi, which were previously only Sailabi. Water from the city drainage nala is now supplied to it. In Sanda Khurd Sailabi land had increased since 1953-54 from 7 to 118 acres. Prior to 1953, the flood waters did not reach Sanda Khurd lands, but after the heavy floods of 1952 much of the land which was previously irrigated by the city drainage nala, had so much moisture that it was classed as Sailabi. A simultaneous decrease has therefore occured in the land classified as Abi.

The uncultivated land as seen from above has decreased by 24 acres. Changes in the uncultivable are classed as Banjar Jadid and Banjar-Qadim are equally interesting. Banjar Qadim is the area rendered infertile at an early date due to physical changes in the soil fertility while Banjar-Jadid is the area newly rendered infertile for economic use. Both these types of land are termed as culturable waste. At the time of the first settlement, there were about 212 acres of such land, 191 acres in Sanda Kalan and 21 acres in Sanda Khurd out of which 182 acres were of Banjar Qadim, and 45 acres of Banjar Jadid. With the exception of only 24 acres that have been reclaimed recently, no attention was paid to this land that could be brought under cultivation. The recent most figures show only about 41 acres of land classed as Banjar, showing an apparent decrease of more than 10% in the culturable waste. This does dot mean that so much land has been reclaimed but on the other hand most of the area that was previously classed as culturable-waste or Banjar, has now passed into the area not available for cultivation as reclamation work could not be possible. Most of the area classed thus lies near the river and is rendered unproductive due to too much of water and frequent floods. (See Map). The action of the river that has been going on for a long time, has rendered this land completely sterile on account of the rise in the water-table. This apparent decrease in the Banjar area is totally in favour of the area classed as impossible for cultivation as the viliage Patwari puts it, not even fit for reclamation. About 30 acres of land is classed as built area including an area of 17 acres under roads and patris metalled and unmetalled.

Soils of the area are uniformly alluvial, derived from the river deposits through ages, and the changes in the soil are little affected by the distance from the river. It is a soft grey alluvial loam, easy to work and very fertile locally known as Gasra. This type of soil prevails in Sanda Kalan. In Sanda Khurd a mixture of maira and Gasra is found. Maira is a laomy soil of varying density and colour according to the proportion of sand in it. Generally the soils of these villages are very fertile as the system of double cropping and high yields indicate. The natural fertility is maintained by the frequent floods that renew the soil after an interval of a few years. Such over all renewals have become more frequent within recent years. In 1947, 1950, and 1955 much of the land had been flooded and a five coating of silt had been the gift of these floods along with much damage done to the standing crops and property.

The cultivated land of the two villages has increased from 731 to 787 acrea, 9% from the time of the first settlement. In Sanda Kalan the increase of 44 acres in the cultivated area is partly due to the change in the village boundary which added 21 acres to the total area of the village and partly due to the decrease in the uncultivated acreage as about 24 acres of land have been reclaimed from Banjar Jadid and brought under cultivation. The increase in the cultivated land amounts to about 10% in Sada Kalan and 8% in Sanda Khurd.

The total cultivated area under all heads now forms 65% of the total area, 63% of the total area in Sanda Kalan and 88% of the total area in Sanda Khurd.

Climatic Conditions.

Climatic conditions are almost the same as in Lahore. Winters are the dry period, a greater half of the year's total rainfall comes in the three monsoon months of July, August and September. Mean temperature during the winter months usually remains above 50° F. While the minimum below freezing point is a very rare occurence. The summers are quite hot with maximum temperatures rising above 110° in May and June before the breaking of Monsoon. From July to Sptember the mean temperature remains between 80° and 96° F. The driest months are autumn months of October and November with plenty of sunshine.

The total amount of rainfall received during the year is about 20". It varies considerabley from year to year. The last five years show a great variation from 28.84" to 10 88" in 1950 and 1951 respectively. More serious is the deviation from the monthly normals. During the monsoon months of July to September heavy incidents of rainfall over a short period are often recorded. August and September of 1950 show abnormally heavy incidents of 7.01" and 10 81" respectively. Similarly 1953 had 7.52" and 8.35" in July and August respectively while in 1954 it beat all previous records when more than 16" of rainfall occured within 36 hours in September, and the total for the month of September was 26.69" much more than the years total.

TABLE II.

Monthly Rainfall at Lahore.

	1950	1951	1952	1953	1954
January ...	3.33	1.07	0.41	1.60	0.75
February ...	0.90	0.07	0.18	0.12	2.03
March ...	3.20	0,62	1.63	0.00	0.03
April ...	0.12	1.24	0,05	0.29	0.00
May ...	0.14	0.86	0.10	0.60	0.03
June ...	0.00	0.45	1.33	0.60	3.83
July ...	3.33	6.60	5.72	7.52	1.67
August ...	7.01	3,36	1.31	8.35	1.49
September ...	10.81	0.00	0.06	4.62	20.69
October ...	0.00	0.00	0.10	0.00	0.58
November ...	0.00	1.31	0.03	0.03	0.00
December ...	0.00	0.00	0.00	0.45	0.00
Total ...	28.84	16.48	10.88	23.34	28 16

On the other hand the deficiencies of rainfall are also great. In 1951 and 1952 the total for the years were 16.48″ and 10.88″ respectively. The three monsoon months receiving under 10″ of rainfall, just 10″ in 1951 and 7″ in 1952. In a highly irrigated tract like the Sanda Kalan and Sanda Khurd, deficiencies of rainfall are not felt so acutely as the abnormally great amounts. The problems of too little rainfall is adequately met with by the plantiful irrigation water available, but too much of water destroys the standing corps, and no remedy could be sought at such occasion. As we shall see later on the acreage of Kharaba or the acreage under crops that fails to mature is closely connected with the incidents of abnormally great amount of rainfall and the Ravi floods.

Crops.

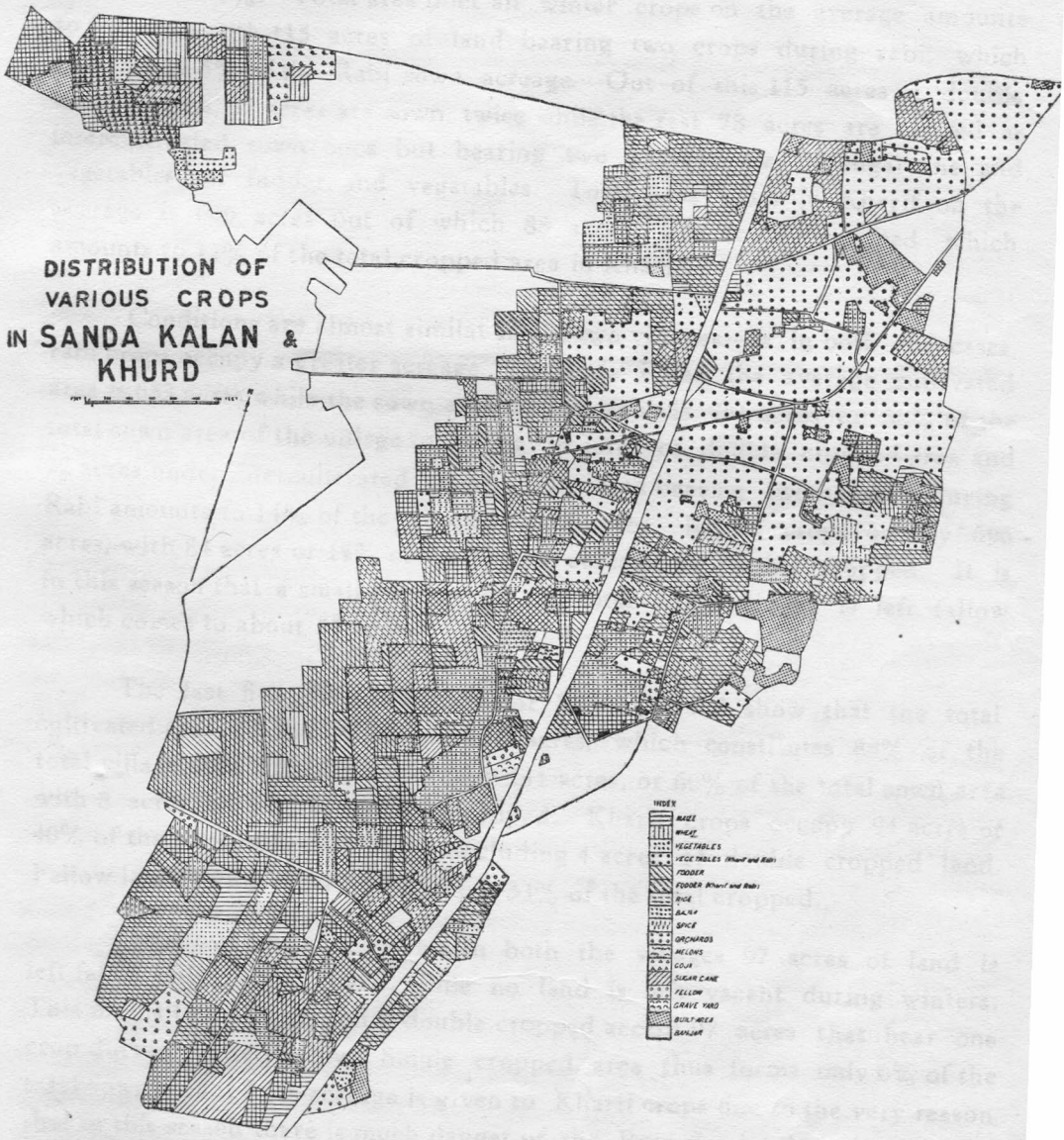
The area shows one of the best examples of very intensive type of agriculture relying on the fertility of the land, planty of water supply and the presence of a large market near at hand for the entire produce in the city of Lahore. The average figures show that the total cultivated area in the two villages including the current fallow of 8 acres is 787 acres. This forms 65%

TABLE III.

ACREAGE UNDER RABI CROPS SANDA KALAN AND SANDA KHURD.

Average 1950—55.

Type of Land	Food crops.					Cash crops.									Total harvested under all corps	Failure	Total Sown	Double cropped	Net area Sown.
	Wheat	Barley	Bajra (Millet)	Peas	Total	Tobacco	Spices	Flower Garden	Potatoes & Cauliflower	Turnips	Other Vegetables	Javi Fodder	Other Fodder	Tetal					
Chahi ...	7	...	...	...	7	1	1	2	26	2	2	33	15	82	89	2	91	2	89
Abi ...	12	1	...	1	14	4	8	3	172	4	20	18	53	282	296	1	297	3	294
Abi Chahi ...	6	...	...	...	6	1	6	1	12	1	4	7	9	41	47	1	48	5	43
Sailabi ...	56	2	26	1	85	...	...	...	10	...	41	17	11	79	164	3	167	4	163
Chahi Sailabi ...	10	...	...	...	10	1	2	...	3	...	1	7	4	18	28	...	28	2	26
Chahi Abi Sailabi	1	...	...	...	1	...	1	...	3	...	...	2	2	8	9	...	9	...	9
Abi Sailabi ...	39	1	...	7	47	7	11	...	58	7	11	71	39	204	251	11	262	20	242
Total ...	131	4	26	9	170	14	29	6	284	14	79	175	133	714	884	18	902	37	866


DISTRIBUTION OF
VARIOUS CROPS
IN SANDA KALAN &
KHURD
INDEX
MAIZE
WHEAT
VEGETABLES
VEGETABLES (Kharif and Rabi)
FODDER
FODDER (Kharif and Rabi)
RICE
BAJRA
SPICE
ORCHARDS
MELONS
GOJA
SUGAR CANE
FELLOW
GRAVE YARD
BUILT AREA
BANJAR

of the total area of the villages. The area uder all crops in Rabi as well as Kharif is 1892 acres, implying thereby that not only that almost all the area is double cropped but some of it bears more than two crops within Rabi or Kharif. *See* table III.

Rabi crops occupy 59% of the cropped acreage while Kharif sown area amounts to 41%. Total area uder all winter crops on the average amounts to 902 acres with 115 acres of land bearing two crops during rabi, which amounts 12.5% of the Rabi sown acreage. Out of this 115 acres of double cropped area, 37 aeres are sown, twice while the rest 78 acres are classed as intercultivated, sown once but bearing two harvests *i.e.* of sugarcane and vegetables, or fodder and vegetables. Total area sown in Kharif on the average is 690 acres out of which 88 acres are double cropped which amounts to 12% of the total cropped area in Kharif.

Conditions are almost similar in the two villages—as in both the cases, rabi crops occupy a greater acreage. In Sanda Kalan the average cultivated area is 653 acres while the sown area during rabi is 761 acres or 56% of the total sown area of the village including 36 acres of double cropped area and 72 acres under intercultivated crops. The area bearing two harvests during Rabi amounts to 14% of the cropped area in rabi. Kharif crops occupy 596 acres, with 84 acres or 14% of the Kharif acreage as double cropped. It is in this season that a small portion of the total cropped area is left fallow which comes to about 57 acres.

The last five years averages for Sanda Khurd show that the total cultivated area of the village is 134 acres, which constitutes 88% of the total village area. Rabi crops occupy 141 acres, or 60% of the total sown area with 8 acres of land as double cropped. Kharif crops occupy 94 acres or 40% of the total under all crops including 4 acres of double cropped land. Fallow land during Kharif amounts to 33% of the total cropped.

The above figures show that in both the villages 97 acres of land is left fallow only during Kharif, while no land is left vacant during winters. This means that all the land is double cropped accept 97 acres that bear one crop during winters only. Single cropped area thus forms only 6% of the total sown area. Less acreage is given to Kharif crops due to the very reason that in this season there is much danger of the Ravi floods that damage the standing crops. Moreover the Sailaba is too much when the river in spate and too much of water renders some land unfit for economic use, hence all

the fallow land lies in Kharif only. Current fallow only occupies 8 acres of land.

Considerable variations from the average cropped acreages exist in both the villages depending on the variations in the physical conditions.

	Rabi acreages			Kharif acreages			Total		
	Sanda Kh	Sanda Kh	Total	Sanda Kh	Sanda Kh	Total	Sanda Kh	Sanda Kh	Tatal
1950-51	814	151	965	669	79	748	1483	230	1713
1952-53	883	126	1009	567	104	671	1450	230	1680
1951-52	571	110	681	596	106	702	1167	216	1383
1953-54	769	137	906	645	109	754	1414	246	1660
1954-55	715	131	846	630	106	736	1345	237	1582
Average	761	141	902	596	94	690	1357	235	1592

The total sown area has fluctuated from 1383 acres in 1952-53 to 1713 acres in 1950-51. In the year 1952-53, the acreage under all crops was less than the average by about 200 acres, almost all this difference was due to the decreased acreage under rabi crops in Sanda Kalan when only 571 acres were sown instead of an average of 761 acres sown during winters. It was entirely due to the floods in 1952 that rendered much of the land incapable of sowing for rabi crops in the autumn of 1952, because of too much of moisture. Other years show slight fluctuations from the average. Sanda Khurd shows lesser variations as it is at a greater distance from the river Ravi. Rabi sown acreage fluctuates more than the Kharif sown area as the after effects of the floods are conspicuous in autumn which is the sowing time for rabi crops.

Main Crops.

Food crops occupy only 22% of the total cropped acreage which amounts to 259 acres. The area under food crops is more in Kharif than in Rabi being 33% and 19% of the total harvested in Kharif and Rabi respectively. In Sanda Kalan the food crops occupy 298 acres or 22% of the total cropped, 167 acres in Kharif and 131 acres in rabi which amounts to 33% and 18% of the Kharif and rabi harvests respectively. Similarly in Sanda Khurd a greater acreage is given to Kharif food crops than rabi food grains but the difference is smallar than in the case of Sanda Kalan. The totol acreage under all food crops is only 61 or 25% of the total sown, 30% of the Kharif harvest and 27% of the rabi harvest.

TABLE IV.

ACREAGE UNDER KHARIF CROPS SANDA KALAN AND SANDA KHURD

Average 1950—55.

Type of Land	Food crops (cereals)																				
	Rice	Bajra	Maize	Total	Chillies	Spices	Sugarcane	Cotton	Flower Sardais	Fruits	Potatoes	Cauli Flower	Tornips	Other Vegetables	Chari Fodder	Other Fodder	Total	Total harvested under all crops	Failure	Total sown	Double Cropped	Net Area Sown.
Chahi ...	1	8	16	25	...	1	1	1	...	3	4	4	1	9	3	2	29	54	7	61	6	55
Abi ...	6	7	31	44	2	4	8	...	2	2	54	36	2	70	3	3	186	230	53	263	57	226
Abi Chahi ...	2	2	7	11	...	1	8	...	1	2	12	2	...	12	1	2	41	52	8	60	7	53
Sailabi ...	...	6	12	18	...	1	...	...	...	..	1	...	...	1	1	1	5	23	25	48	...	48
Chahi Sailabi	...	1	2	3	...	...	1	...	...	1	—	...	1	2	1	...	6	9	3	12	...	12
Abi Sailabi...	12	6	53	71	...	...	25	...	...	1	16	...	...	11	3	...	56	127	24	151	16	132
Abi Sailabi... Chahi	...	...	1	1	...	...	2	...	...	1	4	...	...	1	...	...	8	9	1	10	...	10
Total ...	24	33	132	189	2	7	72	1	3	10	93	42	4	107	12	19	372	561	129	690	88	620

While on the average as we have seen due to the danger of floods greater sown area lies under rabi crops, a greater area under food crops is in Kharif season. This is due to the fact that Khrif food crops like maize or Bajra thrive well on heavy loams of sailabi land with plenty of water supply while the winter food crop like wheat can not adapt to too much of moisture.

Kharif food crops.

Maize is the most widespread food crop in Kharif. It occupies 132 acres and accounts for 69% of the area harvested under Kharif food crops and 39% of the area harvested under all food crops and only 8% of the total sown area. In Sanda Kalan it covers 119 acres out of a total of 167 acres harvested under food crops giving a percentage of 71 of the food crops during Kharif and 35% of the total food grains and only 8% of the total sown area of the village In Sanda Khurd it occupies only 22 acres amounting to 66% of the Kharif good harvest, 33% of the total acreage under food crops and about 9% of the total cropped acreage. *See* table IV.

Maize in this area is grown on all classes of land but because it is adopted to heavy loams of Abi, Abi-Sailabi and Sailabli lands which contain, a lot of moisture, the greater acreage of maize is on these classes of land. The largest acreage of maize in both villages is on Abi-Sailabi land, second comes Abi and third the Sailabi land. In the economy of the crops, Chahi lands are saved for other crops.

It is sown in June and harvested at the end of August. Yields of maize are highest over well irrigated land where the quantity of water supplied is just the amount needed, but unfortunately very little maize is grown over chahi lands. On the Abi, Sailabi and Abi-Sailabi lands it yields 7510 maunds per acre.

The harvested acreage under maize fluctuates a great deal as shown in the figures below :—

Average			1950			1951			1952		
S.K.	S.Kh	Total	S.k.	S.Kh	Total	S.K	S.Kh	Total	S.K.	S.Kh	Total
119	13	132	37	4	41	132	23	155	230	35	265

1953			1954		
S.K.	S.Kh	Total	S.K	S.Kh	Total
202	20	222	57	x	57

In 1950 only 37 acres of maize was harvested due to heavy losses by floods while in the good years of 1952 and 53, the maize was harvested from 265 and 222 acres respectively. In 1954 again the area under maize was reduced to 57 acres only, due to the abnormal incidents of rainfall which dealt a severe blow to the standing crops.

Other Kharif food crops are Bajra and Rice. Bajra occupies only 33 acres, 29 acres in Sanda Kalan and 4 acres in Sanda Khurd. It does well on all types of land, but is generally grown over chahi, Abi and Sailabi lands. It yields about 7 to 8 maunds per acre.

Rice is grown over an area of 24 acres only, 19 acres in Sanda Kalan and 5 acres in Sanda Khurd. It is mostly grown on Abi and Abi-Sailabi lands where the irrigrtion water from the Mozang nala is available. About 12 to 15 maunds of rice are obtained from one acre.

Rabi Food crops.

Rabi food crops are of lesser important than Kharif. Wheat and Goji are the only crops worth mentioning. Wheat occupies almost an equal area as maize, of 131 acres, which forms 79% of the Rabi food crops, 39% of all total sown under food crops and only 8% of the total sown area. In Sanda Kalan it covers about 100 acres and in Sanda-Khurd 31 acres. It grows on almost all types of land from Chahi to Abi-Sailabi, but it is mostly given Abi and Abi-Sailabi land. Wheat yields about 11 maunds per acre on chahi land, 7 maunds on Sailabi soils. The last five years fugures show fluctuationsin wheat production from year to year. As compared to the variations in the area harvested under maize, fluctuations of wheat harvested area are very small from 114 to 171 acres in 1952-53 and 1950-51. In 1952 the floods allowed only a small acreage to be sown under wheat due to too much of moisture in the soil which cut down all the rabi sowings for the year.

AREA HARVESTED UNDER WHEAT (ACRES)

1950-51			1951-52			1952-53			1953-54		
Sanda K.	Sanda Kh.	Total	S.k	S.kh	Total	S.k	S.kh	Total	S.k	S.kh	Total
124	47	171	120	28	148	93	21	114	92	26	118

1954-55			Average.		
S.k	S.kh	Total	S.k	S.kh	Total
103	30	133	100	31	131

Other rabi crop is the mixed grain of wheat and Gram known as Goji. It occupies 26 acres of land, 25 acres in Sanda Kalan and only 1 acre in Sanda Khurd. All of it is grown on Sailabi land as grams want a moist sandy loam. It yields about 7-8 maunds of grains per acre. No acreage was harvested under this crop in 1952 and 1953, and grams do not like too much of moisture which was present in the sailabi land after the heavy floods of 1952.

Peas are grown over some 9 acres of land during Rabi.

Cash Crops.

Cash crops occupy 78% of the cropped area in the villages being 67% of the total cropped in Kharif and 81% of the total cropped in Rabi. All the cash crops cover an area of 1,086 acres, 372 acres in Kharif and a greater acreage of 714 acres in Rabi season from fear of the danger of floods. The acreage under cash crops was reduced considerably on account of floods in 1950 and 52. Sanda Kalan has 944 acres under cash crops 627, acres in rabi and 317 acres in Kharif. In Sanda Khurd 142 acres are harvested under cash crops, which account for 73% of the total harvested in Rabi and 70% of the total harvested in Kharif.

Cash crops include tobaco, spices, fruits vegetables and fodder crops. Vegetables occupy the largest acreage both in Rabi and in Kharif. Vegetables cover 623 acres or 42% of the total cropped area. During Rabi 377 acres are given to the cultivation of vegetables which forms 42.3% of the total cropped area and 56% of the area harvested under all rabi cash crops. In Kharif the vegetables occupy 245 acres which covers 45% of the total cropped area and 79% of the total harvested under all Kharif cash crops.

Vegetables include, Potatoes, cauliflower, Turnips carrots and spinach. Potatoes are grown in winters as well as in summers and occupy considerable acreage in Rabi. Total area under potatoes is 223 acres about 200 acres in Rabi and 93 acres in Kharif. In Sanda Kalan about 193 acres and in Sanda Khurd 7 acres are harvested under potatoes in Rabi. In Kharif 89 acres under potatoes lie in Sanda Kalan and only 4 acres lie in Sanda-Khurd.

Potatoes require deep, freely worked sandy loam. Such soil is found almost in all parts of the village lands. Its requirements of heavy manuring and plenty of irrigation water give it a placing on the Abi and Abi-Sailabi lands where the waters of the city drainage of the Mozang nala supply plenty of water which also serves as a manure.

In winters potatoes are sown from the middle of October to the middle of November, and the spring crop is soon in January and February.

Potatoes are sown on raised beds on both sides, the intervening drainage channels are watered at frequent intervals. The seed rate is usually 7 maunds of tubers per acre. Harvesting starts in January and February for the winter crop and in May for the spring crop. Inter-culture is carried on in the heavily manured potatoes fields and usually the short lived vegetables that grow for a month or so like spinach, or pumpkins are grown in between the rows of potatoe plants yield heavily, about 100 maunds are obtained from an acre. Due to the large profets by the cultivation of this crop, its area has increased during the last few years, and the area under cauliflower has shown a small decrease. Almost 90% of the potatoes come from the Rabi harvest of Sanda Kalan. Fluctuations do exist out the correlation is not so obvious with the floods in the river Ravi as the crop is sown after the floods are over in autumn over the wet sandy loams which are not so injurious to the seedings as for other crops.

Cauliflower and cabbage is also grown a winter as well as an early spring crop. About 80 acres are sown under cauliflower and cabbage in Rabi and 42 acres in Kharif, Almost all this crop is sown in Sanda Kalan. Three harvests are obtained from September to March. The first plantings take place in August that give an early variety ready for market in October, that brings large profits. The second crop is sown in October and the harvest is marketed in December. The third plantings take place in December and harvested in February and March. During all this period, replacement of the plants goes on. As soon as the flower is taken off, new plant is replaced. Summber crop is sown in Mnrch and send to the market in May.

Rich heavy loams are suited for this vegetable. It is sown on Abi lands mostly as it is supplied with plentiful irrigation water. The yields vary from 200 to 250 maunds per acre in case of cabbage and 150-200 maunds per acre in case of cauliflower. The early plantings of cauliflower and cabbage suffer great damages from the Rabi floods. In 1950,52 and 55 the first plantings were almost washed away by heavy floods. Replantings had to be done at an early time immediately after the floods. When the land was fit for tilling.

Turnips and carrots occupy a small area of 14 acres in Rabi and 4 acres in Kharif. Other vegetables which include spinach, Lady's fingures and Bringals occupy a considerable area in Kharif, 90% of these are cultivated in Sanda-Kalan. All those vegetables are heavily manured and irrigated.

Fodder crops occupy a very important position in the economy of land use in these villages. The main fodder crops are Chari and Jawi which occupy 339 acres, 308 acres in Rabi and 31 acres in Kharif and forms 35% of the total harvest and 43% of the total cash crops in Rabi, while these form only 5% of the total harvested and 8% of the cash crops in Kharif. Javi is a rabi fodder and occupies 175 acres, 120 acres in Sanda-Kalan and 55 acres in Sanda Khurd. It forms 20 % of the total harvested crops during Rabi though it is sown only once in October and November but three to four harvests are obtained during the period from November to March. It is cut from the top while the roots are left in the ground to let it grow again.

Other fooder crops are chari and green cut wheat or Barley. These fodder crops occupy 15% and 5% of the harvested acreage in Rabi and Kharif respectively.

Most of the fodder crops are sent to the Lahore market while a small proportion is fed to the cattle in the village. Very small acreage are given to onion, spices and garlic.

Sugarcane is another important Kharif cash crop. It occupies 72 acres, 40 acres in Sanda Kalan and 32 acres in Sanda Khurd. It forms 13% of the total harvested area in Kharif, 8% in Sanda-Kalan and 41% of the Kharif harvest in Sanda-Khurd. Abi and Abi-Sailabi lands are best suited for its cultivation with high fertility and plenty of water. It is sown in March and April and harvested in October and November. Since it remains long in the ground it is usually followed by fodder crops in winter or by vegetables. A small acreage of cane is single cropped followed by fallow. About 30 to 35 maunds of gur is obtained from one acre under sugar cane. Much of the sugar cane is of local Katha variety.

One acre is sown under Cotton and about 9 acres are given over for the production of flowers—mostly roses, jasmin and marigold. Flowers fetch high prices in Lahore. About 10 acres of land is under fruits, including melons and water-melons and orchards of citrus fruits. Almost all the orchards are on well irrigated lands. Too much of water in the sub-soil injures the roots of the citrus trees, no groves therefore appear in Sailabli lands.

Crop rotation.—In an intensively cultivated area, rotation of crops plays an important role in helping to maintain the soil fertility. Fodder crops as we have seen occupy a considerable acreage and forms an important rotation crop. It generally follows the exausting crops of maize in Kharif. Only over fodder acres maize is followed by wheat which in turn is followed by fodder

crops in Kharif. Sugarcane is also followed by fodder crops, partly because it is an exausting crop and partly because it remains in the ground for a longer period and the rabi crops would not thrive well if sown late.

Vegetables and fodders are also alternated, while large areas grow vegetables in both seasons, followed by fodder and then again vegetables. Fodder crops form an important cash crops, a rotation crop, and a feed for dairy cattle for milk supply to the city of Lahore:

Manner of cultivation.—The methods of cultivation are not primitive as in most parts of the country. Though still much of the work of weeding and loosening the soil are done with hand during the period when the crops are in the ground, tractors are used for ploughing the land on co-operative basis. It has almost freed the agriculturists from the need of oxen and bullocks, and more fodder is saved for milk cattle. No special manure is used inspite of the heavy croppings. Mostly the young alluvium is renewed after an interval of few years while the irrigation water which comes from the city drainage from Mozang in itself contains heavy manures. Recently the waters of Mozang Nala are filtered before use and the filtered manure is used in the quantity as required by different crops. This manure is applied freely to almost all crops except fodder crops which require only small quantities of manure.

Crop failures.—Not all the crops that are sown come to maturity. The amount of Kharaba or failed crops fluctuates from year to year according to the abnormal conditions. On the average 147 acres of sown area fails to mature, the acreage of Kharaba is much more in Kharif being 129 acres while during Rabi only 18 acres fail to mature, It forms 2% of the sown area during Rabi and 16% of the total sown during Kharif.

CROP FAILURES ACREAGE

	1950-51			51-52			52-53			53-54		
	S.k	S.kh	Total	S.k	S.kh	Total	S.k	S.kh	Total	S.k	S.kh	Total
Rabi	8	24	32	2	...	2	...	...	...	2	21	23
Kharif	274	31	330	16	1	17	3	1	4	62	1	63

54-55			average.		
S.k	S.kh	Total	S.k	S.kh	Total
7	17	2 4	4	13	17
240	48	263	114	16	130

In the years 1951-52 and 52-53 the failure of crops was very small, almost none in Rabi and 17 acres and 4 acres of Kharaba in Kharif respectively. In 1953-54 86 acres of sown crops failed to mature, 23 acres in Rabi and 63 acres in Kharif. It was mainly on account of the high incidents of rainfall. In the years 1950-51 and 54-55 the acreage of Kharaba during Kharif amounted to 274 and 293 respectively. It formed 39 and 38% of the total sown area in Kharif in 1950-51 and 54-55 respectively. These high figures are directly related to the Ravi floods and too much of rainfall in 1954-55. Kharaba during Rabi in these years was not very great as it is the maturing Kharif crop that suffers from flood damages and greater variations of monsoon rainfall.

To save the city of Lahore and the suburban lands a dam is constructed on the left bank of the river Ravi. It passes through these two villages almost throwing half the cropped land on the other side towards the river and the remaining half on the side away from the river Ravi.

It has been effective in saving at least half of the land on this side of the mud-dam, but the very high floods of 1955 could not be controlled by it and breeches occured at many places that caused much damage to the standing crops. Less severe foods are kept away by this dam.

Irrigation facilities exist in these villages and with the exception of 256 acres of sailabi and 4 acres of Barani land all the cultivated land is irrigated, which forms 68% of the total cultivated area. Irrigation is carried on by three methods, wells, Mozang Nala free flow irrigation and by Jhallars.

There are 29 wells all in Sanda Kalan which irrigated 99 acres of land which forms 11% of the total cultivated area.

The number of wells at the time of first settlement in 1916-17 was 49 in Sanda Kalan and 10 in Sanda Khurd. The number has decreased in Sanda Kalan as we have seen above, and all wells have gone out of use in Sanda Khurd. Rise in the water-table due to frequent floods have converted much of the well-irrigated land into Sailabi or Abi-Sailabi class.

Almost all the wells in Sanda-Kalan are electrified, only a few wells are drawn by oxen.

The other source of water supply is the Mozang Nala, which brings large quantities of water of the Lahore city and ends in the river Ravi. It irrigates all the land classified as Abi, Abi-Sailabi, or chahi-Abi. The land thus irrigated forms 56% of the total cultivated area. Priviously this water

was used with all its fertilizing constituents but now it is filtered before letting on to the fields. The filtered mud is used more economically as a fertilizer in the quantity required for various crops. This irrigation system is very economical as not much money is spent in buying fertilizers which are needed in large quantitites in an area which is so intensively cultivated.

Dairy farming.—Milk buffalos are kept by most of the agriculturists for the milk supply for their own consumption, while most of the tenants keep daily buffalos as a supplement to their sources of income. The fodder supply is plentiful throughout the year and since most of the wells are electrified and tractor plough are used, all the attention is paid to the dairy cattle. Other livestock include a small number of oxen and he-buffalos for transport purpose.

Tenancy and Holdings.

There are about 2,895 people engaged in agriculture, 428 in Sanda Khurd and 2,467 persons in Sanda Kalan. It includes 12,27 owners, 539 Khewats and 1139 tenents. The cultivated area is divided among the cultivators as follows.

Averages 1945-50	SANDA-KALAN		SANDA-KHURD.	
	No. of Holdings	Total cultivated	No. of Holding	Total cultivated.
I By owners.	304	325	98	80
II *Tenants* at will	97	16	14	4
(*a*) free of rent.				
(*b*) Cash payment	213	243	18	19
(*c*) Paying in kind $\frac{1}{2}$.	20	26	3	2
(*d*) Paying in Kind $\frac{1}{3}$	39	56	36	27
Total	673	666	169	132

Cultivated.

The area cultivated by owners amounts to 60% of the total cultivated in Sanda-Khurd and 50% in Sanda Kalan, the rest is cultivated by tenants.

The tenants who pay rent in cash cultivate 15% of the total cultivated area in Sanda Khurd and 36% in Sanda Kalan. Some of the tenants pay rent in kind amounting from half to one third of the total produce. Tenants free of rent cultivate 3% and 2% of the cutivated area in Sanda Khurd and Sanda Kalan respectively. The cultivation of land by tenants here is not a detrimental factor for the fertility of soil as the intensive type of forming is governed by the strong impetus of a large urban market in Lohore. High prices of all these products like vegetables, fruits and fodder enable the cultivators to take care of the land they till.

The average size of the holdings both for the cultivators and tenants is less than one acre, only in case of the tenents paying in kind the individual holdings exceed one acre. The smallest holdings are of tenants free of rent who cultivate land that is given to them as a gift. The small holdings intensively cultivated bearing more than two harvests have a great supporting power.

Economy of Land use.—The land use pattern in these villages shows very clearly how the economy of the crop production is directed by the presence of a large urban market. These villagess produce small quantities of food grains as cash crops are much more profitable. One acre under vegetables or fodder pays at least three times the price of wheat yields from one acre. The food stuffs are bought as the villages are not self sufficient in the production of food grains. The vegetables and other perishable produce loaded in carts is seen moving along the Sanda-road to the city of Lahore where it is readily sold. The returns are high as to give a fairly good living to the tenants who own only one acre of land or even less than that. Proper care taking of the land and proper rotation has maintained the fertility of the soil which is also renewed by the natural floodings after every few years. The river Ravi is a source of underground sweet water, alluvial soil and general fertility though at times it leads to large scale crop failures as in 1950 and 1955. The intensive cultivation here reminds one of some of the intensively cultivated tracts round the large industrial centres of the world.

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