

“Economic Effects of Waterlogging and Salinity in West Pakistan”

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Introduction

Waterlogging and salinity constitute one of the very serious problems facing our agriculture today and have been identified with the lingering disease of the soil. As Pakistan's economy continues to be based predominantly on agriculture, any factor tending to retard the smooth working of any department of our agricultural set-up cannot but seriously affect it.

Pakistan today is confronted with a serious food situation which has progressively deteriorated over the past few years. Although the immediate causes of recurrent food deficit were related to failure of the monsoon, reduction in the supply of canal waters as a result of unilateral action of the Indian Government, hoarding, smuggling across the border, etc., the more permanent causes were those connected with the soil deterioration brought about mainly by waterlogging, salinity, erosion, defective crop rotation and land tenure systems, recurring floods etc.

As waterlogging and salinity have been with us now for many decades, a casual observer is apt to under-estimate their harmful effects on our agricultural production and, in turn, on the overall economy of the country. In this paper an attempt has, therefore, been made to assess the economic effects of salinity and waterlogging in West Pakistan. Before any assessment is made, it is, however, necessary to find out the extent of the menace in this Province.

The Magnitude of the Problem

Various estimates of the area effected by waterlogging and salinization have been advanced from time to time from different quarters as presented below :

(i) The Pakistan Agricultural Inquiry Committee (1951-52) under the Chairmanship of Lord Boyd Orr observed that though new land was being brought under cultivation by irrigation schemes and otherwise, land already cultivated was deteriorating. Waterlogging and salinity had already affected 2.5 million acres.¹

(1) Report of The Pakistan Agricultural Inquiry Committee, para 138.

(ii) The National Planning Board puts the estimate¹ of the total area affected by salinity and rising water table by 1955 at 6 million acres of land to which over 50,000 acres are being added annually.

(iii) The estimates contained in the Report on "Progress of Economic Development in Pakistan", issued in 1955, by the Ministry of Economic Affairs, Government of Pakistan, put the figure of waterlogged area in West Pakistan at 500,000 acres and of that suffering from salinity at about 2 million acres. These two menaces together have been putting out of cultivation annually from 30 to 40 thousand acres.²

(iv) The Governor of West Pakistan while referring to the extent³ of waterlogging and salinity in the province of West Pakistan stated that out of our total cultivated area, about 60 per cent. was irrigated and 40 per cent. under dry cultivation. According to him nearly half of the irrigated area had already been affected by waterlogging and salinity, and West Pakistan was losing nearly 75,000 acres of cultivable irrigated land every year. He warned that if this process was allowed to continue unabated the annual losses might increase to a hundred thousand acres by 1961 and thus in four years time the fertile Indus Basin might be turned into a vast uncultivable waste.

(v) The West Pakistan Minister for Development and Irrigation stated⁴ in September, 1957 that the acreage of affected land was reported to be 0.5 million in the former Sind, 0.14 million in the former Bahawalpur State and 9,927 acres in the former N.-W.F.P. In the former Punjab about 3 million acres of land had been affected by salinity. The estimate for the waterlogged area was put at 22,000 acres.

Former Punjab.— The former province of the Punjab (now a part of West Pakistan province) deserves special mention in this respect. This area has been called the 'wheat bowl' of the country and has also been the worst affected by waterlogging and salinity as compared to other regions of West Pakistan. The magnitude of the problem in this region becomes clear from the following estimates :

(i) According to the Economic Appraisal Committee set up by the Government of Pakistan in 1952, 40,000 acres of land was waterlogged while another 2 million acres of land had been made barren by salinity in the former Punjab province alone. Besides, it also reported that between 20 and 30 thousand acres of good land was going out of cultivation every year.⁵

(ii) A recent survey undertaken in the former Punjab showed that out of a total commandable area of 14.6 million acres, over 3 million

(1) First Five Year Plan, Vol. II, page 174, para. 59.

(2) Progress of Economic Development in Pakistan, page 20, para 81.

(3) Speech delivered on February 11, 1957, at Agricultural Workshop, Sind Agricultural College, Tando Jam.

(4) Speech in the Provincial Assembly, Lahore on 15th September, 1957.

(5) Report of the Economic Appraisal Committee, page 60, para. 183.

acres had already become seriously affected by salts. Out of this, 1.3 million acres had altogether gone out of cultivation while 1.7 million acres had been affected to the extent that the yields were reduced on an average by 50 or 60 per cent. Besides, another 4.6 million acres had also been damaged by salts though to a lesser degree. ¹

(iii) The Director of I.C.A. (International Co-operation Administration) in Pakistan, Mr. John O. Bell while assessing the critical food situation in Pakistan in 1957, put the estimate of total irrigated land in the former Punjab affected by salinity at 8.0 million acres and of that totally out of cultivation at 1.0 million, besides additional 2.0 and 5.0 million acres reduced to half the normal productivity and to 20 per cent less than normal productivity respectively.

Estimates of Soil the Reclamation Board

The Soil Reclamation Board estimated ² that the total area affected upto 1956 was 2.3 million acres in the former Punjab. The criterion fixed for estimating saline area was the visibility of sodium salts over 20 per cent. or more of a field. If the area affected to less than 20 per cent. were taken into account another 4.6 million acres should also be considered as having deteriorated. To make matters worse, 40,000 acres are added each year to the already affected area of 6.9 million acres. Out of this a total area of 800,000 acres has gone completely out of cultivation and the deterioration of the rest where normal yields can yet be obtained, is fairly rapid.

According to the latest estimates ³ (August 1958) by the Chairman, Soil Reclamation Board, 7 million acres were seriously affected and 12 million acres were partially affected in West Pakistan, while in the former Punjab, 3 million and 6 million acres were seriously and partially affected as shown below :—

Table 1
Extent of Salinity and Waterlogging in West Pakistan and the
Former Punjab
(Million Acres)

Head	West Pakistan	Former Punjab
Total area	55.0	37.0
Area irrigated	20.0	15.0
Area seriously affected	7.0	3.0
Area partially affected	12.0	6.0

(1) Agricultural Crisis in Pakistan, 1957, p. 12.

(2) Pamphlet on Chuharkana Reclamation Project, 1956, p. 2

(3) Reclamation of Land in West Pakistan, by S.A. Majid.

Special Field Inspections

In the districts of the former Punjab special field inspections are carried out every year to estimate areas affected by *thur*¹ (salinity) and *sem*² (waterlogging). The following table shows figures of affected areas in the districts of the former Punjab since 1931-32, percentage increase in affected area, etc.

Table 2
Thur and *Sem* Area in the Affected Districts of the Former Punjab Since 1931-32

Year	Affected Districts	Affected Area (thousand acres)	Percentage increase over previous year	Index Number
1	2	3	4	5
1931-32	7	324
1932-33	7	347	7.1	...
1933-34	9	348	0.3	...
1934-35	9	364	4.6	...
1935-36	9	377	3.6	...
1936-37	9	438	16.2	...
1937-38	9	483	10.3	...
1938-39	9	513	6.2	...
1939-40	9	531	3.5	...
1940-41	9	553	4.1	...
1941-42	12	628	13.6	...
1942-43	12	713	13.4	...
1943-44	13	1,415	98.5	100
1944-45	13	1,644	16.2	116
1945-46	13	1,854	12.8	131
1946-47	13	1,945	4.9	137
1947-48	13	2,310	18.8	163
1948-49	13	2,337	1.2	165
1949-50	13	2,349	0.5	166
1950-51	13	2,348	...	166
1951-52	13	2,363	0.6	167
1952-53	13	2,385	0.9	169
1953-54	13	2,409	1.0	170
1954-55	13	2,421	0.5	171
1955-56	13	2,439	0.7	172
1956-57	13	2,502	2.6	177

1. The areas in which effervescence is apparant on the natural surface during the months of December, January or February causing one-fifth or more damage to the crop of the area are classed as '*thur*' stricken.
2. The fields rendered unfit for cultivation to the extent of one-fifth or more of its area by their sub-soil moisture are classed as '*sem*' stricken.

There has been steady increase year after year, in the area affected as shown by percentage rise over the preceding year under column 4 of the table above. 13 out of 16 districts of the former Punjab were affected by 1943-44. Taking this year as base period, the Index Number of affected area has increased from 100 in 1943-44 to 177 in 1956-57. The following table shows increase in affected area over the decade since Independence separately for *sem* and *thur*.

Table 3

Affected Area in Thirteen Districts of the Former Punjab
(Thousand Acres)

Year	By <i>Sem</i> (Waterlogging)	By <i>Thur</i> (Salinity)	Total Area
1947-48	34	2,276	2,310
1948-49	34	2,303	2,337
1949-50	37	2,312	2,349
1950-51	43	2,305	2,348
1951-52	43	2,320	2,363
1952-53	43	2,342	2,385
1953-54	43	2,366	2,409
1954-55	41	2,380	2,421
1955-56	43	2,396	2,439
1956-57	64	2,438	2,502

Source.—'Agricultural Data' November, 1958, p. 115

Salinity, as is clear from the table above, accounts for more than 97 per cent. of the total affected area. By the end of the year 1956-57, 2.5 million acres of land in the thirteen districts had been damaged by waterlogging and salinity. The following table shows figures relating to area affected by *sem* and *thur* in the districts of the former Punjab individually in 1956-57 :

Table 4

Districtwise Affected Area in the Former Punjab in 1956-57

(In Thousand Acres)

Districts	Total cultivated acreage	Affected area			% of affected area to total cultivated area
		by <i>sem</i>	by <i>thur</i>	Total	
Lahore ...	1,000	7	80	87	8.7
Sialkot ...	1,063	1	3	4	0.4
Gujranwala ...	958	5	401	406	42.4
Sheikhupura ...	918	4	461	465	50.7
Gujrat ...	1,050	36	55	90	8.6
Shahpur ...	1,972	4	110	114	5.8
Jhelum ...	761	*	56	56	7.4
Mianwali ...	1,544	*	5	5	0.3
Montgomery ...	1,959	*	177	177	9.0
Lyallpur ...	1,756	3	270	273	15.5
Jhang ...	1,233	4	295	299	24.2
Multan ...	2,510	*	309	309	12.3
Muzaffargarh ...	1,009	*	216	216	21.4
Total ...	17,733	64	2,438	2,502	14.1

*Less than 500 acres

Totals may disagree due to rounding.

Source.—Directorate of Land Records, West Pakistan, Lahore.

A study of the table above reveals that Sheikhupura and Gujranwala have been the worst affected districts while Mianwali and Sialkot the least affected districts. It is evident that as much as 14% of the cultivated area of the 13 districts has been affected by this menace. This affected area amounted to about one-fifth of the total irrigated area in these districts.

Economic Effects

As agriculture is the main industry of the country engaging directly and indirectly more than 75 per cent of the population of the country, any factor adversely affecting our crop yields is likely to have far reaching consequences. Waterlogging and salinity constitute one such factor and has, with the passage of time, resulted in deterioration of the overall food position of the country. Huge amounts of money in foreign exchange had to be spent on imports of foodgrains from abroad to fill the gap. This had had the effect of slowing down the rate of economic development in the country. Such a situation also had its harmful repercussions on the foreign trade and balance of payments position of the country.

Many prosperous villages and small towns have been wiped out partially or wholly. Fertile lands have become barren and valuable orchards have disappeared. The first to suffer are the cultivators whose land is affected. They have to give up their hearths and homes and shift to other places in search of fresh opportunities. Reduced to the position of destitution,

The Government has also to spend large amounts of money on reclamation of waterlogged and saline areas. The cost of repairing damage to urban and rural properties has to be met, and is a constant drain on the financial resources of both the public authorities and the people affected.

The economic effects of waterlogging and salinity are studied below under the following heads :

- (i) Cultivated Area ;
- (ii) Agricultural Production ;
- (iii) Immovable Property ;
- (iv) Living and Nutritional Standards ;
- (v) Government Expenditure ;
- (vi) Economic Development.

1. Effects on Cultivated Area

As a result of waterlogging and salinization of the land more and more areas have been affected every year as illustrated below :

Table 5
Increase in Affected Area in the Former Punjab

Districts	Affected Area		
	1931-32	1941-42	1951-52
Lahore	27,028	34,507	96,639
Sialkot	1,925	3,324	3,571
Gujranwala	188,580	242,620	385,177
Sheikhupura	60,636	190,997	510,836
Gujrat	18,382	14,750	50,834
Shahpur	20,340	35,152	115,933
Jhelum	...	46,962	51,176
Mianwali	...	1,236	2,764
Montgomery	...	19,045	188,711
Lyallpur	...	22,356	137,634
Jhang	7,415	11,163	298,662
Multan	...	5,603	305,371
Muzaffargarh	215,552
Total	324,306	627,715	2,362,860

Source : "Agricultural Statistics of the Punjab".

The table above shows that affected acreage has increased at a rapid speed. From 324,306 acres in 1931 it rose to 627,715 acres in 1941-42 and to 2,362,860 acres in 1951-52. During the decade ending 1941-42, the annual average rate of increase in the affected area was 30,341 acres while the decade ending 1951-52 registered the highest annual increase, *i.e.*, 173,514 acres. During the six years ending 1956-57, the annual rate of increase decreased to 23,167 acres in the former Punjab only.

The sub-soil water-level in the canal irrigated area of the former Punjab had risen to within 0 to 5 feet of the ground surface under 0.27 million acres and to within 5 to 10 feet under 3.42 million acres.¹ Such a widespread damage resulted from seepage from the beds and sides of unlined canals in the regions they traverse.

Jaranwala Tehsil of Lyallpur District was well known for its fertile soils and high crop yields but the damage caused by salinity has already risen to an average of 43 per cent. There are parts of it where the damage is as high as 90 per cent.²

The severity of the problem can be better gauged from the example³ of a particular tract where out of a total cultivable area of 145,907 acres, 43,349 acres were affected by salinity. After 4 years saline area increased to 65,831 acres. Thus, within a short span of four years salinity in this case rose from 29.7 per cent. to 45.1 per cent. It also resulted in additional 12,213 acres going out of cultivation. In the beginning, the area out of cultivation was 13 per cent. which rose to 21.4 per cent in just over four years. The annual rate of complete deterioration thus worked out to 2.1 per cent. per year. At this rate, no land would be available in this tract at the end of about 40 years if proper steps were not taken to arrest the progress of this menace.

At places where cultivators were rendered landless as a result of their cultivation units having become barren, arrangements were made by the Provincial Government to provide alternative land to them. For instance, the cultivators of various *Chaks* of Canal Colony areas of Lyallpur District were provided with land in the Thal area for cultivation.

2. Effects on Agricultural Production

In West Pakistan, the acreage under foodgrain crops did not show any appreciable increase during the last decade. But whatever increase took place in acreage it did not result in any rise on the production side due to reduction in the crop yielding capacity of the land. Waterlogging and salinity is one of the causes responsible for reducing yields of crops. According to a survey carried out in 1955-56 by the Land Reclamation Department out of

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- (1) Rising Water Table—Dawn, Karachi - Editorial.
 - (2) Reclamation of Land in West Pakistan, by S.A. Majid.
 - (3) Pamphlet on Chuharkana Reclamation Project, 1956, p. 2.

9.5 million acres of canal irrigated area in the former Punjab 14.0 per cent. had gone out of cultivation, 17.2 per cent. yielded no more than 55 per cent. of normal crop, while 14.4 per cent. accounted for yields varying from 55 to 85 per cent. of normal productivity. It was disclosed that it was only 20.4 per cent. of land which was in sound condition yielding above 85 per cent. of normal crop. Similar surveys, though very necessary for ascertaining up-to-date position in this respect, have not been carried out in other areas of West Pakistan although Lower Sind Valley is also seriously affected by this menace.

It has been estimated that about 50,000 acres of land is going out of cultivation annually in West Pakistan. As foodgrain crops account for 78.3 per cent. (which is a ten-year average) of the total cropped area, it comes to this that roughly about 39,150 acres of land under food crops and 10,850 acres of land under other crops is being destroyed by salinity and waterlogging every year. In terms of actual quantities at the calculated rate of 9.3 maunds per acre (10-year average yield per acre of foodgrain crops) nearly 13,003 tons of foodgrains are being lost to the province every year. Now in order to find out how many persons could be fed on this quantity of foodgrains lost in this way every year, we calculate the food requirements at the rate of 8 *chattaks* of cereals per adult per day (or about 365 lbs. per annum per adult) as recommended by the nutrition experts. According to this rate, the estimated quantity of foodgrains lost *i.e.*, 13,003 tons would be enough for 81,794 adult male units for one full year. Then by converting these adult male units into actual population (at the rate of 80 adult male units being equal to 100 population) we get the figure of 102,242 human souls. This means that the menace of waterlogging and salinity is responsible for destroying every year as much land as would be enough to meet the cereal requirements of a population of 102,242 for full one year. Similarly considerable quantities of non-food items which could have been grown in the remaining acreage *i.e.*, 10,850 acres destroyed annually are likewise lost to the province every year.

To meet the recurring annual food deficit, Pakistan had to import huge quantities of foodgrains from abroad. From 1952 to 1957 foodgrain imports amounted to about 3 million tons. During the year 1956 alone, import of foodgrains valued Rs 800 million.

3. Effects on Immovable Property

The damaging effects of salinity have penetrated as far as the immovable properties both in the rural and urban areas, adjoining the lands already affected by the menace. The resistance of the *kacha* mud houses to seepage being weak, these are susceptible to destruction much more quickly than *pucca* houses. There were reports of houses, built in days of prosperity brought by the introduction of canal irrigation system, undermined by salts which have eaten into the very foundations of buildings. So much so that the plaster in such buildings crumble at the slightest touch. At various places roads were reported to have become bumpy, floors of houses were sinking while dampness was creeping up the walls. This phenomenon was not confined to any

particular area ; the entire Indus Basin was afflicted with salinity, causing extensive damage to rural and urban properties.

The damage to lands and buildings or the fear of their being damaged in future by the creeping salinity and waterlogging brings about depreciation of the value of property in affected areas. When attempts are made to get rid of such properties their market value invariably registers further fall. This hits the affected families very hard.

4. Effects on Living and Nutritional Standards

The general living standard of the bulk of our people engaged in different agricultural pursuits is already very low. As waterlogging and salinity eat into the productivity of the land under cultivation, forcing it eventually out of production, there is a further fall in the living standard of the peasant families concerned.

Human body needs a certain minimum of vitamins and minerals essential for its development and maintenance. The Food and Agriculture Organisation of the United Nations recommended a minimum per capita consumption standard of 2,300 calories daily from various food items for maintaining sound health for the people of South Asia and the Far East. But in Pakistan the average per capita food supply in 1955-56 was calculated to provide 1,980 calories per head only.¹ Even in India, the per capita consumption is higher than that of Pakistan by 50 calories per day. With the declining per acre yield due partly to the menace of salinity, per capita acreage, production, income and food supply tends to show a further fall.

Waterlogging and salinity also create certain health problems for the people of the affected areas. In rural areas, water supplies for household use are usually obtained from wells whose water becomes affected with certain chemical salts being in the vicinity of the sub-soil surface of the water-table in the affected areas. The continuous use of this salty water causes stomach disorders. Various other diseases also cause a good deal of human misery in the affected areas. Livestock which are one of the most valuable possessions of cultivators are also found to be suffering from one disease or the other having its origin in waterlogging and salinity.

5. Effects on Government Expenditure

In the Rs. 2,600 million Six-Year Development Programme (1951-57) of Pakistan, Rs. 820 or 32 per cent. were earmarked for agriculture, out of which Rs. 123 million were allocated for anti-waterlogging measures.²

(1) "Diets Not Adequate in Most of Asia" by Robert E. Marx—Foreign Agriculture, U S.A., June 1958, No. 6, page 3.

(2) Progress of Economic Development in Pakistan, page 18, para 68.

The Provincial Government has also to incur large expenditure on the maintenance of and reclamation work done by the Land Reclamation Department as shown by the table below :

Table 6
**Government Expenditure on Land Reclamation Department,
West Pakistan**

Year	Expenditure (Rupees)
1947-48	204,676
1948-49	458,998
1949-50	444,328
1950-51	1,376,316
1951-52	1,268,134
1952-53	1,390,998
1953-54	1,564,983
1954-55	1,807,306
1955-56	1,546,671
1956-57	1,571,578
1957-58	1,587,926
Total	13,221,914

Source.—Land Reclamation Department, West Pakistan, Lahore.

The table above shows that since the Independence, the Provincial Government has spent Rs. 13·22 million out of which Rs. 10·95 million were spent on the maintenance of staff and Rs. 2·27 million on the reclamation operations.

Similarly, the following table shows expenditure incurred by the Government on the maintenance of Soil Reclamation Board, excluding expenditure on various Reclamation Projects.

Table 7
Budgets of the Soil Reclamation Board

Year	Amounts (Rupees)
1953-54	50,000
1954-55	70,000
1955-56	158,000
1956-57	182,000
1957-58	62,500
1958-59	125,000

Source.— Soil Reclamation Board, Lahore.

The estimated cost of the four Reclamation Projects already under exception amounted to Rs. 7.50 million. The cost of five Reclamation Schemes included in the development plan for the current financial year is estimated at Rs. 10.85 million. The cost of the eleven Reclamation Schemes under preparation is being worked out by the Soil Reclamation Board.

As the major portion of Pakistan's revenue comes from agriculture, any factor adversely affecting it, also tends to affect adversely the state of Government finances. As more and more of good cultivable land goes out of production due to this menace, the internal revenue sources of the Government also suffer a set-back.

6. Effects on Economic Development

Waterlogging and salinity is one of the factors responsible for the difficult food position in the country. The cumulative impact of recurrent food shortage on economic development of the country has tended to retard this process. In the first place, it led to a rise in food prices followed by a rise in general price level of the country. This discourages consumption and ultimately reduces production. Besides, high prices of foodstuffs cut into the capacity of the middle and lower middle classes to save, thus reducing investment in economic development projects. On the other hand, increased expenditure on imports of foodgrains meant reduced foreign exchange available for imports of capital goods and commercial merchandise leading to a fall in the volume of general activity in the country.

Role of the Government

The Punjab Government took notice of salinity and waterlogging in 1908 when R.B. Baij Nath, an Executive Engineer, was deputed for the

investigation of the area waterlogged by the Upper Bari Doab Canal. Experiments were performed, in this connection, on a small minor near Amritsar city. Around 1913 another Engineer, Capt. Ashfield, suggested drawing out of sub-soil water by means of tube-wells. As a result, Government sanctioned fifty seven tube-wells for Amritsar waterlogged area. After seven tube-wells had been sunk and kept in continuous use for more than a year, Mian Iqbal Hussain, I.S.E., was asked to report on their working and the effects on the sub-soil water. Waterlogging conditions of Upper Bari Doab Canal were again studied in 1918 by the engineers of the Irrigation Department. When Upper Jhelum Canal was constructed, the entire length of the canal was seriously waterlogged within two years of its opening and the menace spread at the rate of one mile per year.¹ Besides other measures taken to combat the menace, many surface seepage drains were opened about 2,000 feet apart. An Irrigation Research Laboratory, now known as Irrigation Research Institute, was also established in 1925. This menace was, however, systematically dealt with by the Directorate of Land Reclamation when established in the former Punjab.

Waterlogging Board. A waterlogging Board was also constituted by the Provincial Government to hold regular meetings and to review progress made in the direction of eradicating this menace. Regular reports were presented by (i) the Chief Engineer (Irrigation Works), (ii) the Director, Irrigation Research; (iii) the Waterlogging Assistant to the Financial Commissioner; (iv) the Superintending Engineer (Drainage Circle); (v) the Chief of Revenue Department; and (vi) the Director, Land Reclamation. The last 35th meeting of the Board before the Partition of the country was held on 24th January 1947 while the first meeting after the Independence was held on 15th February 1949.

Land Reclamation Directorate. This Directorate was established with four sections, namely, (i) Chemical Section (ii) Soil Research Section; (iii) Land Reclamation Section and (iv) Canal Section. Five Experimental-cum-Demonstration Farms, namely, (1) Bhallewala Farm; (2) Chakkanwali Farm; (3) Haveli Farm; (4) Moharanwala Farm; (5) Jagattan Farm and three Thal Experimental Farms, namely, (1) Kundian Farm; (2) Bhakkar Farm; and (3) Leiah Farm were also established by the Directorate to ascertain the effects of reclamation on soils of different types which had deteriorated to varying degrees under different meteorological conditions and forms of irrigation.²

The efforts of this Directorate resulted in the annual reclamation of about 20,000 acres of affected land in the former Punjab. But as the area going out of cultivation turned out to be invariably larger than the area reclaimed by the Directorate, a high powered statutory body known as Soil Reclamation Board was also set up by the Government in 1952, to tackle this problem.

Soil Reclamation Board. This Board was established under the Punjab Soil Reclamation Act of 1952. Representatives of the Departments of

(1) "Waterlogging—a Self Created Menace" by Mian Iqbal Hussain, I.S.E. (Rtd.)

(2) Annual Report — Land Reclamation Directorate, 1948—49.

Irrigation, Agriculture, Forests, Revenue and Cooperation were taken on the Board. The Board's line of action was to formulate and execute big reclamation projects over compact blocks by.

(i) providing permanent additional water supply from tube-wells and pooling it with the canal supply ;

(ii) providing adequate drainage by open drains or tile drains and by tubewells;

(iii) giving to the cultivator a scientific cropping pattern based on the results of soil capability surveys and most suited to the type of soil so as to maintain desirable moisture equilibrium;

(iv) conducting soil and water research on experimental-cum-demonstration farms and other suitable sites; and

(v) establishing extension service to serve as a bridge between the specialist and the cultivator who is not in a position to assimilate and put into operation highly technical research bulletins.

In order to establish effective and economic techniques of combating waterlogging and salinity, surveys and investigations were started on a large scale in co-operation with the International Co-operation Administration in the former Punjab areas.

Several low head falls on the canals were being utilized by the Provincial Government to generate hydro-electric power to operate primarily a net work of tube wells to pump out water and keep the level of sub-soil water low in the areas affected by waterlogging and salinity. Four such hydel projects namely, (i) the Chichoki Mallian Scheme ; (ii) the Gujranwala Scheme ; (iii) the Shadiwal Scheme ; and (iv) the Khanki Scheme were expected to be completed soon.

Ground Water Development Organization.—This Organisation was set up in this province as a result of an agreement between the Governments of Pakistan and U.S.A. on 17th May, 1954 to undertake an investigation of the ground-water resources of the former Punjab areas of West Pakistan with considerations of related land use problems, for use in the planning of further irrigation, drainage and land reclamation. These investigations would lead to a determination of the most economic and expeditious measures required for the control of groundwater levels in waterlogged and saline areas, prevention of an extension of the menace to unaffected land and development of additional sources of water.

Water and Power Development Authority.—A special Act, namely The West Pakistan Water and Power Development Authority Act, 1958, was passed by the Provincial Government to provide for the unified and co-ordinated development of water and power resources of this province. As a result, this Authority was set-up recently under the Chairmanship of Mr. Ghulam Farooq, the former Chairman of the Pakistan Industrial Development Corporation. WAPDA has also been authorised to frame schemes for "the prevention of waterlogging and reclamation of waterlogged and salted

A high-level food conference¹ was convened in Lahore on 13th December, 1958, under the Presidentship of General Mohammad Ayub Khan where it was decided that WAPDA should be entrusted with the task of combating waterlogging and salinity through the installation of a minimum of 1,800 tube-wells in a period of three years. It was estimated that the installation of these tube-wells would help reclaim 0.9 million acres of affected land and check further deterioration of another 1.6 million affected acres.

Area Reclaimed.

Information regarding the progress of work on reclamation of affected area since 1939 is tabulated below :

Table 8
Progress of Reclamation Operations in the Former Punjab
(Figures in Acres)

Year	Area Reclaimed during the Year	Progressive Total
1939-45 *	62,921	62,921
1945-46	23,086	86,007
1946-47	28,913	114,920
1947-48	29,336	144,256
1948-49	24,165	168,421
1949-50	17,110	185,531
1950-51	22,190	207,721
1951-52	17,399	225,120
1952-53	12,907	238,027
1953-54	26,810	264,837
1954-55	26,240	291,077
1955-56	36,782	327,859
1956-57	19,921	347,780
1957-58	25,973	373,753
Total	373,753	...

The table above shows that in a little less than two decades only 0.37 million acres could be reclaimed which is a poor progress. The annual average area reclaimed since 1939 comes to 18,686 acres. while since Independence the annual average comes to 23,530 acres. It means that the reclamation operations every year cover less than one-half of the area that gets affected and there is no guarantee that the area once reclaimed will not get affected again due to faulty cultivation, crop removal methods, etc.

In this connection, Mr. K. A. Ghafoor, I. S. E., Chief Engineer Punjab Irrigation (Rtd.) described¹ the situation in 1949 as follows: "Thur reclamation was started in 1938. The method decided upon.....is washing down salts to lower depth.....This process requires a cusec of water for reclamation of 45 acres.....Area reclaimed has steadily been increasing from year to year but even at this rate it would take about 70 years to reclaim area already *thur*-affected. The annual increase in the *thur* area is about 0.3 of the present *thur*-affected area. Thus in another 70 years there will be further increase of about 500,000 acres..... On the other hand, the present reclamation is also not permanent. In 70 years half of the area already *thur*-affected and reclaimed might have again started showing *thur*. Thus at the end of 70 years we might have again to deal with 1.6 millions acres.....Thus the present rate of reclamation is thoroughly unsatisfactory."

Experience has shown that success in reclamation achieved can be considered as permanent only for a period of 3, 5, 8 or at the most 10 years depending upon the water-table depth and other factors. At the existing speed it will take about 80 years to reclaim the existing waterlogged areas. In the meantime another 4 million acres would be thrown out of cultivation by accumulation of salts in the upper layers of the soil if the present annual rate of 50,000 acres going out of cultivation is not checked.

Reclamation Projects.

To reclaim the area on a large scale the Provincial Government sanctioned the following four reclamation projects, comprising an area of about 115,000 acres, to be undertaken by the Soil Reclamation Board. Work on these projects has already been taken up with the assistance of foreign experts.

(1) Quoted by Main Afzal Hussain (Article on Waterlogging and Salinity).

Table 9
Reclamation Projects Under Execution

Sr. No.	Name of the Reclamation Project	Gross Area	Tube-Wells under Installation	Estimated Cost
		Acres	Number	Rupees
1.	Chuharkana R.S. (Sheikhupura Distt.)	10,000	24	3,500,000
2.	Pindi Bhattian R.S. (Gujranwala Distt.)	8,000	21	200,000
3.	Jaranwala R.S. (Lyallpur Distt.)	90,000	143	3,500,000
4.	Chichoki Mallian R.S. (Sheikhupura Distt.)	7,000	N.A.	300,000
	Total ...	115,000	188	7,500,000

The following five projects have already been prepared by the Board and are included in the development plan for the current financial year 1958-59.

Table 10
Reclamation Projects Prepared by the Board

Sr. No.	Name of the Reclamation Project	Gross Area	Tube-wells to be Installed	Estimated Cost
		Acres	Number	Rupees
1.	2-L Dhaya (Montgomery Distt.)	22,000	24	400,000
2.	Shahbore (Montgomery Distt.)	8,000	12	250,000
3.	Shahkot (Sheikhupura & Lyallpur Distts.)	250,000	245	5,700,000
4.	Khanqah Dogran (Gujranwala Distt.)	122,000	233	2,600,000
5.	Muzaffargarh (Muzaffargarh Distt.)	90,000	90	1,900,000
	Total ...	492,000	604	10,850,000

Relevant data for the following eleven reclamation schemes are collected from the revenue and irrigation records for the formulation of projects. Investigations regarding the soil and water qualities of those needing relief are in progress.

Table No 11
Reclamation Schemes Under Preparation

Sr. No.	Name of Reclamation Scheme	Area (Acres)	No. of wells & Installations
1.	Maggowal R. S.	31,000	45
2.	Renala R. S.	88,000	135
3.	Mona R. S.	230,000	400
4.	Zafarwal R. S.	200,000	300
5.	Hafizabad R. S.	60,000	80
6.	Shadman R. S.	35,000	60
7.	Sangla Hill R. S.	110,000	160
8.	Beranwala R. S.	85,000	125
9.	Thatta R. S.	22,000	60
10.	Haresh Sheikh R. S.	100,000	150
11.	Lalian R. S.	300,000	560
Total		1,261,000	1,875

Conclusion

Waterlogging and salinity are now nearly half a century old and the rate at which these are claiming good cultivable land year after year is alarming. It is disconcerting to find that this menace is taking a heavy toll of the cultivable land that is considered to be one of the most productive—the canal colony areas—in West Pakistan. It has been estimated that this menace is responsible for destroying every year as much land as would be enough to meet the cereal requirements of a population of 102,242 for full one year. If preventive and reclamation methods are not adopted on a scale compatible with the proportions of the problem, most of the cultivable land still in good condition would go barren in the next 50 years or so. And it does not require much imagination to appreciate the consequences of such a situation.

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