

## CHAPTER II. RAWAL AND K-2 DAM RESERVOIR OPERATION STUDIES UNDER THE PROJECT

Reservoir operation study inclusive of Rawal Dam and K-2 Dams was made in the following two cases;

Plan I : Plan without Combination of Rawal Dam

Plan II : Plan with Combination of Rawal Dam

Subsequent deals with the descriptions of these two cases of alternative reservoir plans.

### 2.1. Reservoir Operation Study in Plan I

#### 2.1.1. Outline of Plan I

The runoff discharge of the Kurang River at the proposed K-2 site will be stored in the reservoir, when the spilled discharges at the Rawal Dam are observed, and the stored water will be released for the irrigation of 6,600 ha. Therefore, no influence to Rawal reservoir operation conducting as it is will be caused by the provision of K-2 Dam in the upstream of the Kurang River.

However, since an available water resources at the K-2 damsite could not be expected except the wet season, in which the Rawal Dam will release the surplus water through spillway, this plan is deemed to be inadequate from viewpoint of maximum utilization of the Kurang River water resources.

### 2.1.2. Calculation Methods and Procedures of Reservoir Operation Study

Calculation methods and procedures for reservoir operation of Rawal and K-2 Dams are described as follows;

#### Rawal Dam

$$\text{Inflow; } Q_3 = Q_2 + Q_6 - q_1$$

where;

- $Q_3$  : Rawal Dam inflow
- $Q_2$  : Inflow from K-2 downstream catchment area
- $Q_6$  : K-2 Dam released discharge to Kurang River
- $q_1$  : Diverted water for domestic water at Rawal Dam upstream

$$\text{Outflow; } Q_{or} = Q_4 + q_2$$

where;

- $Q_{or}$  : Outflow from Rawal Dam
- $Q_4$  : Spilled discharge from Rawal Dam
- $q_2$  : Released water for domestic water at Rawal Dam

$$\text{Water Balance; } Q_4 \text{ or } Q_{sr} = Q_{vr} + Q_3 - (Q_{or} + Q_{lr})$$

where;

- $Q_{sr}$  : Water shortage at Rawal Dam
- $Q_{vr}$  : Effective storage capacity of Rawal Dam
- $Q_{lr}$  : Water losses at Rawal Dam =  $Q_{sp} + Q_{ep}$
- $Q_{sp}$  : Reservoir seepage (2% of effective storage capacity)
- $Q_{ep}$  : Evaporation from water surface  
(Surface area x Pan-evaporation Rate x 0.7)

#### K-2 Dam

$$\text{Inflow; } Q_5 = Q_1, \text{ when } Q_4 = Q_{vr} + Q_3 - (Q_{or} + Q_{lr}) > 0$$

where;

- $Q_5$  : Inflow from K-2 catchment area

$$\text{Outflow; } Q_{ok} = Q_1 + Q_6 + Q_{sk}$$

where;

- $Q_{ok}$  : Outflow from K-2 Dam
- $Q_1$  : Irrigation water demand for 6,600 ha
- $Q_{sk}$  : Spilled discharge from K-2 Dam

Water Balance;  $Q_7$  or  $Q_{sk} = Q_{vk} + Q_5 - (Q_{ok} + Q_{lk})$

where;

$Q_7$  : Water shortage at K-2 Dam

$Q_{vk}$ : Effective storage capacity of K-2 Dam

$Q_{lk}$ : Water losses at K-2 Dam

Figure F-9 shows the flow diagram of reservoir operation.

### 2.1.3. Reservoir Operation Study of Plan I

Following nine cases of reservoir operation study for Rawal and K-2 Dams were made in Plan I.

K-2 Dam Size	Case Study		
	Present	Stage-I	Stage-II
Case A (29.4 MCM) <sup>1/</sup>	*	*	*
Case B (24.7 MCM)	*	*	*
Case C (20.5 MCM)	*	*	*

<sup>1/</sup>: Gross storage capacity

Irrigation demand: Case 3

Results of reservoir operation study in the above cases are indicated in Table F-7 to Table F-15, and they are summarized in Table F-6 and Figure F-6.

TABLE F-6. RESULT OF WATER BALANCE STUDY IN PLAN I  
(IRRIGATION DEMAND FROM K-2 DAM : CASE 3)

Item	Rawal Dam			K-2 Dam				
	Inflow <sup>1/</sup> Discharge (MCM)	Spilled <sup>1/</sup> Discharge (MCM)	Water <sup>2/</sup> Shortage (Times)	Inflow Discharge (MCM)	Covered by Dam (ha)	Irrigation Area Covered by Head Works (ha)	Spilled Discharge (MCM)	Water Shortage (Times)
Dam Size: Case A								
Present	80	46	0	62	4,900	800	26	4
Future								
Stage I	80	36	0	62	3,800	800	22	4
Stage II	80	28	0	62	3,200	800	17	4
Dam Size: Case B								
Present	84	50	0	62	3,800	800	30	4
Future								
Stage I	83	39	0	62	2,900	800	25	4
Stage II	84	31	0	62	2,300	800	21	3
Dam Size: Case C								
Present	88	54	0	62	2,800	800	34	4
Future								
Stage I	87	43	0	62	1,900	800	29	4
Stage II	87	34	0	62	1,500	800	24	2

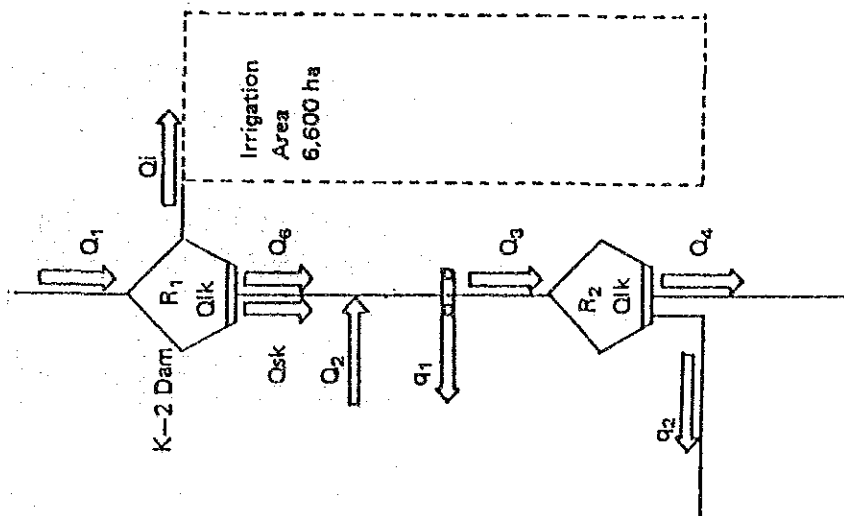
Note: 1/: Annual average discharge for 35 years (1952 - 1986)

2/: Occurrence time of water shortage during 35 years

3/: Irrigation area covered by three head works depending upon baseflow of the Kurang River and Gumreh Kas.

**FIGURE F-6. RESULT OF WATER BALANCE STUDY IN PLAN I  
(K-2 DAM SIZE: CASE A, IRRIGATION DEMAND : CASE 3)**

(unit: MCM)



	Case Study	
	Stage-I	Stage-II
<b>Present</b>		
$Q_1$ : Inflow (137.0 sq.km)	62.1 <sup>1/</sup>	62.1
$Q_{lk}$ : Reservoir Loss	2.9	2.9
$R_1$ : Rainfall in Reservoir	2.4	2.4
$Q_i$ : Irrigation Demand	18.2	11.7
$Q_6$ : Release for Rawal Dam	17.2	32.5
$Q_{sk}$ : Spillage	26.2	17.4
<b>Rawal Dam Operation</b>		
$Q_5 + Q_{sk}$ : Total Release	43.4	47.4
$Q_2$ : Runoff (138.1 sq.km)	40.9 <sup>1/</sup>	40.9
$q_1$ : H. W Release (Domestic)	4.2	8.5
$Q_3$ : Inflow	80.1	79.8
$Q_{lk}$ : Reservoir Loss	9.2	9.0
$R_2$ : Rainfall in Reservoir	7.3	7.3
$q_2$ : Right Canal	32.6	42.5
$Q_4$ : Spillage	45.6	35.6

<sup>1/</sup> : Total runoff at Rawal Dam is estimated at 103.0 MCM

TABLE F-7. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(PRESENT PLAN-1, K2-DAM SIZE: CASE-A, AREA: 4,900 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	52.51	23.97	0.00	26.17	20.45	16.59	12.69	29.28	0.00
1953	49.72	11.50	0.00	24.55	19.63	19.32	3.00	22.32	4.70
1954	73.09	37.15	0.00	48.09	20.19	18.57	25.47	44.04	0.00
1955	86.68	47.37	0.00	53.00	19.05	26.97	33.69	60.66	7.28
1956	90.54	53.52	0.00	62.28	22.23	19.41	38.83	58.24	0.00
1957	76.87	41.65	0.00	49.56	11.55	18.01	32.63	50.64	0.00
1958	69.52	33.26	0.00	47.73	24.21	18.81	22.25	41.06	0.00
1959	112.31	79.86	0.00	65.23	13.68	13.90	52.50	66.20	0.00
1960	40.06	8.82	0.00	22.59	22.26	19.04	4.25	23.29	0.00
1961	82.12	42.61	0.00	50.73	16.19	18.45	28.59	47.05	0.00
1962	49.17	13.38	0.00	14.73	16.95	21.94	0.00	21.94	0.00
1963	80.43	47.51	0.00	37.83	19.20	14.89	15.25	30.14	0.00
1964	90.92	59.77	0.00	49.78	22.39	13.94	33.63	47.58	0.00
1965	67.04	36.01	0.00	45.44	14.55	14.22	27.84	42.06	0.00
1966	61.37	21.70	0.00	33.43	18.04	18.73	13.35	32.08	0.00
1967	79.23	41.86	0.00	46.84	17.58	18.73	24.83	43.56	0.00
1968	84.27	50.29	0.00	40.39	17.14	13.07	22.82	35.88	0.00
1969	36.78	5.45	0.00	17.05	20.56	17.11	0.12	17.23	0.00
1970	98.78	63.99	0.00	54.18	21.19	14.37	30.48	44.85	0.00
1971	68.21	38.27	0.00	33.61	23.63	15.22	12.40	27.63	0.00
1972	47.26	7.55	0.00	13.21	14.53	26.42	4.74	31.16	0.00
1973	68.19	34.51	0.00	45.37	19.87	18.30	16.99	35.28	0.00
1974	39.87	4.46	0.00	12.12	21.33	20.60	0.00	20.60	0.00
1975	70.04	35.71	0.00	39.95	16.09	21.92	15.56	37.48	5.79
1976	169.66	136.09	0.00	98.00	16.62	14.89	80.99	95.88	0.00
1977	108.55	72.35	0.00	67.61	20.10	19.39	45.10	62.49	0.00
1978	127.79	96.65	0.00	75.86	18.05	13.48	57.78	71.26	0.00
1979	79.60	46.34	0.00	44.89	16.34	13.10	28.71	41.81	0.00
1980	72.95	38.80	0.00	43.49	13.89	16.65	30.44	47.09	0.00
1981	110.48	80.88	0.00	52.64	14.83	11.01	40.62	51.63	0.00
1982	108.20	72.25	0.00	51.34	12.31	14.93	33.35	48.28	0.00
1983	106.68	79.41	0.00	47.18	16.38	10.93	35.90	46.83	0.00
1984	76.50	42.05	0.00	45.53	22.80	14.94	22.82	37.76	0.00
1985	67.80	29.30	0.00	40.69	16.05	15.10	19.23	34.33	5.12
1986	99.49	63.85	0.00	70.39	17.59	19.42	51.81	71.23	0.00
MEAN	80.08	45.60	0.00	44.90	18.21	17.21	26.19	43.40	0.65

TABLE F-8. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(PRESENT PLAN-1, K2-DAM SIZE: CASE-B, AREA: 3,800 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	K-2 DAM ***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	55.50	26.96	0.00	26.17	15.86	16.59	15.68	32.27	0.00
1953	54.64	16.42	0.00	24.55	15.14	19.32	7.93	27.25	3.73
1954	78.00	42.07	0.00	48.09	15.66	18.57	30.39	48.95	0.00
1955	91.63	52.33	0.00	53.00	14.10	26.97	38.65	65.62	6.52
1956	95.55	58.53	0.00	62.28	17.24	19.41	43.84	63.25	0.00
1957	80.65	45.43	0.00	49.56	8.96	18.01	36.41	54.42	0.00
1958	75.04	38.78	0.00	47.73	18.77	18.81	27.77	46.58	0.00
1959	115.28	82.84	0.00	65.23	10.61	13.90	55.28	69.18	0.00
1960	43.99	12.75	0.00	22.59	17.26	19.04	8.18	27.22	0.00
1961	86.99	47.48	0.00	50.73	12.56	18.45	35.46	51.91	0.00
1962	49.50	13.71	0.00	14.73	13.14	21.94	0.33	22.26	0.00
1963	88.07	55.15	0.00	37.83	14.89	14.89	22.89	37.78	0.00
1964	94.88	63.73	0.00	49.78	17.36	13.94	37.60	51.54	0.00
1965	70.88	39.85	0.00	45.44	11.28	14.22	31.68	45.90	0.00
1966	65.72	26.04	0.00	33.43	13.99	18.73	17.69	36.43	0.00
1967	84.07	46.70	0.00	46.84	13.63	18.73	29.68	48.41	0.00
1968	88.20	54.21	0.00	40.39	13.29	13.07	26.74	39.81	0.00
1969	38.71	5.38	0.00	17.05	15.94	17.11	2.04	19.15	0.00
1970	105.84	71.05	0.00	54.18	16.43	14.37	37.54	51.91	0.00
1971	73.01	43.07	0.00	33.61	18.33	15.22	17.21	32.43	0.00
1972	49.01	9.30	0.00	13.21	11.27	26.42	6.49	32.91	0.00
1973	74.38	40.70	0.00	45.37	15.41	18.30	23.18	41.48	0.00
1974	39.87	4.46	0.00	12.12	16.54	20.60	0.00	20.60	0.00
1975	74.98	40.65	0.00	39.95	15.33	21.92	20.50	42.42	1.64
1976	173.56	139.99	0.00	98.00	12.89	14.89	84.89	99.78	0.00
1977	114.01	77.81	0.00	67.61	15.59	19.39	48.56	67.96	0.00
1978	131.95	100.81	0.00	75.86	14.00	13.48	61.93	75.41	0.00
1979	83.19	49.93	0.00	44.89	12.67	13.10	32.30	45.40	0.00
1980	75.78	41.63	0.00	43.49	10.77	16.65	33.27	49.92	0.00
1981	113.43	83.84	0.00	62.64	11.50	11.01	43.57	54.58	0.00
1982	112.34	76.39	0.00	51.34	9.55	17.49	37.49	52.42	0.00
1983	109.48	82.21	0.00	47.18	12.70	10.93	38.71	49.63	0.00
1984	81.57	47.11	0.00	45.53	17.69	14.94	27.89	42.83	0.00
1985	73.33	34.83	0.00	40.69	11.76	15.10	24.77	39.86	4.66
1986	103.52	67.87	0.00	70.39	13.64	19.42	55.83	75.25	0.00
MEAN	84.19	49.72	0.00	44.90	14.16	17.21	30.30	47.51	0.47

TABLE F-9. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(PRESENT PLAN-1, K2-DAM SIZE: CASE-C, AREA: 2,800 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	58.22	29.68	0.00	26.17	11.68	16.59	18.40	34.99	0.00
1953	59.06	20.84	0.00	24.55	11.06	19.32	12.34	31.66	2.85
1954	82.47	46.54	0.00	48.09	11.54	18.57	34.85	53.42	0.00
1955	96.07	56.76	0.00	53.00	9.76	26.97	43.08	70.05	5.28
1956	100.26	63.24	0.00	62.28	12.70	19.41	48.55	67.96	0.00
1957	83.95	48.73	0.00	49.56	6.60	18.01	39.70	57.71	0.00
1958	80.16	43.90	0.00	47.73	13.73	18.81	32.89	51.70	0.10
1959	117.99	85.55	0.00	65.23	7.82	13.90	57.98	71.89	0.00
1960	47.57	16.53	0.00	22.59	12.72	19.04	11.75	30.80	0.00
1961	91.42	51.90	0.00	50.73	9.25	18.45	37.89	56.34	0.00
1962	53.16	17.37	0.00	14.73	9.69	21.94	3.99	25.92	0.00
1963	92.05	59.13	0.00	37.83	10.97	14.89	26.87	41.77	0.00
1964	98.14	66.99	0.00	49.78	12.79	13.94	40.86	54.80	0.00
1965	74.37	43.34	0.00	45.44	8.31	14.22	35.17	49.39	0.00
1966	69.66	29.99	0.00	33.43	10.31	18.73	21.64	40.38	0.00
1967	88.48	51.11	0.00	46.84	10.05	18.73	34.09	52.82	0.00
1968	91.77	57.78	0.00	40.39	9.79	13.07	30.31	43.38	0.00
1969	42.45	9.12	0.00	17.05	11.75	17.11	5.78	22.89	0.00
1970	110.28	75.49	0.00	54.18	12.11	14.37	41.98	56.35	0.00
1971	77.38	47.44	0.00	33.61	13.50	15.22	21.58	36.80	0.00
1972	50.60	10.89	0.00	13.21	8.30	26.42	8.08	34.50	0.00
1973	80.01	46.33	0.00	45.37	11.36	18.30	28.81	47.11	0.00
1974	39.87	4.46	0.00	12.12	12.19	20.60	0.00	20.60	0.00
1975	81.45	47.12	0.00	39.95	12.50	21.92	26.97	48.89	0.00
1976	177.10	143.54	0.00	98.00	9.49	14.89	88.44	103.33	0.00
1977	118.98	82.78	0.00	67.61	11.49	19.39	53.53	72.92	0.00
1978	135.73	104.58	0.00	75.86	10.31	13.48	65.71	79.19	0.00
1979	86.45	53.19	0.00	44.89	9.34	13.10	35.56	48.66	0.00
1980	78.36	44.20	0.00	43.49	7.94	16.65	35.85	52.49	0.00
1981	116.11	86.52	0.00	52.64	8.47	11.01	46.25	57.27	0.00
1982	116.10	80.15	0.00	51.34	7.04	14.93	41.25	56.18	0.00
1983	112.03	84.76	0.00	47.18	9.36	10.93	41.25	52.18	0.00
1984	86.18	51.73	0.00	45.53	13.03	14.94	32.51	47.45	0.00
1985	78.28	39.78	0.00	40.69	7.99	15.10	29.72	44.82	4.11
1986	107.18	71.53	0.00	70.39	10.05	19.42	59.49	78.91	0.00
MEAN	87.98	53.51	0.00	44.90	10.43	17.21	34.09	51.30	0.35



TABLE F-10. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(STAGE-1, PLAN-1, K2-DAM SIZE: CASE-A, AREA: 3,800 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** RAWAL DAM ***** INFLOW	***** RAWAL DAM ***** SPILL	***** RAWAL DAM ***** SHORT	***** K-2 DAM ***** INFLOW	***** K-2 DAM ***** IRRI: DEMAND	***** K-2 DAM ***** TO RAWAL RELEASE	***** K-2 DAM ***** SPILL	***** K-2 DAM ***** TOTAL RELEASE	***** K-2 DAM ***** SHORT
1952	51.60	17.53	0.00	20.76	15.86	21.99	10.41	32.41	0.00
1953	52.50	4.07	0.00	14.91	16.61	28.95	0.00	28.95	2.25
1954	69.95	23.37	0.00	38.88	15.66	27.78	17.37	45.15	0.00
1955	83.42	34.29	0.00	48.23	17.98	31.74	29.40	61.15	2.44
1956	91.82	44.30	0.00	50.91	17.24	30.77	33.07	63.84	0.00
1957	75.55	28.49	0.00	39.08	8.96	28.48	25.14	53.63	0.00
1958	71.12	24.66	0.00	40.12	18.77	26.41	20.09	46.50	0.00
1959	110.90	70.07	0.00	61.14	10.61	18.00	51.11	69.10	0.00
1960	42.45	3.37	0.00	13.69	17.26	27.95	1.81	29.76	0.00
1961	80.84	29.89	0.00	41.75	12.56	27.44	22.64	50.07	0.00
1962	52.57	5.25	0.00	7.23	13.14	29.43	0.00	29.43	0.00
1963	77.70	36.54	0.00	31.57	14.89	21.16	10.34	31.50	0.00
1964	88.90	49.65	0.00	45.25	17.36	18.48	31.29	49.76	0.00
1965	66.51	26.87	0.00	35.15	11.28	24.51	21.32	45.82	0.00
1966	61.65	9.69	0.00	21.58	13.99	30.59	6.03	36.62	0.00
1967	79.41	29.96	0.00	39.32	13.63	26.25	21.81	48.05	0.00
1968	86.46	42.95	0.00	31.64	13.29	21.81	20.58	42.39	0.00
1969	42.00	0.36	0.00	7.56	15.94	26.60	0.00	26.60	0.00
1970	91.57	47.34	0.00	46.98	16.43	21.57	20.29	41.86	0.00
1971	68.67	30.56	0.00	26.86	18.33	21.97	10.40	32.38	0.00
1972	45.16	2.71	0.00	7.99	11.27	31.65	1.69	33.34	0.00
1973	69.65	18.58	0.00	31.02	15.41	32.65	8.40	41.06	0.00
1974	45.08	0.80	0.00	2.88	16.54	29.84	0.00	29.84	0.00
1975	72.04	27.09	0.00	28.70	5.44	33.17	10.59	43.75	11.53
1976	169.03	125.08	0.00	87.93	12.89	24.96	74.62	99.57	0.00
1977	109.50	62.34	0.00	57.94	15.59	29.06	38.69	67.76	0.00
1978	127.83	86.75	0.00	67.93	14.00	21.41	54.15	75.57	0.00
1979	78.99	38.03	0.00	38.34	12.67	19.66	25.86	45.52	0.00
1980	71.00	26.51	0.00	31.82	10.77	28.32	21.14	49.46	0.00
1981	109.08	70.01	0.00	49.08	11.50	14.57	39.98	54.55	0.00
1982	109.52	60.62	0.00	40.06	9.55	26.21	27.70	53.91	0.00
1983	103.54	68.44	0.00	42.62	12.70	15.49	32.51	48.00	0.00
1984	77.22	33.90	0.00	42.27	17.69	18.20	24.59	42.79	0.00
1985	64.80	12.86	0.00	29.31	15.62	26.48	8.66	35.13	0.80
1986	99.12	54.01	0.00	59.90	13.64	29.91	45.26	75.17	0.00
MEAN	79.92	35.63	0.00	36.58	14.14	25.53	21.91	47.44	0.49



TABLE F-12. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(STAGE-1, PLAN-1, K2-DAM SIZE: CASE-C, AREA: 1,900 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI DEMAND	***** TO RAWAL RELEASE	DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	56.69	22.62	0.00	20.76	7.93	21.99	15.51	37.50	0.00
1953	58.04	9.61	0.00	14.91	8.14	28.95	5.54	34.50	1.30
1954	82.17	35.60	0.00	38.88	7.83	27.78	29.59	57.37	0.00
1955	92.59	43.46	0.00	48.23	8.91	31.74	38.57	70.31	1.31
1956	100.48	52.96	0.00	50.91	8.62	30.77	41.73	72.50	0.00
1957	82.11	35.04	0.00	39.08	4.48	28.48	31.70	60.18	0.00
1958	80.67	34.21	0.00	40.12	9.39	26.41	29.64	56.05	0.00
1959	116.05	75.22	0.00	61.14	5.30	18.00	56.26	74.26	0.00
1960	46.89	7.81	0.00	13.69	8.63	27.95	6.25	34.20	0.00
1961	91.26	40.31	0.00	41.75	6.28	27.44	33.06	60.49	0.00
1962	53.59	6.07	0.00	7.23	6.57	29.43	0.82	30.25	0.00
1963	90.89	49.72	0.00	31.57	7.45	21.16	23.52	44.68	0.00
1964	95.86	56.61	0.00	45.25	8.68	18.48	38.25	56.73	0.00
1965	73.14	33.51	0.00	35.15	5.64	24.51	27.96	52.46	0.00
1966	68.96	17.00	0.00	21.58	6.99	30.59	13.33	43.92	0.00
1967	87.99	38.54	0.00	39.32	6.82	26.25	30.39	56.64	0.00
1968	92.02	48.51	0.00	31.64	6.65	21.81	26.13	47.95	0.00
1969	42.00	0.36	0.00	7.56	7.97	26.60	0.00	26.60	0.00
1970	108.21	63.98	0.00	46.98	8.22	21.57	36.92	58.50	0.00
1971	76.98	38.87	0.00	26.86	9.16	21.97	18.71	40.68	0.00
1972	48.19	5.74	0.00	7.99	5.64	31.65	4.72	36.37	0.00
1973	80.32	29.25	0.00	31.02	7.71	32.65	19.08	51.73	0.00
1974	45.08	0.80	0.00	2.88	8.27	29.84	0.00	29.84	0.00
1975	81.16	36.22	0.00	28.70	3.96	33.17	19.71	52.88	4.53
1976	175.86	131.91	0.00	87.93	6.44	24.96	81.45	106.40	0.00
1977	118.96	71.80	0.00	57.94	7.80	29.06	48.15	77.22	0.00
1978	134.82	93.74	0.00	67.93	7.00	21.41	61.14	82.56	0.00
1979	85.19	44.23	0.00	38.34	6.33	19.66	32.06	51.71	0.00
1980	76.12	31.63	0.00	31.82	5.39	28.32	26.26	54.57	0.00
1981	114.20	75.12	0.00	49.08	5.75	14.57	45.10	59.66	0.00
1982	115.68	66.77	0.00	40.06	4.77	26.21	33.86	60.07	0.00
1983	109.30	74.21	0.00	42.62	6.35	15.49	38.27	53.76	0.00
1984	86.04	42.71	0.00	42.27	8.84	18.20	33.41	51.61	0.00
1985	75.14	23.20	0.00	29.51	7.59	26.48	19.00	45.48	0.62
1986	106.09	60.98	0.00	59.90	6.82	29.91	52.23	82.13	0.00
MEAN	87.10	42.81	0.00	36.58	7.09	25.53	29.09	54.62	0.22

TABLE F-13. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(STAGE-2, PLAN-1, K2-DAM SIZE: CASE-A, AREA: 3,200 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	51.47	12.53	0.00	15.03	13.35	27.73	6.26	33.99	0.00
1953	57.22	0.00	0.00	8.61	15.89	35.26	0.00	35.26	0.00
1954	65.11	9.69	0.00	30.77	13.18	35.89	6.23	42.13	0.00
1955	82.59	25.25	0.00	39.33	17.20	40.64	21.26	61.91	0.00
1956	92.24	36.46	0.00	42.13	14.52	39.55	26.63	66.18	0.00
1957	75.62	18.35	0.00	29.17	7.55	38.40	17.25	55.65	0.00
1958	72.46	17.50	0.00	31.15	15.81	35.39	14.07	49.46	0.00
1959	110.53	62.47	0.00	58.02	8.93	21.12	49.57	70.69	0.00
1960	46.66	1.27	0.00	6.17	14.53	35.47	0.18	35.65	0.00
1961	77.76	17.78	0.00	33.07	10.57	36.12	12.79	48.91	0.00
1962	54.94	0.00	0.00	3.10	11.07	33.56	0.00	33.56	0.00
1963	77.87	28.16	0.00	24.91	11.31	27.82	5.47	33.29	1.23
1964	89.30	41.78	0.00	39.89	14.62	23.84	28.08	51.92	0.00
1965	66.73	19.62	0.00	27.05	9.50	32.61	15.27	47.88	0.00
1966	62.40	1.17	0.00	14.17	11.78	38.00	1.17	39.16	0.00
1967	79.90	19.94	0.00	28.29	11.48	37.29	13.16	50.45	0.00
1968	86.43	37.89	0.00	29.42	11.19	24.03	20.23	44.26	0.00
1969	47.84	0.00	0.00	0.00	13.42	34.16	0.00	34.16	0.00
1970	95.68	39.61	0.00	39.47	7.05	29.08	18.63	47.71	6.78
1971	68.89	23.73	0.00	22.02	15.43	26.81	7.66	34.47	0.00
1972	45.33	0.00	0.00	4.26	9.49	35.38	0.00	35.38	0.00
1973	72.27	7.51	0.00	20.91	11.20	42.75	2.87	45.63	1.78
1974	46.47	0.00	0.00	0.00	13.93	32.72	0.00	32.72	0.00
1975	70.89	11.98	0.00	17.46	4.72	44.41	0.00	44.41	9.57
1976	168.60	115.79	0.00	80.37	10.85	32.52	68.59	101.10	0.00
1977	110.49	54.18	0.00	51.83	13.13	35.18	35.52	70.69	0.00
1978	128.78	79.60	0.00	60.05	11.79	29.29	49.10	78.39	0.00
1979	78.34	30.99	0.00	32.50	10.67	25.49	21.52	46.81	0.00
1980	70.60	17.00	0.00	24.30	9.07	35.84	15.13	50.97	0.00
1981	108.69	61.66	0.00	43.13	9.68	20.52	35.59	56.11	0.00
1982	110.03	52.91	0.00	34.79	8.04	31.48	24.89	56.37	0.00
1983	102.89	59.41	0.00	40.77	10.69	17.34	31.96	49.30	0.00
1984	78.00	26.50	0.00	34.07	14.89	26.40	19.05	45.45	0.00
1985	66.85	3.90	0.00	16.96	13.83	38.83	0.00	38.83	0.00
1986	97.90	44.79	0.00	54.15	11.48	35.66	40.24	75.90	0.00
MEAN	80.51	27.98	0.00	29.64	11.77	32.47	17.38	49.85	0.55

TABLE F-14. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(STAGE-2, PLAN-1, K2-DAM SIZE: CASE-B, AREA: 2,300 HA, DEMAND: CASE-3)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	53.89	14.95	0.00	15.03	9.60	27.73	8.68	36.40	0.00
1953	57.22	0.00	0.00	8.61	11.42	35.26	0.00	35.26	0.00
1954	73.91	18.49	0.00	30.77	9.48	35.89	15.03	50.92	0.00
1955	87.36	30.02	0.00	39.33	12.36	40.64	26.03	66.68	0.00
1956	96.43	40.65	0.00	42.13	10.44	39.55	30.82	70.37	0.00
1957	78.73	21.47	0.00	29.17	5.42	38.40	20.37	58.76	0.00
1958	77.00	22.03	0.00	31.15	11.36	35.39	18.61	53.99	0.00
1959	112.98	64.92	0.00	58.02	6.42	21.12	52.02	73.14	0.00
1960	46.82	1.43	0.00	6.17	10.45	35.47	0.34	35.81	0.00
1961	84.59	24.61	0.00	33.07	7.60	36.12	19.62	55.74	0.00
1962	54.94	0.00	0.00	3.10	7.96	33.56	0.00	33.56	0.00
1963	83.01	33.30	0.00	24.91	9.01	27.82	10.61	38.43	0.00
1964	92.61	45.08	0.00	39.89	10.51	23.84	31.39	55.22	0.00
1965	69.88	22.77	0.00	27.05	6.83	32.61	18.42	51.03	0.00
1966	65.86	4.63	0.00	14.17	8.47	38.00	4.63	42.62	0.00
1967	83.97	24.01	0.00	28.29	8.25	37.29	17.24	54.53	0.00
1968	89.06	40.53	0.00	29.42	8.05	24.03	22.87	46.90	0.00
1969	47.84	0.00	0.00	39.47	9.65	34.16	0.00	34.16	0.00
1970	100.47	44.40	0.00	0.00	6.01	29.08	23.42	52.50	3.94
1971	72.95	27.79	0.00	22.02	11.09	26.81	11.72	38.53	0.00
1972	45.70	0.37	0.00	4.26	6.82	35.38	0.37	35.75	0.00
1973	77.02	12.26	0.00	20.91	8.69	42.75	7.62	50.37	0.64
1974	46.47	0.00	0.00	0.00	10.01	32.72	0.00	32.72	0.00
1975	75.12	16.20	0.00	17.46	3.59	44.41	4.23	48.64	6.68
1976	172.42	119.60	0.00	80.37	7.80	32.52	72.40	104.92	0.00
1977	114.97	58.66	0.00	51.83	9.44	35.18	40.00	75.18	0.00
1978	131.99	82.81	0.00	60.05	8.47	29.29	52.31	81.60	0.00
1979	81.39	34.05	0.00	32.50	7.67	25.49	24.37	49.86	0.00
1980	73.04	19.43	0.00	24.30	6.52	35.84	17.56	53.40	0.00
1981	111.13	64.09	0.00	43.13	6.96	20.52	38.02	58.54	0.00
1982	112.95	55.83	0.00	34.79	5.78	31.48	27.81	59.29	0.00
1983	105.65	62.15	0.00	40.77	7.69	17.34	34.70	52.04	0.00
1984	82.16	30.66	0.00	34.07	10.70	26.40	23.21	49.62	0.00
1985	71.06	8.11	0.00	16.96	9.94	38.83	4.20	43.03	0.00
1986	101.92	48.81	0.00	54.15	8.25	35.66	44.26	79.91	0.00
MEAN	83.78	31.26	0.00	29.64	8.53	32.47	20.65	53.13	0.32

TABLE F-15. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN I  
(STAGE-2, PLAN-1, K2-DAM SIZE: CASE-C, AREA: 1,500 HA, DEMAND: CASE-3)

YEAR	***** RAWAL DAM *****										***** K-2 DAM *****			*****	
	INFLOW	SPILL	SHORT	INFLOW	IRRI. DEMAND	TO RAWAL RELEASE	SPILL	TOTAL RELEASE	SHORT	*****	*****	*****	*****	*****	
1952	56.04	17.10	0.00	15.03	6.26	27.73	10.83	38.55	0.00	*****	*****	*****	*****	*****	
1953	57.22	0.00	0.00	8.61	7.45	35.26	0.00	35.26	0.00	*****	*****	*****	*****	*****	
1954	81.73	26.32	0.00	30.77	6.18	35.89	22.86	58.75	0.00	*****	*****	*****	*****	*****	
1955	91.60	34.26	0.00	39.33	8.06	40.64	30.28	70.92	0.00	*****	*****	*****	*****	*****	
1956	100.16	44.38	0.00	42.13	6.81	39.55	34.55	74.10	0.00	*****	*****	*****	*****	*****	
1957	81.50	24.24	0.00	29.17	3.54	38.40	23.14	61.53	0.00	*****	*****	*****	*****	*****	
1958	81.03	26.06	0.00	31.15	7.41	35.39	22.64	58.02	0.00	*****	*****	*****	*****	*****	
1959	115.16	67.10	0.00	58.02	4.19	21.12	54.20	75.31	0.00	*****	*****	*****	*****	*****	
1960	46.96	1.57	0.00	6.17	6.81	35.47	0.48	35.95	0.00	*****	*****	*****	*****	*****	
1961	90.68	30.70	0.00	33.07	4.96	36.12	25.71	61.83	0.00	*****	*****	*****	*****	*****	
1962	54.94	0.00	0.00	3.10	5.19	33.56	0.00	33.56	0.00	*****	*****	*****	*****	*****	
1963	88.91	39.20	0.00	24.91	5.88	27.82	16.51	44.33	0.00	*****	*****	*****	*****	*****	
1964	95.54	48.02	0.00	39.89	6.85	23.84	34.33	58.16	0.00	*****	*****	*****	*****	*****	
1965	72.68	25.57	0.00	27.05	4.45	32.61	21.22	53.83	0.00	*****	*****	*****	*****	*****	
1966	68.94	7.70	0.00	14.17	5.52	38.00	7.70	45.70	0.00	*****	*****	*****	*****	*****	
1967	87.59	27.64	0.00	28.29	5.38	37.29	20.86	58.15	0.00	*****	*****	*****	*****	*****	
1968	91.41	42.87	0.00	29.42	5.25	24.03	25.21	49.25	0.00	*****	*****	*****	*****	*****	
1969	47.84	0.00	0.00	0.00	6.29	34.16	0.00	34.16	0.00	*****	*****	*****	*****	*****	
1970	104.75	48.69	0.00	39.47	4.83	29.08	27.70	56.78	1.66	*****	*****	*****	*****	*****	
1971	76.56	31.40	0.00	22.02	7.23	26.81	15.33	42.15	0.00	*****	*****	*****	*****	*****	
1972	46.97	1.65	0.00	4.26	4.45	35.38	1.65	37.03	0.00	*****	*****	*****	*****	*****	
1973	81.26	16.50	0.00	20.91	5.68	42.75	11.86	54.61	0.40	*****	*****	*****	*****	*****	
1974	46.47	0.00	0.00	0.00	6.53	32.72	0.00	32.72	0.00	*****	*****	*****	*****	*****	
1975	79.42	20.50	0.00	17.46	2.54	44.41	8.52	52.93	4.15	*****	*****	*****	*****	*****	
1976	175.30	122.49	0.00	80.37	5.09	32.52	75.29	107.81	0.00	*****	*****	*****	*****	*****	
1977	118.97	62.66	0.00	51.83	6.15	35.18	44.00	79.17	0.00	*****	*****	*****	*****	*****	
1978	134.85	85.67	0.00	60.05	5.52	29.29	55.17	84.46	0.00	*****	*****	*****	*****	*****	
1979	84.10	36.76	0.00	32.50	5.00	25.49	27.08	52.57	0.00	*****	*****	*****	*****	*****	
1980	75.20	21.59	0.00	24.30	4.25	35.84	19.73	55.57	0.00	*****	*****	*****	*****	*****	
1981	113.29	66.25	0.00	43.13	4.54	20.52	40.18	60.71	0.00	*****	*****	*****	*****	*****	
1982	115.55	58.43	0.00	34.79	3.77	31.48	30.41	61.89	0.00	*****	*****	*****	*****	*****	
1983	108.06	64.58	0.00	40.77	5.01	17.34	37.13	54.47	0.00	*****	*****	*****	*****	*****	
1984	85.88	34.37	0.00	34.07	6.98	26.40	26.93	53.33	0.00	*****	*****	*****	*****	*****	
1985	75.12	12.17	0.00	16.96	6.48	38.83	8.26	47.09	0.00	*****	*****	*****	*****	*****	
1986	105.18	52.07	0.00	54.15	5.38	35.66	47.51	83.17	0.00	*****	*****	*****	*****	*****	
MEAN	86.77	34.24	0.00	29.64	5.60	32.47	23.64	56.11	0.18	*****	*****	*****	*****	*****	

(UNIT : MCM)

FIGURE F-7. STAGE-STORAGE CAPACITY CURVE OF RAWAL DAM

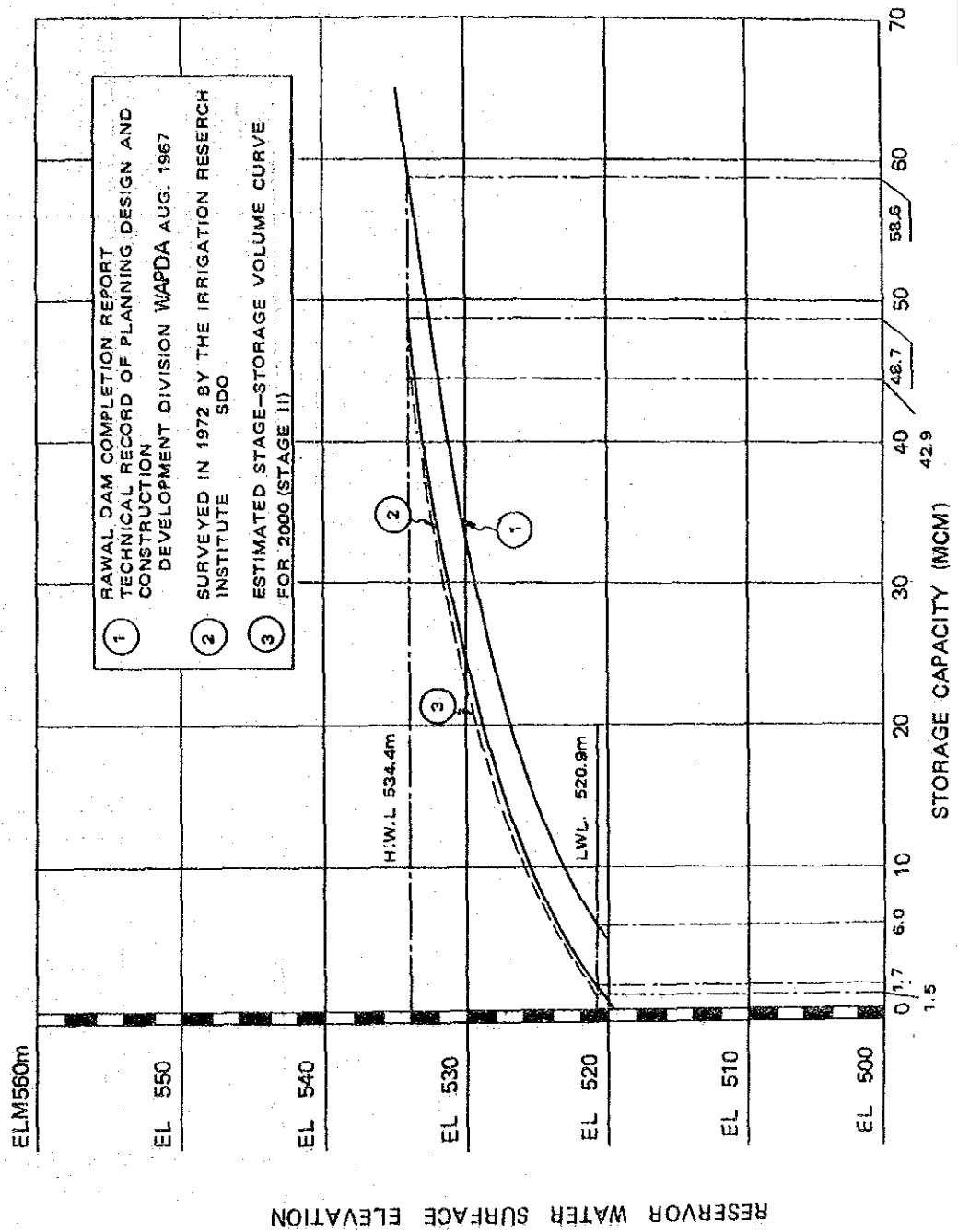
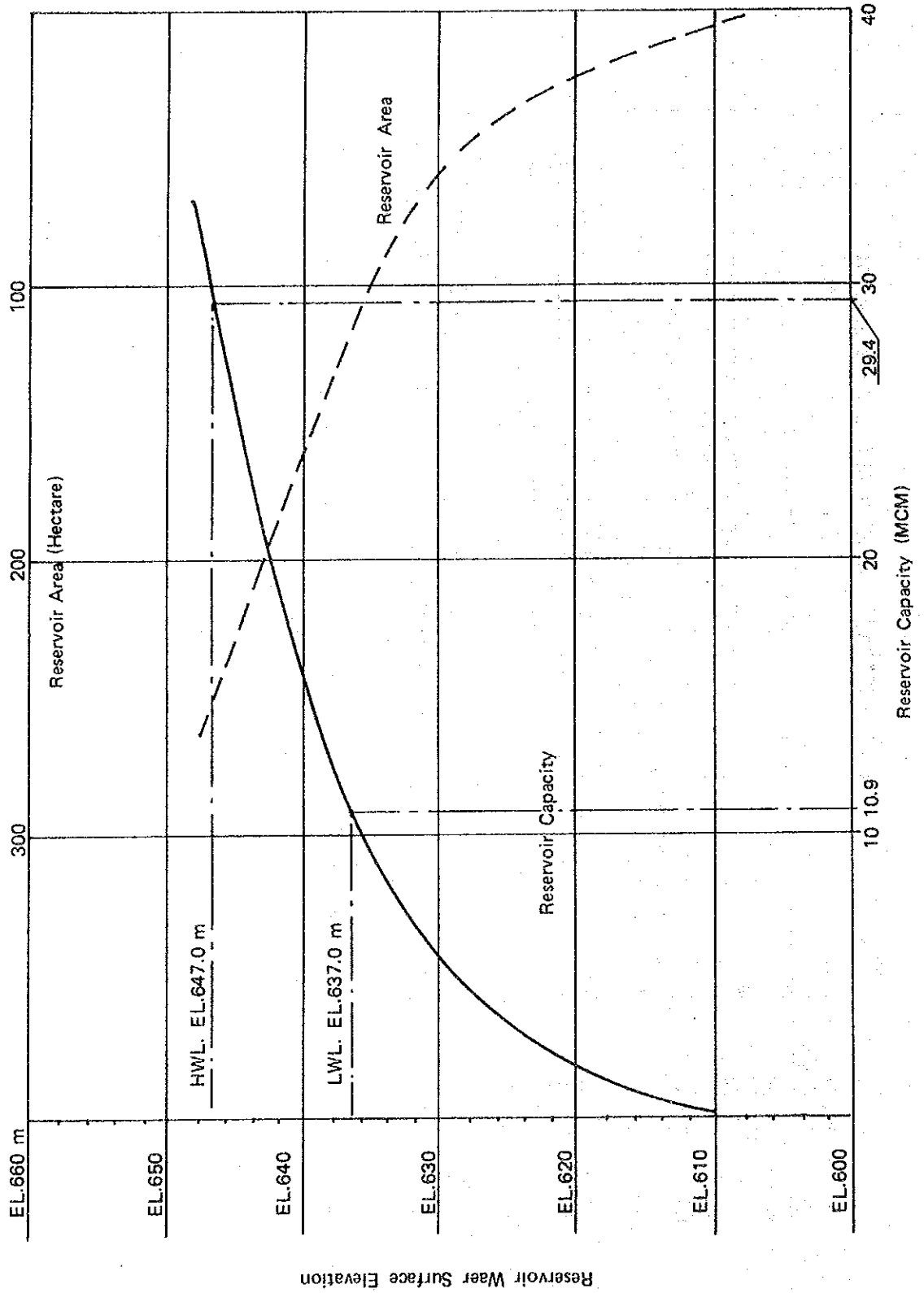


FIGURE F-8. STAGE-STORAGE VOLUME AND AREA CURVE OF K-2 DAM







## 2.2. Reservoir Operation Study in Plan II

### 2.2.1. Outline of Plan II

Combined reservoir operation of the Rawal Dam and K-2 Dam will be made taking into account the most effective utilization of the runoff discharges of the Kurang River, for the purpose of irrigation for the area of 6,600 ha. In this plan, runoff discharges of the Kurang River at K-2 site will be stored in the K-2 reservoir as much as possible, and required water demand of the Rawal Dam will be supplied in accordance with the runoff discharges from the Rawal Dam's catchment area of the Kurang River located on downstream of the K-2 Dam. If the amounts of said runoff discharges are not sufficient to meet the demand, the stored water in the K-2 Dam will be supplemented to the Rawal Dam.

### 2.2.2. Calculation Methods and Procedures of Reservoir Operation Study

Calculation methods and procedures for reservoir operation of Rawal and K-2 Dam are described as follows;

#### Rawal Dam

$$\text{Inflow; } Q_3 = Q_2 + Q_6 - q_1$$

where;

- $Q_3$  : Rawal Dam inflow
- $Q_2$  : Inflow from K-2 downstream catchment area
- $Q_6$  : K-2 Dam released discharge to Kurang River
- $q_1$  : Diverted water for domestic water at Rawal Dam upstream

$$\text{Outflow; } Q_{or} = Q_{sr} + q_2$$

where;

- $Q_{or}$  : Outflow from Rawal Dam
- $Q_{sr}$  : Water shortage at Rawal Dam
- $q_2$  : Released water for domestic water at Rawal Dam

Water Balance;  $Q_4$  or  $Q_{sr} = Q_{vr} + Q_3 - (Q_{or} + Q_{lr})$   
 where;  $Q_4$  : Spilled discharge from Rawal Dam  
 $Q_{sr}$ : Water shortage at Rawal Dam  
 $Q_{vr}$ : Effective storage capacity of Rawal Dam  
 $Q_{lr}$ : Water losses at Rawal Dam  
 $= Q_{sp} + Q_{ep}$   
 $Q_{sp}$ : Reservoir seepage (2% of effective storage capacity)  
 $Q_{ep}$ : Evaporation from water surface  
 (Surface area x Pan-evaporation Rate x 0.7)

K-2 Dam

Inflow;  $Q_5 = Q_1$   
 where;  $Q_5$  : Inflow from K-2 catchment area

Outflow;  $Q_{ok} = Q_i + Q_6 + Q_{sk}$   
 where;  $Q_{ok}$ : Outflow from K-2 Dam  
 $Q_i$  : Irrigation water demand for 6,600 ha  
 $Q_{sk}$ : Spilled Discharge from K-2 Dam

Water Balance;  $Q_7$  or  $Q_{sk} = Q_{vk} + Q_5 - (Q_{sr} + Q_{ok} + Q_{lk})$   
 where;  $Q_7$  : Water shortage at K-2 Dam  
 $Q_{sk}$ : Spilled discharge from K-2 Dam  
 $Q_{vk}$ : Effective storage capacity of K-2 Dam  
 $Q_{lk}$ : Water losses at K-2 Dam

Figure F-9 shows the flow diagram of reservoir operation in case of Plan II.

2.2.3. Reservoir Operation Study of Plan II

Following 27 cases of reservoir operation study for Rawal and K-2 Dams were made in Plan II.

K-2 Dam Size	Irrigation Demand Case 1			Irrigation Demand Case 2			Irrigation Demand Case 3		
	Present	Stage-I	Stage-II	Present	Stage-I	Stage-II	Present	Stage-I	Stage-II
Case A (29.4 MCM)	*	*	*	*	*	*	*	*	*
Case B (24.7 MCM)	*	*	*	*	*	*	*	*	*
Case C (20.5 MCM)	*	*	*	*	*	*	*	*	*

Results of reservoir operation study in the above cases are indicated in Table F-17 to Table F-45, and they are summarized in Table F-16, Table F-26 and Table F-36, and Figure F-10, Figure F-11 and Figure F-12.

TABLE F-16. RESULT OF WATER BALANCE STUDY IN PLAN II  
(IRRIGATION DEMAND FROM K-2 DAM : CASE 1)

Item	Rawal Dam				K-2 Dam			
	Inflow Discharge (MCM)	Spilled Discharge (MCM)	Water Shortage (Times)	Inflow Discharge (MCM)	Covered by Dam (ha)	Covered by Head Works (ha)	Spilled Discharge (MCM)	Water Shortage (Times)
Dam Size: Case A								
Present	68	33	0	62	6,600	-	31	4
Future								
Stage I	68	24	0	62	5,600	800	35	3
Stage II	77	25	0	62	3,400	800	45	0
Dam Size: Case B								
Present	75	40	0	62	5,100	800	38	4
Future								
Stage I	71	27	0	62	5,100	800	38	4
Stage II	79	27	0	62	3,000	800	47	0
Dam Size: Case C								
Present	81	47	0	62	3,700	800	44	4
Future								
Stage I	78	33	0	62	3,700	800	44	4
Stage II	81	29	0	62	2,600	800	49	0

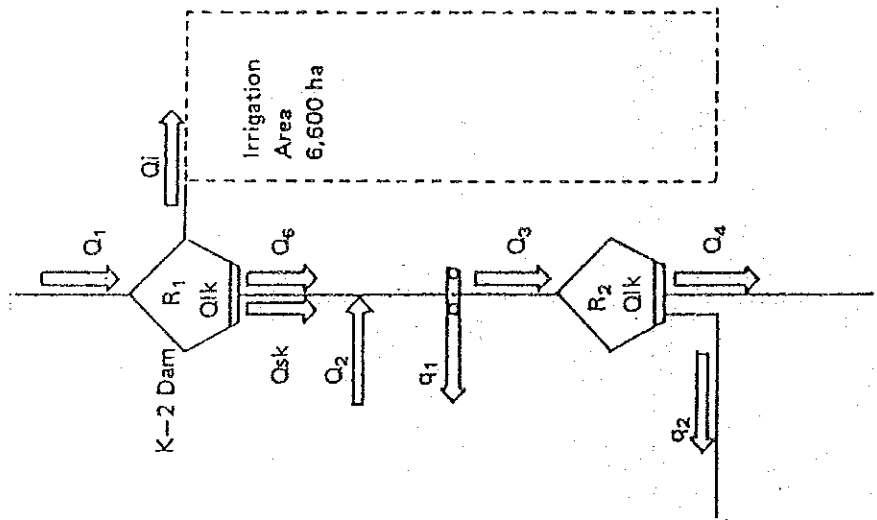
Note: 1/: Annual average discharge for 35 years (1952 - 1986)

2/: Occurrence time of water shortage during 35 years

3/: Irrigation area covered by three head works depending upon baseflow of the Kurang River and Gumreh Kas.

FIGURE F-10. RESULT OF WATER BALANCE STUDY IN PLAN II  
(K-2 DAM SIZE: CASE A, IRRIGATION DEMAND: CASE 1)

(unit: MCM)



	Case Study	
	Stage-I	Stage-II
<u>K-2 Dam Operation</u>		
$Q_1$ : Inflow (137.0 sq.km)	62.1 1/	62.1
$Q_{lk}$ : Reservoir Loss	3.0	3.0
$R_1$ : Rainfall in Reservoir	2.4	2.4
$Q_i$ : Irrigation Demand	30.5	26.3
$Q_6$ : Release for Rawal Dam	0.0	0.3
$Q_{sk}$ : Spillage	31.0	34.9
<u>Rawal Dam Operation</u>		
$Q_6 + Q_{sk}$ : Total Release	31.0	35.2
$Q_2$ : Runoff (138.1 sq.km)	40.8 1/	40.9
$q_1$ : H. W Release (Domestic)	4.1	7.8
$Q_3$ : Inflow	67.8	68.3
$Q_{lk}$ : Reservoir Loss	9.1	9.0
$R_2$ : Rainfall in Reservoir	7.3	7.3
$q_2$ : Right Canal	32.6	42.5
$Q_4$ : Spillage	33.4	24.1

1/ : Total runoff at Rawal Dam is estimated at 103.0 MCM

TABLE F-17. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 6,600 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	40.81	15.30	0.00	42.75	34.03	0.00	17.39	17.39	0.00
1953	33.25	0.00	0.00	43.87	34.45	0.00	5.53	5.53	5.29
1954	59.04	17.83	0.00	66.66	34.45	0.00	29.97	29.97	0.00
1955	75.00	37.48	0.00	79.97	28.69	0.00	48.59	48.59	13.07
1956	75.77	40.11	0.00	81.68	35.89	0.00	43.46	43.46	0.00
1957	69.34	29.05	0.00	67.57	21.32	0.00	43.10	43.10	0.00
1958	59.48	23.06	0.00	66.53	34.75	0.00	30.78	30.78	5.05
1959	101.05	70.28	0.00	79.13	24.08	0.00	54.93	54.93	0.00
1960	27.49	3.25	0.00	41.64	37.14	0.00	10.62	10.62	0.00
1961	69.28	23.05	0.00	69.18	27.28	0.00	6.83	6.83	0.00
1962	34.22	0.00	0.00	36.66	28.72	0.00	21.28	21.28	0.00
1963	71.77	37.96	0.00	52.73	31.28	0.00	34.05	34.05	0.00
1964	77.42	48.13	0.00	63.73	36.17	0.00	31.07	31.07	0.00
1965	56.05	24.91	0.00	59.66	25.96	0.00	19.62	19.62	0.00
1966	48.94	7.69	0.00	52.16	30.10	0.00	31.66	31.66	0.00
1967	67.33	27.84	0.00	65.57	29.63	0.00	22.48	22.48	0.00
1968	70.88	39.07	0.00	53.45	30.55	0.00	1.97	1.97	0.00
1969	21.58	0.00	0.00	34.16	34.25	0.00	32.60	32.60	0.00
1970	86.59	40.37	0.00	68.55	34.78	0.00	16.14	16.14	0.00
1971	56.73	27.02	0.00	48.83	36.41	0.00	7.34	7.34	0.00
1972	23.45	3.63	0.00	39.64	26.37	0.00	33.81	33.81	0.00
1973	66.72	14.40	0.00	63.67	31.56	0.00	2.32	2.32	0.00
1974	21.86	0.00	0.00	32.72	34.58	0.00	23.74	23.74	0.00
1975	56.39	8.88	0.00	61.87	35.28	0.00	83.38	83.38	0.00
1976	157.16	123.38	0.00	112.89	28.87	0.00	49.58	49.58	0.00
1977	95.63	59.58	0.00	87.01	31.16	0.00	61.38	61.38	0.00
1978	117.99	85.27	0.00	89.34	29.54	0.00	26.81	26.81	0.00
1979	64.60	34.84	0.00	57.99	28.87	0.00	37.60	37.60	0.00
1980	63.46	27.62	0.00	60.14	25.23	0.00	43.73	43.73	0.00
1981	102.58	71.78	0.00	63.65	24.76	0.00	35.64	35.64	0.00
1982	95.57	58.91	0.00	66.26	23.38	0.00	38.44	38.44	0.00
1983	98.29	70.93	0.00	58.11	26.35	0.00	22.86	22.86	0.00
1984	61.59	29.46	0.00	60.47	36.27	0.00	22.93	22.93	7.79
1985	56.67	15.08	0.00	55.79	26.90	0.00	59.66	59.66	0.00
1986	87.93	52.44	0.00	89.80	29.07	0.00			
MEAN	67.77	33.39	0.00	62.11	30.52	0.00	31.01	31.01	0.89

TABLE F-18. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 5,100 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	45.87	20.29	0.00	42.75	26.30	0.00	22.45	22.45	0.00
1953	40.21	2.17	0.00	43.87	28.34	0.00	12.49	12.49	2.37
1954	67.17	30.63	0.00	66.66	26.62	0.00	38.10	38.10	0.00
1955	80.81	43.28	0.00	79.97	22.89	0.00	54.40	54.40	9.38
1956	84.29	48.22	0.00	81.68	27.73	0.00	51.99	51.99	0.00
1957	75.60	35.74	0.00	67.57	16.47	0.00	49.37	49.37	0.00
1958	66.35	29.97	0.00	66.53	27.89	0.00	37.65	37.65	2.87
1959	106.61	75.47	0.00	79.13	18.61	0.00	60.49	60.49	0.00
1960	33.96	3.62	0.00	41.64	28.70	0.00	17.09	17.09	0.00
1961	77.43	36.99	0.00	69.18	21.08	0.00	42.35	42.35	0.00
1962	40.97	5.13	0.00	36.66	22.19	0.00	13.58	13.58	0.00
1963	78.95	46.37	0.00	52.73	24.17	0.00	28.46	28.46	0.00
1964	83.37	54.85	0.00	63.73	27.95	0.00	40.01	40.01	0.00
1965	62.38	31.31	0.00	59.66	20.06	0.00	37.40	37.40	0.00
1966	56.58	15.25	0.00	52.16	23.26	0.00	27.26	27.26	0.00
1967	75.38	35.93	0.00	65.57	22.89	0.00	39.72	39.72	0.00
1968	77.90	44.64	0.00	53.45	23.61	0.00	29.49	29.49	0.00
1969	28.48	0.31	0.00	34.16	26.45	0.00	8.87	8.87	0.00
1970	94.59	56.17	0.00	68.55	26.88	0.00	40.60	40.60	0.00
1971	64.11	34.44	0.00	48.83	28.14	0.00	23.52	23.52	0.00
1972	29.72	6.29	0.00	39.64	20.37	0.00	13.61	13.61	0.00
1973	74.09	25.20	0.00	63.67	24.39	0.00	41.19	41.19	0.00
1974	24.18	0.00	0.00	32.72	26.72	0.00	4.64	4.64	0.00
1975	69.35	24.03	0.00	61.87	27.26	0.00	36.69	36.69	0.00
1976	164.08	130.23	0.00	112.89	22.31	0.00	90.31	90.31	0.00
1977	104.31	68.01	0.00	87.01	24.08	0.00	58.25	58.25	0.00
1978	124.42	92.00	0.00	89.34	22.83	0.00	67.81	67.81	0.00
1979	71.66	40.98	0.00	57.99	22.31	0.00	33.87	33.87	0.00
1980	68.14	33.21	0.00	60.14	19.50	0.00	42.28	42.28	0.00
1981	107.65	76.84	0.00	63.65	19.13	0.00	48.80	48.80	0.00
1982	102.81	65.63	0.00	66.26	18.06	0.00	42.89	42.89	0.00
1983	102.93	76.19	0.00	58.11	20.36	0.00	43.08	43.08	0.00
1984	69.71	37.40	0.00	60.47	28.03	0.00	30.97	30.97	0.00
1985	63.22	21.78	0.00	55.79	22.12	0.00	29.48	29.48	4.68
1986	94.62	59.10	0.00	89.80	22.47	0.00	66.35	66.35	0.00
MEAN	74.62	40.22	0.00	62.11	23.72	0.00	37.87	37.87	0.55



TABLE F-19. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-C, AREA: 3,700 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	50.77	25.00	0.00	42.75	19.08	0.00	27.36	27.36	0.00
1953	47.84	9.64	0.00	43.87	21.40	0.00	20.12	20.12	0.88
1954	74.76	38.43	0.00	66.66	19.31	0.00	45.69	45.69	0.00
1955	86.05	48.51	0.00	79.97	17.66	0.00	59.64	59.64	5.75
1956	92.55	55.79	0.00	81.65	20.12	0.00	60.24	60.24	0.00
1957	81.14	41.99	0.00	67.57	11.95	0.00	54.91	54.91	0.00
1958	73.80	37.45	0.00	66.53	20.45	0.00	45.10	45.10	1.86
1959	111.79	80.32	0.00	79.13	13.50	0.00	65.68	65.68	0.00
1960	40.01	9.71	0.00	41.64	20.82	0.00	23.14	23.14	0.00
1961	85.05	44.48	0.00	69.18	15.29	0.00	49.97	49.97	0.00
1962	47.25	10.76	0.00	36.66	16.10	0.00	19.86	19.86	0.00
1963	85.66	53.29	0.00	52.73	17.53	0.00	35.16	35.16	0.00
1964	88.97	61.12	0.00	63.73	20.28	0.00	45.61	45.61	0.00
1965	68.26	37.28	0.00	59.66	14.56	0.00	43.28	43.28	0.00
1966	63.74	22.33	0.00	52.16	16.87	0.00	34.43	34.43	0.00
1967	82.86	43.48	0.00	63.57	16.61	0.00	47.20	47.20	0.00
1968	84.44	50.48	0.00	53.45	17.13	0.00	36.04	36.04	0.00
1969	34.99	2.74	0.00	34.16	19.19	0.00	15.38	15.38	0.00
1970	102.05	68.25	0.00	68.55	19.50	0.00	48.06	48.06	0.00
1971	70.94	41.36	0.00	48.83	20.41	0.00	30.35	30.35	0.00
1972	37.09	8.77	0.00	39.64	14.78	0.00	20.98	20.98	0.00
1973	79.48	35.31	0.00	63.67	17.69	0.00	46.57	46.57	0.00
1974	30.85	0.00	0.00	32.72	19.39	0.00	11.32	11.32	0.00
1975	77.06	38.19	0.00	61.87	19.78	0.00	44.40	44.40	0.00
1976	170.58	136.60	0.00	112.89	16.19	0.00	96.81	96.81	0.00
1977	112.58	75.88	0.00	87.01	17.47	0.00	66.53	66.53	0.00
1978	130.22	98.37	0.00	89.34	16.56	0.00	73.62	73.62	0.00
1979	78.38	46.77	0.00	57.99	16.18	0.00	40.60	40.60	0.00
1980	72.31	38.26	0.00	60.14	14.15	0.00	46.44	46.44	0.00
1981	112.45	81.55	0.00	63.65	13.88	0.00	53.61	53.61	0.00
1982	109.52	72.50	0.00	66.26	13.11	0.00	49.60	49.60	0.00
1983	107.23	80.50	0.00	58.11	14.77	0.00	47.38	47.38	0.00
1984	77.28	44.83	0.00	60.47	20.34	0.00	38.55	38.55	0.00
1985	70.66	29.36	0.00	55.79	16.39	0.00	36.92	36.92	3.06
1986	100.86	65.32	0.00	89.80	16.30	0.00	72.60	72.60	0.00
MEAN	81.13	46.70	0.00	62.11	17.28	0.00	44.38	44.38	0.33

TABLE F-20. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-1, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 5,600 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	RAWAL DAM INFLOW	RAWAL DAM SPILL	SHORT	INFLOW	IRRI. DEMAND	TO RAWAL RELEASE	K-2 DAM SPILL	TOTAL RELEASE	SHORT
1952	40.98	9.96	0.00	42.75	28.87	0.00	20.72	20.72	0.00
1953	31.49	0.00	0.00	43.87	33.72	0.00	6.72	6.72	0.00
1954	60.76	0.00	0.00	66.66	29.23	0.00	35.32	35.32	0.00
1955	73.02	23.07	0.00	79.97	27.93	0.00	49.32	49.32	7.51
1956	77.61	31.68	0.00	81.68	30.45	0.00	49.08	49.08	0.00
1957	69.50	16.99	0.00	67.57	18.09	0.00	47.21	47.21	0.00
1958	57.82	11.25	0.00	66.53	33.16	0.00	32.20	32.20	0.61
1959	100.65	61.26	0.00	79.13	20.43	0.00	58.58	58.58	0.00
1960	28.61	1.09	0.00	41.64	31.51	0.00	14.88	14.88	0.00
1961	70.80	9.85	0.00	69.18	23.14	0.00	39.55	39.55	0.00
1962	35.41	0.00	0.00	36.66	24.37	0.00	11.27	11.27	0.00
1963	73.12	21.39	0.00	52.73	26.54	0.00	26.00	26.00	0.00
1964	77.63	39.00	0.00	63.73	30.69	0.00	37.97	37.97	0.00
1965	56.45	16.27	0.00	59.66	22.03	0.00	35.25	35.25	0.00
1966	50.59	0.00	0.00	52.16	25.54	0.00	24.62	24.62	0.00
1967	69.00	15.08	0.00	65.57	25.14	0.00	36.98	36.98	0.00
1968	71.82	33.93	0.00	53.45	25.92	0.00	27.09	27.09	0.00
1969	22.63	0.00	0.00	34.16	29.04	0.00	6.49	6.49	0.00
1970	88.37	22.80	0.00	68.55	29.51	0.00	37.87	37.87	0.00
1971	57.80	19.50	0.00	48.83	30.90	0.00	21.03	21.03	0.00
1972	23.79	0.00	0.00	39.64	22.37	0.00	10.90	10.90	0.00
1973	68.20	0.00	0.00	63.67	26.78	0.00	39.21	39.21	0.00
1974	20.65	0.00	0.00	32.72	29.34	0.00	3.85	3.85	0.00
1975	60.87	0.00	0.00	61.87	29.93	8.35	23.91	32.26	0.00
1976	157.53	106.27	0.00	112.89	24.50	0.00	87.92	87.92	0.00
1977	97.29	50.11	0.00	87.01	26.44	0.00	55.22	55.22	0.00
1978	118.81	77.34	0.00	89.34	25.07	0.00	65.71	65.71	0.00
1979	65.02	26.79	0.00	57.99	24.49	0.00	31.37	31.37	0.00
1980	62.61	16.13	0.00	60.14	21.41	0.00	40.74	40.74	0.00
1981	101.66	61.50	0.00	63.65	21.01	0.00	47.05	47.05	0.00
1982	96.04	49.72	0.00	66.26	19.84	0.00	40.40	40.40	0.00
1983	97.10	58.97	0.00	58.11	22.36	0.00	41.48	41.48	0.00
1984	63.07	21.87	0.00	60.47	30.78	0.00	28.21	28.21	0.00
1985	54.65	0.00	0.00	55.79	26.84	0.00	23.98	23.98	2.59
1986	88.19	42.75	0.00	89.80	24.67	0.00	64.06	64.06	0.00
MEAN	68.27	24.13	0.00	62.11	26.34	0.24	34.92	35.16	0.31

TABLE F-21. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-1, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 5,100 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	42.71	11.66	0.00	42.75	26.30	0.00	22.45	22.45	0.00
1953	37.26	0.00	0.00	43.87	28.34	0.00	12.49	12.49	2.37
1954	63.53	5.38	0.00	66.66	26.62	0.00	38.10	38.10	0.00
1955	78.11	31.05	0.00	79.97	22.89	0.00	54.40	54.40	9.38
1956	80.52	34.52	0.00	81.68	27.73	0.00	51.99	51.99	0.00
1957	71.66	19.29	0.00	67.57	16.47	0.00	49.37	49.37	0.00
1958	63.27	16.71	0.00	66.53	27.89	0.00	37.65	37.65	2.87
1959	102.57	63.05	0.00	79.13	18.61	0.00	60.49	60.49	0.00
1960	30.82	1.22	0.00	41.64	28.70	0.00	17.09	17.09	0.00
1961	73.60	14.58	0.00	69.18	21.08	0.00	42.35	42.35	0.00
1962	37.72	0.00	0.00	36.66	22.19	0.00	13.58	13.58	0.00
1963	75.58	25.90	0.00	52.73	24.17	0.00	28.46	28.46	0.00
1964	79.68	41.30	0.00	63.73	27.95	0.00	40.01	40.01	0.00
1965	58.60	18.46	0.00	59.66	20.06	0.00	37.40	37.40	0.00
1966	53.22	0.56	0.00	52.16	23.26	0.00	27.26	27.26	0.00
1967	71.74	19.84	0.00	65.57	22.89	0.00	39.72	39.72	0.00
1968	74.22	35.83	0.00	53.45	23.61	0.00	29.49	29.49	0.00
1969	25.01	0.00	0.00	34.16	26.45	0.00	8.87	8.87	0.00
1970	91.09	28.20	0.00	68.55	26.88	0.00	40.60	40.60	0.00
1971	60.30	22.12	0.00	48.83	28.14	0.00	23.52	23.52	0.00
1972	26.50	0.00	0.00	39.64	20.37	0.00	13.61	13.61	0.00
1973	70.18	4.52	0.00	63.67	24.39	0.00	41.19	41.19	0.00
1974	21.44	0.00	0.00	32.72	26.72	0.00	4.64	4.64	0.00
1975	65.64	0.00	0.00	61.87	27.26	4.17	32.53	36.70	0.00
1976	159.92	114.12	0.00	112.89	22.31	0.00	90.31	90.31	0.00
1977	100.32	52.98	0.00	87.01	24.08	0.00	58.25	58.25	0.00
1978	120.91	79.52	0.00	89.34	22.83	0.00	67.81	67.81	0.00
1979	67.52	29.01	0.00	57.99	22.31	0.00	33.87	33.87	0.00
1980	64.15	18.06	0.00	60.14	19.50	0.00	42.28	42.28	0.00
1981	103.41	63.25	0.00	63.65	19.13	0.00	48.80	48.80	0.00
1982	98.53	51.85	0.00	66.26	18.06	0.00	42.89	42.89	0.00
1983	98.70	60.92	0.00	58.11	20.36	0.00	43.08	43.08	0.00
1984	65.84	24.61	0.00	60.47	28.03	0.00	30.97	30.97	0.00
1985	60.14	5.25	0.00	55.79	22.12	0.00	29.48	29.48	4.68
1986	90.49	45.32	0.00	89.80	22.47	0.00	66.35	66.35	0.00
MEAN	71.00	26.83	0.00	62.11	23.72	0.12	37.75	37.87	0.55

TABLE F-22. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-1, PLAN-2, K2-DAM SIZE: CASE-C, AREA: 3,700 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	47.62	16.28	0.00	42.75	19.08	0.00	27.36	27.36	0.00
1953	44.89	0.00	0.00	43.87	21.40	0.00	20.12	20.12	0.88
1954	71.12	20.65	0.00	66.66	19.31	0.00	45.69	45.69	0.00
1955	83.35	36.14	0.00	79.97	17.66	0.00	59.64	59.64	5.75
1956	88.78	42.21	0.00	81.68	20.12	0.00	60.24	60.24	0.00
1957	77.14	25.47	0.00	67.57	11.95	0.00	54.91	54.91	0.00
1958	70.72	24.19	0.00	66.53	20.45	0.00	45.10	45.10	1.86
1959	107.63	67.77	0.00	79.13	13.50	0.00	65.68	65.68	0.00
1960	36.87	1.57	0.00	41.64	20.82	0.00	23.14	23.14	0.00
1961	81.22	27.53	0.00	69.18	15.29	0.00	49.97	49.97	0.00
1962	44.00	0.00	0.00	36.66	16.10	0.00	19.86	19.86	0.00
1963	82.28	38.44	0.00	52.73	17.53	0.00	35.16	35.16	0.00
1964	85.27	47.57	0.00	63.73	20.28	0.00	45.61	45.61	0.00
1965	64.48	24.43	0.00	59.66	14.56	0.00	43.28	43.28	0.00
1966	60.39	7.41	0.00	52.16	16.87	0.00	34.43	34.43	0.00
1967	79.22	27.58	0.00	65.57	16.61	0.00	47.20	47.20	0.00
1968	80.77	41.02	0.00	53.45	17.13	0.00	36.04	36.04	0.00
1969	31.53	0.00	0.00	34.16	19.19	0.00	15.38	15.38	0.00
1970	98.56	42.95	0.00	68.55	19.50	0.00	48.06	48.06	0.00
1971	67.13	29.28	0.00	48.83	20.41	0.00	30.35	30.35	0.00
1972	33.73	2.25	0.00	39.64	14.78	0.00	20.98	20.98	0.00
1973	75.57	14.64	0.00	63.67	17.69	0.00	46.57	46.57	0.00
1974	28.04	0.00	0.00	32.72	19.39	0.00	11.32	11.32	0.00
1975	73.71	13.02	0.00	61.87	19.78	0.00	44.40	44.40	0.00
1976	166.42	121.91	0.00	112.89	16.19	0.00	96.81	96.81	0.00
1977	108.60	60.84	0.00	87.01	17.47	0.00	66.53	66.53	0.00
1978	126.72	85.46	0.00	89.34	16.56	0.00	73.62	73.62	0.00
1979	74.25	35.06	0.00	57.99	16.18	0.00	40.60	40.60	0.00
1980	68.31	23.27	0.00	60.14	14.15	0.00	46.44	46.44	0.00
1981	108.21	67.96	0.00	65.65	13.88	0.00	53.61	53.61	0.00
1982	105.24	57.65	0.00	66.26	13.11	0.00	49.60	49.60	0.00
1983	103.00	66.18	0.00	58.11	14.77	0.00	47.38	47.38	0.00
1984	73.41	32.10	0.00	60.47	20.34	0.00	38.55	38.55	0.00
1985	67.59	12.63	0.00	55.79	16.39	0.00	36.92	36.92	3.06
1986	96.73	51.73	0.00	89.80	16.30	0.00	72.60	72.60	0.00
MEAN	77.50	33.29	0.00	62.11	17.28	0.00	44.38	44.38	0.33

TABLE F-23. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 3,400 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	47.42	10.78	0.00	42.75	17.53	0.00	28.51	28.51	0.00
1953	44.68	0.00	0.00	43.87	20.47	0.00	20.94	20.94	0.00
1954	71.20	3.21	0.00	66.66	17.74	0.00	47.12	47.12	0.00
1955	78.09	23.35	0.00	79.97	21.52	0.97	54.42	55.39	0.00
1956	89.16	33.53	0.00	81.68	18.49	0.00	61.98	61.98	0.00
1957	76.46	14.96	0.00	67.57	10.98	0.00	55.70	55.70	0.00
1958	69.34	14.30	0.00	66.53	20.51	0.00	44.81	44.81	0.00
1959	106.76	59.63	0.00	79.13	12.41	0.00	66.59	66.59	0.00
1960	36.92	0.00	0.00	41.64	19.13	0.00	24.28	24.28	0.00
1961	81.12	13.81	0.00	69.18	14.05	0.00	51.37	51.37	0.00
1962	43.88	0.00	0.00	36.66	14.79	0.00	21.00	21.00	0.00
1963	82.20	22.24	0.00	52.73	16.11	0.00	36.40	36.40	0.00
1964	84.80	38.91	0.00	63.73	18.63	0.00	46.65	46.65	0.00
1965	64.40	16.48	0.00	59.66	13.38	0.00	44.40	44.40	0.00
1966	60.35	0.00	0.00	52.16	15.50	0.00	35.70	35.70	0.00
1967	79.26	15.73	0.00	65.57	15.26	0.00	48.57	48.57	0.00
1968	80.45	35.61	0.00	53.45	15.74	0.00	37.25	37.25	0.00
1969	31.60	0.00	0.00	34.16	17.63	0.00	16.61	16.61	0.00
1970	98.67	25.89	0.00	68.55	17.92	2.66	46.82	49.47	0.00
1971	66.88	21.43	0.00	48.83	18.76	0.00	31.65	31.65	0.00
1972	33.90	0.00	0.00	39.64	13.58	0.00	22.31	22.31	0.00
1973	75.10	0.28	0.00	63.67	16.26	0.00	47.57	47.57	0.00
1974	28.70	0.00	0.00	32.72	17.82	0.00	12.96	12.96	0.00
1975	72.35	0.00	0.00	61.87	18.17	15.21	30.30	45.51	0.00
1976	165.90	108.61	0.00	112.89	14.87	0.00	98.00	98.00	0.00
1977	108.46	51.50	0.00	87.01	16.05	0.00	68.07	68.07	0.00
1978	126.26	77.66	0.00	89.34	15.22	0.00	74.69	74.69	0.00
1979	73.93	27.49	0.00	57.99	14.87	0.00	41.82	41.82	0.00
1980	67.56	13.43	0.00	60.14	13.00	0.00	47.18	47.18	0.00
1981	107.25	59.21	0.00	63.65	12.75	0.00	54.45	54.45	0.00
1982	104.69	49.31	0.00	66.26	12.04	0.00	50.82	50.82	0.00
1983	101.98	56.49	0.00	58.11	13.57	0.00	48.11	48.11	0.00
1984	73.34	23.76	0.00	60.47	18.69	0.00	39.98	39.98	0.00
1985	64.84	0.46	0.00	55.79	17.87	0.00	35.39	35.39	0.00
1986	96.23	41.70	0.00	89.80	14.98	0.00	73.74	73.74	0.00
MEAN	76.98	24.56	0.00	62.11	16.18	0.54	44.74	45.28	0.00

TABLE F-24. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 3,000 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	48.95	12.15	0.00	42.75	15.47	0.00	29.84	29.84	0.00
1953	47.30	0.00	0.00	43.87	18.06	0.00	23.55	23.55	0.00
1954	73.44	8.12	0.00	66.66	15.66	0.00	49.36	49.36	0.00
1955	80.80	25.89	0.00	79.97	18.98	0.94	57.16	58.11	0.00
1956	91.76	35.81	0.00	81.68	16.31	0.00	64.58	64.58	0.00
1957	77.77	16.76	0.00	67.57	9.69	0.00	57.08	57.08	0.00
1958	71.84	16.81	0.00	66.53	18.09	0.00	47.31	47.31	0.00
1959	108.31	61.07	0.00	79.13	10.95	0.00	68.15	68.15	0.00
1960	38.70	0.00	0.00	41.64	16.88	0.00	26.07	26.07	0.00
1961	83.38	17.73	0.00	69.18	12.40	0.00	53.63	53.63	0.00
1962	45.75	0.00	0.00	36.66	13.05	0.00	22.87	22.87	0.00
1963	84.19	25.96	0.00	52.73	14.22	0.00	38.39	38.39	0.00
1964	86.45	40.75	0.00	63.73	16.44	0.00	48.31	48.31	0.00
1965	66.20	18.27	0.00	59.66	11.80	0.00	46.20	46.20	0.00
1966	62.43	0.65	0.00	52.16	13.68	0.00	37.78	37.78	0.00
1967	81.47	19.39	0.00	65.57	13.47	0.00	50.79	50.79	0.00
1968	82.40	37.14	0.00	53.45	13.89	0.00	39.19	39.19	0.00
1969	33.53	0.00	0.00	34.16	15.56	0.00	18.53	18.53	0.00
1970	100.87	30.25	0.00	68.55	15.81	0.00	51.67	51.67	0.00
1971	68.90	23.54	0.00	48.83	16.55	0.00	33.66	33.66	0.00
1972	36.10	0.00	0.00	39.64	11.98	0.00	24.50	24.50	0.00
1973	76.70	3.95	0.00	63.67	14.35	0.00	49.17	49.17	0.00
1974	31.29	0.00	0.00	32.72	15.72	0.00	15.55	15.55	0.00
1975	74.20	0.35	0.00	61.87	15.98	11.96	35.24	47.21	0.05
1976	167.84	114.52	0.00	112.89	13.12	0.00	99.93	99.93	0.00
1977	110.91	53.82	0.00	87.01	14.16	0.00	70.52	70.52	0.00
1978	127.99	79.42	0.00	89.34	13.43	0.00	76.42	76.42	0.00
1979	75.90	29.28	0.00	57.99	13.12	0.00	43.81	43.81	0.00
1980	68.81	14.97	0.00	60.14	11.47	0.00	48.42	48.42	0.00
1981	108.70	60.63	0.00	63.65	11.25	0.00	55.90	55.90	0.00
1982	106.72	51.04	0.00	66.26	10.63	0.00	52.85	52.85	0.00
1983	103.23	58.07	0.00	58.11	11.98	0.00	49.37	49.37	0.00
1984	75.57	25.97	0.00	60.47	16.49	0.00	42.21	42.21	0.00
1985	67.51	2.95	0.00	55.79	15.77	0.00	38.07	38.07	0.00
1986	98.09	43.77	0.00	89.80	13.21	0.00	75.59	75.59	0.00
MEAN	78.97	26.54	0.00	62.11	14.27	0.37	46.90	47.27	0.00

TABLE F-25. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-C, AREA: 2,600 HA, DEMAND: CASE-1)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** SPILL	***** SHORT	***** INFLOW	***** IRRI DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	50.47	13.51	0.00	42.75	13.41	0.00	31.36	31.36	0.00
1953	49.90	0.00	0.00	43.87	15.65	0.00	26.16	26.16	0.00
1954	75.69	13.03	0.00	66.66	13.57	0.00	51.61	51.61	0.00
1955	83.82	28.42	0.00	79.97	16.45	0.90	60.23	61.12	0.00
1956	94.02	38.09	0.00	81.68	14.14	0.00	66.84	66.84	0.00
1957	79.04	18.50	0.00	67.57	8.40	0.00	58.46	58.46	0.00
1958	74.33	19.30	0.00	66.53	15.68	0.00	49.79	49.79	0.00
1959	109.86	62.51	0.00	79.13	9.49	0.00	69.69	69.69	0.00
1960	40.48	0.11	0.00	41.64	14.63	0.00	27.86	27.86	0.00
1961	85.62	21.52	0.00	69.18	10.75	0.00	55.88	55.88	0.00
1962	47.59	0.00	0.00	36.66	11.31	0.00	24.71	24.71	0.00
1963	86.16	29.65	0.00	52.73	12.32	0.00	40.37	40.37	0.00
1964	88.10	42.58	0.00	63.73	14.25	0.00	49.95	49.95	0.00
1965	67.98	20.04	0.00	59.66	10.23	0.00	48.07	48.07	0.00
1966	64.42	2.59	0.00	52.16	11.86	0.00	39.76	39.76	0.00
1967	83.65	21.65	0.00	65.57	11.67	0.00	53.00	53.00	0.00
1968	84.33	38.67	0.00	53.45	12.04	0.00	41.12	41.12	0.00
1969	35.44	0.00	0.00	34.16	13.48	0.00	20.45	20.45	0.00
1970	103.14	34.58	0.00	68.55	13.70	0.00	53.95	53.95	0.00
1971	70.82	25.64	0.00	48.83	14.34	0.00	35.59	35.59	0.00
1972	38.28	0.00	0.00	39.64	10.39	0.00	26.69	26.69	0.00
1973	78.31	7.61	0.00	63.67	12.43	0.00	50.78	50.78	0.00
1974	33.84	0.00	0.00	32.72	13.62	0.00	18.10	18.10	0.00
1975	76.00	4.67	0.00	61.87	13.90	8.64	40.16	48.80	0.00
1976	169.81	116.42	0.00	112.89	11.37	0.00	101.90	101.90	0.00
1977	113.30	56.12	0.00	87.01	12.27	0.00	72.91	72.91	0.00
1978	129.70	81.15	0.00	89.34	11.64	0.00	78.14	78.14	0.00
1979	77.85	31.07	0.00	57.99	11.57	0.00	45.79	45.79	0.00
1980	70.05	16.49	0.00	60.14	9.94	0.00	49.66	49.66	0.00
1981	110.14	62.04	0.00	63.65	9.75	0.00	57.34	57.34	0.00
1982	108.73	52.75	0.00	66.26	9.21	0.00	54.86	54.86	0.00
1983	104.48	59.64	0.00	58.11	10.38	0.00	50.62	50.62	0.00
1984	77.81	28.17	0.00	60.47	14.29	0.00	44.46	44.46	0.00
1985	70.15	5.43	0.00	55.79	13.67	0.00	40.71	40.71	0.00
1986	99.89	45.77	0.00	89.80	11.45	0.00	77.44	77.44	0.00
MEAN	80.95	28.51	0.00	62.11	12.37	0.27	48.98	49.26	0.00

TABLE F-26. RESULT OF WATER BALANCE STUDY IN PLAN II  
(IRRIGATION DEMAND FROM K-2 DAM : CASE 2)

Item	Rawal Dam			K-2 Dam				
	Inflow <sup>1/</sup> Discharge (MCM)	Spilled <sup>1/</sup> Discharge (MCM)	Water <sup>2/</sup> Shortage (Times)	Inflow Discharge (MCM)	Covered by Dam (ha)	Irrigation Area Covered by Head Works (ha)	Spilled Discharge (MCM)	Water Shortage (Times)
Dam Size: Case A								
Present	70	36	0	62	6,600	-	34	4
Future								
Stage I	68	24	0	62	6,200	400	35	3
Stage II	77	25	0	62	3,700	800	45	0
Dam Size: Case B								
Present	75	40	0	62	5,600	800	38	4
Future								
Stage I	71	27	0	62	5,600	800	38	4
Stage II	79	27	0	62	3,200	800	47	0
Dam Size: Case C								
Present	81	47	0	62	4,100	800	44	4
Future								
Stage I	77	33	0	62	4,100	800	44	4
Stage II	81	29	0	62	2,800	800	49	0

Note: <sup>1/</sup>: Annual average discharge for 35 years (1952 - 1986)

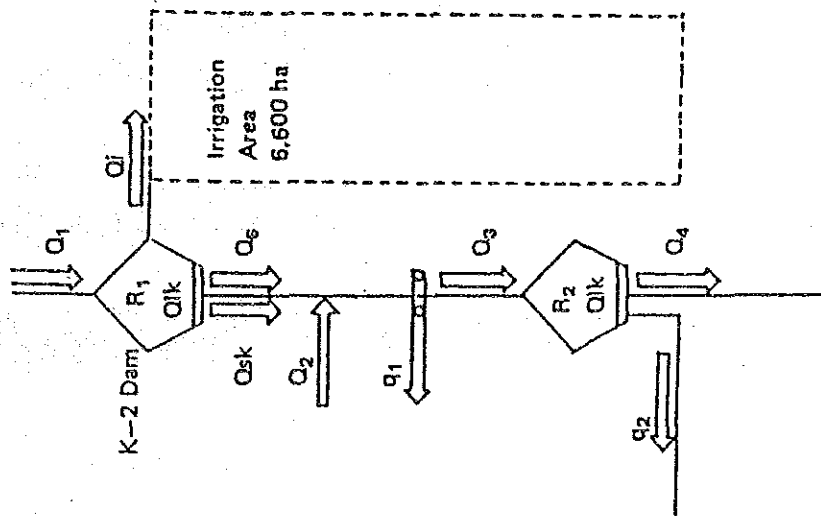
<sup>2/</sup>: Occurrence time of water shortage during 35 years

<sup>3/</sup>: Irrigation area covered by three head works depending upon baseflow of the Kurang River and Gumreh Kas.



FIGURE F-11. RESULTS OF WATER BALANCE STUDY IN PLAN II  
(K-2 DAM SIZE: CASE A, IRRIGATION DEMAND: CASE 2)

(unit: MCM)



	Case Study	
	Stage-I	Stage-II
<b>Present</b>		
<u>K-2 Dam Operation</u>		
Q <sub>1</sub> : Inflow (137.0 sq.km)	62.1	62.1
Q <sub>lk</sub> : Reservoir Loss	3.0	3.0
R <sub>1</sub> : Rainfall in Reservoir	2.4	2.4
Q <sub>i</sub> : Irrigation Demand	26.3	15.9
Q <sub>e</sub> : Release for Rawal Dam	0.0	0.6
Q <sub>sk</sub> : Spillage	33.7	45.0
<u>Rawal Dam Operation</u>		
Q <sub>e</sub> + Q <sub>sk</sub> : Total Release	33.7	45.6
Q <sub>2</sub> : Runoff (138.1 sq.km)	40.9	40.9
q <sub>1</sub> : H. W Release (Domestic)	4.1	9.3
Q <sub>3</sub> : Inflow	70.5	77.2
Q <sub>lk</sub> : Reservoir Loss	9.1	8.8
R <sub>2</sub> : Rainfall in Reservoir	7.3	7.3
q <sub>2</sub> : Right Canal	32.6	50.9
Q <sub>4</sub> : Spillage	36.1	24.8

1/ : Total runoff at Rawal Dam is estimated at 103.0 MCM

TABLE F-27. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 6,600 HA, DEMAND: CASE-2)

YEAR	***** RAWAL DAM *****										***** K-2 DAM *****			***** SHORT *****	
	INFLOW	SPILL	SHORT	INFLOW	IRRI. DEMAND	TO RAWAL RELEASE	SPILL	TOTAL RELEASE	SHORT	SHORT					
1952	43.00	17.43	0.00	42.75	30.80	0.00	19.58	19.58	0.00	0.00					
1953	33.91	0.00	0.00	43.87	34.24	0.00	6.19	6.19	2.04	0.00					
1954	62.60	22.02	0.00	66.66	30.82	0.00	33.53	33.53	0.00	0.00					
1955	75.85	38.33	0.00	79.97	27.86	0.00	49.44	49.44	10.75	0.00					
1956	78.92	43.02	0.00	81.68	32.91	0.00	46.62	46.62	0.00	0.00					
1957	72.52	32.51	0.00	67.57	18.44	0.00	46.28	46.28	0.00	0.00					
1958	60.75	24.37	0.00	66.53	33.38	0.00	32.06	32.06	2.81	0.00					
1959	103.90	72.87	0.00	79.13	21.23	0.00	57.79	57.79	0.00	0.00					
1960	30.45	3.52	0.00	41.64	33.56	0.00	13.58	13.58	0.00	0.00					
1961	72.49	28.78	0.00	69.18	24.55	0.00	37.41	37.41	0.00	0.00					
1962	37.28	1.97	0.00	36.66	25.76	0.00	9.89	9.89	0.00	0.00					
1963	74.44	41.54	0.00	52.73	28.59	0.00	23.95	23.95	0.00	0.00					
1964	79.75	50.96	0.00	63.73	33.12	0.00	36.38	36.38	0.00	0.00					
1965	58.68	27.56	0.00	59.66	22.78	0.00	33.70	33.70	0.00	0.00					
1966	52.73	11.44	0.00	52.16	27.19	0.00	23.41	23.41	0.00	0.00					
1967	70.63	31.17	0.00	65.57	26.67	0.00	34.97	34.97	0.00	0.00					
1968	74.59	41.73	0.00	53.45	26.83	0.00	26.19	26.19	0.00	0.00					
1969	24.58	0.00	0.00	34.16	30.97	0.00	4.77	4.77	0.00	0.00					
1970	89.61	47.12	0.00	68.55	31.67	0.00	35.62	35.62	0.00	0.00					
1971	58.69	29.01	0.00	48.83	34.11	0.00	18.10	18.10	0.00	0.00					
1972	26.06	4.28	0.00	39.64	22.97	0.00	9.95	9.95	0.00	0.00					
1973	70.28	19.80	0.00	63.67	29.16	0.00	37.37	37.37	0.00	0.00					
1974	22.19	0.00	0.00	32.72	31.65	0.00	2.65	2.65	0.00	0.00					
1975	61.50	14.34	0.00	61.87	32.39	0.00	28.84	28.84	0.00	0.00					
1976	160.64	126.79	0.00	112.89	25.63	0.00	86.86	86.86	0.00	0.00					
1977	97.88	61.82	0.00	87.01	29.12	0.00	51.83	51.83	0.00	0.00					
1978	120.53	87.82	0.00	89.34	26.91	0.00	63.93	63.93	0.00	0.00					
1979	68.16	37.90	0.00	57.99	25.44	0.00	30.37	30.37	0.00	0.00					
1980	66.42	31.13	0.00	60.14	21.98	0.00	40.56	40.56	0.00	0.00					
1981	104.92	74.11	0.00	63.65	22.36	0.00	46.08	46.08	0.00	0.00					
1982	99.37	62.14	0.00	66.26	19.99	0.00	39.45	39.45	0.00	0.00					
1983	100.12	73.59	0.00	58.11	24.20	0.00	40.27	40.27	0.00	0.00					
1984	64.15	31.93	0.00	60.47	33.50	0.00	25.42	25.42	0.00	0.00					
1985	57.75	16.25	0.00	55.79	26.39	0.00	24.00	24.00	5.20	0.00					
1986	90.61	55.11	0.00	89.80	26.38	0.00	62.35	62.35	0.00	0.00					
MEAN	70.45	36.06	0.00	62.11	27.82	0.00	33.70	33.70	0.59	0.59					

TABLE F-28. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II.  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 5,600 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	46.06	20.49	0.00	42.75	26.13	0.00	22.65	22.65	0.00
1953	40.31	2.18	0.00	43.87	28.42	0.00	12.59	12.59	2.37
1954	67.51	31.03	0.00	66.66	26.15	0.00	38.44	38.44	0.00
1955	81.17	43.64	0.00	79.97	22.57	0.00	54.76	54.76	10.20
1956	84.16	48.02	0.00	81.68	27.93	0.00	51.86	51.86	0.00
1957	76.25	36.48	0.00	67.57	15.65	0.00	50.01	50.01	0.00
1958	66.72	30.36	0.00	66.53	27.57	0.00	38.02	38.02	3.14
1959	107.21	75.96	0.00	79.13	18.01	0.00	61.09	61.09	0.00
1960	34.34	3.93	0.00	41.64	28.48	0.00	17.47	17.47	0.00
1961	77.49	37.07	0.00	69.18	20.83	0.00	42.41	42.41	0.00
1962	41.34	5.53	0.00	36.66	21.86	0.00	13.94	13.94	0.00
1963	78.86	46.24	0.00	52.73	24.26	0.00	28.37	28.37	0.00
1964	83.40	55.05	0.00	63.73	28.10	0.00	40.04	40.04	0.00
1965	62.51	31.45	0.00	59.66	19.33	0.00	37.53	37.53	0.00
1966	57.31	15.95	0.00	52.16	23.07	0.00	27.99	27.99	0.00
1967	75.51	36.09	0.00	65.57	22.63	0.00	39.85	39.85	0.00
1968	78.74	45.06	0.00	53.45	22.76	0.00	30.33	30.33	0.00
1969	28.62	0.37	0.00	34.16	26.28	0.00	9.00	9.00	0.00
1970	94.52	56.54	0.00	68.55	26.87	0.00	40.53	40.53	0.00
1971	63.31	33.68	0.00	48.83	28.94	0.00	22.72	22.72	0.00
1972	30.72	5.97	0.00	39.64	19.49	0.00	14.61	14.61	0.00
1973	73.86	26.22	0.00	63.67	24.74	0.00	40.95	40.95	0.00
1974	23.70	0.00	0.00	32.72	26.86	0.00	4.16	4.16	0.00
1975	69.45	23.69	0.00	61.87	27.48	0.00	36.79	36.79	0.00
1976	164.78	130.86	0.00	112.89	21.75	0.00	91.01	91.01	0.00
1977	103.46	67.14	0.00	87.01	24.71	0.00	57.41	57.41	0.00
1978	124.33	92.00	0.00	89.34	22.83	0.00	67.72	67.72	0.00
1979	72.46	41.51	0.00	57.99	21.58	0.00	34.68	34.68	0.00
1980	69.01	34.35	0.00	60.14	18.65	0.00	43.14	43.14	0.00
1981	107.98	77.16	0.00	63.65	18.97	0.00	49.13	49.13	0.00
1982	103.66	66.50	0.00	66.26	16.96	0.00	43.74	43.74	0.00
1983	102.96	76.22	0.00	58.11	20.54	0.00	43.11	43.11	0.00
1984	69.21	36.88	0.00	60.47	28.43	0.00	30.47	30.47	0.00
1985	63.52	22.11	0.00	55.79	21.80	0.00	29.78	29.78	5.01
1986	94.70	59.18	0.00	89.80	22.38	0.00	66.43	66.43	0.00
MEAN	74.83	40.43	0.00	62.11	23.51	0.00	38.08	38.08	0.59

TABLE F-28. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(PRESENT, PLAN-2, K2-DAM SIZE: CASE-C, AREA: 4,100 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	50.91	25.03	0.00	42.75	19.13	0.00	27.50	27.50	0.00
1953	47.79	9.64	0.00	43.87	21.46	0.00	20.07	20.07	1.08
1954	74.83	38.54	0.00	66.66	19.15	0.00	45.76	45.76	0.00
1955	86.29	48.75	0.00	79.97	17.45	0.00	59.88	59.88	6.53
1956	92.10	55.46	0.00	81.68	20.45	0.00	59.80	59.80	0.00
1957	81.64	42.38	0.00	67.57	11.46	0.00	55.40	55.40	0.00
1958	73.27	36.94	0.00	66.53	20.97	0.00	44.57	44.57	1.51
1959	112.11	80.56	0.00	79.13	13.19	0.00	65.99	65.99	0.00
1960	40.14	9.90	0.00	41.64	20.85	0.00	23.27	23.27	0.00
1961	84.91	44.31	0.00	69.18	15.25	0.00	49.83	49.83	0.00
1962	47.37	10.93	0.00	36.66	16.00	0.00	19.98	19.98	0.00
1963	85.43	52.95	0.00	52.73	17.76	0.00	34.94	34.94	0.00
1964	88.85	61.11	0.00	63.73	20.57	0.00	45.49	45.49	0.00
1965	68.26	37.25	0.00	59.66	14.15	0.00	43.28	43.28	0.00
1966	64.06	22.68	0.00	52.16	16.89	0.00	34.75	34.75	0.00
1967	82.78	43.42	0.00	65.57	16.57	0.00	47.11	47.11	0.00
1968	84.90	50.94	0.00	53.45	16.67	0.00	36.50	36.50	0.00
1969	34.94	2.66	0.00	34.16	19.24	0.00	15.32	15.32	0.00
1970	101.82	68.01	0.00	68.55	19.67	0.00	47.83	47.83	0.00
1971	70.19	40.64	0.00	48.83	21.19	0.00	29.59	29.59	0.00
1972	37.64	8.48	0.00	39.64	14.27	0.00	21.54	21.54	0.00
1973	79.18	35.83	0.00	63.67	18.11	0.00	46.27	46.27	0.00
1974	30.46	0.00	0.00	32.72	19.66	0.00	10.93	10.93	0.00
1975	76.83	37.60	0.00	61.87	20.12	0.00	44.17	44.17	0.00
1976	170.94	136.91	0.00	112.89	15.92	0.00	97.17	97.17	0.00
1977	111.76	75.05	0.00	87.01	18.09	0.00	65.71	65.71	0.00
1978	130.04	98.22	0.00	89.34	16.72	0.00	73.43	73.43	0.00
1979	78.79	47.08	0.00	57.99	15.80	0.00	41.01	41.01	0.00
1980	72.84	38.91	0.00	60.14	13.66	0.00	46.98	46.98	0.00
1981	112.59	81.68	0.00	63.65	13.89	0.00	53.75	53.75	0.00
1982	110.01	72.97	0.00	66.26	12.42	0.00	50.09	50.09	0.00
1983	107.11	80.42	0.00	58.11	15.03	0.00	47.26	47.26	0.00
1984	76.73	44.27	0.00	60.47	20.81	0.00	38.00	38.00	0.00
1985	70.81	29.52	0.00	55.79	16.18	0.00	37.06	37.06	3.45
1986	100.77	65.23	0.00	89.80	16.39	0.00	72.51	72.51	0.00
MEAN	81.12	46.69	0.00	62.11	17.29	0.00	44.36	44.36	0.36

TABLE F-30. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-1, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 6,200 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	41.04	9.99	0.00	42.75	28.93	0.00	20.78	20.78	0.00
1953	31.30	0.00	0.00	43.87	34.08	0.00	6.52	6.52	0.00
1954	60.89	0.00	0.00	66.66	28.95	0.00	35.46	35.46	0.00
1955	73.38	23.36	0.00	79.97	27.61	0.00	49.68	49.68	8.67
1956	77.21	31.24	0.00	81.68	30.92	0.00	48.68	48.68	0.00
1957	70.03	17.60	0.00	67.57	17.32	0.00	47.73	47.73	0.00
1958	58.17	11.61	0.00	66.53	32.82	0.00	32.55	32.55	1.17
1959	101.15	61.65	0.00	79.13	19.94	0.00	59.07	59.07	0.00
1960	28.84	1.20	0.00	41.64	31.53	0.00	15.11	15.11	0.00
1961	70.62	9.73	0.00	69.18	23.06	0.00	39.37	39.37	0.00
1962	35.61	0.00	0.00	36.66	24.20	0.00	11.47	11.47	0.00
1963	72.80	21.17	0.00	52.73	26.86	0.00	25.68	25.68	0.00
1964	77.48	39.01	0.00	63.73	31.11	0.00	37.82	37.82	0.00
1965	56.40	16.23	0.00	59.66	21.40	0.00	35.20	35.20	0.00
1966	51.16	0.00	0.00	52.16	25.54	0.00	25.20	25.20	0.00
1967	68.90	15.55	0.00	65.57	25.05	0.00	36.88	36.88	0.00
1968	72.54	34.24	0.00	53.45	25.20	0.00	27.81	27.81	0.00
1969	22.57	0.00	0.00	34.16	29.09	0.00	6.43	6.43	0.00
1970	88.04	22.76	0.00	68.55	29.75	0.00	37.54	37.54	0.00
1971	56.69	18.47	0.00	48.83	32.04	0.00	19.91	19.91	0.00
1972	24.66	0.00	0.00	39.64	21.58	0.00	11.77	11.77	0.00
1973	67.76	0.34	0.00	63.67	27.59	0.00	38.77	38.77	0.00
1974	20.04	0.00	0.00	32.72	29.74	0.00	3.24	3.24	0.00
1975	60.59	0.00	0.00	61.87	30.42	9.84	22.14	31.98	0.00
1976	158.09	105.97	0.00	112.89	24.08	0.00	88.48	88.48	0.00
1977	96.09	48.88	0.00	87.01	27.35	0.00	54.02	54.02	0.00
1978	118.50	77.05	0.00	89.34	25.28	0.00	65.40	65.40	0.00
1979	65.71	27.26	0.00	57.99	23.89	0.00	32.06	32.06	0.00
1980	63.43	17.23	0.00	60.14	20.65	0.00	41.56	41.56	0.00
1981	101.87	61.70	0.00	63.65	18.01	0.00	47.26	47.26	0.00
1982	96.76	50.17	0.00	66.26	21.78	0.00	41.12	41.12	0.00
1983	96.99	59.11	0.00	58.11	22.74	0.00	41.37	41.37	0.00
1984	62.27	21.09	0.00	60.47	31.47	0.00	27.41	27.41	0.00
1985	55.03	0.29	0.00	55.79	26.36	0.00	24.36	24.36	3.32
1986	88.08	42.74	0.00	89.80	24.78	0.00	63.94	63.94	0.00
MEAN	68.30	24.16	0.00	62.11	26.31	0.28	34.91	35.19	0.38

TABLE F-31. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-1, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 5,600 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** RAWAL DAM *****	***** K-2 DAM *****	***** TOTAL *****	***** SHORT *****	
	INFLOW	IRRI. DEMAND	RELEASE	RELEASE	
	INFLOW	TO RAWAL	SPILL	SHORT	
	SPILL	RELEASE	RELEASE	RELEASE	
1952	42.90	26.13	22.65	22.65	0.00
1953	37.36	28.42	12.59	12.59	2.37
1954	63.87	26.15	38.44	38.44	0.00
1955	78.46	22.57	54.76	54.76	10.20
1956	80.39	27.93	51.86	51.86	0.00
1957	72.31	15.65	50.01	50.01	0.00
1958	63.65	27.57	38.02	38.02	3.14
1959	103.17	18.01	61.09	61.09	0.00
1960	31.20	28.48	17.47	17.47	0.00
1961	73.66	20.83	42.41	42.41	0.00
1962	38.08	21.86	13.94	13.94	0.00
1963	75.48	24.26	28.37	28.37	0.00
1964	79.70	28.10	40.04	40.04	0.00
1965	58.73	19.33	37.53	37.53	0.00
1966	53.95	23.07	27.99	27.99	0.00
1967	71.88	22.63	39.85	39.85	0.00
1968	75.06	22.76	30.33	30.33	0.00
1969	25.15	26.28	9.00	9.00	0.00
1970	91.02	26.87	40.53	40.53	0.00
1971	59.49	28.94	22.72	22.72	0.00
1972	27.50	19.49	14.61	14.61	0.00
1973	69.94	24.74	40.95	40.95	0.00
1974	20.96	26.86	4.16	4.16	0.00
1975	65.74	27.48	31.57	31.57	0.00
1976	160.61	21.75	91.01	91.01	0.00
1977	99.48	24.71	57.41	57.41	0.00
1978	120.82	22.83	67.72	67.72	0.00
1979	68.33	21.58	34.68	34.68	0.00
1980	65.01	18.65	43.14	43.14	0.00
1981	103.74	18.97	49.13	49.13	0.00
1982	99.38	16.96	43.74	43.74	0.00
1983	98.73	20.54	43.11	43.11	0.00
1984	65.34	28.43	30.47	30.47	0.00
1985	60.44	21.80	29.78	29.78	5.01
1986	90.57	22.38	66.43	66.43	0.00
MEAN	71.20	23.51	37.93	38.08	0.59
		0.15			
	62.11				
	27.04				
	0.00				



TABLE F-33. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 3,700 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	47.77	10.99	0.00	42.75	17.26	0.00	28.66	28.66	0.00
1953	44.83	0.00	0.00	43.87	20.34	0.00	21.09	21.09	0.00
1954	71.59	3.86	0.00	66.66	17.28	0.00	47.51	47.51	0.00
1955	77.98	23.23	0.00	79.97	21.65	0.94	54.34	55.28	0.00
1956	89.16	33.58	0.00	81.68	18.45	0.00	61.98	61.98	0.00
1957	77.06	15.54	0.00	67.57	10.34	0.00	56.34	56.34	0.00
1958	69.56	14.53	0.00	66.53	20.29	0.00	45.02	45.02	0.00
1959	107.27	60.06	0.00	79.13	11.90	0.00	67.10	67.10	0.00
1960	37.30	0.00	0.00	41.64	18.81	0.00	24.66	24.66	0.00
1961	81.32	14.35	0.00	69.18	13.76	0.00	51.57	51.57	0.00
1962	44.26	0.00	0.00	36.66	14.44	0.00	21.38	21.38	0.00
1963	82.28	22.68	0.00	52.73	16.03	0.00	36.49	36.49	0.00
1964	84.94	39.16	0.00	63.73	18.57	0.00	46.79	46.79	0.00
1965	64.66	16.70	0.00	59.66	12.77	0.00	44.66	44.66	0.00
1966	60.94	0.00	0.00	52.16	15.24	0.00	36.28	36.28	0.00
1967	79.50	16.61	0.00	65.57	14.95	0.00	48.82	48.82	0.00
1968	81.15	36.01	0.00	53.45	15.04	0.00	37.94	37.94	0.00
1969	31.83	0.00	0.00	34.16	17.36	0.00	16.83	16.83	0.00
1970	98.78	26.47	0.00	68.55	17.75	2.61	46.97	49.59	0.00
1971	66.49	21.10	0.00	48.83	19.12	0.00	31.26	31.26	0.00
1972	34.72	0.00	0.00	39.64	12.88	0.00	23.13	23.13	0.00
1973	75.06	1.00	0.00	63.67	16.35	0.00	47.53	47.53	0.00
1974	28.72	0.00	0.00	32.72	17.75	0.00	12.99	12.99	0.00
1975	72.39	0.00	0.00	61.87	18.16	15.68	29.86	45.54	0.00
1976	166.50	109.26	0.00	112.89	14.37	0.00	98.60	98.60	0.00
1977	108.08	51.09	0.00	87.01	16.32	0.00	67.69	67.69	0.00
1978	126.34	77.73	0.00	89.34	15.08	0.00	74.77	74.77	0.00
1979	74.58	28.02	0.00	57.99	14.26	0.00	42.48	42.48	0.00
1980	68.22	14.29	0.00	60.14	12.32	0.00	47.83	47.83	0.00
1981	107.58	59.53	0.00	63.65	12.54	0.00	54.78	54.78	0.00
1982	105.42	49.82	0.00	66.26	11.21	0.00	51.55	51.55	0.00
1983	102.05	56.80	0.00	58.11	13.57	0.00	48.19	48.19	0.00
1984	73.17	23.60	0.00	60.47	18.78	0.00	39.81	39.81	0.00
1985	65.00	0.55	0.00	55.79	17.71	0.00	35.55	35.55	0.00
1986	96.42	41.97	0.00	89.80	14.79	0.00	73.93	73.93	0.00
MEAN	77.23	24.81	0.00	62.11	15.93	0.55	44.98	45.53	0.00



TABLE F-34. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-B, AREA: 3,200 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** RAWAL DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****	***** K-2 DAM *****
	INFLOW	SPILL	SHORT	INFLOW	IRRI. DEMAND	TO RAWAL RELEASE	SPILL	TOTAL RELEASE	SHORT
1952	49.47	12.52	0.00	42.75	14.93	0.00	30.36	30.36	0.00
1953	47.80	0.00	0.00	43.87	17.59	0.00	24.06	24.06	0.00
1954	74.10	9.39	0.00	66.66	14.94	0.00	50.02	50.02	0.00
1955	81.11	26.15	0.00	79.97	18.72	0.92	57.50	58.41	0.00
1956	92.12	36.18	0.00	81.68	15.96	0.00	64.94	64.94	0.00
1957	78.42	17.45	0.00	67.57	8.94	0.00	57.83	57.83	0.00
1958	72.38	17.37	0.00	66.53	17.55	0.00	47.85	47.85	0.00
1959	108.97	61.65	0.00	79.13	10.29	0.00	68.80	68.80	0.00
1960	39.29	0.08	0.00	41.64	16.27	0.00	26.67	26.67	0.00
1961	83.86	18.67	0.00	69.18	11.90	0.00	54.12	54.12	0.00
1962	46.33	0.00	0.00	36.66	12.49	0.00	23.45	23.45	0.00
1963	84.54	26.85	0.00	52.73	13.86	0.00	38.74	38.74	0.00
1964	86.81	41.23	0.00	63.73	16.06	0.00	48.66	48.66	0.00
1965	66.68	18.72	0.00	59.66	11.05	0.00	46.73	46.73	0.00
1966	63.19	1.39	0.00	52.16	13.18	0.00	38.53	38.53	0.00
1967	81.98	19.96	0.00	65.57	12.93	0.00	51.32	51.32	0.00
1968	83.27	37.70	0.00	53.45	13.01	0.00	40.06	40.06	0.00
1969	34.00	0.00	0.00	34.16	15.01	0.00	19.00	19.00	0.00
1970	101.28	31.37	0.00	68.55	15.35	0.00	52.08	52.08	0.00
1971	68.85	23.56	0.00	48.83	16.54	0.00	33.62	33.62	0.00
1972	37.12	0.00	0.00	39.64	11.14	0.00	25.52	25.52	0.00
1973	76.89	5.10	0.00	63.67	14.14	0.00	49.36	49.36	0.00
1974	31.68	0.00	0.00	32.72	15.35	0.00	15.94	15.94	0.00
1975	74.41	0.97	0.00	61.87	15.70	11.93	35.49	47.42	0.00
1976	168.65	115.27	0.00	112.89	12.43	0.00	100.75	100.75	0.00
1977	110.90	53.79	0.00	87.01	14.12	0.00	70.51	70.51	0.00
1978	128.31	79.73	0.00	89.34	13.05	0.00	76.73	76.73	0.00
1979	76.73	30.00	0.00	57.99	12.33	0.00	44.66	44.66	0.00
1980	69.55	15.92	0.00	60.14	10.66	0.00	49.17	49.17	0.00
1981	109.19	61.10	0.00	63.65	10.84	0.00	56.39	56.39	0.00
1982	107.64	51.72	0.00	66.26	9.69	0.00	53.77	53.77	0.00
1983	103.47	58.55	0.00	58.11	11.73	0.00	49.61	49.61	0.00
1984	75.74	26.14	0.00	60.47	16.24	0.00	42.39	42.39	0.00
1985	68.04	3.39	0.00	55.79	15.32	0.00	38.59	38.59	0.00
1986	98.47	44.25	0.00	89.80	12.79	0.00	76.02	76.02	0.00
MEAN	79.46	27.03	0.00	62.11	13.77	0.37	47.41	47.77	0.00

TABLE F-35. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS IN PLAN II  
(STAGE-2, PLAN-2, K2-DAM SIZE: CASE-C' AREA: 2,800 HA, DEMAND: CASE-2)

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	50.83	13.75	0.00	42.75	13.06	0.00	31.72	31.72	0.00
1953	50.18	0.00	0.00	43.87	15.39	0.00	26.44	26.44	0.00
1954	76.16	13.84	0.00	66.66	13.08	0.00	52.08	52.08	0.00
1955	83.92	28.53	0.00	79.97	16.34	0.84	60.38	61.22	0.04
1956	94.19	38.28	0.00	81.68	13.96	0.00	67.01	67.01	0.00
1957	79.57	19.04	0.00	67.57	7.82	0.00	59.03	59.03	0.00
1958	74.65	19.64	0.00	66.53	15.35	0.00	50.12	50.12	0.00
1959	110.34	62.93	0.00	79.13	9.00	0.00	70.17	70.17	0.00
1960	40.88	0.17	0.00	41.64	14.24	0.00	28.29	28.29	0.00
1961	85.92	22.10	0.00	69.18	10.41	0.00	56.18	56.18	0.00
1962	47.97	0.00	0.00	36.66	10.93	0.00	25.09	25.09	0.00
1963	86.36	30.22	0.00	52.73	12.13	0.00	40.56	40.56	0.00
1964	88.31	42.90	0.00	63.73	14.05	0.00	50.16	50.16	0.00
1965	68.37	20.32	0.00	59.66	9.67	0.00	48.53	48.53	0.00
1966	64.84	3.07	0.00	52.16	11.54	0.00	40.19	40.19	0.00
1967	83.97	22.02	0.00	65.57	11.31	0.00	53.33	53.33	0.00
1968	84.98	39.06	0.00	53.45	11.38	0.00	41.77	41.77	0.00
1969	35.72	0.00	0.00	34.16	13.14	0.00	20.75	20.75	0.00
1970	103.46	35.28	0.00	68.55	13.43	0.00	54.26	54.26	0.00
1971	70.57	25.53	0.00	48.83	14.47	0.00	35.34	35.34	0.00
1972	39.04	0.00	0.00	39.64	9.74	0.00	27.45	27.45	0.00
1973	78.39	8.39	0.00	63.67	12.37	0.00	50.86	50.86	0.00
1974	34.02	0.00	0.00	32.72	13.43	0.00	18.28	18.28	0.00
1975	76.14	5.01	0.00	61.87	13.74	8.70	40.23	48.93	0.00
1976	170.40	116.97	0.00	112.89	10.88	0.00	102.50	102.50	0.00
1977	113.14	55.96	0.00	87.01	12.35	0.00	72.75	72.75	0.00
1978	129.91	81.34	0.00	89.34	11.42	0.00	78.34	78.34	0.00
1979	78.45	31.59	0.00	57.99	10.79	0.00	46.39	46.39	0.00
1980	70.62	17.25	0.00	60.14	9.33	0.00	50.27	50.27	0.00
1981	110.45	62.33	0.00	63.65	9.49	0.00	57.65	57.65	0.00
1982	109.42	53.24	0.00	66.26	8.48	0.00	55.55	55.55	0.00
1983	104.61	59.97	0.00	58.11	10.27	0.00	50.75	50.75	0.00
1984	77.85	28.19	0.00	60.47	14.21	0.00	44.50	44.50	0.00
1985	70.43	5.67	0.00	55.79	13.40	0.00	40.98	40.98	0.00
1986	100.15	46.11	0.00	89.80	11.19	0.00	77.70	77.70	0.00
MEAN	81.26	28.82	0.00	62.11	12.05	0.27	49.30	49.58	0.00

TABLE F-36. RESULT OF WATER BALANCE STUDY IN PLAN II  
(IRRIGATION DEMAND FROM K-2 DAM : CASE 3)

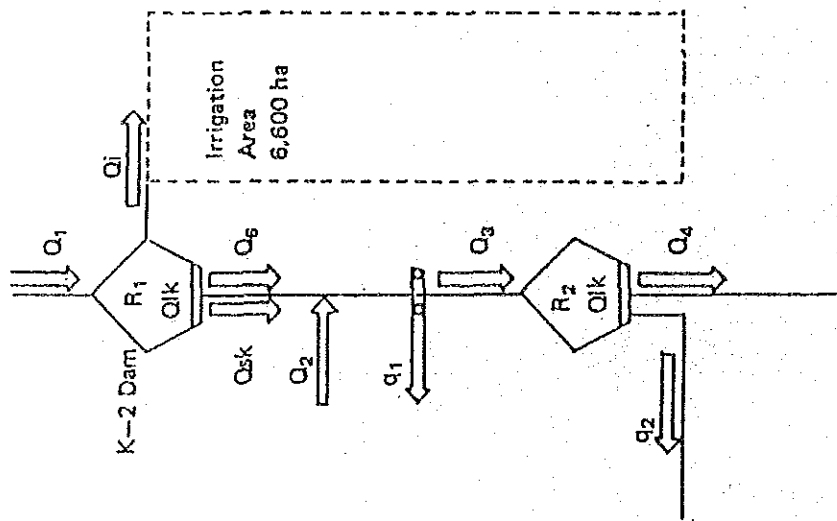
Item	Rawal Dam			K-2 Dam				
	Inflow <sup>1/</sup> Discharge (MCM)	Spilled <sup>1/</sup> Discharge (MCM)	Water <sup>2/</sup> Shortage (Times)	Inflow Discharge (MCM)	Covered by Dam (ha)	Irrigation Area Covered by Head Works (ha)	Spilled Discharge (MCM)	Water Shortage (Times)
Dam Size: Case A								
Present	73	39	0	62	6,600	-	36	3
Future								
Stage I	70	25	0	62	6,600	-	36	3
Stage II	78	25	0	62	4,000	800	46	0
Dam Size: Case B								
Present	76	41	0	62	6,100	500	39	4
Future								
Stage I	72	28	0	62	6,100	500	39	4
Stage II	80	27	0	62	3,500	800	48	0
Dam Size: Case C								
Present	81	47	0	62	4,500	800	45	4
Future								
Stage I	78	34	0	62	4,500	800	45	4
Stage II	82	29	0	62	3,000	800	50	1

Note: 1/: Annual average discharge for 35 years (1952 - 1986)

2/: Occurrence time of water shortage during 35 years

3/: Irrigation area covered by three head works depending upon baseflow of the Kurang River and Gumreh Kas.

FIGURE F-12. RESULTS OF WATER BALANCE STUDY IN PLAN II  
(K-2 DAM SIZE: CASE A, IRRIGATION DEMAND: CASE 3)



(unit: MCM)

	Case Study	
	Stage-I	Stage-II
<u>K-2 Dam Operation</u>		
Q <sub>1</sub> : Inflow (137.0 sq.km)	62.1 <sup>1/</sup>	62.1
Q <sub>lk</sub> : Reservoir Loss	3.0	3.0
R <sub>1</sub> : Rainfall in Reservoir	2.4	2.4
Q <sub>i</sub> : Irrigation Demand	25.1	15.4
Q <sub>6</sub> : Release for Rawal Dam	0.0	0.6
Q <sub>sk</sub> : Spillage	36.4	45.5
<u>Rawal Dam Operation</u>		
Q <sub>6</sub> + Q <sub>sk</sub> : Total Release	36.4	46.1
Q <sub>2</sub> : Runoff (138.1 sq.km)	40.9 <sup>1/</sup>	40.9
q <sub>1</sub> : H. W Release (Domestic)	4.1	9.3
Q <sub>3</sub> : Inflow	73.2	77.7
Q <sub>lk</sub> : Reservoir Loss	8.1	8.8
R <sub>2</sub> : Rainfall in Reservoir	7.3	7.3
q <sub>2</sub> : Right Canal	32.6	50.9
Q <sub>4</sub> : Spillage	38.8	25.3

<sup>1/</sup> : Total runoff at Rawal Dam is estimated at 103.0 MCM

TABLE F-37. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( PRESENT, PLAN-2, K2-DAM SIZE:CASE-A, AREA:6600HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM ***** SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	45.24	19.64	0.00	42.75	27.54	0.00	21.83	21.83	0.00
1953	35.86	0.00	0.00	43.87	32.77	0.00	8.14	8.14	0.00
1954	66.17	27.47	0.00	66.66	27.19	0.00	37.11	37.11	0.00
1955	76.71	39.20	0.00	79.97	27.01	0.00	50.30	50.30	8.45
1956	82.09	45.93	0.00	81.68	29.94	0.00	49.78	49.78	0.00
1957	75.70	35.97	0.00	67.57	15.56	0.00	49.46	49.46	0.00
1958	62.01	25.65	0.00	66.53	32.07	0.00	33.31	33.31	0.54
1959	106.70	75.40	0.00	79.13	18.43	0.00	60.58	60.58	0.00
1960	33.40	3.78	0.00	41.64	29.98	0.00	16.53	16.53	0.00
1961	75.76	34.54	0.00	69.18	21.81	0.00	40.69	40.69	0.00
1962	40.29	4.71	0.00	36.66	22.89	0.00	12.89	12.89	0.00
1963	77.16	44.36	0.00	52.73	25.87	0.00	26.67	26.67	0.00
1964	82.01	53.72	0.00	63.73	30.16	0.00	38.65	38.65	0.00
1965	61.29	30.22	0.00	59.66	19.60	0.00	36.31	36.31	0.00
1966	56.55	15.19	0.00	52.16	24.29	0.00	27.24	27.24	0.00
1967	73.93	34.53	0.00	65.57	23.68	0.00	38.27	38.27	0.00
1968	78.32	44.40	0.00	53.45	23.09	0.00	29.92	29.92	0.00
1969	27.27	0.00	0.00	34.16	27.69	0.00	7.66	7.66	0.00
1970	92.64	53.93	0.00	68.55	28.54	0.00	38.65	38.65	0.00
1971	60.57	30.98	0.00	48.83	31.83	0.00	19.98	19.98	0.00
1972	30.27	4.92	0.00	39.64	19.58	0.00	14.16	14.16	0.00
1973	72.22	25.17	0.00	63.67	26.77	0.00	39.31	39.31	0.00
1974	22.53	0.00	0.00	32.72	28.73	0.00	2.99	2.99	0.00
1975	66.67	19.83	0.00	61.87	29.48	0.00	34.01	34.01	0.00
1976	164.18	130.22	0.00	112.89	22.38	0.00	90.41	90.41	0.00
1977	100.32	64.05	0.00	87.01	27.08	0.00	54.27	54.27	0.00
1978	122.81	90.45	0.00	89.34	24.31	0.00	66.20	66.20	0.00
1979	71.90	40.91	0.00	57.99	22.00	0.00	34.11	34.11	0.00
1980	69.17	34.57	0.00	60.14	18.71	0.00	43.30	43.30	0.00
1981	107.29	76.46	0.00	63.65	19.97	0.00	48.45	48.45	0.00
1982	103.19	66.03	0.00	66.26	16.59	0.00	43.27	43.27	0.00
1983	101.94	75.20	0.00	58.11	22.06	0.00	42.09	42.09	0.00
1984	66.71	34.39	0.00	60.47	30.72	0.00	27.98	27.98	0.00
1985	58.82	17.43	0.00	55.79	25.86	0.00	25.08	25.08	2.67
1986	93.30	57.77	0.00	89.80	23.69	0.00	65.03	65.03	0.00
MEAN	73.17	38.77	0.00	62.11	25.08	0.00	36.42	36.42	0.33

TABLE F-38. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( PRESENT , PLAN-2, K2-DAM SIZE:CASE-B, AREA:6100HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	46.75	21.03	0.00	42.75	25.46	0.00	23.33	23.33	0.00
1953	40.52	2.39	0.00	43.87	28.32	0.00	12.80	12.80	1.97
1954	68.41	32.01	0.00	66.66	25.13	0.00	39.34	39.34	0.00
1955	81.67	44.15	0.00	79.97	22.10	0.00	55.26	55.26	10.68
1956	84.51	48.26	0.00	81.68	27.68	0.00	52.21	52.21	0.00
1957	77.38	37.75	0.00	67.57	14.38	0.00	51.14	51.14	0.00
1958	67.27	30.92	0.00	66.53	27.03	0.00	38.57	38.57	3.10
1959	108.18	76.80	0.00	79.13	17.03	0.00	62.07	62.07	0.00
1960	35.16	4.80	0.00	41.64	27.71	0.00	18.29	18.29	0.00
1961	78.07	37.53	0.00	69.18	20.15	0.00	42.99	42.99	0.00
1962	42.14	6.33	0.00	36.66	21.10	0.00	14.74	14.74	0.00
1963	79.21	46.54	0.00	52.73	23.91	0.00	28.72	28.72	0.00
1964	83.70	55.60	0.00	63.73	27.87	0.00	40.34	40.34	0.00
1965	63.05	32.01	0.00	59.66	18.11	0.00	38.07	38.07	0.00
1966	58.61	17.21	0.00	52.16	22.45	0.00	29.29	29.29	0.00
1967	76.18	36.80	0.00	65.57	21.89	0.00	40.51	40.51	0.00
1968	80.16	46.21	0.00	53.45	21.34	0.00	31.76	31.76	0.00
1969	29.21	0.30	0.00	34.16	25.59	0.00	9.60	9.60	0.00
1970	94.91	57.81	0.00	68.55	26.38	0.00	40.92	40.92	0.00
1971	62.78	33.21	0.00	48.83	29.42	0.00	22.19	22.19	0.00
1972	32.34	5.74	0.00	39.64	18.09	0.00	16.24	16.24	0.00
1973	73.90	28.05	0.00	63.67	24.74	0.00	40.99	40.99	0.00
1974	23.27	0.00	0.00	32.72	26.55	0.00	3.74	3.74	0.00
1975	70.34	24.18	0.00	61.87	27.24	0.00	37.68	37.68	0.00
1976	166.04	132.04	0.00	112.89	20.69	0.00	92.26	92.26	0.00
1977	102.98	66.59	0.00	87.01	25.03	0.00	56.93	56.93	0.00
1978	124.59	92.39	0.00	89.34	22.47	0.00	67.99	67.99	0.00
1979	73.80	42.59	0.00	57.99	20.34	0.00	36.01	36.01	0.00
1980	70.29	35.91	0.00	60.14	17.29	0.00	44.43	44.43	0.00
1981	108.71	77.85	0.00	63.65	18.46	0.00	49.86	49.86	0.00
1982	105.09	67.98	0.00	66.26	15.33	0.00	45.17	45.17	0.00
1983	103.26	76.52	0.00	58.11	20.39	0.00	43.41	43.41	0.00
1984	69.09	36.72	0.00	60.47	28.39	0.00	30.35	30.35	0.00
1985	64.10	22.74	0.00	55.79	21.35	0.00	30.35	30.35	5.01
1986	95.19	59.65	0.00	89.80	21.89	0.00	66.92	66.92	0.00
MEAN	75.45	41.05	0.00	62.11	22.89	0.00	38.70	38.70	0.59

TABLE F-39. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
( PRESENT, PLAN-2, K2-DAM SIZE:CASE-C, AREA:4500HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** RAWAL DAM ***** INFLOW	***** RAWAL DAM ***** SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	51.38	25.34	0.00	42.75	18.78	0.00	27.97	27.97	0.00
1953	47.93	9.83	0.00	43.87	21.34	0.00	20.21	20.21	1.01
1954	75.34	39.11	0.00	66.66	18.54	0.00	46.27	46.27	0.00
1955	86.64	49.10	0.00	79.97	17.13	0.00	60.23	60.23	7.05
1956	92.08	55.48	0.00	81.68	20.42	0.00	59.78	59.78	0.00
1957	82.48	43.20	0.00	67.57	10.61	0.00	56.25	56.25	0.00
1958	73.16	36.85	0.00	66.53	21.09	0.00	44.47	44.47	1.14
1959	112.73	81.08	0.00	79.13	12.56	0.00	66.61	66.61	0.00
1960	40.63	10.47	0.00	41.64	20.44	0.00	23.76	23.76	0.00
1961	85.18	44.55	0.00	69.18	14.87	0.00	50.10	50.10	0.00
1962	47.84	11.45	0.00	36.66	15.57	0.00	20.44	20.44	0.00
1963	85.55	52.89	0.00	52.73	17.64	0.00	35.06	35.06	0.00
1964	88.96	61.39	0.00	63.73	20.56	0.00	45.60	45.60	0.00
1965	68.62	37.54	0.00	59.66	13.56	0.00	43.64	43.64	0.00
1966	64.82	23.47	0.00	52.16	16.56	0.00	35.50	35.50	0.00
1967	83.12	43.79	0.00	65.57	16.15	0.00	47.46	47.46	0.00
1968	85.82	51.86	0.00	53.45	15.74	0.00	37.42	37.42	0.00
1969	35.24	2.94	0.00	34.16	18.88	0.00	15.63	15.63	0.00
1970	101.96	68.15	0.00	68.55	19.46	0.00	47.97	47.97	0.00
1971	69.65	40.15	0.00	48.83	21.70	0.00	29.06	29.06	0.00
1972	38.70	8.26	0.00	39.64	13.35	0.00	22.60	22.60	0.00
1973	79.10	36.98	0.00	63.67	18.25	0.00	46.19	46.19	0.00
1974	30.48	0.00	0.00	32.72	19.59	0.00	10.94	10.94	0.00
1975	76.87	37.68	0.00	61.87	20.10	0.00	44.21	44.21	0.00
1976	171.74	137.66	0.00	112.89	15.26	0.00	97.97	97.97	0.00
1977	111.23	74.49	0.00	87.01	18.46	0.00	65.18	65.18	0.00
1978	130.11	98.38	0.00	89.34	16.57	0.00	73.51	73.51	0.00
1979	79.65	47.76	0.00	57.99	15.00	0.00	41.87	41.87	0.00
1980	73.71	39.98	0.00	60.14	12.76	0.00	47.84	47.84	0.00
1981	113.04	82.10	0.00	63.65	13.62	0.00	54.20	54.20	0.00
1982	110.97	73.93	0.00	66.26	11.31	0.00	51.05	51.05	0.00
1983	107.21	80.55	0.00	58.11	15.04	0.00	47.36	47.36	0.00
1984	76.49	44.02	0.00	60.47	20.94	0.00	37.76	37.76	0.00
1985	71.17	29.90	0.00	55.79	15.92	0.00	37.42	37.42	3.53
1986	101.01	65.45	0.00	89.80	16.15	0.00	72.74	72.74	0.00
MEAN	81.45	47.02	0.00	62.11	16.96	0.00	44.69	44.69	0.36

TABLE F-40. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( STAGE-1, PLAN-2, K2-DAM SIZE:CASE-A, AREA:6600HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	42.09	10.94	0.00	42.75	27.54	0.00	21.83	21.83	0.00
1953	32.91	0.00	0.00	43.87	32.77	0.00	8.14	8.14	0.00
1954	62.54	0.18	0.00	66.66	27.19	0.00	37.11	37.11	0.00
1955	74.01	26.94	0.00	79.97	27.01	0.00	50.30	50.30	8.45
1956	78.31	32.26	0.00	81.68	29.94	0.00	49.78	49.78	0.00
1957	71.76	19.51	0.00	67.57	15.56	0.00	49.46	49.46	0.00
1958	58.93	12.39	0.00	66.53	32.07	0.00	33.31	33.31	0.54
1959	102.66	62.99	0.00	79.13	18.43	0.00	60.58	60.58	0.00
1960	30.26	1.38	0.00	41.64	29.98	0.00	16.53	16.53	0.00
1961	71.94	12.16	0.00	69.18	21.81	0.00	40.69	40.69	0.00
1962	37.03	0.00	0.00	36.66	22.83	0.00	12.89	12.89	0.00
1963	73.79	23.47	0.00	52.73	25.87	0.00	26.67	26.67	0.00
1964	78.31	40.17	0.00	63.73	30.16	0.00	38.65	38.65	0.00
1965	57.51	17.37	0.00	59.66	19.60	0.00	36.31	36.31	0.00
1966	53.20	0.45	0.00	52.16	24.29	0.00	27.24	27.24	0.00
1967	70.29	18.51	0.00	65.57	23.68	0.00	38.27	38.27	0.00
1968	74.65	35.60	0.00	53.45	23.09	0.00	29.92	29.92	0.00
1969	23.81	0.00	0.00	34.16	27.69	0.00	7.66	7.66	0.00
1970	89.14	25.65	0.00	68.55	28.54	0.00	38.65	38.65	0.00
1971	56.76	18.68	0.00	48.83	31.83	0.00	19.98	19.98	0.00
1972	26.91	0.00	0.00	39.64	19.58	0.00	14.16	14.16	0.00
1973	68.30	3.02	0.00	63.67	26.77	0.00	39.31	39.31	0.00
1974	19.79	0.00	0.00	32.72	28.73	0.00	2.99	2.99	0.00
1975	62.65	0.00	0.00	61.87	29.48	9.34	24.70	34.04	0.00
1976	160.02	109.63	0.00	112.89	22.38	0.00	90.41	90.41	0.00
1977	96.34	49.03	0.00	87.01	27.08	0.00	54.27	54.27	0.00
1978	119.30	77.87	0.00	89.34	24.31	0.00	66.20	66.20	0.00
1979	67.76	28.96	0.00	57.99	22.00	0.00	34.11	34.11	0.00
1980	65.17	19.51	0.00	60.14	18.71	0.00	43.30	43.30	0.00
1981	103.05	62.87	0.00	63.65	19.97	0.00	48.45	48.45	0.00
1982	98.91	51.82	0.00	66.26	16.59	0.00	43.27	43.27	0.00
1983	97.71	60.31	0.00	58.11	22.06	0.00	42.09	42.09	0.00
1984	62.84	21.67	0.00	60.47	30.72	0.00	27.98	27.98	0.00
1985	55.75	0.83	0.00	55.79	25.86	0.00	25.08	25.08	2.67
1986	89.17	44.06	0.00	89.80	23.69	0.00	65.03	65.03	0.00
MEAN	69.53	25.38	0.00	62.11	25.08	0.27	36.15	36.42	0.33



TABLE F-41. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( STAGE-1, PLAN-2, K2-DAM SIZE:CASE-B, AREA:6100HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** RAWAL DAM ***** INFLOW	***** RAWAL DAM ***** SPILL	***** RAWAL DAM ***** SHORT	***** K-2 DAM ***** INFLOW	***** K-2 DAM ***** IRRI. DEMAND	***** K-2 DAM ***** TO RAWAL RELEASE	***** K-2 DAM ***** SPILL	***** K-2 DAM ***** TOTAL RELEASE	***** K-2 DAM ***** SHORT
1952	43.59	12.32	0.00	42.75	25.46	0.00	23.33	23.33	0.00
1953	37.57	0.00	0.00	43.87	28.32	0.00	12.80	12.80	1.97
1954	64.77	7.06	0.00	66.66	25.13	0.00	39.34	39.34	0.00
1955	78.96	31.83	0.00	79.97	22.10	0.00	55.26	55.26	10.68
1956	80.74	34.64	0.00	81.68	27.68	0.00	52.21	52.21	0.00
1957	73.44	21.29	0.00	67.57	14.38	0.00	51.14	51.14	0.00
1958	64.19	17.66	0.00	66.53	27.03	0.00	38.57	38.57	3.10
1959	104.10	64.34	0.00	79.13	17.03	0.00	62.07	62.07	0.00
1960	32.02	1.47	0.00	41.64	27.71	0.00	18.29	18.29	0.00
1961	74.24	16.03	0.00	69.18	20.15	0.00	42.99	42.99	0.00
1962	38.88	0.00	0.00	36.66	21.10	0.00	14.74	14.74	0.00
1963	75.83	27.24	0.00	52.73	23.91	0.00	28.72	28.72	0.00
1964	80.00	42.05	0.00	63.73	27.87	0.00	40.34	40.34	0.00
1965	59.27	19.16	0.00	59.66	18.11	0.00	38.07	38.07	0.00
1966	55.25	2.42	0.00	52.16	22.45	0.00	29.29	29.29	0.00
1967	72.54	20.82	0.00	65.57	21.89	0.00	40.51	40.51	0.00
1968	76.49	37.09	0.00	53.45	21.34	0.00	31.76	31.76	0.00
1969	25.75	0.00	0.00	34.16	25.59	0.00	9.60	9.60	0.00
1970	91.41	30.04	0.00	68.55	26.38	0.00	40.92	40.92	0.00
1971	58.97	20.98	0.00	48.83	29.42	0.00	22.19	22.19	0.00
1972	28.99	0.00	0.00	39.64	18.09	0.00	16.24	16.24	0.00
1973	69.98	6.68	0.00	63.67	24.74	0.00	40.99	40.99	0.00
1974	20.54	0.00	0.00	32.72	26.55	0.00	3.74	3.74	0.00
1975	66.45	0.00	0.00	61.87	27.24	6.00	31.69	37.69	0.00
1976	161.87	115.93	0.00	112.89	20.69	0.00	92.26	92.26	0.00
1977	99.00	51.57	0.00	87.01	25.03	0.00	56.93	56.93	0.00
1978	121.09	79.69	0.00	89.34	22.47	0.00	67.99	67.99	0.00
1979	69.67	30.69	0.00	57.99	20.34	0.00	36.01	36.01	0.00
1980	66.29	20.91	0.00	60.14	17.29	0.00	44.43	44.43	0.00
1981	104.47	64.26	0.00	63.65	18.46	0.00	49.86	49.86	0.00
1982	100.81	53.48	0.00	66.26	15.33	0.00	45.17	45.17	0.00
1983	99.03	61.88	0.00	58.11	20.39	0.00	43.41	43.41	0.00
1984	65.22	24.02	0.00	60.47	28.39	0.00	30.35	30.35	0.00
1985	61.02	6.01	0.00	55.79	21.35	0.00	30.35	30.35	5.01
1986	91.06	46.07	0.00	89.80	21.89	0.00	66.92	66.92	0.00
MEAN	71.81	27.65	0.00	62.11	22.89	0.17	38.53	38.70	0.59

TABLE F-42. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( STAGE-1, PLAN-2, K2-DAM SIZE:CASE-C, AREA:4500HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** RAWAL DAM *****	***** K-2 DAM *****	***** TO RAWAL *****	***** SPILL *****	***** TOTAL *****	***** SHORT *****
	INFLOW	INFLOW	DEMAND	RELEASE	RELEASE	SHORT
1952	48.22	42.75	18.78	27.97	27.97	0.00
1953	44.98	43.87	21.34	20.21	20.21	1.01
1954	71.70	66.66	18.54	46.27	46.27	0.00
1955	83.93	79.97	17.13	60.23	60.23	7.05
1956	88.31	81.68	20.42	59.78	59.78	0.00
1957	78.47	67.57	10.61	56.25	56.25	0.00
1958	70.09	66.53	21.09	44.47	44.47	1.14
1959	108.57	79.13	12.56	66.61	66.61	0.00
1960	37.49	41.64	20.44	23.76	23.76	0.00
1961	81.35	69.18	14.87	50.10	50.10	0.00
1962	44.58	36.66	15.57	20.44	20.44	0.00
1963	82.17	52.73	17.64	35.06	35.06	0.00
1964	85.26	63.73	20.56	45.60	45.60	0.00
1965	64.84	59.66	13.36	43.64	43.64	0.00
1966	61.46	52.16	16.56	35.50	35.50	0.00
1967	79.48	65.57	16.15	47.46	47.46	0.00
1968	82.15	53.45	15.74	37.42	37.42	0.00
1969	31.78	34.16	18.88	15.63	15.63	0.00
1970	98.47	68.55	19.46	47.97	47.97	0.00
1971	65.84	48.83	21.70	29.06	29.06	0.00
1972	35.34	39.64	13.35	22.60	22.60	0.00
1973	75.18	63.67	18.25	46.19	46.19	0.00
1974	27.67	32.72	19.59	10.94	10.94	0.00
1975	73.52	61.87	20.10	44.21	44.21	0.00
1976	167.57	112.89	15.26	97.97	97.97	0.00
1977	107.25	87.01	18.46	65.18	65.18	0.00
1978	126.61	89.34	16.57	73.51	73.51	0.00
1979	75.51	57.99	15.00	41.87	41.87	0.00
1980	69.71	60.14	12.76	47.84	47.84	0.00
1981	108.80	63.65	13.62	54.20	54.20	0.00
1982	106.69	66.26	11.31	51.05	51.05	0.00
1983	102.98	58.11	15.04	47.36	47.36	0.00
1984	72.62	60.47	20.94	37.76	37.76	0.00
1985	68.09	55.79	15.92	37.42	37.42	3.53
1986	96.88	89.80	16.15	72.74	72.74	0.00
MEAN	77.82	62.11	16.96	44.69	44.69	0.36

TABLE F-43. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
( STAGE-2, PLAN-2, K2-DAM SIZE:CASE-A, AREA:4000HA, DEMAND:CASE-3 )

YEAR	(UNIT : MCM)									
	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	K-2 DAM ***** SPILL	***** TOTAL RELEASE	***** SHORT	
1952	48.36	11.40	0.00	42.75	16.69	0.00	29.25	29.25	0.00	
1953	45.34	0.00	0.00	43.87	19.86	0.00	21.60	21.60	0.00	
1954	72.31	5.23	0.00	66.66	16.48	0.00	48.23	48.23	0.00	
1955	78.16	23.37	0.00	79.97	21.50	0.91	54.55	55.46	0.00	
1956	89.47	33.91	0.00	81.68	18.15	0.00	62.29	62.29	0.00	
1957	77.81	16.33	0.00	67.57	9.43	0.00	57.25	57.25	0.00	
1958	70.08	15.07	0.00	66.53	19.76	0.00	45.55	45.55	0.00	
1959	108.00	60.69	0.00	79.13	11.17	0.00	67.83	67.83	0.00	
1960	37.94	0.06	0.00	41.64	18.17	0.00	25.33	25.33	0.00	
1961	81.82	15.36	0.00	69.18	13.22	0.00	52.07	52.07	0.00	
1962	44.93	0.00	0.00	36.66	13.84	0.00	22.01	22.01	0.00	
1963	82.63	23.65	0.00	52.73	15.68	0.00	36.84	36.84	0.00	
1964	85.23	39.63	0.00	63.73	18.28	0.00	47.08	47.08	0.00	
1965	65.19	17.18	0.00	59.66	11.88	0.00	45.24	45.24	0.00	
1966	61.80	0.05	0.00	52.16	14.72	0.00	37.15	37.15	0.00	
1967	80.04	18.01	0.00	65.57	14.35	0.00	49.39	49.39	0.00	
1968	82.19	36.65	0.00	53.45	13.99	0.00	38.99	38.99	0.00	
1969	32.34	0.00	0.00	34.16	16.78	0.00	17.34	17.34	0.00	
1970	99.17	27.68	0.00	68.55	17.30	2.21	47.77	49.98	0.00	
1971	66.27	20.96	0.00	48.83	19.29	0.00	31.04	31.04	0.00	
1972	35.92	0.00	0.00	39.64	11.86	0.00	24.32	24.32	0.00	
1973	75.19	2.24	0.00	63.67	16.22	0.00	47.66	47.66	0.00	
1974	29.11	0.00	0.00	32.72	17.41	0.00	13.32	13.32	0.00	
1975	72.62	0.00	0.00	61.87	17.86	15.81	29.97	45.78	0.00	
1976	167.45	110.79	0.00	112.89	13.56	0.00	99.54	99.54	0.00	
1977	107.91	50.88	0.00	87.01	16.41	0.00	67.52	67.52	0.00	
1978	126.62	78.00	0.00	89.34	14.73	0.00	75.05	75.05	0.00	
1979	75.55	28.83	0.00	57.99	13.34	0.00	43.47	43.47	0.00	
1980	69.13	15.47	0.00	60.14	11.34	0.00	48.75	48.75	0.00	
1981	108.15	60.06	0.00	63.65	12.10	0.00	55.35	55.35	0.00	
1982	106.51	50.61	0.00	66.26	10.05	0.00	52.64	52.64	0.00	
1983	102.28	57.33	0.00	58.11	13.37	0.00	48.42	48.42	0.00	
1984	73.23	23.66	0.00	60.47	18.62	0.00	39.88	39.88	0.00	
1985	65.50	0.96	0.00	55.79	17.29	0.00	36.05	36.05	0.00	
1986	96.81	42.47	0.00	89.80	14.36	0.00	74.36	74.36	0.00	
MEAN	77.74	25.33	0.00	62.11	15.40	0.54	45.52	46.06	0.00	

TABLE F-44. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
( STAGE-2, PLAN-2, K2-DAM SIZE:CASE-B, AREA:3500HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** INFLOW	RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	TOTAL RELEASE	***** SHORT
1952	49.86	12.77	0.00	42.75	14.61	0.00	30.76	30.76	0.00
1953	48.02	0.00	0.00	43.87	17.38	0.00	24.28	24.28	0.00
1954	74.59	10.18	0.00	66.66	14.42	0.00	50.51	50.51	0.00
1955	80.98	26.06	0.00	79.97	18.81	0.84	57.43	58.28	0.00
1956	92.19	36.29	0.00	81.68	15.88	0.00	65.01	65.01	0.00
1957	79.05	18.07	0.00	67.57	8.25	0.00	58.52	58.52	0.00
1958	72.64	17.64	0.00	66.53	17.29	0.00	48.11	48.11	0.00
1959	109.49	62.09	0.00	79.13	9.77	0.00	69.32	69.32	0.00
1960	39.71	0.16	0.00	41.64	15.90	0.00	27.11	27.11	0.00
1961	84.12	19.20	0.00	69.18	11.56	0.00	54.38	54.38	0.00
1962	46.71	0.00	0.00	36.66	12.11	0.00	23.83	23.83	0.00
1963	84.69	27.37	0.00	52.73	13.72	0.00	38.89	38.89	0.00
1964	86.93	41.49	0.00	63.73	15.99	0.00	48.78	48.78	0.00
1965	67.07	18.99	0.00	59.66	10.39	0.00	47.23	47.23	0.00
1966	63.63	1.91	0.00	52.16	12.88	0.00	38.98	38.98	0.00
1967	82.29	20.32	0.00	65.57	12.56	0.00	51.64	51.64	0.00
1968	84.03	38.14	0.00	53.45	12.24	0.00	40.83	40.83	0.00
1969	34.27	0.00	0.00	34.16	14.68	0.00	19.29	19.29	0.00
1970	101.51	32.06	0.00	68.55	15.13	0.00	52.32	52.32	0.00
1971	68.41	23.26	0.00	48.83	16.88	0.00	33.18	33.18	0.00
1972	37.99	0.00	0.00	39.64	10.38	0.00	26.40	26.40	0.00
1973	76.87	5.89	0.00	63.67	14.20	0.00	49.34	49.34	0.00
1974	31.75	0.00	0.00	32.72	15.24	0.00	16.01	16.01	0.00
1975	74.48	1.14	0.00	61.87	15.63	12.35	35.14	47.49	0.00
1976	169.35	115.91	0.00	112.89	11.87	0.00	101.44	101.44	0.00
1977	110.52	53.41	0.00	87.01	14.36	0.00	70.13	70.13	0.00
1978	128.44	79.82	0.00	89.34	12.89	0.00	76.86	76.86	0.00
1979	77.41	30.57	0.00	57.99	11.67	0.00	45.35	45.35	0.00
1980	70.26	16.84	0.00	60.14	9.92	0.00	49.87	49.87	0.00
1981	109.58	61.46	0.00	63.65	10.59	0.00	56.77	56.77	0.00
1982	108.43	52.27	0.00	66.26	8.80	0.00	54.56	54.56	0.00
1983	103.57	58.90	0.00	58.11	11.70	0.00	49.71	49.71	0.00
1984	75.63	26.02	0.00	60.47	16.29	0.00	42.28	42.28	0.00
1985	68.23	3.54	0.00	55.79	15.13	0.00	38.78	38.78	0.00
1986	98.70	44.56	0.00	89.80	12.56	0.00	76.25	76.25	0.00
MEAN	79.75	27.32	0.00	62.11	13.48	0.38	47.69	48.07	0.00

TABLE F-45. RESULT OF WATER BALANCE STUDY AT RAWAL DAM AND K-2 DAM  
 ( STAGE-2, PLAN-2, K2-DAM SIZE:CASE-C, AREA:3000HA, DEMAND:CASE-3 )

(UNIT : MCM)

YEAR	***** RAWAL DAM INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** K-2 DAM SPILL	***** TOTAL RELEASE	***** SHORT
1952	51.36	14.13	0.00	42.75	12.52	0.00	32.25	32.25	0.00
1953	50.70	0.00	0.00	43.87	14.89	0.00	26.96	26.96	0.00
1954	76.87	15.14	0.00	66.66	12.36	0.00	52.79	52.79	0.00
1955	84.22	28.82	0.00	79.97	16.04	0.77	60.75	61.52	0.08
1956	94.54	38.65	0.00	81.68	13.61	0.00	67.36	67.36	0.00
1957	80.31	19.84	0.00	67.57	7.07	0.00	59.78	59.78	0.00
1958	75.19	20.19	0.00	66.53	14.82	0.00	50.65	50.65	0.00
1959	110.97	63.48	0.00	79.13	8.38	0.00	70.80	70.80	0.00
1960	41.49	0.25	0.00	41.64	13.63	0.00	28.89	28.89	0.00
1961	86.36	22.99	0.00	69.18	9.91	0.00	56.69	56.69	0.00
1962	48.52	0.00	0.00	36.66	10.38	0.00	25.64	25.64	0.00
1963	86.73	31.12	0.00	52.75	11.76	0.00	40.93	40.93	0.00
1964	88.62	43.35	0.00	63.73	13.71	0.00	50.47	50.47	0.00
1965	68.98	20.77	0.00	59.66	8.91	0.00	49.23	49.23	0.00
1966	65.43	3.77	0.00	52.16	11.04	0.00	40.79	40.79	0.00
1967	84.52	22.62	0.00	65.57	10.76	0.00	53.88	53.88	0.00
1968	85.86	39.62	0.00	53.45	10.49	0.00	42.66	42.66	0.00
1969	36.19	0.00	0.00	34.16	12.58	0.00	21.23	21.23	0.00
1970	103.98	36.41	0.00	68.55	12.97	0.00	54.79	54.79	0.00
1971	70.49	25.55	0.00	48.83	14.47	0.00	35.26	35.26	0.00
1972	39.97	0.00	0.00	39.64	8.90	0.00	28.37	28.37	0.00
1973	78.59	9.52	0.00	63.67	12.17	0.00	51.05	51.05	0.00
1974	34.39	0.00	0.00	32.72	13.06	0.00	18.66	18.66	0.00
1975	76.43	5.68	0.00	61.87	13.40	8.52	40.71	49.22	0.00
1976	171.22	117.74	0.00	112.89	10.17	0.00	103.31	103.31	0.00
1977	113.13	55.94	0.00	87.01	12.31	0.00	72.74	72.74	0.00
1978	130.26	81.64	0.00	89.34	11.05	0.00	78.68	78.68	0.00
1979	79.26	32.29	0.00	57.99	10.00	0.00	47.20	47.20	0.00
1980	71.43	18.23	0.00	60.14	8.50	0.00	51.08	51.08	0.00
1981	110.90	62.81	0.00	63.65	9.08	0.00	58.09	58.09	0.00
1982	110.33	53.93	0.00	66.26	7.54	0.00	56.47	56.47	0.00
1983	104.86	60.45	0.00	58.11	10.03	0.00	51.00	51.00	0.00
1984	78.05	28.36	0.00	60.47	13.96	0.00	44.69	44.69	0.00
1985	70.92	6.11	0.00	55.79	12.97	0.00	41.47	41.47	0.00
1986	100.57	46.63	0.00	89.80	10.77	0.00	78.12	78.12	0.00
MEAN	81.76	29.32	0.00	62.11	11.55	0.27	49.81	50.08	0.00

CHAPTER III. K-2 DAM RESERVOIR OPERATION STUDY  
(ALTERNATION OF CROPPING ACREAGE BY YEAR)

In order to estimate an average annual irrigable areas in case of proposed plan (Plan II, Stage I, Dam size: Case A, Irrigation Demand: Case 3), reservoir operation study of the project was made considering no water shortage for irrigation by reducing irrigation area of Kharif vegetable (I) in Kharif season. As the result, irrigable area in 1955, 1958 and 1985, which was found out to be water shortage year (drought year) through the reservoir operation in case of the project plan, are estimated as shown below;

Irrigable Area in Drought Year

Year	Cropping Intensity			Annual Irrigation Area (ha)
	Rabi Season (%)	Kharif Season (%)	Total (%)	
1955	100.0	21.0	121.0	7,986
1958	100.0	40.2	140.2	9,253
1985	100.0	31.9	131.9	8,705
Average	100.0	31.0	131.0	8,648
Average for 35 Years	100.0	41.1	141.1	9,310

Note: Details are given in Table F-46.

TABLE F-46. CROPPING AREA BY CROPS IN NORMAL AND DROUGHT YEARS

(unit: %)

Item	Irrigated Area										Non-Irrigated Area			
	Rabi Season			Kharif Season			Kharif Season			Kharif Season				
	Wheat	Fodders	Rabi Vegetables	Veget. (I)	Veget. (II)	Orchard	Perennial	Taotal(1)	Maize	Pulses	Total(2)	Maize	Pulses	Total(2)
1. Normal Year	62.6	10.4	21.0	21.0	21.0	6.0	6.0	142.0	13.0	13.0	26.0	13.0	13.0	26.0
2. Drought Year														
- 1955	62.6	10.4	21.0	0	21.0	6.0	6.0	121.0	13.0	13.0	26.0	13.0	13.0	26.0
- 1958	62.6	10.4	21.0	19.2	21.0	6.0	6.0	140.2	13.0	13.0	26.0	13.0	13.0	26.0
- 1985	62.6	10.4	21.0	10.1	21.0	6.0	6.0	131.9	13.0	13.0	26.0	13.0	13.0	26.0
3. Average of 35-Years	62.6	10.4	21.0	20.1	21.0	6.0	6.0	141.1	13.0	13.0	26.0	13.0	13.0	26.0

Annual average cropping area = 6,600 ha x 141.1%  
= 9,310 ha

TABLE F-47. RESULT OF WATER BALANCE STUDY AT RAWAL AND K-2 DAMS (ALTERNATION OF CROPPING AREA)  
 (STAGE-1, PLAN-2, K2-DAM SIZE: CASE-A, AREA: 6,600 HA, DEMAND: CASE 3-1)

(UNIT : MCM)

YEAR	***** INFLOW	***** RAWAL DAM SPILL	***** SHORT	***** INFLOW	***** IRRI. DEMAND	***** TO RAWAL RELEASE	***** SPILL	***** TOTAL RELEASE	***** SHORT
1952	42.09	10.94	0.00	42.75	27.54	0.00	21.83	21.83	0.00
1953	32.91	0.00	0.00	43.87	32.77	0.00	8.14	8.14	0.00
1954	62.54	0.18	0.00	66.66	27.19	0.00	37.11	37.11	0.00
1955	74.01	26.94	0.00	79.97	27.01	0.00	50.30	50.30	0.00
1956	78.31	32.26	0.00	81.68	29.94	0.00	49.78	49.78	0.00
1957	71.76	19.51	0.00	67.57	15.56	0.00	49.46	49.46	0.00
1958	58.95	12.41	0.00	66.53	32.05	0.00	33.33	33.33	0.00
1959	102.66	62.99	0.00	79.13	18.43	0.00	60.58	60.58	0.00
1960	30.26	1.38	0.00	41.64	29.98	0.00	16.53	16.53	0.00
1961	71.94	12.16	0.00	69.18	21.81	0.00	40.69	40.69	0.00
1962	37.03	0.00	0.00	36.66	22.83	0.00	12.89	12.89	0.00
1963	73.79	23.47	0.00	52.73	25.87	0.00	26.67	26.67	0.00
1964	78.31	40.17	0.00	63.73	30.16	0.00	38.65	38.65	0.00
1965	57.51	17.37	0.00	59.66	19.60	0.00	36.31	36.31	0.00
1966	53.20	0.45	0.00	52.16	24.29	0.00	27.24	27.24	0.00
1967	70.29	18.51	0.00	65.57	23.68	0.00	38.27	38.27	0.00
1968	74.65	35.60	0.00	53.45	23.09	0.00	29.92	29.92	0.00
1969	23.81	0.00	0.00	34.16	27.69	0.00	7.66	7.66	0.00
1970	89.14	25.65	0.00	68.55	28.54	0.00	38.65	38.65	0.00
1971	56.76	18.68	0.00	48.83	31.83	0.00	19.98	19.98	0.00
1972	26.91	0.00	0.00	39.64	19.58	0.00	14.16	14.16	0.00
1973	68.30	3.02	0.00	63.67	26.77	0.00	39.31	39.31	0.00
1974	19.79	0.00	0.00	32.72	28.73	0.00	2.99	2.99	0.00
1975	62.65	0.00	0.00	61.87	29.48	9.34	24.70	34.04	0.00
1976	160.02	109.63	0.00	112.89	22.38	0.00	90.41	90.41	0.00
1977	96.34	49.03	0.00	87.01	27.08	0.00	54.27	54.27	0.00
1978	119.30	77.87	0.00	89.34	24.31	0.00	66.20	66.20	0.00
1979	67.76	28.96	0.00	57.99	22.00	0.00	34.11	34.11	0.00
1980	65.17	19.51	0.00	60.14	18.71	0.00	43.30	43.30	0.00
1981	103.05	62.87	0.00	63.65	19.97	0.00	48.45	48.45	0.00
1982	98.91	51.82	0.00	66.26	16.59	0.00	43.27	43.27	0.00
1983	97.71	60.31	0.00	58.11	22.06	0.00	42.09	42.09	0.00
1984	62.84	21.67	0.00	60.47	30.72	0.00	27.98	27.98	0.00
1985	55.76	0.85	0.00	55.79	25.75	0.00	25.10	25.10	0.00
1986	89.17	44.06	0.00	89.80	23.69	0.00	65.03	65.03	0.00
MEAN	69.53	25.38	0.00	62.11	25.08	0.27	36.15	36.42	0.00



TABLE F-48. DIVERSION WATER REQUIREMENT (CASE 3-1)  
(ALTERNATION OF CROPPING AREA)

CROPPING PATTERN	WHEAT = 0.626		FODDERS = 0.104		VEGET(R) = 0.210		VEGET(K1) = 0.210		VEGET(K2) = 0.210				
	ORCHARD = 0.060	MAIZE(K) = 0.130	ORCHARD = 0.060	MAIZE(K) = 0.130	PULSES(K) = 0.130	PULSES(K) = 0.130	PULSES(K) = 0.130	PULSES(K) = 0.130	PULSES(K) = 0.130	PULSES(K) = 0.130			
CROPPING INTENSITY = 168.0%	IRRIGATION EFFICIENCY = 60.0%												
YEAR	(JAN)	(FEB)	(MAR)	(APR)	(MAY)	(JUN)	(JUL)	(AUG)	(SEP)	(OCT)	(NOV)	(DEC)	ANNUAL
1952	0.076	0.198	0.447	0.914	0.610	0.201	0.109	0.076	0.200	0.293	0.498	0.549	4.173
1953	0.004	0.367	1.233	0.720	0.535	0.555	0.177	0.085	0.165	0.176	0.498	0.452	4.967
1954	0.060	0.013	0.723	0.939	0.608	0.469	0.173	0.074	0.124	0.142	0.441	0.354	4.118
1955	0.686	0.805	0.815	0.421	0.153	0.341	0.201	0.122	0.048	0.256	0.498	0.269	4.617
1956	0.273	0.972	0.378	0.719	0.708	0.160	0.034	0.008	0.274	0.144	0.418	0.449	4.536
1957	0.024	0.224	0.509	0.103	0.401	0.285	0.416	0.086	0.195	0.056	0.042	0.018	2.359
1958	0.039	0.907	0.561	0.858	0.627	0.403	0.087	0.107	0.157	0.209	0.270	0.189	4.855
1959	0.002	0.862	0.361	0.526	0.416	0.540	0.162	0.077	0.006	0.127	0.077	0.090	2.791
1960	0.116	0.299	1.062	0.609	0.665	0.525	0.135	0.088	0.126	0.192	0.498	0.481	4.544
1961	0.229	0.360	0.515	0.301	0.625	0.374	0.139	0.072	0.006	0.106	0.065	0.136	3.302
1962	0.518	1.050	0.379	0.608	0.565	0.323	0.141	0.029	0.042	0.281	0.275	0.088	3.457
1963	0.115	0.527	0.949	0.422	0.441	0.467	0.215	0.012	0.024	0.256	0.051	0.080	3.917
1964	0.354	0.098	0.501	0.283	0.538	0.461	0.107	0.126	0.093	0.352	0.498	0.517	4.567
1965	0.548	0.363	0.440	0.311	0.307	0.377	0.259	0.127	0.232	0.316	0.113	0.223	2.966
1966	0.395	0.504	0.764	0.573	0.531	0.377	0.187	0.043	0.035	0.094	0.306	0.426	3.679
1967	0.188	0.078	0.686	0.646	0.653	0.436	0.147	0.040	0.142	0.088	0.193	0.025	3.588
1968	0.597	0.134	0.764	0.754	0.499	0.475	0.209	0.075	0.299	0.177	0.074	0.077	3.502
1969	0.494	0.415	0.615	0.936	0.681	0.354	0.156	0.023	0.021	0.096	0.125	0.376	4.196
1970	0.554	0.758	0.997	0.623	0.524	0.085	0.251	0.064	0.098	0.179	0.237	0.213	4.325
1971	0.112	0.234	0.412	0.262	0.561	0.363	0.374	0.162	0.090	0.112	0.252	0.031	4.823
1972	0.378	0.653	0.723	0.584	0.569	0.250	0.065	0.033	0.034	0.115	0.482	0.279	2.966
1973	0.230	0.254	0.928	0.851	0.581	0.202	0.117	0.121	0.151	0.207	0.498	0.104	4.055
1974	0.694	0.178	0.423	0.897	0.470	0.378	0.101	0.068	0.056	0.207	0.333	0.505	4.467
1975	0.292	0.065	0.364	0.303	0.686	0.375	0.087	0.030	0.058	0.119	0.435	0.577	3.392
1976	0.238	0.750	1.449	0.270	0.482	0.234	0.028	0.041	0.169	0.101	0.119	0.225	4.105
1977	0.387	0.341	0.680	0.734	0.578	0.362	0.020	0.010	0.031	0.185	0.083	0.272	3.682
1978	0.007	0.567	0.462	0.504	0.534	0.350	0.297	0.032	0.142	0.140	0.173	0.103	3.551
1979	0.078	0.039	0.172	0.627	0.621	0.307	0.073	0.146	0.050	0.165	0.354	0.274	2.834
1980	0.203	0.203	0.187	0.404	0.457	0.375	0.072	0.012	0.075	0.201	0.405	0.577	3.025
1981	0.101	0.049	0.129	0.497	0.326	0.404	0.396	0.046	0.187	0.133	0.172	0.073	2.513
1982	0.486	0.293	0.437	0.186	0.551	0.255	0.084	0.078	0.030	0.028	0.339	0.577	3.342
1983	0.804	0.576	0.746	0.408	0.642	0.310	0.056	0.041	0.042	0.318	0.428	0.283	4.654
1984	0.014	0.670	0.974	0.714	0.356	0.449	0.095	0.050	0.170	0.086	0.212	0.112	3.901
1985	0.410	0.398	0.584	0.685	0.496	0.308	0.178	0.055	0.150	0.086	0.224	0.015	3.590
MEAN	0.282	0.407	0.628	0.549	0.529	0.361	0.156	0.065	0.110	0.176	0.282	0.269	3.814



**ANNEX G. AGRICULTURE AND REGIONAL ECONOMY**



ANNEX G. AGRICULTURE AND REGIONAL ECONOMY

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## CHAPTER I. PRESENT CONDITION

### 1.1. Population and Household

Population, total household and farm household in the Project Area are estimated based on the Village wise data of "Population Census, 1981" and "Village Profile Survey, 1986".

Table G-1 shows the list of beneficiary villages and Table G-2 to G-3 shown the number of household and population in the Project Area.

### 1.2. Social Infrastructure

Present condition of social infrastructure in the Project Area is shown in Table G-6 to 10 and Figure G-1.

### 1.3. Cooperative Society

Number of cooperative societies and irrigator's cooperative societies are shown in Table G-11 and G-12.

### 1.4. Agricultural Condition

General condition of agriculture in the Project Area is shown in Table G-13 to G-16. And the result of farm survey in the Project Area are shown in the Table G-17 to G-24 and Figure G-2.

### 1.5. Household Income and Expenditure

Level of household income and expenditure in Pakistan and Punjab Province are summarised in Table G-25 to 31.

TABLE G-1. LIST OF VILLAGES IN THE PROJECT AREA

<u>Markaz</u>	<u>Code No. of Vilalge</u>	<u>Name of Village</u>	<u>Union Council</u>
1. Rural Area of Islamabad			
1-1. Bharakao	1.	Khot Hathial	Bharakao
	2.	Mohra Noor	"
	3.	Phulgran	Phulgran
	4.	Shah Pur	"
	5.	Athal	"
	6.	Pind Begawal	"
	7.	Malot	Kuri
	8.	Rihara	"
	9.	Kuri	"
	10.	Muhrian	"
	11.	Ghora Baz	"
	12.	Jagyot	"
	13.	Naugazi	"
1-2. Tarlai	14.	Tamma	Kirpa
	15.	Farash	"
	16.	Ali Pur	"
	17.	Khadrir Pur	"
	18.	Chattha Bakhtawar	Tarlai
	19.	Chappar Mir Khanal	"
	20.	Tarlai Kalan	"
	21.	Taramri	"
	22.	Ghora Sirdar	"
	23.	Suhder	"
	24.	Tarlai Khurd	"
	25.	Gangal	"
	26.	Khana Dak	"
	27.	Mohra Jujan	Sohan
	28.	Chak Bira Singh	"
	29.	Majohan	"
	30.	Kartal Bhakral	"
	31.	Chak Shahdad	"
	32.	Dhock Sharaf	"
	33.	Sohana	"
	34.	Bohan	"
	35.	Pandori	"
	36.	Jaba Teli	"
	37.	Shak Rial	"
	38.	Kana Kak	"
	39.	Sohan Dehati	"
2. Urban Area of Islamabad			
	40.	Rawal	Urban Area
	41.	Pona Faqiran	"
	42.	Dhok Mohra Malan	"
	43.	Ojhri Khurd	"

TABLE G-2. POPULATION AND HOUSEHOLD IN THE PROJECT AREA

Code No. of Village	Name of Village	Population (Persons)			Family Size per House	Households in 1987 Estimated (houses)
		1981 1/	1982 2/	1987		
<b>1. Rural Area of Islamabad</b>						
<b>1-1. Bharakao Markaz</b>						
1.	Khot Hathial	5,066	8,471	9,150	6.3	1,450
2.	Mohra Noor	2,676	3,077	3,160	5.9	540
3.	Phulgran	4,426	5,157	5,300	6.4	830
4.	Shah Pur	87	100	100	6.7	15
5.	Athal	1,183	1,356	1,390	5.7	245
6.	Pind Begawal	3,489	*	4,710e	6.0	790
7.	Malot	1,516	1,872	1,940	6.0	320
8.	Rihara	571	601	610	5.9	100
9.	Kuri	2,248	2,305	2,320	5.9	390
10.	Muhrian	2,015	*	2,720e	5.8	470
11.	Ghara Baz	37	*	50e	4.6	10
12.	Jagyt	2,597	*	3,510e	5.4	650
13.	Naugazi	324	*	440e	5.6	80
	<b>Sub-Total</b>	<b>26,235</b>		<b>35,400</b>		<b>5,890</b>
<b>1-2. Tarlai Markaz</b>						
14.	Tamma	526	*	710e	5.7	120
15.	Farash	1,505	1,654	1,680	6.1	280
16.	Ali Pur	1,267	*	1,710e	5.7	300
17.	Khadri Pur	786	*	1,060e	6.6	160
18.	Chattha Bakhtawar	863	*	1,160e	5.4	210
19.	Chappar Mir Khanal	735	*	990e	6.9	140
20.	Tarlai Kalan	3,568	*	4,820e	5.9	820
21.	Taramri	132	*	180e	4.4	40
22.	Ghara Sirdar	279	*	380e	6.1	65
23.	Suhder	201	*	270e	5.4	50
24.	Tarlai Khurd	654	*	880e	7.2	120
25.	Gangal	702	*	950e	6.6	140
26.	Khana Dak	5,072	*	6,850e	6.8	1,010
27.	Mohra Jujan	134	200	210	6.1	35
28.	Chak Bira Singh	411	500	520	5.1	100
29.	Majohan	295	500	540	6.7	80
30.	Kartal Bhakral	*	*	*	*	*
31.	Chak Shahdad	1,983	2,895	3,080	5.6	550
32.	Dhock Sharaf	8	20	20	2.7	10
33.	Sohana	341	436	460	6.6	70
34.	Bohan	61	*	80e	3.8	20
35.	Pandori	602	534	530	5.8	90
36.	Jaba Teli	680	976	1,030	6.6	160
37.	Shak Rial	6,213	*	8,390e	7.0	1,200
38.	Kana Kak	208	*	280e	5.8	50
39.	Sohan Dehati	1,914	*	2,580e	5.5	470
	<b>Sub-Total</b>	<b>29,140</b>		<b>39,360</b>		<b>6,290</b>
<b>2. Urban Area of Islamabad</b>						
40.	Rawal	1,989	*	2,690e	6.3	430
41.	Pona Faqiran	678	*	910e	6.7	140
42.	Dhok Mohra Malan	150	*	200e	5.8	30
43.	Ojhri Khurd	336	*	450e	6.9	70
	<b>Sub-Total</b>	<b>3,153</b>		<b>4,250</b>		<b>670</b>
	<b>Total</b>	<b>58,528</b>		<b>79,010</b>	<b>6.2</b>	<b>12,850</b>

Data Source: 1/ ... "Population Census, 1981", Population Census Organization  
2/ ... "Village Profile Survey, 1986" LGRD, ICTA

Note : e .... estimated  
\* .... data is not available

TABLE G-3. FARM HOUSEHOLD IN THE PROJECT AREA

Code No. of Village	Name of Village	Total Household, 1987 (houses)	Total Cultivated Area, 1986 (ha)	Farm Household, 1987 (houses)
<b>1. Rural Area of Islamabad</b>				
<b>1-1. Bharakao Markaz</b>				
1.	Khot Hathial	1,450	311	541
2.	Mohra Noor	540	476	197
3.	Phulgran	830	455	400
4.	Shah Pur	15	330	71
5.	Athal	245	257	105
6.	Pind Begawal	790	725	404
7.	Malot	320	431	145
8.	Rihara	100	236	47
9.	Kuri	390	334	162
10.	Muhrian	470	752	243
11.	Ghara Baz	10	83	8
12.	Jagyot	650	348	312
13.	Naugazi	80	50	35e
	<u>Sub-Total</u>	<u>5,890</u>	<u>4,788</u>	<u>2,670</u>
<b>1-2. Tarlai Markaz</b>				
14.	Tanma	120	149	70
15.	Faraah	280	154	100e
16.	Ali Pur	300	143	169
17.	Khadrir Pur	160	85e	55e
18.	Chattha Bakhtawar	210	139	63
19.	Chappar Mir Khanal	140	248	54
20.	Tarlai Kalan	820	444	260
21.	Taramri	40	27	15e
22.	Ghara Sirdar	65	131	25e
23.	Suhder	50	87	15
24.	Tarlai Khurd	120	219	48
25.	Gangal	140	97	295
26.	Khana Dak	1,010	202	188
27.	Mohra Jujan	35	35	10
28.	Chak Bira Singh	100	162	26
29.	Majohan	80	151	26
30.	Kartal Bhakral	*	*	*
31.	Chak Shahdad	550	255	149
32.	Dhock Sharaf	10	37	5e
33.	Sohana	70	150	23
34.	Bohan	20	15e	10e
35.	Pandori	90	143	27
36.	Jaba Teil	160	115	90
37.	Shak Rial	1,200	10	17
38.	Kana Kak	50	185	360
39.	Sohan Dehati	470	221	170e
	<u>Sub-Total</u>	<u>6,290</u>	<u>3,604</u>	<u>2,270</u>
<b>2. Urban Area of Islamabad</b>				
40.	Rawal	430	240e	155e
41.	Pona Faqiran	140	80e	50e
42.	Dhok Mohra Malan	30	20e	10e
43.	Ojhri Khurd	70	40e	25e
	<u>Sub-Total</u>	<u>670</u>	<u>380</u>	<u>240</u>
	<u>Total</u>	<u>12,850</u>	<u>8,772</u>	<u>5,180</u>

Data Source: 1/ ... "Population Census, 1981", Population Census Organization

2/ ... "Village Profile Survey, 1986" LGRD, ICTA

3/ ... "Land Revenue, 1984-87", Land Revenue Dept., ICTA

Note : e .... estimated

\* .... data is not available

TABLE G-4. COMPARISON OF POPULATION IN 1981 WITH THOSE IN 1972 (IN THOUSANDS)

	Total			Urban			Rural		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
<u>Islamabad Federal Area</u>									
1972	235	130	105	77	46	31	158	84	74
1981	340	185	155	204	113	91	136	72	64
1981/1972	1.45	1.42	1.48	2.65	2.46	2.94	0.86	0.86	0.86
<u>Punjab Province</u>									
1972	37,610	20,211	17,399	9,183	4,977	4,206	28,427	15,234	13,193
1981	47,292	24,860	22,432	13,051	6,951	6,100	34,241	17,909	16,332
1981/1972	1.26	1.23	1.29	1.42	1.40	1.45	1.20	1.18	1.24
<u>Pakistan</u>									
1972	65,309	34,833	30,476	16,594	9,027	7,567	48,715	25,806	22,909
1981	84,253	44,232	40,021	23,840	12,766	11,074	60,413	31,466	28,947
1981/1972	1.29	1.27	1.31	1.44	1.41	1.46	1.24	1.22	1.26

Source: Population Census, 1981, 1972.

TABLE G-5. COMPOSITION OF POPULATION BY AGE, SEX, URBAN/RURAL AREAS, 1981 CENSUS, ISLAMABAD FEDERAL AREA

All ages	Urban			Rural			Rural + Urban	
	Both sexes	Male	Female	Both sexes	Male	Female	Male %	Female %
0 - 4	13.90	12.64	15.46	15.06	14.46	15.73	114	102
5 - 9	13.58	12.61	14.78	14.57	14.20	14.98	113	101
10 - 14	11.75	11.28	12.33	12.75	12.91	12.56	114	102
15 - 19	9.76	9.74	9.79	9.84	9.81	9.87	101	101
20 - 24	9.12	9.34	8.84	7.75	7.94	7.53	85	85
25 - 29	8.41	8.52	8.26	7.08	6.87	7.31	81	88
30 - 34	7.00	7.27	6.66	5.81	5.71	5.92	79	89
35 - 39	6.47	6.61	6.28	5.67	5.43	5.94	82	95
40 - 44	5.42	5.67	5.12	4.99	5.04	4.93	89	96
45 - 49	4.21	4.70	3.60	4.01	4.02	4.02	86	112
50 - 54	3.63	4.11	3.03	3.66	3.92	3.39	95	112
55 - 59	1.90	2.27	1.46	2.12	2.31	1.92	102	132
60 - 64	2.08	2.33	1.77	2.69	3.05	2.28	131	129
65 - 69	0.82	0.88	0.74	1.21	1.32	1.09	150	147
70 - 74	0.86	0.88	0.85	1.37	1.45	1.28	165	151
75 and over	1.09	1.15	1.03	1.42	1.56	1.25	136	121
Total	100.00	100.00	100.00	100.00	100.00	100.00		

Source: Pakistan Statistical Yearbook, 1985.  
Federal Bureau of Statistics  
Statistics Division Government of Pakistan

TABLE G-6. PUBLIC HEALTH AND POST OFFICES

Code No. of Village	Name of Village	Health Facilities				Post Office	
		Basic Health Unit	Rural Health Center	No. of Doctor	No. of Midwife	Post Office	Sub-post Office
1. Rural Area of Islamabad							
1-1. Bharakao Markaz							
1.	Khot Nathial	-	1	3	5	1	-
2.	Mohra Noor	-	-	-	1	-	-
3.	Phulgran	-	-	-	-	-	1
4.	Shah Pur	-	-	-	-	-	-
5.	Athal	-	-	-	-	-	-
6.	Pind Begawal	1	-	1	4	-	2
7.	Malot	-	-	-	-	-	-
8.	Rihara	-	-	-	-	-	-
9.	Kuri	-	-	-	-	-	-
10.	Muhrian	-	-	-	-	-	-
11.	Ghora Baz	-	-	-	-	-	-
12.	Jagyt	1	-	2	4	1	-
13.	Naugazi	-	-	-	-	-	-
	<u>Sub-Total</u>	<u>(2)</u>	<u>(1)</u>	<u>(6)</u>	<u>(14)</u>	<u>(2)</u>	<u>(3)</u>
1-2. Tarlai Markaz							
14.	Tamma	-	-	-	-	-	-
15.	Ferash	-	-	-	-	-	-
16.	Ali Pur	-	-	-	-	-	-
17.	Khadrir Pur	*	*	*	*	*	*
18.	Chattha Bakhtawar	-	-	-	-	-	-
19.	Chappar Mir Khanal	-	-	-	-	-	-
20.	Tarlai Kalan	1	1	2	4	1	-
21.	Taramri	-	-	-	-	-	-
22.	Ghora Sirdar	-	-	-	-	-	-
23.	Suher	-	-	-	-	-	-
24.	Tarlai Khurd	-	-	-	-	-	-
25.	Gangai	-	-	-	-	-	-
26.	Khana Dak	-	-	-	-	1	-
27.	Mohra Jujan	-	-	-	-	-	-
28.	Chak Bira Singh	-	-	-	-	-	-
29.	Majohan	-	-	-	-	-	-
30.	Kartai Bhakral	*	*	*	*	*	*
31.	Chak Shahdad	-	-	-	-	-	-
32.	Dhock Sharaf	-	-	-	-	-	-
33.	Sohana	-	-	-	-	-	-
34.	Bohan	*	*	*	*	*	*
35.	Pandori	-	-	-	-	-	-
36.	Jaba Teli	-	-	-	-	-	-
37.	Shak Rial	-	-	-	-	-	-
38.	Kana Kak	-	-	-	-	-	-
39.	Sohan Dehati	1	-	1	1	-	-
	<u>Sub-Total</u>	<u>(2)</u>	<u>(1)</u>	<u>(3)</u>	<u>(5)</u>	<u>(2)</u>	<u>(-)</u>
2. Urban Area of Islamabad							
40.	Rawal	*	*	*	*	*	*
41.	Pona Faqiran	*	*	*	*	*	*
42.	Dhok Mohra Malan	*	*	*	*	*	*
43.	Ojhri Khurd	*	*	*	*	*	*
	<u>Sub-Total</u>						
	<u>Total (36 villages)</u>	<u>4</u>	<u>2</u>	<u>9</u>	<u>19</u>	<u>4</u>	<u>3</u>

Data Source: "Village Profile Survey, 1986" LGPD, ICTA  
 Note : \* .... data is not available

TABLE G-7. DRINKING WATER SOURCE AND ELECTRIFICATION

Code No. of Village	Name of Village	Drinking Water Source		Electrification		
		Well	Spring	Complete	Partial	Non
1. Rural Area of Islamabad						
1-1. Bharakao Markaz						
1.	Khot Hathial	16	-	-	0	-
2.	Mohra Noor	11	3	-	0	-
3.	Phulgran	28	5	0	-	-
4.	Shah Pur	2	1	0	-	-
5.	Athal	7	2	0	-	-
6.	Pind Begawal	10	4	-	0	-
7.	Malot	22	4	0	-	-
8.	Rihara	5	3	0	-	-
9.	Kuri	6	1	0	-	-
10.	Muhran	6	-	0	-	-
11.	Ghora Baz	1	-	0	-	-
12.	Jagyt	10	-	0	-	-
13.	Naugazi	2	-	0	-	-
	<u>Sub-Total</u>	<u>(126)</u>				
1-2. Tarlai Markaz						
14.	Tamma	2	-	0	-	-
15.	Farash	9	-	0	-	-
16.	Ali Pur	6	-	0	-	-
17.	Khadrir Pur	*	*	*	*	*
18.	Chattha Bakhtawar	8	-	0	-	-
19.	Chappar Mir Khanai	5	-	0	-	-
20.	Tarlai Kalan	23	-	0	-	-
21.	Taramri	2	-	0	-	-
22.	Ghora Sirdar	3	-	0	-	-
23.	Suher	5	-	-	0	-
24.	Tarlai Khurd	8	-	-	0	-
25.	Gangal	32	-	0	-	-
26.	Khana Dek	36	6	0	-	-
27.	Mohra Jujan	1	-	-	-	0
28.	Chak Bira Singh	2	-	-	-	0
29.	Majohan	2	-	0	-	-
30.	Kartal Bhakral	*	*	*	*	*
31.	Chak Shahdad	4	-	0	-	-
32.	Dhock Sharaf	-	-	-	-	0
33.	Sohana	5	-	0	-	-
34.	Bohan	*	*	*	*	*
35.	Pandori	3	-	-	0	-
36.	Jaba Tell	5	-	0	-	-
37.	Shak Rial	6	-	-	0	-
38.	Kana Kak	8	-	0	-	-
39.	Sohan Dehati	52	-	-	0	-
	<u>Sub-Total</u>	<u>(227)</u>				
2. Urban Area of Islamabad						
40.	Rawal	*	*	*	*	*
41.	Pona Faqiran	*	*	*	*	*
42.	Dhok Mohra Malan	*	*	*	*	*
43.	Ojhri Khurd	*	*	*	*	*
	<u>Sub-Total</u>					
	<u>Total (36 villages)</u>	<u>353</u>	<u>29</u>	<u>25</u>	<u>8</u>	<u>3</u>

Data Source: "Village Profile Survey, 1986" LGRD, ICTA  
 Note : \* .... data is not available



TABLE G-8. DENSITY OF ROAD

Item	Bharakau	Phulgran	Tarlei Kalan	Sohan	11 U.C. Total
(1) Total length of road (km)	24.3	35.8	29.5	56.3	388.0
(2) Metal road (km)	7.0	16.0	19.3	41.1	229.4
(3) Total land area (km <sup>2</sup> )	59.8	48.7	24.8	30.7	595.0
(1)/(3) (km/km <sup>2</sup> )	0.41	0.74	1.19	1.83	0.65
(2)/(3) (km/km <sup>2</sup> )	0.12	0.33	0.78	1.34	0.39

Source: Master Plan Study Report, 1986, JICA.

TABLE G-9. COLD STORAGE INSTALLED IN SECTOR I-11/4, ISLAMABAD

<u>No.</u>	<u>Name of Company</u>	<u>Estab: period</u>	<u>Main function</u>	<u>Storage capacity</u>	<u>Present situation of usage</u>	<u>Management organisation</u>
1.	M/S Mashriq Cold Storage	1983	Storage of Fruit/Vegetable, Poultry Dairy etc.	50,000 crates of fruit/vegetable at a time.	In full production	23 employees
2.	M/S Universal Cold Storage	1986	- do -	20,000 crates of fruit/vegetable at a time.	In progress	7 employees
3.	M/S Islamabad Cold Storage	1986	- do -	50,000 crates of fruit/vegetable at a time.	In production	11 employees
4.	M/S Rehman Cold Storage	1986	- do -	20,000 crates of fruit/vegetable at a time.	In production	10 employees
5.	M/S AL-Badir Cold Storage	1979-81	- do -	50,000 crates of fruit/vegetable at a time.	In progress	8 employees

Source: CDA

FIGURE G-1. EXISTING TRANSMISSION LINE (11 KV)

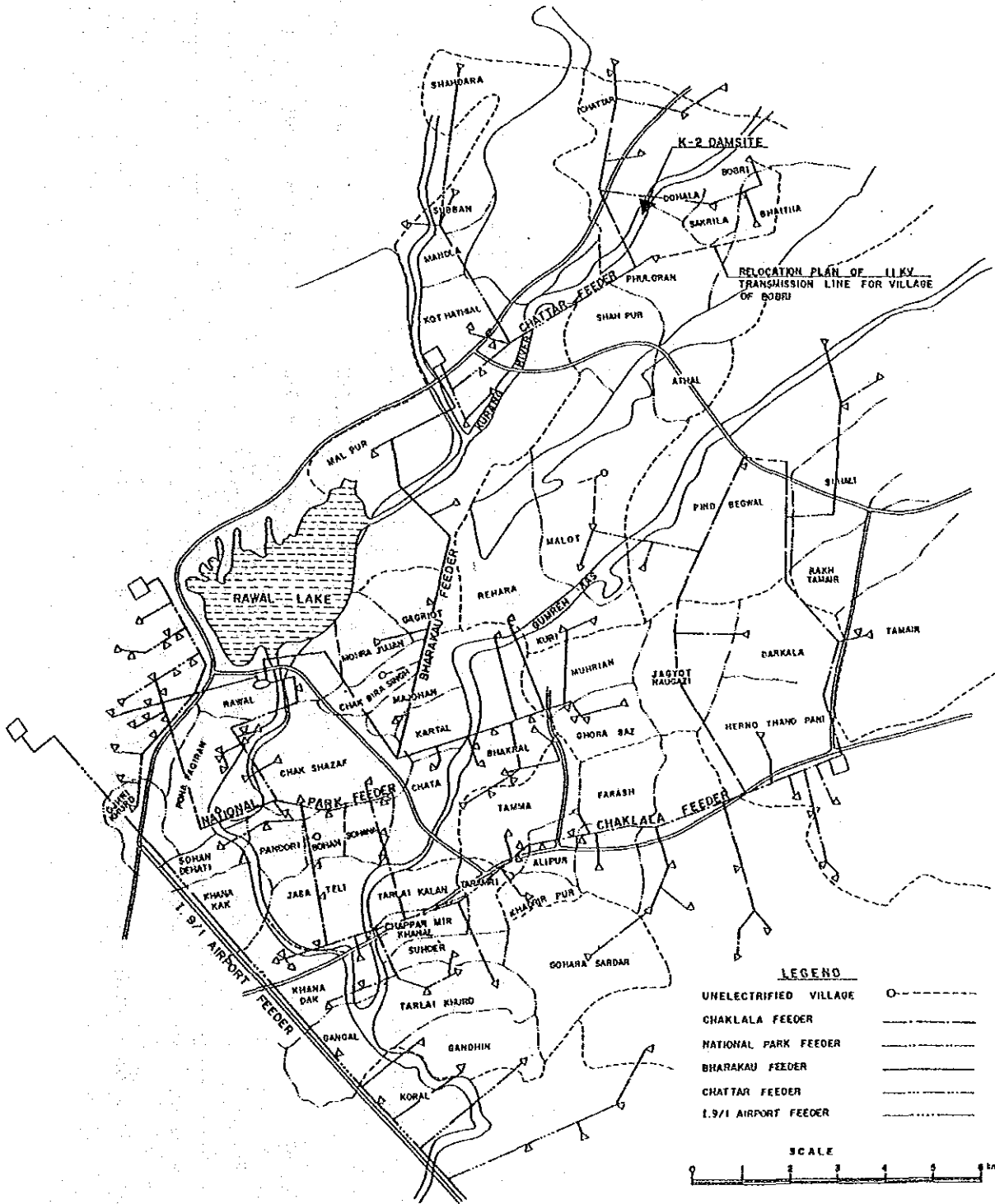


TABLE G-10. ACHIEVEMENT OF SOIL CONSERVATION DEPARTMENT WORKS

Component	1981	1982	1983	1984	1985	1986
1. WATABANI, Terracing, Contour Ploughing, Improved Culture & Agronomic Practices (ha)	90	70	121	235	222	193
2. Afforestation to cover badly eroded lands (ha)	12	6	40	57	50	23
3. Gully Plugging to stabilize lands in Gullies and Reclamation of eroded lands (ha)	156	104	150	217	180	103
4. Improvement of Ponds (nos)	1	2	2	2	2	6
5. Harnessing of wild stream (km)	-	1/2	3/4	3/4	1	-
6. Bulldozer (hr)	5,302	3,932	4,100	6,088	5,609	3,827
7. Tractor (hr)	-	-	3,700	5,400	4,000	1,644
8. Mini dam (nos)					1984 to 1986	6

Note: WATABANI means embankment.

Source: Soil Conservation Department, ICT.

TABLE G-11. COOPERATIVE SOCIETY, BANK, SHOPS AND MILL

Code No. of Village	Name of Village	Cooperative Society	Commercial Bank	Shops	Chakki Flour
1. Rural Area of Islamabad					
1-1. Bharakao Markaz					
1.	Khot Hathial	2	1	170	2
2.	Mohra Noor	1	-	9	1
3.	Phuigran	1	-	31	3
4.	Shah Pur	-	-	2	-
5.	Athal	1	-	6	-
6.	Pind Begawal	3	-	10	1
7.	Malot	1	-	6	-
8.	Rihara	1	1	4	-
9.	Kuri	1	-	42	2
10.	Muhran	1	-	4	-
11.	Ghora Baz	-	-	-	-
12.	Jagyt	-	-	50	1
13.	Naugazi	-	-	3	-
	<u>Sub-Total</u>	<u>(12)</u>	<u>(2)</u>	<u>(337)</u>	<u>10</u>
1-2. Tarlai Markaz					
14.	Tamma	1	-	-	-
15.	Farash	-	-	8	1
16.	Ali Pur	-	1	15	-
17.	Khadrir Pur	*	*	*	*
18.	Chattha Bakhtawar	1	-	8	-
19.	Chappar Mir Khansal	-	-	-	-
20.	Tarlai Kalan	3	1	56	1
21.	Taramri	-	-	-	-
22.	Ghora Sirdar	-	-	-	-
23.	Suher	-	-	-	-
24.	Tarlai Khurd	-	-	12	3
25.	Gangal	-	-	8	-
26.	Khana Dak	2	-	-	-
27.	Mohra Jujan	-	-	3	-
28.	Chak Bira Singh	-	-	2	-
29.	Majohan	-	-	2	-
30.	Kartal Bhakral	*	*	*	*
31.	Chak Shahdad	-	1	20	-
32.	Dhock Sharaf	-	-	-	-
33.	Sohana	1	-	2	-
34.	Bohan	*	*	*	*
35.	Pandori	1	-	1	-
36.	Jaba Teli	-	-	2	-
37.	Shak Rial	-	-	4	2
38.	Kana Kak	-	-	3	-
39.	Sohan Dehati	1	-	9	-
	<u>Sub-Total</u>	<u>(10)</u>	<u>(3)</u>	<u>(155)</u>	<u>(7)</u>
2. Urban Area of Islamabad					
40.	Rawal	*	*	*	*
41.	Pona Faqiran	*	*	*	*
42.	Dhok Mohra Malan	*	*	*	*
43.	Ojhri Khurd	*	*	*	*
	<u>Sub-Total</u>				
	<u>Total (36 villages)</u>	<u>22</u>	<u>5</u>	<u>492</u>	<u>17</u>

Data Source: "Village Profile Survey, 1986" LGRD, ICTA

Note : \* .... data is not available

TABLE G-12. IRRIGATOR'S COOPERATIVE SOCIETIES

Name of association and location	Date of registration	Number of member-ships	Irrigated acreage & irrigation facilities	Organization	Irrigation fee & method of levy	Operation & maintenance	Benefits
JANDALA Union Council PHULGRAN	9.6.1984	20	216	Managing Committee Consisting five officers i.e. President Vice President, Treasurer, Secretary, Managing member	There is no fee	Soil Conservation Department is responsible for maintenance of these dams.	Members of these societies get loan for fertilizer, seed free of interest for utilization in their land to get maximum yield per acre.
TALHAR U.C. Shah Allah Ditta	9.6.1984	24	48				
GOKINA U.C. Shah Allah Ditta	17.6.1984	30	62				
PAHIONT U.C. Tumair	2.9.1986	13	120				
SHAHDARA KALAN U.S. Bharakau	9.7.1984	40	70				
Dhoke LUBANA U.C. SHAH ALLAH DITTA	19.5.1984	30	60				

Source: Cooperative Society Department, ICTA

TABLE G-13. CROPPED AREA FOR RABI SEASON

(unit: ha)

Code No. of Village	Name of Village	Total Cultivated Land	Wheat	Fodder	Oil Seed	Vegetable	Barely	Pulses	Fallow Land	Note
1. Rural Area of Islamabad										
1-1. Bharekso Markaz										
1.	Khot Hathial	311	153	1	3	1	-	-	153	1/
2.	Mohra Noor	476	330	2	4	2	-	-	138	1/
3.	Phulgran	(445)	*	*	*	*	*	*	*	2/
4.	Shah Pur	(330)	*	*	*	*	*	*	*	2/
5.	Athal	257	181	-	3	-	-	-	73	1/
6.	Pind Begawal	725	423	-	7	-	-	2	293	1/
7.	Malot	431	227	-	8	-	-	-	196	1/
8.	Rihara	236	52	2	3	-	-	-	179	1/
9.	Kuri	(334)	*	*	*	*	*	*	*	2/
10.	Muhrian	752	384	2	14	-	-	-	352	1/
11.	Ghara Baz	83	61	-	-	-	-	-	22	2/
12.	Jagyot	348	174	10	9	-	-	-	155	1/
13.	Naugazi	50	16	8	-	-	-	-	26	2/
		(4,788)								
	<u>Sub-Total</u>	<u>3,669</u>	<u>2,001</u>	<u>25</u>	<u>51</u>	<u>3</u>		<u>2</u>	<u>1,587</u>	
1-2. Tarlai Markaz										
14.	Temna	149	75	5	1	-	-	-	68	1/
15.	Farash	154	142	8	-	-	-	-	4	
16.	Ali Pur	143	79	-	1	-	-	-	63	1/
17.	Khadrir Pur	*	*	*	*	*	*	*	*	
18.	Chattha Bakhtawar	139	62	-	-	-	-	5	72	1/
19.	Chappar Mir Khanal	248	61	24	-	-	-	-	163	1/
20.	Tarlai Kalan	444	135	80	-	2	-	-	227	1/
21.	Taramri	27	12	8	-	-	-	-	7	2/
22.	Ghara Sirdar	131	81	15	-	-	-	-	35	2/
23.	Suher	87	42	10	-	-	-	-	35	1/
24.	Tarlai Khurd	219	92	46	-	1	1	-	79	1/
25.	Gangal	97	36	12	-	-	-	-	49	2/
26.	Khana Dak	202	121	-	-	-	-	-	81	2/
27.	Mohra Jujan	35	27	1	-	-	-	-	7	1/
28.	Chak Bira Singh	(162)	*	*	*	*	*	*	*	2/
29.	Majohan	(151)	*	*	*	*	*	*	*	2/
30.	Kartal Bhakral	*	*	*	*	*	*	*	*	
31.	Chak Shahdad	(255)	*	*	*	*	*	*	*	2/
32.	Dhock Sharaf	(37)	*	*	*	*	*	*	*	2/
33.	Sohana	150	-	-	-	1	-	-	149	2/
34.	Bohan	*	*	*	*	*	*	*	*	
35.	Pandori	143	49	16	-	3	-	-	75	2/
36.	Jaba Teli	115	40	16	-	2	-	-	57	2/
37.	Shak Rial	10	8	-	-	-	-	-	2	2/
38.	Kana Kak	185	101	16	-	3	-	-	65	2/
39.	Sohan Dehati	221	20	32	-	10	-	-	159	2/
		(3,504)								
	<u>Sub-Total</u>	<u>2,899</u>	<u>1,183</u>	<u>289</u>	<u>2</u>	<u>22</u>	<u>1</u>	<u>5</u>	<u>1,397</u>	
2. Urban Area of Islamabad										
40.	Rawal	*	*	*	*	*	*	*	*	
41.	Pona Faqiran	*	*	*	*	*	*	*	*	
42.	Dhok Mohra Malan	*	*	*	*	*	*	*	*	
43.	Ojhri Khurd	*	*	*	*	*	*	*	*	
	<u>Sub-Total</u>									
	Total (1)	(8,292)								
	Total (2)	6,568	3,184	314	53	25	1	7	2,984	
		(100.0)	(48.5)	(4.8)	(0.8)	(0.4)	(0)	(0.1)	(45.4)	

Source: 1/ ... "Land Revenue, 1984-87", Land Revenue Dept., ICTA

2/ ... "Village Profile Survey, 1986", LGRD, ICTA

Note : 3/ ... included the figures in the parenthesis

4/ ... excluded the figures in the parenthesis

\* ... data is not available

TABLE G-14. CROPPED AREA FOR KHARIF SEASON

(unit: ha)

Code No. of Village	Name of Village	Total Cultivate Land	Maize	Ground Nut	Pulses	Vegetable	Fodder	Millet	Indian Corn	Fallow Land	Note
<b>1. Rural Area of Islamabad</b>											
<b>1-1. Bharakao Markaz</b>											
1.	Khot Hathial	311	86	-	37	2	-	-	-	186	1/
2.	Mohra Noor	476	150	-	97	3	-	-	-	226	1/
3.	Phulgran	(455)	*	*	*	*	*	*	*	*	2/
4.	Shah Pur	(330)	*	*	*	*	*	*	*	*	2/
5.	Athal	257	102	-	40	-	4	-	-	111	1/
6.	Pind Begawal	725	157	-	249	-	9	-	-	310	1/
7.	Malot	431	129	1	101	-	-	-	-	200	1/
8.	Rihara	236	33	2	21	-	-	-	-	180	1/
9.	Kurl	(334)	*	*	*	*	*	*	*	*	2/
10.	Huhrian	752	144	-	250	-	-	-	-	358	1/
11.	Ghora Baz	83	20	12	24	4	16	-	-	7	2/
12.	Jagyot	348	95	-	91	-	-	-	-	162	1/
13.	Neugazi	50	12	-	4	4	-	-	-	30	2/
	<b>Sub-Total</b>	<b>(4,788)</b> <b>3,669</b>	<b>928</b>	<b>15</b>	<b>914</b>	<b>13</b>	<b>29</b>	<b>-</b>	<b>-</b>	<b>1,770</b>	
<b>1-2. Tarlai Markaz</b>											
14.	Tamma	149	35	-	34	4	-	-	-	76	1/
15.	Farash	154	20	-	1	-	8	-	-	125	2/
16.	Ali Pur	143	35	-	55	-	-	-	-	53	1/
17.	Khadrir Pur	*	*	*	*	*	*	*	*	*	
18.	Chattha Bakhtawar	139	34	-	30	-	-	-	-	75	1/
19.	Chappar Mir Khanal	248	40	-	30	15	-	-	-	163	1/
20.	Tarlai Kalan	444	76	-	52	49	-	-	-	267	1/
21.	Taramri	27	12	-	1	-	-	-	-	14	2/
22.	Ghori Sirdar	131	81	-	20	10	5	-	-	15	2/
23.	Suher	87	22	-	6	4	7	-	4	44	1/
24.	Tarlai Khurd	219	72	-	18	8	6	1	11	103	1/
25.	Gangal	97	36	-	8	-	4	-	-	49	2/
26.	Khana Dak	202	81	4	20	-	-	-	-	97	2/
27.	Mohra Jujan	35	11	-	10	1	-	-	-	13	1/
28.	Chak Bira Singh	(162)	*	*	*	*	*	*	*	*	2/
29.	Majohan	(151)	*	*	*	*	*	*	*	*	2/
30.	Kartal Bhakral	*	*	*	*	*	*	*	*	*	
31.	Chak Shahdad	(255)	*	*	*	*	*	*	*	*	2/
32.	Dhock Sharaf	(37)	*	*	*	*	*	*	*	*	2/
33.	Sohana	150	101	-	20	8	-	-	-	21	2/
34.	Bohan	*	*	*	*	*	*	*	*	*	
35.	Pandori	143	49	22	12	38	4	-	-	18	2/
36.	Jaba Teli	115	40	12	20	19	4	-	-	20	2/
37.	Shak Rial	10	8	-	2	-	-	-	-	-	2/
38.	Kana Kak	185	101	-	20	40	4	-	-	20	2/
39.	Sohan Dehsti	221	20	20	40	132	8	-	-	1	2/
	<b>Sub-Total</b>	<b>(3,504)</b> <b>2,899</b>	<b>874</b>	<b>58</b>	<b>399</b>	<b>328</b>	<b>50</b>	<b>1</b>	<b>15</b>	<b>1,174</b>	
<b>2. Urban Area of Islamabad</b>											
40.	Rawal	*	*	*	*	*	*	*	*	*	
41.	Pona Faqiran	*	*	*	*	*	*	*	*	*	
42.	Dhok Mohra Malan	*	*	*	*	*	*	*	*	*	
43.	Ojhri Khurd	*	*	*	*	*	*	*	*	*	
	<b>Sub-Total</b>										
	<b>Total (1)</b> <sup>3/</sup>	<b>(8,292)</b>									
	<b>Total (2)</b>	<b>6,568</b>	<b>1,802</b>	<b>73</b>	<b>1,313</b>	<b>341</b>	<b>79</b>	<b>1</b>	<b>15</b>	<b>2,944</b>	
		<b>(100.0)</b>	<b>(27.5)</b>	<b>(1.1)</b>	<b>(20.0)</b>	<b>(5.2)</b>	<b>(1.2)</b>	<b>(0)</b>	<b>(0.2)</b>	<b>(44.8)</b>	

Source: 1/ ... "Land Revenue, 1984-87", Land Revenue Dept., ICTA  
2/ ... "Village Profile Survey, 1986", LGRD, ICTA

Note: 3/ ... included the figures in the parenthesis  
4/ ... excluded the figures in the parenthesis  
\* ... data is not available



TABLE G-15. NUMBER OF LIVESTOCK

Code No. of Village	Name of Village	Milk animals	Draft animals	Poultry	Seeps & Goats
<b>1. Rural Area of Islamabad</b>					
<b>1-1. Bharakao Markaz</b>					
1.	Khot Hathial	239	26	1,000	66
2.	Mohra Noor	192	130	7,000	168
3.	Phulgran	341	172	19,000	1,422
4.	Shah Pur	72	56	8,000	362
5.	Athal	211	72	2,200	680
6.	Pind Begawal	190	70	1,990	218
7.	Malot	228	136	620	818
8.	Rihara	116	89	235	110
9.	Kuri	426	256	1,682	588
10.	Muhrian	140	30	300	250
11.	Ghora Baz	4	1	50	6
12.	Jagyt	500	50	800	500
13.	Naugazi	-	-	-	-
	<b>Sub Total</b>	<b>2,659</b>	<b>1,088</b>	<b>42,877</b>	<b>5,188</b>
<b>1-2. Tarlai Markaz</b>					
14.	Tamma	10	1	400	30
15.	Parash	-	-	-	-
16.	Ali Pur	81	2	1,000	120
17.	Khadrir Pur	-	-	-	-
18.	Chattha Bakhtawar	60	2	2,000	100
19.	Chappar Mir Khanal	85	2	2,000	50
20.	Tarlai Kalan	350	10	150,000	300
21.	Taramri	-	-	-	-
22.	Ghora Sirdar	-	-	-	-
23.	Suher	15	2	200	200
24.	Tarlai Khurd	3	1	50	10
25.	Gangal	80	-	2,000	70
26.	Khana Dak	100	4	14,000	200
27.	Mohra Jujan	24	6	50	-
28.	Chak Bira Singh	20	8	600	-
29.	Majohan	60	10	600	180
30.	Kartal Bhakral	-	-	-	-
31.	Chak Shahdad	90	15	243	-
32.	Dhock Sharaf	6	-	30	-
33.	Sohana	69	6	201	-
34.	Bohan	-	-	-	-
35.	Pandori	35	6	200	-
36.	Jaba Teli	41	8	200	-
37.	Shak Rial	48	10	238	-
38.	Kana Kak	20	16	233	-
39.	Sohan Dehati	200	12	1,000	20
	<b>Sub Total</b>	<b>1,397</b>	<b>121</b>	<b>175,245</b>	<b>1,280</b>
<b>2. Urban Area of Islamabad</b>					
40.	Rawal	-	-	-	-
41.	Pona Faquiran	-	-	-	-
42.	Dhok Mahra Malan	-	-	-	-
43.	Ojhri Khurd	-	-	-	-
	<b>Total</b>	<b>4,056</b>	<b>1,209</b>	<b>218,122</b>	<b>6,468</b>

Source: Village Profile Survey, 1986, LGRO.

TABLE G-16. FARM MACHINERY AND EMPLOYMENT

Code No. of Village	Name of Village	Farm Machinery		Employment	
		Private Tractor	Private Thresher	Carpenters	Government Employees
1. Rural Area of Islamabad					
1-1. Bharakao Markaz					
1.	Khot Hathial	2	1	16	552
2.	Mohra Noor	5	1	8	136
3.	Phulgran	4	-	8	326
4.	Shah Pur	2	1	2	12
5.	Athal	2	1	3	57
6.	Pind Begawal	3	1	7	317
7.	Malot	1	-	2	58
8.	Rihara	2	-	2	31
9.	Kuri	1	-	5	344
10.	Muhran	2	2	5	80
11.	Ghora Baz	-	-	-	3
12.	Jagyt	4	2	20	250
13.	Naugazi	1	1	-	30
	<u>Sub-Total</u>	<u>(29)</u>	<u>(10)</u>	<u>(78)</u>	<u>(2,196)</u>
1-2. Tarlai Markaz					
14.	Tanma	2	2	-	38
15.	Farash	4	1	200	53
16.	Ali Pur	-	-	210	42
17.	Khadrir Pur	*	*	*	*
18.	Chattha Bakhtawar	2	1	10	100
19.	Chappar Mir Khanal	4	3	-	95
20.	Tarlai Kalan	4	4	25	450
21.	Taramri	-	-	-	*
22.	Ghora Sirdar	1	1	-	*
23.	Suher	2	-	-	8
24.	Tarlai Khurd	1	1	3	80
25.	Gangal	-	-	5	90
26.	Khana Dak	2	2	15	600
27.	Mohra Jujan	-	-	1	14
28.	Chak Bira Singh	-	-	4	20
29.	Majohan	-	-	2	28
30.	Kartal Bhakral	*	*	*	*
31.	Chak Shahdad	-	12	6	50
32.	Dhock Sharaf	-	-	-	-
33.	Sohana	2	-	-	35
34.	Bohan	*	*	*	*
35.	Pandori	1	3	2	30
36.	Jaba Teli	2	-	1	100
37.	Shak Rial	-	-	2	20
38.	Kana Kak	-	-	6	30
39.	Sohan Dehati	6	4	2	321
	<u>Sub-Total</u>	<u>(33)</u>	<u>(34)</u>	<u>(494)</u>	<u>(2,204)</u>
2. Urban Area of Islamabad					
40.	Rawal	*	*	*	*
41.	Pona Faqiren	*	*	*	*
42.	Dhok Mohra Malan	*	*	*	*
43.	Ojhri Khurd	*	*	*	*
	<u>Sub-Total</u>				
	<u>Total (36 villages)</u>	<u>62</u>	<u>44</u>	<u>572</u>	<u>4,400</u>

Data Source: "Village Profile Survey, 1986" LGRD, ICTA  
 Note : \* .... data is not available

TABLE G-17. NUMBER OF SAMPLE FARMS BY VILLAGES  
IN THE PROJECT AREA

Union Council	Name of Sample Villages	Number of Sample Farms
1. Phulgran	1. Rihara	8
	2. Athal	8
	3. Sakrila	8
	4. Malot	8
	5. Shah Pun	15
2. Tarlai	6. Tarlai Kalan	15
	7. Khana Dak	6
	8. Tarlai Khurd	7
	9. Chapper Nirkhannal	8
	10. Gangal	10
3. Sohan	11. Khana Kak	10
	12. Sohana	16
	13. Jaba Teli	8
	14. Pandori	6
4. Bhara Kau	15. Kot Hathial	7
	16. Mohra Noor	8
<b>Total</b>		<b>148</b>

FIGURE G-2. LOCATION OF SAMPLE VILLAGES FOR FARM SURVEY

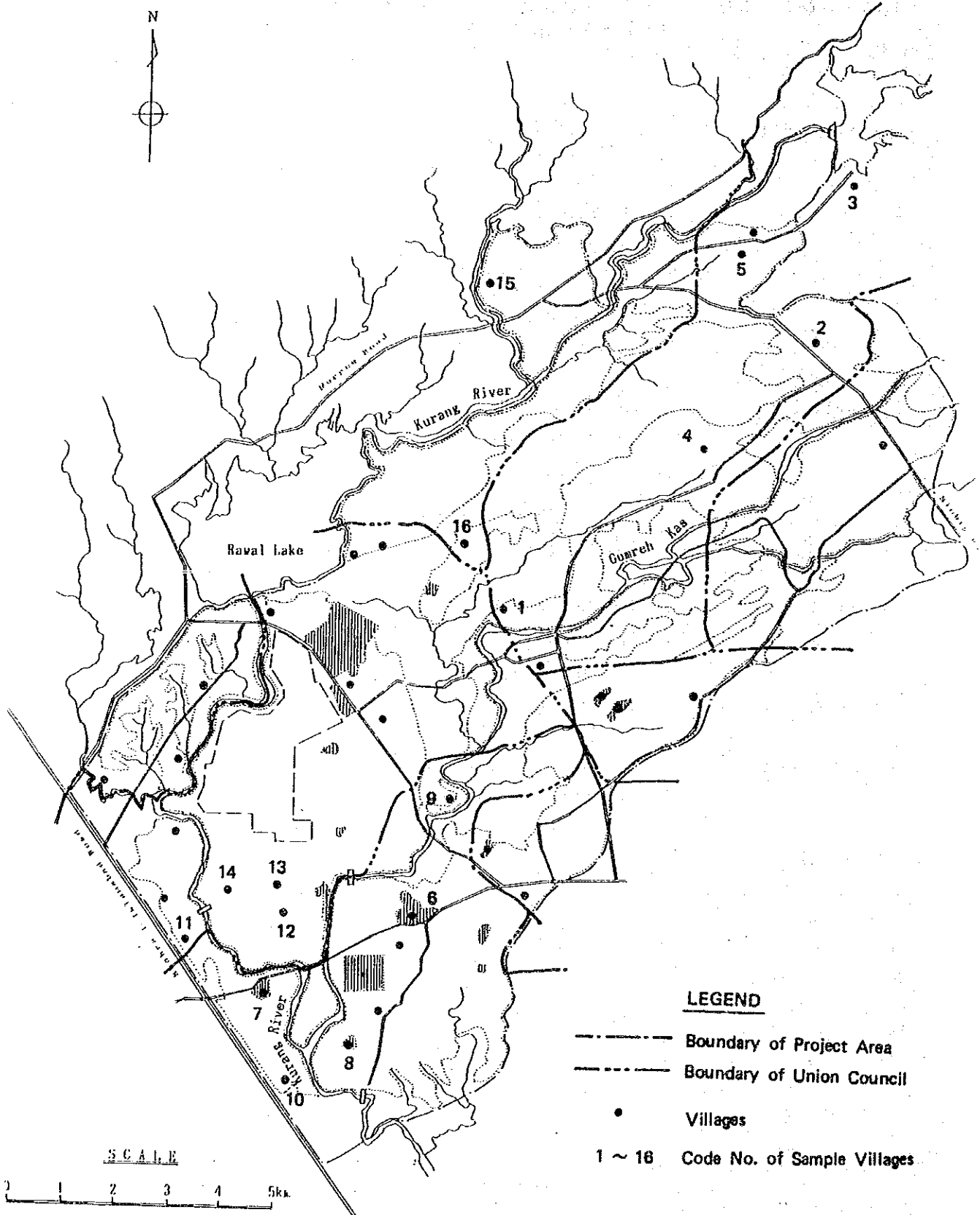


TABLE G-18. AGRICULTURAL LAND AND CROPPING AREA  
BY SAMPLE FARM

(unit: acres)

Sample Villages	Arable Land	Cropping Area											Pasture Land
		Rabi Crops				Kharif Crops				Total	Total	Pasture Land	
		Wheat	Pulses	Fodder	Vegetable	Maize	Pulses	Fodder	Vegetable				
1	100.5	87.5	-	-	-	87.5	35.0	6.5	-	0.5	42.0	4.9	
2	67.5	52.0	-	5.5	-	57.5	45.0	1.5	4.0	-	50.5	-	
3	53.5	37.5	-	3.0	-	40.5	29.5	4.0	1.0	-	34.5	-	
4	91.1	56.5	-	12.6	-	69.1	23.5	3.0	6.0	-	32.5	3.0	
5	360.0	183.5	29.0	28.0	1.0	241.5	98.0	23.0	27.5	2.0	150.5	20.0	
6	162.0	52.0	-	32.0	21.0	105.0	39.0	3.0	7.0	8.5	57.5	6.0	
7	65.0	24.0	-	21.0	10.0	55.0	18.0	2.0	15.0	3.0	38.0	3.0	
8	75.9	34.0	-	9.4	10.0	53.4	17.0	1.0	7.0	4.0	29.0	4.0	
9	123.0	42.0	5.0	29.0	10.0	86.0	27.0	4.0	18.0	4.0	53.0	35.0	
10	90.5	38.0	-	39.5	1.0	78.5	21.0	3.0	22.0	-	46.0	18.0	
11	91.5	52.0	-	33.0	-	85.0	17.0	-	41.0	-	58.0	-	
12	74.8	17.0	-	3.5	50.6	71.1	9.0	-	5.5	51.6	66.1	-	
13	33.5	28.5	-	3.0	-	31.5	15.0	2.0	10.0	-	27.0	-	
14	32.5	14.0	-	-	13.0	27.0	7.0	1.0	4.0	13.0	25.0	-	
15	59.3	54.0	-	-	-	54.0	32.5	2.0	-	-	34.5	-	
16	55.0	55.0	-	-	-	55.0	21.0	12.0	-	-	33.0	-	
Total	1,535.6	827.5	34.0	219.5	116.6	1,197.6	454.5	68.0	168.0	86.6	777.1	93.9	
	(100)					(78.0)					(50.6)		

TABLE G-19. AGRICULTURAL LAND AND CROPPING AREA BY SAMPLE FARM

(unit: acres)

Sample Villages	Arable Land	Cropping Area										Pasture Land
		Rabi Crops					Kharif Crops					
		Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total	
<b>1. Village Rihara</b>												
1-1	6.0	6.0	-	-	-	6.0	5.0	0.5	-	0.5	6.0	-
1-2	5.0	5.0	-	-	-	5.0	4.0	1.0	-	-	5.0	-
1-3	*	*	*	*	*	*	*	*	*	*	*	*
1-4	32.0	25.0	-	-	-	25.0	20.0	5.0	-	-	25.0	-
1-5	4.0	3.0	-	-	-	3.0	4.0	-	-	-	4.0	0.4
1-6	3.5	3.5	-	-	-	3.5	-	-	-	-	-	-
1-7	5.0	5.0	-	-	-	5.0	2.0	-	-	-	2.0	-
1-8	45.0	40.0	-	-	-	40.0	-	-	-	-	-	4.5
<b>Total</b>	<b>100.5</b>	<b>87.5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>87.5</b>	<b>35.0</b>	<b>6.5</b>	<b>-</b>	<b>0.5</b>	<b>42.0</b>	<b>4.9</b>
<b>2. Village Athal</b>												
2-1	4.5	2.0	-	-	-	3.0	1.0	-	1.0	-	2.0	-
2-2	9.0	6.0	-	-	-	7.5	2.0	1.0	1.0	-	4.0	-
2-3	6.5	3.0	-	-	-	5.0	2.0	0.5	1.0	-	3.5	-
2-4	6.0	3.0	-	-	-	4.0	2.0	-	1.0	-	3.0	-
2-5	6.5	6.0	-	-	-	6.0	6.0	-	-	-	6.0	-
2-6	3.0	3.0	-	-	-	3.0	3.0	-	-	-	3.0	-
2-7	7.0	4.0	-	-	-	4.0	4.0	-	-	-	4.0	-
2-8	25.0	25.0	-	-	-	25.0	25.0	-	-	-	25.0	-
<b>Total</b>	<b>67.5</b>	<b>52.0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>57.5</b>	<b>45.0</b>	<b>1.5</b>	<b>4.0</b>	<b>-</b>	<b>50.5</b>	<b>-</b>

Sample Villages	Arable Land	Cropping Area											Pasture Land			
		Rabi Crops				Kharif Crops				Total	Vegetable	Fodder		Vegetable	Total	
		Wheat	Pulses	Fodder	Vegetable	Maize	Pulses	Fodder	Vegetable							
3. Village Sakrila																
3-1	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
3-2	12.5	10.0	-	2.0	-	12.0	5.0	1.0	-	1.0	-	-	-	6.0	-	-
3-3	5.0	3.0	-	1.0	-	4.0	2.0	-	-	-	-	-	-	2.0	-	-
3-4	3.0	1.0	-	-	-	1.0	1.0	2.0	-	-	-	-	-	3.0	-	-
3-5	4.0	4.0	-	-	-	4.0	4.0	-	-	-	-	-	-	4.0	-	-
3-6	3.5	3.5	-	-	-	3.5	3.5	-	-	-	-	-	-	3.5	-	-
3-7	12.0	10.0	-	-	-	10.0	8.0	2.0	-	-	-	-	-	10.0	-	-
3-8	13.5	6.0	-	-	-	6.0	6.0	-	-	-	-	-	-	6.0	-	-
Total	53.5	37.5	-	3.0	-	40.5	29.5	4.0	1.0	1.0	-	-	-	34.5	-	-
4. Village Malot																
4-1	6.3	4.0	-	-	-	4.0	1.0	-	-	-	-	-	-	1.0	-	-
4-2	20.0	20.0	-	2.0	-	22.0	5.0	1.0	2.0	-	-	-	-	8.0	-	-
4-3	7.5	2.5	-	1.0	-	3.8	2.5	-	-	-	-	-	-	1.5	-	-
4-4	18.0	10.0	-	3.0	-	13.0	6.0	2.0	4.0	-	-	-	-	12.0	-	-
4-5	8.8	2.5	-	6.3	-	8.8	-	-	-	-	-	-	-	-	-	-
4-6	3.5	3.5	-	-	-	3.5	-	-	-	-	-	-	-	-	-	3.0
4-7	9.0	9.0	-	-	-	9.0	9.0	-	-	-	-	-	-	9.0	-	-
4-8	18.0	5.0	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-
Total	91.1	56.5	-	12.6	-	69.1	23.5	3.0	6.0	-	-	-	-	32.5	-	3.0

Sample Villages	Cropping Area														Pasture Land
	Arable Land				Rabi Crops				Kharif Crops				Total		
	Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total					
5. Village Shah Pur															
5-1	6.5	4.0	0.5	1.0	5.5	2.0	0.5	1.0	-	3.5	-	-	-	-	-
5-2	8.5	4.0	0.5	2.0	6.5	3.0	0.5	1.5	-	5.0	-	-	-	-	-
5-3	209.0	100.0	20.0	15.0	136.0	50.0	15.0	12.0	1.0	78.0	1.0	-	-	20.0	-
5-4	14.0	6.0	1.0	2.0	9.0	3.0	2.0	3.0	-	8.0	-	-	-	-	-
5-5	12.5	5.0	3.0	2.0	10.0	3.0	2.0	2.0	-	7.0	-	-	-	-	-
5-6	10.0	5.0	2.0	2.0	9.0	3.0	2.0	2.0	1.0	6.0	1.0	-	-	-	-
5-7	4.5	2.0	-	1.0	3.0	1.0	-	1.0	-	2.0	-	-	-	-	-
5-8	37.0	20.0	2.0	3.0	25.0	10.0	3.0	5.0	-	18.0	-	-	-	-	-
5-9	3.5	3.5	-	-	3.5	-	-	-	-	-	-	-	-	-	-
5-10	3.5	3.5	-	-	3.5	3.5	-	-	-	3.5	-	-	-	-	-
5-11	11.0	8.5	-	-	8.5	-	-	-	-	-	-	-	-	-	-
5-12	10.0	5.0	-	-	5.0	5.0	-	-	-	5.0	-	-	-	-	-
5-13	10.5	10.0	-	-	10.0	-	-	-	-	-	-	-	-	-	-
5-14	13.0	5.0	-	-	5.0	12.5	-	-	-	12.5	-	-	-	-	-
5-15	6.5	2.0	-	-	2.0	2.0	-	-	-	2.0	-	-	-	-	-
5-16	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	360.0	183.5	29.0	28.0	241.5	98.0	23.0	27.5	2.0	150.5	2.0	-	-	20.0	-
6. Village Tarlai Kalan															
6-1	13.0	3.0	-	4.0	9.0	3.0	-	2.0	1.0	6.0	1.0	-	-	-	-
6-2	6.0	3.0	-	2.0	6.0	2.0	-	1.0	-	3.0	-	-	-	-	-
6-3	8.0	3.0	-	2.0	7.0	2.0	-	2.0	1.0	5.0	1.0	-	-	1.0	-
6-4	14.0	4.0	-	3.0	9.0	2.0	-	2.0	2.0	4.0	2.0	-	-	-	-
6-5	11.0	5.0	-	3.0	10.0	3.0	-	2.0	2.0	5.0	2.0	-	-	1.0	-
6-6	10.0	4.0	-	-	5.0	2.0	-	1.0	1.0	4.0	1.0	-	-	-	-
6-7	17.0	4.0	-	2.0	8.0	3.0	-	1.0	1.5	5.5	1.5	-	-	1.0	-
6-8	9.0	3.0	-	1.0	5.0	2.0	-	2.0	-	2.0	-	-	-	-	-
6-9	6.0	2.0	-	-	3.0	1.0	-	1.0	1.0	1.0	-	-	-	-	-
6-10	9.0	4.0	-	3.0	8.0	4.0	-	1.0	-	5.0	-	-	-	-	-



Sample Villages	Cropping Area														Pasture Land
	Arable Land		Rabi Crops				Kharif Crops				Total				
	Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total	Vegetable	Total			
6-11	10.0	4.0	-	3.0	2.0	9.0	3.0	-	-	-	3.0	-	-	-	
6-12	8.0	3.0	-	2.0	1.0	6.0	3.0	-	-	-	3.0	-	-	-	
6-13	9.0	2.0	-	2.0	1.0	5.0	3.0	-	-	-	3.0	-	-	-	
6-14	18.0	4.0	-	3.0	1.0	8.0	3.0	1.0	-	-	4.0	-	-	2.0	
6-15	14.0	4.0	-	2.0	1.0	7.0	3.0	1.0	-	-	4.0	-	-	1.0	
Total	162.0	52.0	-	32.0	21.0	105.0	39.0	3.0	7.0	8.5	57.5	-	-	6.0	
7. Village Khana Dat															
7-1	21.0	3.0	-	10.0	8.0	21.0	4.0	-	8.0	2.0	14.0	-	-	-	
7-2	13.0	8.0	-	4.0	-	12.0	4.0	-	5.0	-	9.0	-	-	-	
7-3	8.0	3.0	-	2.0	1.0	6.0	3.0	-	2.0	1.0	6.0	-	-	3.0	
7-4	5.0	3.0	-	2.0	-	5.0	2.0	1.0	-	-	3.0	-	-	-	
7-5	14.0	5.0	-	2.0	1.0	8.0	3.0	1.0	-	-	4.0	-	-	-	
7-6	4.0	2.0	-	1.0	-	3.0	2.0	-	-	-	2.0	-	-	-	
Total	65.0	24.0	-	21.0	10.0	55.0	18.0	2.0	15.0	3.0	38.0	-	-	3.0	
8. Village Tarlai Khurd															
8-1	6.5	4.0	-	2.0	1.0	7.0	2.0	-	3.0	1.5	6.5	-	-	-	
8-2	8.0	4.0	-	1.0	1.5	6.5	2.0	-	-	1.0	3.0	-	-	-	
8-3	9.0	6.0	-	-	2.0	8.0	2.0	-	2.0	0.5	4.5	-	-	2.0	
8-4	18.0	8.0	-	2.0	2.0	12.0	3.0	-	2.0	1.0	6.0	-	-	2.0	
8-5	8.4	5.0	-	2.4	1.0	8.4	4.0	1.0	-	-	5.0	-	-	-	
8-6	12.0	3.0	-	-	1.5	4.5	-	-	-	-	-	-	-	-	
8-7	14.0	4.0	-	2.0	1.0	7.0	4.0	-	-	-	4.0	-	-	-	
Total	75.9	34.0	-	9.4	10.0	53.4	17.0	1.0	7.0	4.0	29.0	-	-	4.0	

Sample Villages	Cropping Area														Pasture Land
	Arable Land		Wheat				Rabi Crops				Kharif Crops				
	Chapper	Nirkhannaal	Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total	Vegetable	Total	
<b>9. Village</b>															
9-1	58.0	12.0	12.0	-	8.0	4.0	24.0	8.0	-	6.0	4.0	18.0	8.0	-	20.0
9-2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9-3	18.0	6.0	6.0	-	100.0	-	16.0	8.0	-	10.0	-	18.0	8.0	-	4.0
9-4	11.0	5.0	5.0	2.0	4.0	-	11.0	5.0	3.0	2.0	-	10.0	5.0	-	2.0
9-5	6.0	3.0	3.0	1.0	1.0	-	5.0	2.0	-	-	-	2.0	2.0	-	-
9-6	9.0	6.0	6.0	-	2.0	1.0	9.0	2.0	-	-	-	3.0	2.0	-	2.0
9-7	7.0	3.0	3.0	-	4.0	-	7.0	2.0	-	-	-	2.0	2.0	-	5.0
9-8	14.0	7.0	7.0	2.0	-	5.0	14.0	-	-	-	-	-	-	-	-
<b>Total</b>	<b>123.0</b>	<b>41.0</b>	<b>41.0</b>	<b>5.0</b>	<b>29.0</b>	<b>10.0</b>	<b>86.0</b>	<b>27.0</b>	<b>4.0</b>	<b>18.0</b>	<b>4.0</b>	<b>53.0</b>	<b>4.0</b>	<b>4.0</b>	<b>35.0</b>
<b>10. Village</b>															
<b>Gangal</b>															
10-1	6.5	3.0	3.0	-	2.0	-	5.0	2.0	1.0	3.0	-	6.0	2.0	-	-
10-2	20.0	5.0	5.0	-	10.0	-	15.0	-	-	10.0	-	10.0	-	-	10.0
10-3	11.0	4.0	4.0	-	6.0	1.0	11.0	6.0	-	5.0	-	11.0	6.0	-	-
10-4	14.0	10.0	10.0	-	4.0	-	14.0	5.0	2.0	4.0	-	11.0	5.0	-	8.0
10-5	6.0	3.0	3.0	-	3.0	-	6.0	2.0	-	-	-	2.0	2.0	-	-
10-6	8.0	4.0	4.0	-	3.0	-	7.0	-	-	-	-	-	-	-	-
10-7	8.0	2.0	2.0	-	3.0	-	5.0	1.0	-	-	-	1.0	1.0	-	-
10-8	2.5	1.0	1.0	-	1.5	-	2.5	2.0	-	-	-	2.0	2.0	-	-
10-9	6.5	3.0	3.0	-	3.0	-	6.0	1.0	-	-	-	1.0	1.0	-	-
10-10	8.0	3.0	3.0	-	4.0	-	7.0	2.0	-	-	-	2.0	2.0	-	-
<b>Total</b>	<b>90.5</b>	<b>38.0</b>	<b>38.0</b>	<b>-</b>	<b>39.5</b>	<b>1.0</b>	<b>78.5</b>	<b>21.0</b>	<b>3.0</b>	<b>22.0</b>	<b>-</b>	<b>46.0</b>	<b>22.0</b>	<b>-</b>	<b>18.0</b>

Sample Villages	Cropping Area														Pasture Land				
	Arable Land		Wheat				Rabi Crops				Maize					Kharif Crops			
	Land		Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total	Maize	Pulses		Fodder	Vegetable	Total	
11. Village Khana Kal																			
11-1	25.0	15.0	-	-	10.0	-	25.0	-	-	20.0	-	20.0	-	-	-	-	20.0	-	
11-2	4.0	4.0	-	-	-	4.0	4.0	-	-	3.0	-	3.0	-	-	-	-	3.0	-	
11-3	2.5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
11-4	3.0	3.0	-	-	-	3.0	3.0	-	-	-	-	3.0	-	-	-	-	3.0	-	
11-5	32.0	20.0	-	-	12.0	-	22.0	-	-	12.0	-	22.0	-	-	-	-	22.0	-	
11-6	4.0	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
11-7	4.0	2.0	-	-	2.0	-	4.0	-	-	4.0	-	4.0	-	-	-	-	4.0	-	
11-8	8.0	4.0	-	-	4.0	-	8.0	-	-	-	-	8.0	-	-	-	-	-	-	
11-9	5.0	2.0	-	-	3.0	-	5.0	-	-	2.0	-	5.0	-	-	-	-	2.0	-	
11-10	4.0	2.0	-	-	2.0	-	4.0	-	-	2.0	-	4.0	-	-	-	-	2.0	-	
Total	91.5	52.0	-	-	33.0	-	85.0	17.0	-	41.0	-	58.0	-	-	-	-	58.0	-	
12. Village Sahana																			
12-1	4.0	3.0	-	-	1.0	-	4.0	2.0	-	1.0	-	3.0	-	-	-	-	3.0	-	
12-2	5.0	3.0	-	-	1.0	-	4.0	2.0	-	2.0	-	4.0	-	-	-	-	4.0	-	
12-3	5.0	5.0	-	-	-	-	5.0	2.0	-	2.0	-	4.0	-	-	-	-	4.0	-	
12-4	2.5	-	-	-	-	2.3	2.3	-	-	-	2.3	2.3	-	-	-	2.3	2.3	-	
12-5	5.5	-	-	-	0.5	-	5.5	-	-	0.5	-	5.5	-	-	-	5.0	5.5	-	
12-6	4.0	-	-	-	-	4.0	4.0	-	-	-	-	4.0	-	-	-	4.0	4.0	-	
12-7	5.0	2.0	-	-	-	3.0	5.0	-	-	-	-	4.0	-	-	-	4.0	4.0	-	
12-8	5.0	-	-	-	-	5.0	5.0	-	-	-	-	5.0	-	-	-	5.0	5.0	-	
12-9	2.5	-	-	-	-	2.5	2.5	-	-	-	-	2.5	-	-	-	2.5	2.5	-	
12-10	4.0	-	-	-	-	4.0	4.0	-	-	-	-	4.0	-	-	-	4.0	4.0	-	
12-11	5.0	-	-	-	-	5.0	5.0	-	-	-	-	5.0	-	-	-	5.0	5.0	-	
12-12	6.0	-	-	-	-	5.0	5.0	-	-	-	-	5.0	-	-	-	5.0	5.0	-	
12-13	5.0	-	-	-	-	4.0	4.0	-	-	-	-	4.0	-	-	-	4.0	4.0	-	
12-14	5.5	4.0	-	-	1.0	-	5.0	3.0	-	-	-	5.0	-	-	-	3.0	3.0	-	
12-15	4.0	-	-	-	-	4.0	4.0	-	-	-	-	4.0	-	-	-	4.0	4.0	-	
12-16	6.8	-	-	-	-	6.8	6.8	-	-	-	-	6.8	-	-	-	6.8	6.8	-	
Total	74.8	17.0	-	-	3.5	50.6	71.1	9.0	-	5.5	51.6	66.1	-	-	-	66.1	66.1	-	

Sample Villages	Cropping Area												Pasture Land
	Arable Land			Wheat			Rabi Crops			Kharif Crops			
	Arable Land	Wheat	Total	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total	
13. Village Tabe Teli													
13-1	4.0	4.0	4.0	-	-	-	4.0	3.0	-	1.0	-	4.0	-
13-2	6.0	3.0	6.0	-	3.0	-	6.0	3.0	-	2.0	-	5.0	-
13-3	4.5	4.5	4.5	-	-	-	4.5	3.0	1.0	-	-	4.0	-
13-4	6.0	6.0	6.0	-	-	-	6.0	-	-	4.0	-	4.0	-
13-5	3.0	2.0	2.0	-	-	-	2.0	1.0	-	-	-	1.0	-
13-6	4.0	4.0	4.0	-	-	-	4.0	3.0	-	-	-	3.0	-
13-7	3.0	2.0	2.0	-	-	-	2.0	2.0	-	1.0	-	3.0	-
13-8	3.0	3.0	3.0	-	-	-	3.0	-	1.0	2.0	-	3.0	-
Total	33.5	28.5	31.5	-	3.0	-	31.5	15.0	2.0	10.0	-	27.0	-
14. Village Pandari													
14-1	5.0	-	5.0	-	-	5.0	5.0	-	-	-	5.0	5.0	-
14-2	3.0	3.0	3.0	-	-	-	3.0	3.0	-	-	-	3.0	-
14-3	8.0	4.0	8.0	-	-	4.0	8.0	-	-	4.0	4.0	8.0	-
14-4	4.0	-	4.0	-	-	4.0	4.0	-	-	-	4.0	4.0	-
14-5	6.5	3.0	3.0	-	-	-	3.0	2.0	1.0	-	-	3.0	-
14-6	6.0	4.0	4.0	-	-	-	4.0	2.0	-	-	-	2.0	-
Total	32.5	14.0	27.0	-	-	13.0	27.0	7.0	1.0	4.0	13.0	25.0	-
15. Village Kot Hathial													
15-1	1.0	1.0	1.0	-	-	-	1.0	1.0	-	-	-	1.0	-
15-2	7.3	6.0	6.0	-	-	-	6.0	-	-	-	-	-	-
15-3	5.5	4.5	4.5	-	-	-	4.5	4.0	-	-	-	4.0	-
15-4	25.0	25.0	25.0	-	-	-	25.0	15.0	2.0	-	-	17.0	-
15-5	1.5	1.0	1.0	-	-	-	1.0	-	-	-	-	-	-
15-6	6.5	4.0	4.0	-	-	-	4.0	-	-	-	-	-	-
15-7	12.5	12.5	12.5	-	-	-	12.5	12.5	-	-	-	12.5	-
Total	59.3	54.0	54.0	-	-	-	54.0	32.5	2.0	-	-	34.5	-

Sample Villages	Cropping Area															
	Arable Land		Wheat				Rabi Crops				Kharif Crops				Pasture Land	
			Wheat	Pulses	Fodder	Vegetable	Total	Maize	Pulses	Fodder	Vegetable	Total				
16. Village Mohra Noor																
16-1	3.0	3.0	-	*	-	3.0	2.0	-	-	-	-	2.0	-	-		
16-2	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
16-3	15.0	15.0	-	*	-	15.0	9.0	3.0	-	-	-	12.0	-	-		
16-4	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
16-5	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
16-6	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
16-7	12.0	12.0	-	-	-	12.0	-	2.0	-	-	-	2.0	-	-		
16-8	25.0	25.0	-	-	-	25.0	10.0	7.0	-	-	-	17.0	-	-		
Total	55.0	55.0	-	-	-	55.0	21.0	12.0	-	-	-	33.0	-	-		

TABLE G-20. WHEAT PRODUCTION OF SAMPLE FARMS

Code No. of Sample Village	1984/85		1985/86		1986/87		Three Years Average Yield (tons/ha)
	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	
1	39.7	64.36( 8)	39.7	77.92( 8)	37.4	82.72( 8)	1.93
2	21.1	36.80( 8)	21.1	44.20( 8)	21.1	46.42( 8)	2.01
3	15.2	26.04( 7)	15.2	29.24( 7)	15.2	28.92( 7)	1.85
4	22.9	34.44( 8)	22.9	43.60( 8)	22.9	46.08( 8)	1.81
5	70.9	107.48( 12)	78.6	135.76( 15)	77.7	144.44( 15)	1.71
6	18.2	25.68( 15)	16.6	23.44( 15)	21.0	31.52( 15)	1.45
7	10.1	13.76( 6)	9.7	16.00( 6)	9.7	15.64( 6)	1.54
8	11.3	14.40( 7)	11.0	14.44( 7)	13.8	19.24( 7)	1.33
9	18.2	22.64( 5)	17.4	25.68( 6)	14.2	19.64( 5)	1.36
10	15.4	25.20( 10)	15.8	27.00( 10)	15.4	25.76( 10)	1.67
11	21.0	35.76( 8)	21.0	38.64( 8)	21.0	39.20( 8)	1.80
12	6.9	11.08( 5)	6.9	12.04( 5)	6.9	11.24( 5)	1.66
13	11.4	17.52( 8)	11.4	20.88( 8)	11.4	21.64( 8)	1.76
14	5.6	9.32( 4)	5.6	10.60( 4)	5.6	9.32( 4)	1.74
15	12.7	22.00( 4)	15.2	29.48( 5)	15.2	31.08( 5)	1.92
16	22.7	31.00( 4)	37.8	50.00( 7)	22.1	28.40( 5)	1.32
<u>Total</u>	<u>323.3</u>	<u>497.48(119)</u>	<u>345.8</u>	<u>598.92(127)</u>	<u>330.6</u>	<u>601.26(124)</u>	<u>1.70</u>

Note: Figures in the parenthesis are the number of samples.

TABLE G-21. MAIZE PRODUCTION OF SAMPLE FARMS

Code No. of Sample Village	1984/85		1985/86		1986/87		Three Years Average Yield (tons/ha)
	Planted Area (ha)	Production (tons)	Planted Area (ha)	Production (tons)	Planted Area (ha)	Production (tons)	
1	14.1	33.40( 5)	25.5	64.16( 7)	14.1	37.48( 5)	2.51
2	18.2	39.60( 8)	18.2	43.08( 8)	18.2	44.48( 8)	2.33
3	11.9	27.26( 7)	11.9	29.30( 7)	11.9	31.64( 7)	2.47
4	14.0	28.52( 8)	14.0	34.24( 8)	9.5	24.20( 5)	2.32
5	33.0	75.76( 12)	43.5	93.00( 14)	34.8	82.44( 10)	2.26
6	11.4	13.13( 15)	10.9	13.92( 15)	15.8	20.88( 15)	1.26
7	6.0	11.12( 5)	6.0	12.88( 5)	6.0	11.16( 5)	1.95
8	5.2	5.44( 6)	5.8	7.76( 7)	6.8	8.70( 6)	1.23
9	7.7	13.44( 6)	9.3	17.12( 6)	9.3	13.44( 4)	1.67
10	9.7	17.52( 9)	9.7	18.08( 9)	8.1	15.62( 7)	1.70
11	6.9	11.76( 4)	6.9	12.00( 4)	6.1	11.04( 3)	1.75
12	3.6	6.24( 4)	3.6	6.40( 4)	3.6	6.40( 4)	1.76
13	6.0	11.32( 6)	6.0	12.32( 6)	3.6	7.28( 6)	1.98
14	2.8	4.00( 2)	2.8	4.08( 2)	2.8	4.00( 2)	1.44
15	8.5	18.56( 4)	8.5	20.48( 4)	8.1	20.60( 3)	2.38
16	15.6	21.80( 5)	19.4	26.80( 7)	8.5	12.20( 3)	1.40
Total	174.6	338.87(106)	202.0	415.62(113)	167.2	351.56( 93)	2.03

Note: Figures in the parenthesis are the number of samples.

TABLE G-22. PULSE PRODUCTION OF SAMPLE FARMS (IN RABI)

Code No. of Sample Village	1984/85		1985/86		1986/87		Three Years Average Yield (tons/ha)
	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	
1	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-
4	0.1	0.04(1)	-	-	-	-	0.10
5	5.7	6.36(5)	5.7	6.88(5)	4.9	6.86(5)	1.23
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
9	0.8	0.32(1)	0.8	0.32(1)	0.8	0.40(1)	0.43
10	1.2	1.04(2)	1.2	1.20(2)	1.2	1.20(2)	0.96
11	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-
<u>Total</u>	<u>7.8</u>	<u>7.76(9)</u>	<u>7.7</u>	<u>8.40(9)</u>	<u>6.9</u>	<u>8.46(9)</u>	<u>1.10</u>

Note: Figures in the parenthesis are the number of samples.



TABLE G-23. PULSE PRODUCTION OF SAMPLE FARMS (IN KHARIF)

Code No. of Sample Village	1984/85		1985/86		1986/87		Three Years Average Yield (tons/ha)
	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	Planted Area(ha)	Production (tons)	
1	3.0	1.32( 4)	4.2	2.60( 6)	3.0	1.47( 4)	0.53
2	0.6	0.52( 2)	0.6	0.64( 2)	0.6	0.62( 2)	0.99
3	1.6	1.16( 2)	1.6	1.28( 2)	1.6	1.28( 2)	0.78
4	0.8	0.80( 1)	0.8	1.20( 1)	0.8	1.44( 1)	1.43
5	7.3	6.84( 6)	9.3	8.92( 6)	9.3	10.46( 6)	1.01
6	1.2	0.28( 3)	1.2	0.24( 3)	1.2	0.28( 3)	0.22
7	0.8	0.80( 2)	0.8	0.72( 2)	0.8	0.88( 2)	1.00
8	0.4	0.08( 1)	1.2	0.16( 2)	0.4	0.12( 1)	0.18
9	2.4	1.44( 3)	1.6	1.40( 2)	1.6	1.20( 2)	0.72
10	1.2	1.40( 2)	1.2	1.42( 2)	1.2	1.28( 2)	1.14
11	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-
13	0.8	0.64( 2)	0.8	0.80( 2)	0.4	0.40( 1)	0.92
14	-	-	-	-	-	-	-
15	0.8	0.40( 1)	0.8	0.48( 1)	0.8	0.52( 1)	0.58
16	3.6	1.52( 2)	9.0	3.96( 4)	6.0	4.00( 4)	0.51
<u>Total</u>	<u>24.5</u>	<u>17.20(31)</u>	<u>33.1</u>	<u>23.82(35)</u>	<u>27.7</u>	<u>23.95(31)</u>	<u>0.76</u>

Note: Figures in the parenthesis are the number of samples.

TABLE G-24. CROP SELECTION BY THE FARMERS UNDER THE PROPOSED IRRIGATION PROJECT  
- IN CASE OF FULL DEVELOPMENT -

(Unit: farms)

Crops	Percent of Cropping by Season (%)											Total (farms) = 100
	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100	
I. Total of Sample Farms (74 farms)												
A. Rabi Season												
1. Wheat	-	-	5	15	27	8	2	2	4	-	-	63 (85)
2. Vegetables	3	19	21	1	2	6	-	1	-	-	8	61 (82)
3. Fodders	5	22	17	2	-	2	-	-	-	-	1	49 (66)
4. Oil Seeds	8	16	3	-	-	-	-	-	-	-	-	27 (36)
5. Fruit Trees	10	8	-	-	-	-	-	-	-	-	-	18 (24)
6. Pulses	7	7	2	-	-	-	-	-	-	-	-	16 (22)
7. Others	3	5	-	-	-	-	-	-	-	-	-	8 (11)
B. Kharif Season												
1. Vegetables	5	23	20	-	2	8	-	-	-	-	9	67 (91)
2. Maize	1	1	13	30	9	6	1	-	-	-	-	61 (82)
3. Fodders	15	12	23	2	-	-	-	-	-	-	-	55 (74)
4. Pulses	16	8	2	2	-	-	-	-	-	-	-	28 (38)
5. Fruit Trees	6	5	4	-	-	-	-	-	-	-	-	15 (20)
6. Others	6	1	1	1	-	-	-	-	-	-	-	9 (12)
II. Sample Farms in the Up-stream (30 farms)												
A. Rabi Season												
1. Wheat	-	-	-	6	20	4	-	-	-	-	-	30 (100)
2. Vegetables	3	15	5	1	-	-	-	-	-	-	-	24 (80)
3. Fodders	4	14	3	1	-	-	-	-	-	-	-	22 (73)
4. Oil Seeds	4	13	1	-	-	-	-	-	-	-	-	18 (60)
5. Fruit Trees	2	1	-	-	-	-	-	-	-	-	-	3 (10)
6. Pulses	4	2	-	-	-	-	-	-	-	-	-	6 (20)
7. Others	2	3	-	-	-	-	-	-	-	-	-	5 (17)
B. Kharif Season												
1. Vegetables	5	17	4	-	-	-	-	-	-	-	-	26 (87)
2. Maize	1	-	3	22	4	-	-	-	-	-	-	30 (100)
3. Fodders	15	7	1	-	-	-	-	-	-	-	-	23 (77)
4. Pulses	13	5	-	-	-	-	-	-	-	-	-	18 (60)
5. Fruit Trees	3	-	-	-	-	-	-	-	-	-	-	3 (10)
6. Others	6	1	1	1	-	-	-	-	-	-	-	9 (30)
III. Sample Farms in the Down-stream (44 farms)												
A. Rabi Season												
1. Wheat	-	-	5	9	7	4	2	2	4	-	-	33 (75)
2. Vegetables	-	4	16	-	2	6	-	1	-	-	8	37 (84)
3. Fodders	1	8	14	1	-	2	-	-	-	-	1	27 (61)
4. Oil Seeds	4	3	2	-	-	-	-	-	-	-	-	9 (20)
5. Fruit Trees	8	7	-	-	-	-	-	-	-	-	-	15 (34)
6. Pulses	3	5	2	-	-	-	-	-	-	-	-	10 (23)
7. Others	1	2	-	-	-	-	-	-	-	-	-	3 (7)
B. Kharif Season												
1. Vegetables	-	6	16	-	2	8	-	-	-	-	9	41 (93)
2. Maize	-	1	10	8	5	6	1	-	-	-	-	31 (70)
3. Fodders	-	5	22	2	-	-	-	-	-	-	-	29 (66)
4. Pulses	3	3	2	2	-	-	-	-	-	-	-	10 (23)
5. Fruit Trees	3	5	4	-	-	-	-	-	-	-	-	12 (27)
6. Others	-	-	-	-	-	-	-	-	-	-	-	0 (0)

Source: "Farm Plan Survey in the Project Area", Aug., 1987 JICA Survey Team

TABLE G-25. SOURCE OF MONTHLY HOUSEHOLD INCOME

<u>Items</u>	<u>Total of Pakistan</u>	<u>Rural Area of Pakistan</u>	<u>Rural Area of Punjab</u>
1. Average Income (Rs/month)	1,774.11	1,537.75	1,526.61
2. Source of Income (Total Income = 100)			
- Wages and Salaries	28.87	21.65	20.65
- Self Employment	49.10	57.62	58.44
- Property other than Owner Occupied Houses	3.88	4.38	3.67
- Owner Occupied Houses	8.34	5.87	5.78
- Social Insurance Benefits Including Pension	0.54	0.37	0.44
- Gift and Assistance	1.05	0.94	1.07
- Other Sources	8.22	9.17	9.97

Source: "Household Income and Expenditure, 1984 ~ 85"  
Statistics Division, Govt. of Pakistan.

TABLE G-26. MONTHLY HOUSEHOLD INCOME BY INCOME CLASS

Size of an Average Household	Income Class 1984 ~ 85 (Rs/month)												
	All	Upto 600	601 ~ 700	701 ~ 800	801 ~ 1000	1001 ~ 1500	1501 ~ 2000	2001 ~ 2500	2501 ~ 3000	3001 ~ 3500	3501 ~ 4000	4001 ~ 4500 and above	
<b>1. Total of Pakistan</b>													
No. of Sample Households	16,580	1,050	652	871	1,958	4,419	2,911	1,667	949	571	379	260	893
Percentage of Households	100.00	6.35	3.93	5.25	11.81	26.65	17.56	10.05	5.72	3.44	2.29	1.57	5.39
Average No. of Members per Household	6.21	3.43	4.09	4.74	4.98	5.87	6.94	7.61	8.02	8.61	8.69	9.25	9.04
<b>2. Rural Area of Pakistan</b>													
No. of Sample Households	9,119	818	493	628	1,255	2,649	1,554	717	388	187	113	89	228
Percentage of Households	100.00	8.97	5.41	6.89	13.76	29.05	17.04	7.86	4.25	2.05	1.24	0.98	2.50
Average No. of Members per Household	6.05	3.47	4.13	4.80	5.03	5.95	6.99	7.69	8.10	8.77	8.95	9.62	9.42
<b>3. Rural Area of Punjab (included Islamabad)</b>													
No. of Sample Households	5,474	545	318	375	738	1,537	928	419	236	99	81	59	159
Percentage of Households	100.00	9.96	5.81	6.85	13.48	28.08	16.95	7.65	4.31	1.81	1.48	1.08	2.54
Average No. of Members per Household	6.15	3.50	4.44	5.08	5.25	6.08	7.06	7.84	8.37	8.72	9.10	9.46	9.23

Source: "Household Income and Expenditure Survey, 1984 ~ 85" Statistics Division, Govt. of Pakistan.

TABLE G-27. TOTAL OF MONTHLY HOUSEHOLD RECEIPT

Items	(Unit: Rs/month)		
	Total of Pakistan	Rural Area of Pakistan	Rural Area of Punjab
1. Income	1,774.11	1,537.75	1,526.61
2. Other Receipts <sup>1/</sup>	106.49	116.12	141.65
<u>Total</u>	<u>1,880.60</u>	<u>1,653.87</u>	<u>1,668.26</u>

Note: <sup>1/</sup> --- included (1) sale of property and other assets (2) withdrawal from working capital and savings (3) borrowings and others.

Source: "Household Income and Expenditure, 1984 ~ 85"  
Statistics Division, Govt. of Pakistan.

TABLE G-28. UTILIZATION OF MONTHLY HOUSEHOLD RECEIPTS  
BY INCOME CLASS, 1987 - 85

Monthly Household Income Groups (Rupees)	Average				Total		Percentage of Total Receipts Utilized Towards (%)					
	Income	Tax	Disposable Income	Other Receipt	Monthly Receipt	Total	Consump- tion Expendi- ture	Income Tax and Other Taxes	Remitt- ance 1/	Liquida- tion 2/	Gross Savings 3/	Net Savings
----- (Rs/household) -----												
1. Average of Total Pakistan	1,774.11	3.83	1,770.28	106.49	1,880.60	97.14	86.91	0.20	0.38	0.73	8.92	7.68
2. Average of Rural Area Pakistan	1,537.75	1.07	1,536.68	116.12	1,653.87	97.56	86.77	0.06	0.18	0.75	9.80	6.61
3. Rural Area of Punjab												
All Groups	1,526.61	1.16	1,525.46	141.65	1,668.27	98.03	85.69	0.07	0.17	1.00	11.10	6.29
Upto ~ 600	468.99	0.37	468.61	63.08	532.07	108.06	104.27	0.07	0.13	0.41	3.18	-18.59
601 ~ 700	656.60	0.34	656.26	54.44	711.04	102.54	99.48	0.05	0.21	0.20	2.60	-7.79
701 ~ 800	753.87	0.42	753.45	72.91	826.78	103.97	98.68	0.05	0.30	0.68	4.26	-8.28
801 ~ 1000	904.31	0.72	903.58	74.88	979.18	99.47	94.15	0.07	0.07	0.68	4.50	-2.03
1001 ~ 1500	1,239.28	0.68	1,238.60	85.22	1,324.50	99.23	92.70	0.05	0.27	0.72	5.49	0.87
1501 ~ 2000	1,723.57	0.78	1,722.79	99.68	1,823.26	97.60	88.72	0.04	0.11	0.51	8.22	6.11
2001 ~ 2500	2,228.92	0.75	2,228.17	196.00	2,424.92	97.10	85.29	0.03	0.15	0.75	10.88	7.18
2501 ~ 3000	2,708.25	2.46	2,705.79	288.78	2,997.03	97.04	80.42	0.08	0.25	1.34	14.95	10.92
3001 ~ 3500	3,214.79	1.77	3,213.02	200.65	3,415.43	96.21	82.17	0.05	0.31	1.11	12.57	12.66
3501 ~ 4000	3,741.20	3.22	3,737.98	245.43	3,986.63	94.45	74.89	0.08	0.23	1.51	17.74	20.13
4001 ~ 4500	4,213.62	1.41	4,212.21	564.43	4,778.05	97.23	75.69	0.03	0.04	2.49	20.98	16.42
4501 & above	7,482.09	15.99	7,466.10	1,454.24	8,936.34	93.90	63.88	0.18	0.06	2.21	27.57	23.55

Note : 1/ --- Remittance to household members living away.

2/ --- Liquidation of liabilities and payment of interest.

3/ --- Included (1) purchase of jewellery (2) purchase of assets and (3) unconsumed goods.

Source: "Household Income and Expenditure Survey, 1984-85" Statistics Division, Govt. of Pakistan.

TABLE G-29. NUMBER OF EARNERS AND MONTHLY INCOME BY INCOME CLASS

Monthly Income Groups (in rupees)	Average Monthly Income of Categories of Agricultural Status, 1984-85										
	All Categories	Landlord	Self Cultivator	Share Cropper	Lessee Cultivator	Agricultural Labourer	Self Cultivator/Share Cropper	Self Cultivator/Lessee	Share Cropper/Lessee		
1. Total of Pakistan	(100.0)	(9.6)	(81.6)	(4.4)	(1.9)	(0.4)	(1.9)	(0.1)	(0.1)	(0.1)	
Estimated No. of Earners in Agriculture	4,025,413	388,526	3,285,691	177,396	76,081	15,549	74,590	3,502	4,278	4,278	
Average Monthly Income (Rs)	1,727.58	1,827.08	1,740.70	1,420.19	1,575.23	862.90	1,560.44	3,400.21	2,764.24	2,764.24	
2. Rural Area of Pakistan	(100.0)	(9.1)	(82.0)	(4.5)	(1.9)	(0.4)	(1.9)	(0.1)	(0.1)	(0.1)	
Estimated No. of Earners in Agriculture	3,933,253	359,048	3,224,656	175,989	76,029	15,161	74,590	3,502	4,278	4,278	
Average Monthly Income (Rs)	1,710.33	1,767.68	1,727.59	1,417.64	1,575.17	806.13	1,560.44	3,400.21	2,764.24	2,764.24	
3. Rural Area of Punjab	(100.0)	(11.0)	(81.9)	(2.4)	(1.5)	(0.6)	(2.5)	(0.2)	(0.1)	(0.1)	
Estimated No. of Earners in Agriculture	2,114,923	231,755	1,732,389	51,980	27,257	15,578	52,240	3,502	2,222	2,222	
Average Monthly Income (Rs)	1,962.16	2,075.28	1,969.27	1,634.66	2,137.65	884.46	1,681.62	3,400.21	1,042.03	1,042.03	
All Groups	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
Upto 600	1.22	1.81	1.08	4.16	2.25	0.37					
601 ~ 700	1.18	1.68	1.11	2.01	1.12	6.26					
701 ~ 800	2.14	1.72	2.22	2.15	1.83		1.27			30.59	
801 ~ 1000	5.99	5.13	5.79	15.82	2.11	26.06	5.72	29.54			
1000 ~ 1500	19.78	18.02	20.22	21.13	14.37	5.60	18.80	7.66			
1501 ~ 2000	20.74	18.48	20.66	28.60	21.22	44.57	28.02			23.22	
2001 ~ 2500	11.24	12.73	10.76	7.72	9.16						
2501 ~ 3000	10.00	6.40	10.85	8.41			26.50	26.37			
3001 ~ 3500	3.79	2.88	3.70	2.08	10.88	17.14	7.89	25.41		46.20	
3501 ~ 4000	5.36	4.19	5.57	4.12	0.90		7.71	11.02			
4001 ~ 4500	3.76	2.55	4.03	9.17			0.92				
4501 & above	14.81	24.40	14.01	3.79	26.99						

Source: "Household Income and Expenditure Survey, 1984-85" Statistics Division, Govt. of Pakistan.

TABLE G-30. MONTHLY CONSUMPTION EXPENDITURE PER HOUSEHOLD

<u>Items</u>	<u>Total of Pakistan</u>	<u>Rural Area of Pakistan</u>	<u>Rural Area of Punjab</u>
1. Average Consumption Expenditure (Rs/month)	1,653.39	1,447.56	1,441.94
2. Percent of Monthly Consumption Expenditure by Items (Total Expenditure = 100)			
- Food Beverage and Tobacco	48.61	51.35	50.08
- Apparel, Textile, and Footwear	7.50	7.89	7.94
- Transport and Communication	4.45	3.67	3.20
- Cleaning Laundry and Personal Appearance	5.04	5.01	5.04
- Recreation Entertainment and Education	2.08	1.38	1.40
2-1. Housing			
- Rent	11.21	7.90	7.88
- Fuel and Lighting	5.63	6.03	5.42
- Household Furniture Equipment etc.	2.04	2.12	2.00
2-2. Miscellaneous	13.44	14.66	17.03

Source: "Household Income and Expenditure, 1984 ~ 85"  
Statistics Division, Govt. of Pakistan.



TABLE G-31. MONTHLY EXPENDITURE PER HOUSEHOLD BY INCOME CLASS

Income Class (Rs/month)	Total of Pakistan	(Unit: Rs/month)	
		Rural Area of Pakistan	Rural Area of Punjab
All Groups	1,653.39	1,447.57	1,441.94
Upto ~ 600	579.02	578.91	556.18
601 ~ 700	703.62	705.91	710.07
701 ~ 800	803.43	800.72	820.89
801 ~ 1000	935.95	929.44	924.78
1001 ~ 1500	1,239.56	1,234.71	1,234.45
1501 ~ 2000	1,661.67	1,629.08	1,625.90
2001 ~ 2500	2,085.19	2,019.56	2,093.43
2501 ~ 3000	2,522.58	2,464.83	2,441.72
3001 ~ 3500	2,989.10	2,828.51	2,846.86
3501 ~ 4000	3,507.47	3,423.52	3,048.26
4001 ~ 4500	3,691.28	3,512.49	3,560.65
4501 & above	6,017.37	5,753.44	5,824.46

Source: "Household Income and Expenditure Survey, 1984 ~ 85"  
 Statistics Division, Govt. of Pakistan.