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**SCARP PLANNING,
OPERATION AND
MAINTENANCE**

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By

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Synopsis

The efforts made after Independence for eradication of Waterlogging and Salinity in the Canal Irrigated areas of Pakistan by way of Construction of Tubewells, Surface Drains, Pumping Stations, Disposal Channels, Tile Drains, Lining of Distributaries, Improvement of Water-courses, Remodelling/Rehabilitation of existing Surface Drains and the Scarp Operation and Maintenance problems have been outlined in this paper.

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At present about 100 MAF water is diverted annually at Canal Heads from the Indus River and its tributaries for providing Irrigation water to 33 Million acres arable land in the provinces of Punjab, Sind, N.W.F.P. and Baluchistan. Some of these are 60-100 years old. No provision was made then for drainage of the Agricultural lands side by side with the construction of the canals. Water logging was noticed adjacent to the main canals and branches after a few years of operation. The vast canal Irrigation system which developed in the Indus plains caused serious water logging and salinity problem. Prior to the introduction of the canal Irrigation system the ground water level depth below the surface in the Rechna and Chaj and Bari Doabs of the Punjab was about 70-100 ft. As a result of the canal Irrigation the ground water table started rising. In some areas water appeared on the surface. The water logged and salinity affected area increased over the years.

2. To tackle the problem of water logging and salinity some surface drainage projects were constructed before Independence and the Rasul tubewell scheme was initiated in 1947. Under the Rasul scheme 1257 Tubewells of 1.5 cs. capacity were installed along Lower Jhelum and Lower Chenab Canals and their branches during 1947-54 for checking water logging along the canals. These measures were not of much help. According to an estimate about 100,000 acres were going out of cultivation annually due to the twin menace of water logging and salinity which was badly affecting the Agricultural economy of the country and was a matter of great concern to the Government.

3. A water and Soil Investigation Organization was set up by the Punjab Irrigation Department in early fifties to study the water logging and salinity problem and to provide a scientific basis for the planning of Reclamation Projects. The organization was subsequently taken over by WAPDA in 1958. Geohydrological Investigations were carried out by this organization with the assistance of United State Agency for International Development (USAID), in Rechna, Chaj, Bari and Thal Doabs. Information and data on soil salinity, ground water depth and its behaviour and quality was compiled. On its establishment in 1958, WAPDA was assigned the task of combating the water logging and salinity problem. Salinity control and Reclamation Project-I (SCARP-I) was the first Project which was planned by WAPDA for reclaiming the water logged and salinity affected areas in Central Rechna Doab. Planning and preparation of the Project was done by WAPDA's foreign consultants and the project was executed by Harold.T.Smith an American Contractor in 1959-63. Financial assistance for the project was provided by USAID.

4. 2069 Tubewells of 2-5 cs. capacity were installed under SCARP-I to cover an area of 1.21 million acres. This project was followed by other SCARP Projects in the Punjab, Sind and N.W.F.P. Provinces. In addition to the construction of SCARP Tubewell Projects the existing surface drains were remodelled and improved and new surface drainage projects were constructed. Tile Drains were also constructed in Sind, and N.W.F.P. The appended Table-I shows the province wise details of Tubewells, surface Drains and Tile Drains constructed upto June, 1989.

5. The objective of the SCARP Projects were as follows :

- (i) To lower the water table in SCARP area by Tubewells for eliminating water logging and improving soil drainability.
- (ii) To supplement the canal water with Tubewell water and to increase the existing water allowance of 1 cs. per 350 acres to 1 cs. per 150 acres.
- (iii) To meet the crops consumptive use and leaching requirements of the soil with the additional water from Tubewells.
- (iv) To increase the annual cropping intensity to 150% of the cultureable areas.
- (v) to provide perennial water supply to non perennial areas and areas previously not supplied with canal water within the projects.
- (vi) To pump and dispose off the saline and hazardous ground water into drains for depressing the water table.

6. In the schemes it was planned that the Tubewells would deliver water into the existing canal water courses at the Chak outlet. The large capacity Tubewells i.e. 3-5 cs. would deliver Tubewell water to more than one canal outlet chak through link water courses. After a few years of the operation of the Tubewells the water table in the SCARP areas in the Punjab was sufficiently lowered and waterlogging disappeared. The appended tables 2,3 and 4 show the number of public tubewells installed and area covered in the SCARP projects in Punjab, Sind and N.W.F.P. Soil Salinity in these areas also improved. The cropping intensity increased to 115-120 percent but 150% intensity as envisaged in the projects was never achieved. However Agricultural production per acre considerably increased in the project areas. The comparison of the planned, pre-project and the 1981-82 yields of major crops in SCARP-I is given below :-

Yields/Acre in Maunds

Crop	Planned	Pre Project 1959-60	1981-82
Rice	25	10.05	22.55
Wheat	25	8.66	20.20
Cotton	12	5.15	6.53
Sugarcane	5000	263.50	447.80

Though cropping intensities and yields as per targets have not been achieved the SCARP Projects in general have been successful in controlling waterlogging and salinity.

7. The central Monitoring Organization of WAPDA which monitors the performance of SCARPs Tubewells have reported decline in the annual pumpage by the SCARP Tubewells in Punjab. The decrease is attributed to deterioration in the Tubewells discharge. 5-10% Tubewells remain out of order due to electrical and mechanical faults. Specific capacities have decreased due to encrustation of screens. It was envisaged that the Tubewells would last for 20 years. The life span of the Tubewells have actually been much less. Some of the Tubewells failed within 10 years of operation. Due to decline in the pumpage, trend in the water table rise has been observed in the recent years. In about 10% area waterlogging conditions have returned where water table is now at depth between 0-5 ft. In the past years 1700 damaged and deteriorated Tubewells were replaced by WAPDA in various SCARP Projects in Punjab and Sind Provinces. Funds for the replacement were provided by the Federal Government. Further replacement of such Tubewells have been stopped.

8. By 1980 about 10000 public tubewells were constructed in various scarp projects in Punjab, Sind and N.W.F.P.

After one year of operation by WAPDA the Operation & Maintenance of SCARP Tubewells was given under the control of Provincial Irrigation Departments. In Punjab 4 separate SCARP Circles were created for efficient operation of Tubewells. As stated earlier 5-10% of the tubewells remain out of order on account of mechanical and electrical faults. Repairs are not sometimes attended to promptly as the Tubewells are scattered over a wide area. Each Tubewell is under the Charge of a Tubewell Operator. The farmers usually complain about the absence of operators and failures of Tubewells at crucial times. Inadequate provisions of funds is said to be affecting efficient operation of the Tubewells. The operation and maintenance of Tubewells is a great burden on Government exchequer. The tubewell water is being supplied to farmers at highly subsidised rate. The operational cost of the tubewells in Punjab, during the year 1988-89 was Rs. 94-0 crores. Though abiana charged in scarps is at double the rate of non scarp areas the revenue accrued to Government for providing this service was hardly 1/6th of the cost.

9. As per revised policy of the Government it has been decided to stop replacement of the failed Tubewells in fresh water zone areas of the Punjab. A pilot Scarp Transition Project has been started in Khanqah Doran Scarp-I to transfer the Tubewells in the area to a farmer or group of farmers or replace the Tubewells by private Tubewells. This foreign aided project is estimated to cost Rs. 295.6 million & cover Gross area of 122000 acres. Apart from installation of private tubewells, the lining of small distributaries and minors and improvement of Water courses is included in the project. The high cost of maintenance of Scarps Tubewells and the problems faced in efficient operation of public Tubewells due to various reasons have prompted the Government to initiate privatisation of public tubewells. If the pilot

Scarp Transition project proved a success the Government may apply the Transition concept to the entire Scarp area of about 4.5 million acres in the Punjab.

10. Separate Drainage Circles were also set up in Punjab and Sind for Construction of surface drains and maintenance of main and tributary drains. It has been generally observed that surface drains specially the tributaries get choked up in a couple of years due to sloughing and weed growth. This situation develops if regular desilting and cleaning operations are not carried out. For maintenance of surface drains as per designed section, bed clearance by Excavators is required to be undertaken periodically. This aspect is said to be not receiving due attention on account of paucity of funds. For better upkeep and efficient drainage increased allocations for surface drains are necessary.

11. WAPDA had started the 21 years accelerated programme of waterlogging and salinity control in 1974-75. A number of Projects have since been completed and handed over to the Provincial Irrigation Departments for Operation and Maintenance. Under this programme WAPDA planned a four year Reclamation Plan 1986-90 incorporating new policies and strategies for tackling the problem. The total financial out-lay of the plan is Rs. 15 billion. The Reclamation Projects being executed under the plan are given below :-

PUNJAB

Sr. No.	<u>Name of Project</u>	<u>Work Involved</u>	<u>Progress upto June, 1989.</u>
(i)	SCARP-VI Panjnad Abbasia (Unit-II-V) CCA 1.27 M.A.	514 Drainage T/Wells 1079 Mcft Earthwork Drains/ Canals.	319 T/Wells Drilled. 176 T/Wells energized. 970 Mcft E/Work. 80% work Completed.
(ii)	AWL Scheme along TSMB Link CCA 90,000 acres.	76 T/Wells and 40 Mcft. E/Work Drains.	76 T/Wells completed. 36.9 Mcft E/Work. 90% work completed.
(iii)	SCARP Lower Rechna (Khairwala Unit) SCARP-V, CCA 96,000 Acres.	48 Drainage Tube- wells 124 miles of surface Drains.	48 Tubewells installed and energized 223 Mcft earth work completed.
(iv)	SCARP Fordhwa Sadiqia Unit-II CCA 154,000 acres.	30 Drainage Tube- Wells, 105 Miles Surface Drains.	30 T/Wells Drilled and energized 72 M cft E/work done.
(v)	SCARP Sukh Beas (CBDC) phase-I CCA 154,000 acres.	101 drainage T/Wells, 83 miles surface drains.	101 T/Wells drilled and energized 7.8 M cft earthwork done.

(vi)	SCARP lower Rechna Faisalabad CCA 160,000 acres.	Construction of 60 Miles new surface Drains Rehabilitation of 100 Miles Surface Drains and tile drains in over 75000 acres.	52 Mcft excavated from surface drains and tile drains in 31565 acres land. 32 structures on drains. 47% work completed.
(vii)	Gojra Khewra Phase-I	40 drainage Tubewells 30 miles of Surface Drains.	40 Tubewells completed 94% drain's work completed.
(viii)	Scarp Hadali Sub Unit (Khushab)	Construction of 80 miles of Surface Drains, 87 drainage Tubewells and 85 miles of distributaries.	104 Mcft E/work copleted. 42 structures constructed. 12 Tubewells drilled- Overall progress 44%.

SIND AND BALUCHISTAN

(i)	Left Bank Outfall Drain Stage-I(1.3 million acres)	Construction of 1328 km main branch & sub drains, re- modelling of existing outfall drains/canals. 2249 Drainage T/Wells Drainage pumps and installation of tile drains.	E/Work 360 Mcft Comple- ted against total of 1251 Mcft. 210 Tubewells completed.
(ii)	North Dadu Surface Drainage (0.514 million acres).	869 km main branch and sub drains. 4 pumping stations.	467 km surface drains 4 pumping stations completed.
(iii)	SCARP South Rohri (0.426 million acres.	Construction of 1215 T/Wells, improve- ment of 680 Water Courses.	1146 T/Wells drilled. 708 T/wells completed. 680 water courses improved.
(iv)	Ghotki Fresh Ground Water Project (0.441 million acres)	1050 T/Wells, improvement of 120 water courses.	577 T/Wells completed. & handed over to Irrigation Deptt. All T/wells drilled. Energization of T/Wells in progress.

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|------|--|-------------------------------|-------------------------------|--------|
| (v) | Kotri surface Drainage Project phase-I, Part-II (0.51 million acres). | Construction of 430 Km Drain. | 310 Km constructed. | Drains |
| (vi) | Hairdin Surface Drainage Project (87000 acres) Pat Feeder Canal area in Baluchistan. | 161 Km Drains. | 151 Km of Drains constructed. | Drains |

The left Bank out fall drain (LBOD) Project in Sind is a gigantic project which aims at the integrated development of Irrigation and drainage in 1.3 million acres (CCA) and provides for construction of an outfall for saline drainage effluent to the Arabian Sea. The project is expected to be completed in a period of about 8 years at a cost of Rs. 8.594 billion.

N.W.F.P.

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|-------|--|----------------------------|--|
| (i) | Mardan SCARP Remodeling of Surface Drains (200 miles). | 227.2 Mcft. | 74.5 Mcft. |
| (ii) | Mardan SCARP Tile Drains.
Unit-I
Unit-II | 24000 Acres
49000 Acres | 24000 acres Completed.
39395 acres completed. |
| (iii) | Chashma Command area Drainage Project. | 85 Mcft. | 54. Mcft. |
| (iv) | Bund Kurai Drainage System. | 11.5 Mcft. | 9.9 Mcft. |

12. New Scarp projects planned to be implemented by WAPDA under the Accelerated programme of Waterlogging and Salinity Control are listed hereunder :

Punjab

- | | |
|-----|---|
| (i) | Shorkot Kamalia South Zone (Multan and Toba Tek Singh). |
|-----|---|

- (ii) Scarp D.G. Khan
(Saline)
- (iii) Scarp Fordwah Eastern Sadiqia
Southern & Northern Units
- (iv) Khushab Sub-Unit

Sind

- (i) Tando Adam Tubewell Drainage Project
- (ii) Warah Surface Drainage Project.
- (iii) North Dadu Surface Drainage Project Phase-II.

N.W.F.P.

- (i) Swabi Scarp
- (ii) Bannu Scarp Phase-II
- (iii) Doab Daudzai Scarp
- (iv) Pehur Scarp
- (v) Kafur Deri Phase-II

The projects include construction of Drainage Tubewells, Surface Drains, Disposal Channels, Pumping Stations and remodelling/rehabilitation of existing drains. In some of the Projects tile drains will be constructed for sub surface drainage and lining of irrigation channels will be undertaken to check seepage losses.

References :

1. Ground Water Hydrology of the Punjab. WASID Bulletin-6. Greenman, Swarzenski and Benett.
2. Pakistan Engg. Congress Diamond Jubilee Special Publication, 1987.
3. WAPDA Annual Report, 1987 - 88.
4. WAPDA Monthly Report, June, 1989.
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TABLE-I
SCARPS
PROGRESS AT A GLANCE
(PROVINCE-WISE)
UPTO JUNE 1989

	C.C.A.(TUBEWELLS) (M.A)	SURFACE DRAINS (NOS)	TILE DRAINS (KMS)		
COMPLETED PROJECTS.					
PUNJAB	7.15	9426	2139	37565	Acres
SIND	2.94	2896	2730	976	K.Ms
NWFP	0.23	491	358	63395	Acres
BALUCHISTAN	0.09	--	161	--	
TOTAL	1041	12813	5388		

TABLE-2
COMPLETED SCARP PROJECTS
PUNJAB

Project	Gross Area Million OC.	T/Wells No.	Period	Installed Capacitycs.
1	2	3	4	5
SCRAP-I	1.21	2069	1959-63	6343
SCARP-II	1.61	2205	1963-73	10516
SCARP-III	1.07	1635	1966-73	7163
SCARP-IV	0.56	935	1967-73	4483
TOTAL	4.45	6844		285050

TABLE-3

**MISCELLANEOUS PROJECTS
PUNJAB**

Name of Scheme	Year of Commissioning	No. of T/Wells.	Area Covered (Lac Acres).
i. Shorkot Kamalia	1977	101	0.64
ii. Satiana Pilot.	1977	71	0.63
iii. Scarp-III Saline Zone	1976	61	0.92
iv. Fordwah Sadiqia (Phase-I Scarp-V)	1977	226	0.73
v. Panjnad Abbasia (Phase-I Scarp-VI)	1977	632	2.01
vi. Scarp-II Saline Zone	1977	821	5.53
vii. T-P Link Tubewells	1978	80	--
viii. C-J Link Tubewells	1971 & 1975	40	--
ix. R-Q Link Tubewells	1979	40	0.05
x. Q-B Link Tubewells	1979	45	0.56
xi. Shahpur Unit I & II	1980-81	258	0.83
TOTAL :		2375	11.90

TABLE-4

**SCARP PROJECTS TUBEWELLS
SIND**

PROJECT	T/WELLS INSTALLED (RO,S)	GROSS AREA BENEFITTED
SCARP-Khairpur	540	2.58 Million Acre.
SCARP-North Rohri	1392	In Khairpur, Sukkur, Nawab Shah,
SCARP-Sukkur Right Bank	500	Larkana Distt :
TOTAL	2432	

**SCARP PROJECTS TUBEWELLS
N.W.F.P.**

PROJECT	NO,S OF T/WELLS	GROSS AREA BENEFITTED
SCARP-Peshawar Peshawar City Kafur Dhert. Pabbi, Jae Sheikh	132	4,06000 Acres
SCARP-Bannu	176	
SCARP-Mardan	65	