

4.2 Proposed Irrigation Water Demand

4.2.1 Potential Irrigable Area

(1) Land Classification

According to soil conditions, farm land is classified into six classes, of which three classes of 1, 2 and 3 are regarded as suitable land for agriculture without any soil improvement. Land classification in the beneficial area is estimated as shown in Table 4.2.1.1.

Table 4.2.1.1 Land Classification and Irrigable Area in the Study Area

Unit: ha

Area	Class-1	Class-2	Class-3	Class-1,2,3	Total
Qazvin	62,555	141,505	165,835	180	370,075
Hashtgerd	23,850	2,041	12,210	0	38,101
Tehran-Karaj	66,324	40,536	23,943	1,140	131,943

Source: Jamab consultant

Class-1: Land well suited for irrigated agriculture

Class-2: Land moderately suited for irrigated agriculture

Class-3: Land fairly suited for irrigated agriculture

Class-1,2,3: Mixed with Class-1,2,3

(2) Proposed Irrigable Area

In the Master Plan, irrigation area is proposed in the following table based on the land suitability area.

Proposed Irrigable Area in the Master Plan

Unit: ha

Area	Present (1994)	Land suitability area	Proposed irrigation area
Qazvin	107,420	370,075	370,075
Hashtgerd	27,100	38,101	38,101
Karaj	103,305	131,943	66,600
Tehran			81,400
Total	237,825	540,119	556,176

4.2.2 Irrigation Water Demand

In the Master Plan, cropping area of 20 crops in each region is studied as shown in Table 4.2.2.1. Based on the cropping area and assumed actual irrigation requirement, monthly irrigation demand was calculated, as shown in Tables 4.2.2.3 to 4.2.2.5 in the Master Plan. Cropping area in target year (2021) is also planned based on the present cropping area, as shown in Table 4.2.2.2. Major crop is the grain such as wheat and barley, occupies 50% in Qazvin, 51% in Hashtgerd and 45% in Tehran-Karaj. Fruit such as grape and apple is the second crop, occupying 23 – 24 %.

Monthly unit irrigation requirement of each crop was theoretically calculated based on the meteorology data and crop factors. Based on the unit irrigation requirement and cropping area, monthly net irrigation demand was calculated as shown in Tables from 4.2.2.6 to 4.2.2.8.

Water Demand Projection in the Master Plan

Based on unit irrigation requirement per hectare and the potential irrigable area, irrigation demand of each region is estimated as follows in the Master Plan.

Water Demand Projection in the Master Plan

Region	Present (Year 1994)			Target (Year 2021)		
	Irrigation area	Water demand		Irrigation area	Water demand	
	ha	m ³ /ha	MCM	ha	m ³ /ha	MCM
Qazvin	108,420	12,803	1,375	370,075	13,807	5,109.6
Hashtgerd	27,100	12,288	333	38,101	13,906	529.8
Karaj	103,305	12,100	600	66,600	17,106	1,139.3
Tehran			650	81,400	17,106	1,392.4
Total	238,825	12,390	2,958	556,176	14,492	8,171.1

Source : Master Plan by Jamab consultant.

It is impossible however to supply the huge irrigation water demand of 8,171MCM in 2021 because the surface and groundwater resources in the Study Area is limited and could not cover such huge irrigation demand.

Table 4.2.2.1 Present Cropping Area in Master Plan (1994)

Crop	Bueen-Ghazvin		Hashtgerd		Tehran-Karaj	
	ha	%	ha	%	ha	%
1.Wheat	38,456	35.8	7,371	27.2	20,661	20.0
2.Barley	21,484	20.0	7,263	26.8	27,479	26.6
3.Maize	537	0.5	163	0.6	620	0.6
4.Rice						
5.Sugacane						
6.Cotton	107	0.1			103	0.1
7.Sugarbeet	3,545	3.3	650	2.4	413	0.4
8.Alfalfa	10,097	9.4	2,656	9.8	9,504	9.2
9.Forage(high yield)	1,719	1.6	1,599	5.9	8,058	7.8
10.Forage(low Yeild)	107	0.1			310	0.3
11.Sunflower, Soybeans	1,504	1.4	27	0.1		
12.Pulses	1,934	1.8	81	0.3	413	0.4
13.Cash crop(melon/onion)	2,471	2.3	705	2.6	10,021	9.7
14.Potatos	752	0.7	27	0.1	620	0.6
15.Dates						
16.Citrus						
17.Orchard(orange)	2,471	2.3	108	0.4	310	0.3
18.Other fruit	22,236	20.7	6,450	23.8	24,793	24.0
19.Tea						
20.Other crop						
Total	107,420	100.0	27,100	100.0	103,305	100.0

Source: Jamb Consultant, Master Plan

Table 4.2.2.2 Cropping area in Target Year (2021)

Crop	Bueen-Ghazvin		Hashtgerd		Tehran-Karaj	
	ha	%	ha	%	ha	%
1.Wheat	111,023	30.0	9,906	26.0	29,600	20.0
2.Barley	74,015	20.0	9,525	25.0	37,000	25.0
3.Maize	7,402	2.0	762	2.0	2,960	2.0
4.Rice						
5.Sugarcane						
6.Cotton	1,850	0.5		0.0	740	0.5
7.Sugarbeet	14,803	4.0	1,143	3.0	1,480	1.0
8.Alfalfa	37,008	10.0	3,429	9.0	12,580	8.5
9.Forage(high yield)	7,402	2.0	2,286	6.0	10,656	7.2
10.Forage(low Yeild)					740	0.5
11.Sunflower, Soybeans	7,402	2.0	381	1.0		
12.Pulses	11,102	3.0	381	1.0	740	0.5
13.Cash crop(melon/onion)	8,512	2.3	762	2.0	14,356	9.7
14.Potatos	3,331	0.9	305	0.8	1,184	0.8
15.Dates						
16.Citrus						
17.Orchard(orange)	8,512	2.3	152	0.4	444	0.3
18.Other fruit	77,716	21.0	9,068	23.8	35,520	24.0
19.Tea						
20.Other crop						
Total	370,075	100.0	38,101	100.0	148,000	100.0

Source: Area (%) is based on the data from Jamb Consultant, Master Plan

Table 4.2.2.3 Present Monthly Water Demand Calculation (Buin-Qazvin) (1994)

Table 4.2.2.4 Present Monthly Water Demand Calculation (Hashtgerd) (1994)

Down; Montly water requirement (MCM)														
Upper; Unit water requirement (m3/ha)														
Crop	Cropping Area (ha)	Dey	Bah	Esf	Far	Ord	Khr	Tir	Mpr	Shr	Mhr	Abn	Azr	Total
1.Wheat	7,371	0.00	0.00	0.00	513	3,386	3,181	390			1,026			8,496
2.Barley	7,263				378	24,96	23,45	2,87	0.00	0.00	7,56	0.00	0.00	62,62
					657	3,120	1,252				1,026			6,055
3.Maize	163	0.00	0.00	0.00	477	22,66	9,09	0.00	0.00	0.00	7,45	0.00	0.00	43,98
4.Rice		0.00	0.00	0.00	0.00	0.00	1,836	4,200	3,625	762				10,423
							0.30	0.68	0.59	0.12	0.00	0.00	0.00	1.70
5.Sugarcane		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
		0.00	0.00	0.00					0.00	0.00				0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
6.Cotton		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
7.Sugarbeet	650	0.00	0.00	0.00	0.00	0.00	2,832	5,685	5,151	3,715				17,383
8.Alfalfa	2,656	0.00	0.00	0.00	0.00	0.00	1.84	3.70	3.35	2.41	0.00	0.00	0.00	11.30
		0.00	0.00	0.00	985	3,284	3,612	4,557	4,434	3,694	1,416	1,272		23,254
9.Forage(high yield)	1,599	0.00	0.00	0.00	2.62	8.72	9.59	12.10	11.78	9.81	3.76	3.38	0.00	61.76
		0.00	0.00	0.00	0.00	0.00	2,380	5,500	3,777					11,657
10.Forage(low Yelid)					0.00	0.00	3.81	8.79	6.04	0.00	0.00	0.00	0.00	18.64
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
11.Sunflower, Soybeans	27	0.00	0.00	0.00	0.00	0.00	1,826	4,849	4,219	1,348				0.00
		0.00	0.00	0.00	0.00	0.00	0.05	0.13	0.11	0.04	0.00	0.00	0.00	12,242
12.Pulses	81	0.00	0.00	0.00	0.00	0.00	26	3,481	5,392	2,894	167			0.33
		0.00	0.00	0.00	0.00	0.00	0.28	0.44	0.23	0.01	0.00	0.00	0.00	11,960
13.Cash crop(melon/onion)	705	0.00	0.00	0.00	0.00	204	2,615	4,989	4,423	1,568	98			0.97
		0.00	0.00	0.00	0.00	1.84	1.84	3.52	3.12	1.11	0.07	0.00	0.00	13,897
14.Potatos	27	0.00	0.00	0.00	0.00	103	2,257	5,192	5,275	3,715	574			11.50
		0.00	0.00	0.00	0.00	0.00	0.06	0.14	0.14	0.10	0.02	0.00	0.00	17,116
15.Dates														0.46
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
16.Cirus														0
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.Orchard(orange)	108	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
		0.00	0.00	0.00	0.00	1,138	3,140	3,654	3,365	2,503				0.00
18.Other fruit	6,450	0.00	0.00	0.00	0.00	0.12	0.34	0.39	0.36	0.27	0.00	0.00	0.00	13,800
		0.00	0.00	0.00	0.00	1,149	3,982	5,050	4,740	3,674				1.49
19.Tea		0.00	0.00	0.00	0.00	7.41	25,68	32,57	30,57	23.70	0.00	0.00	0.00	18,595
		0.00	0.00	0.00	0.00	0.00								119.94
20.Other crop		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Area and Av.m3/ha	27,100	0.00	0.00	0.00	0.00	65.72	76.34	65.34	56.30	37.57	18.86	3.38	0.00	0.00
Total Water Demand (MCM)		0.00	0.00	0.00	0.00	11.17	76.34	65.34	56.30	37.57	18.86	3.38	0.00	334.69

Table 4.2.3.5 Present Monthly Water Demand Calculation (Tehran-Karaj) (1994)

Crop		Cropping Area (ha)	Upper: Unit water requirement (m3/ha)										Down: Monthly water requirement (MCM)			
			Dey	Bah	Esf	Far	Ord	Khr	Tir	Mpr	Shr	Mhr	Abn	Azr	Total	
1.Wheat	20,661		0.00	0.00	0.00	502	3,313	3,111	382				1,004		8,312	
2.Barley			0.00	0.00	0.00	10.37	68.45	64.28	7.89	0.00	0.00	0.00	0.00	0.00	171.73	
3.Maize	620		0.00	0.00	0.00	17.64	83.87	33.66	0.00	0.00	0.00	0.00	0.00	0.00	5,923	
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	162.76	
4.Rice			0.00	0.00	0.00	0.00	0.00	1.15	2.63	2.27	0.48	0.00	0.00	0.00	6.52	
5.Sugarcane			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	
6.Cotton	103		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7.Sugarbeet	413		0.00	0.00	0.00	0.00	0.21	0.42	0.56	0.52	0.40	0.22	0.04	0.00	2.37	
8.Alfalfa	9,504		0.00	0.00	0.00	0.00	0.00	2,771	5,561	5,040	3,634				17,006	
			0.00	0.00	0.00	0.00	0.00	1.14	2.30	2.08	1.50	0.00	0.00	0.00	7.02	
9.Forage(high yield)	8,058		0.00	0.00	0.00	964	3,213	3,533	4,458	4,336	3,614	1,384	1,244		22,746	
			0.00	0.00	0.00	9.16	30.54	33.58	42.37	41.21	34.35	13.15	11.82	0.00	0.00	216.18
10.Forage(low Yield)	310		0.00	0.00	0.00	0.00	0.00	0.00	14.88	18.44	29.12	16.67	0.81	0.00	79.94	
			0.00	0.00	0.00	1,365	3,273	1,024			1,285	944	1,245		9,136	
11.Sunflower, Soybeans			0.00	0.00	0.00	0.42	1.01	0.32	0.00	0.00	0.40	0.29	0.39	0.00	2.83	
12.Pulses	413		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	563	3,490	5,423	2,269	149				11,894	
13.Cash crop(melon/onion)	10,021		0.00	0.00	0.00	0.00	0.23	1.44	2.24	0.94	0.06	0.00	0.00	0.00	4.91	
			0.00	0.00	0.00	0.00	237	2,124	4,958	4,489	1,183				12,991	
14.Potatos	620		0.00	0.00	0.00	0.00	21.28	21.28	49.68	44.98	11.85	0.00	0.00	0.00	149.09	
			0.00	0.00	0.00	0.00	100	2,209	5,080	5,161	3,634	562			16,746	
15.Dates			0.00	0.00	0.00	0.06	0.06	1.37	3.15	3.20	2.25	0.35	0.00	0.00	10.38	
16.Citrus			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17.Orchard(orange)	310		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
			0.00	0.00	0.00	0.00	1,114	3,071	3,574	3,293	2,450				13,502	
18.Other fruit	24,793		0.00	0.00	0.00	0.00	0.35	0.95	1.11	1.02	0.76	0.00	0.00	0.00	4.19	
			0.00	0.00	0.00	0.00	1,124	3,896	4,938	4,639	3,594				18,191	
19.Tea			0.00	0.00	0.00	27.87	96.59	122.43	115.01	89.11	0.00	0.00	0.00	0.00	451.01	
20.Other crop			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Total Area and Av.m3/ha		103,305														
Total Water Demand (MCM)			0.00	0.00	0.00	37.60	233.87	256.18	249.24	229.68	170.28	79.02	13.06	0.00	1,268.93	

Table 4.2.2.6 Monthly Net Crop Water Requirement Calculation (Buin-Qazvin) (2021)

Crop		Cropping Area (ha)	Upper; Unit water requirement (m3/ha)										Down; Monthly water requirement (MCM)				
			Dey	Bah	Esf	Far	Ord	Khr	Tir	Mpr	Shr	Mhr	Abn	Azr	Total		
1.Wheat		111,023	0.00	0.00	550	949	968	1,170	427			54	226	99	4,443		
2.Barley		74,015	0.00	0.00	61.06	105.36	107.47	129.90	47.41	0.00	0.00	6.00	25.09	10.99	493.28		
3.Maize		7,402	0.00	0.00	550	949	968	1,170	427			54	226	99.00	4,443		
4.Rice			0.00	0.00	40.71	70.24	71.65	86.60	31.60	0.00	0.00	4.00	16.73	7.33	328.85		
			0.00	0.00	0.00	0.00	264	790	1,779	2,331	1,177	187			6,528		
5.Sugarcane			0.00	0.00	0.00	0.00	1.95	5.85	13.17	17.25	8.71	1.38	0.00	0.00	48.32		
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
6.Cotton		1,850	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			0.00	0.00		92	608	1,829	2,940	2,993	1,350	198					
7.Sugarbeet		14,803	0.00	0.00	0.00	0.17	1.12	3.38	5.44	5.54	2.50	0.37	0.00	0.00	18.52		
			0.00	0.00		118	294	1,104	2,089	2,404	1,946	1,097	263		9,315		
8.Alfalfa		37,008	0.00	0.00	0.00	1.75	4.35	16.34	30.92	35.59	28.81	16.24	3.89	0.00	137.89		
			0.00	0.00	0.00	231	682	1,592	2,174	2,165	1,723	935	213		9,715		
9.Forage(high yield)		7,402	0.00	0.00	0.00	8.55	25.24	58.92	80.46	80.12	63.76	34.60	7.88	0.00	359.53		
			0.00	0.00			237	1,427	2,101	723					4,488		
10.Forage(low Yield)			0.00	0.00	0.00	0.00	1.75	10.56	15.55	5.35	0.00	0.00	0.00	0.00	33.22		
			0.00	0.00	0.00	0.00	1,021	1,765	1,952	1,861					6,599		
11.Sunflower, Soybeans		7,402	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			0.00	0.00	0.00	0.00	213	1,040	2,207	2,410	948	89			6,907		
12.Pulses		11,102	0.00	0.00	0.00	0.00	1.58	7.70	16.34	17.84	7.02	0.66	0.00	0.00	51.13		
			0.00	0.00	0.00	101	574	1,839	2,023	751	67				5,355		
13.Cash crop(melon/onion)		8,512	0.00	0.00	0.00	1.12	6.37	20.42	22.46	8.34	0.74	0.00	0.00	0.00	59.45		
			0.00	0.00		94	494	1,670	2,377	2,166	1,088	209			8,098		
14.Potatos		3,331	0.00	0.00	0.00	0.80	4.20	14.22	20.23	18.44	9.26	1.78	0.00	0.00	68.93		
			0.00	0.00	0.00	94	311	1,315	2,332	2,370	1,132	191			7,745		
15.Dates			0.00	0.00	0.00	0.31	1.04	4.38	7.77	7.89	3.77	0.64	0.00	0.00	25.80		
			0.00	0.00	0.00	0.00	0.00	0.00	0.00								
16.Citrus			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
17.Orchard(orange)		8,512	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			0.00	0.00	0.00	349	855	1,649	2,101	2,062	1,632	840	179		9,667		
18.Other fruit		77,716	0.00	0.00	0.00	2.97	7.28	14.04	17.88	17.55	13.89	7.15	1.52	0.00	82.29		
			0.00	0.00		135	720	1,839	2,570	2,580	2,061	871	130		10,906		
19.Tea			0.00	0.00	0.00	10.49	55.96	142.92	199.73	200.51	160.17	67.69	10.10	0.00	847.57		
			0.00	0.00	0.00	0.00	0.00	0.00	0.00				0		0		
20.Other crop			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0		
Total Area and Av.m3/ha		370,078	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total Water Demand (MCM)			0.00	0.00	101.77	201.76	289.96	515.21	508.96	414.42	298.64	140.50	65.22	18.32	2,554.77		

Table 4.2.3.7 Monthly Net Crop Water Requirement Calculation (Hashtgerd) (2021)

Crop	Cropping Area (ha)	Dey	Bah	Esf	Far	Ord	Upper; Unit water requirement (m3/ha)					Down; Monthly water requirement (MCM)				
							Khr	Tir	Mpr	Shr	Mhr	Abn	Azr	Total		
1.Wheat	9,906	0.00	0.00	562	970	990	1,196	437			55	231	102	4,543		
2.Barley	9,525			557	961	981	1185	433	0.00	0.00	0.54	229	1.01	45.00		
3.Maize	762	0.00	0.00	562	970	990	1,196	437			55	231	102	4,543		
				535	924	943	1139	416	0.00	0.00	0.52	220	0.97	43.27		
4.Rice		0.00	0.00	0.00	0.00	270	807	1,819	2,383	1,204	191			6,674		
				0.00		0.21	0.61	1.39	1.82	0.92	0.15	0.00	0.00	5.09		
5.Sugarcane		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
6.Cotton		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
7.Sugarbeet	1,143	0.00	0.00	0.00	120	301	1,129	2,136	2,458	1,989	1,122	269		9,524		
8.Alfalfa	3,429	0.00	0.00	0.00	0.14	0.34	1.29	2.44	2.81	2.27	1.28	0.31	0.00	10.89		
		0.00	0.00	0.00	236	697	1,627	2,223	2,214	1,762	956	217		9,932		
9.Forage(high yield)	2,286	0.00	0.00	0.00	0.81	2.39	5.58	7.62	7.59	6.04	3.28	0.74	0.00	34.06		
		0.00	0.00	0.00	0.00	243	1,459	2,148	740					4,590		
10.Forage(low Yield)		0.00	0.00	0.00	0.00	0.56	3.34	4.91	1.69	0.00	0.00	0.00	0.00	10.49		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
11.Sunflower, Soybeans	381	0.00	0.00	0.00	0.00	217	1,061	2,251	2,458	967	91			7,045		
12.Pulses	381	0.00	0.00	0.00	104	587	1,881	2,069	768	69	0.03	0.00	0.00	2.68		
		0.00	0.00	0.00	0.04	0.22	0.72	0.79	0.29	0.03	0.00	0.00	0.00	5.478		
13.Cash crop(melon/onion)	762	0.00	0.00	0.00	96	505	1,707	2,431	2,214	1,112	214			2,09		
		0.00	0.00	0.00	0.07	0.38	1.30	1.85	1.69	0.85	0.16	0.00	0.00	8,279		
14.Potatos	305	0.00	0.00	0.00	96	318	1,345	2,385	2,423	1,158	196			6.31		
		0.00	0.00	0.00	0.03	0.10	0.41	0.73	0.74	0.35	0.06	0.00	0.00	7,921		
15.Dates		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.42		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
16.Citrus		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
17.Orchard(orange)	152	0.00	0.00	0.00	356	874	1,686	2,148	2,108	1,669	859	183		9,883		
		0.00	0.00	0.00	0.05	0.13	0.26	0.33	0.32	0.25	0.13	0.03	0.00	1.50		
18.Other fruit	9,068	0.00	0.00	0.00	138	736	1,880	2,628	2,638	2,107	891	132		11,150		
		0.00	0.00	0.00	1.25	6.67	17.05	23.83	23.92	19.11	8.08	1.20	0.00	101.11		
19.Tea		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
20.Other crop		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Total Area and Av.m3/ha	38,100	0.00	0.00	10.92	21.24	30.33	54.20	53.23	41.81	30.19	14.24	6.76	1.98	264.90		
Total Water Demand (MCM)		0.00	0.00													

Table 4.2.3.8 Monthly Net Crop Water Requirement Calculation (Tehran-Karaj) (2021)

Crop	Cropping Area (ha)	Dey	Bah	Esf	Far	Ord	Khr	Tir	Mpr	Shr	Upper; Unit water requirement (m3/ha)					Down; Montly water requirement (MCM)				
											Tir	Mpr	Shr	Mhr	Abn	Azr	Total			
1.Wheat	29,600	0.00	0.00	840	1,364	1,413	956	243			243			46	197	87	5,146			
2.Barley	37,000			24,86	40,37	41,82	28,30	7,19	0.00	0.00	7,19	0.00	0.00	1,36	5,83	2,58	152,32			
3.Maize	2,960	0.00	0.00	840	1,364	1,413	956	243			243			46	197	87	5,146			
4.Rice		0.00	0.00	31,08	50,47	52,28	35,37	8,99	0.00	0.00	8,99	0.00	0.00	1,70	7,29	3,22	190,40			
		0.00	0.00			443	969	1,882	2,387	1,214	1,882	2,387	1,214	199			7,094			
		0.00	0.00	0.00	0.00	1,31	2,87	5,57	7,07	3,59	5,57	7,07	3,59	0,59	0.00	0.00	21,00			
5.Sugarcane		0.00	0.00														0			
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
6.Cotton	740	0.00	0.00	0.00		80	1,589	2,556	2,602	1,173	2,556	2,602	1,173	172			8,701			
7.Sugarbeet	1,480	0.00	0.00	0.00	0.06	0.39	1,18	1,89	1,93	0.87	1,89	1,93	0.87	0.13	0.00	0.00	6,44			
		0.00	0.00		146	480	1,324	2,217	2,461	2,032	2,217	2,461	2,032	608			9,268			
8.Alfalfa	12,580	0.00	0.00	0.00	0.22	0.71	1,96	3,28	3,64	3,01	3,28	3,64	3,01	0.90	0.00	0.00	13,72			
		0.00	0.00			7,632	5,065	1,980	2,038	1,819	1,980	2,038	1,819	1,086	258		19,878			
9.Forage(high yield)	10,656	0.00	0.00	0.00	0.00	432	63,72	24,91	25,64	22,88	24,91	25,64	22,88	13,66	3,25	0.00	250,07			
		0.00	0.00				1,710	2,255	754		2,255	754					5,151			
10.Forage(low Yeld)	740	0.00	0.00	0.00	0.00	4,60	18,22	24,03	8,03	0.00	24,03	8,03	0.00	0.00	0.00	0.00	54,89			
		0.00	0.00			1,038	1,864	2,028	1,902	612	2,028	1,902	612				7,444			
11.Sunflower, Soybeans		0.00	0.00	0.00	0.00	0.77	1,38	1,50	1,41	0.45	1,50	1,41	0.45	0.00	0.00	0.00	5,51			
		0.00	0.00			1,557	2,018	2,034	1,837		2,034	1,837					7,446			
12.Pulses	740	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
		0.00	0.00		122	877	2,202	2,178	776	68	2,178	776	68				6,223			
13.Cash crop(melon/onion)	14,356	0.00	0.00	0.00	0.09	0.65	1,63	1,61	0.57	0.05	1,61	0.57	0.05	0.00	0.00	0.00	4,61			
		0.00	0.00		108	756	1,995	2,539	2,219	1,125	2,539	2,219	1,125	222			8,964			
14.Potatos	1,184	0.00	0.00	0.00	1,55	10,85	28,64	36,45	31,86	16,15	36,45	31,86	16,15	3,19	0.00	0.00	128,69			
		0.00	0.00		108	497	1,567	2,480	2,427	1,169	2,480	2,427	1,169	203			8,451			
15.Dates		0.00	0.00	0.00	0.13	0.59	1,86	2,94	2,87	1,38	2,94	2,87	1,38	0,24	0.00	0.00	10,01			
		0.00	0.00														0			
16.Citrus		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
		0.00	0.00														0			
17.Orchard(orange)	444	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
		0.00	0.00		658	1,373	2,017	2,255	2,115	1,712	2,255	2,115	1,712	911	198		11,239			
18.Other fruit	35,520	0.00	0.00	0.00	0.29	0.61	0.90	1,00	0.94	0.76	1,00	0.94	0.76	0.40	0.09	0.00	4,99			
		0.00	0.00		167	1,014	2,184	2,743	2,643	2,153	2,743	2,643	2,153	891	120		11,915			
19.Tea		0.00	0.00	0.00	5,93	36,02	77,58	97,43	93,88	76,47	97,43	93,88	76,47	31,65	4,26	0.00	423,22			
		0.00	0.00														0			
20.Other crop		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
		0.00	0.00	180	351	1,782	1,857	2,065	1,624	673	2,065	1,624	673	133	37		8,702			
Total Area and Av.m3/ha	148,000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Total Water Demand (MCMf)		0.00	0.00	55,94	99,11	246,62	263,59	216,80	177,84	125,62	216,80	177,84	125,62	53,82	20,72	5,79	1,265,85			

Table 4.2.3.9. .1 Criteria of Monthly Crop Water Demand

Crop	Irrigation Times	Far	Ord	Khr	Tir	Mpr	Shr	Mhr	Abn	Azr	Dey	Bah	Esf	Total
		Mar. 21 - Apr. 20	Apr. 21 - May 21	May 22 - Jun. 21	Jun. 22 - Jul. 22	Jul. 23 - Aug. 22	Aug. 23 - Sep. 22	Sep 23 - Oct. 22	Oct. 23 - Nov. 21	Nov. 22 - Dec. 21	Dec. 22 - Jan. 20	Jan. 21 - Feb. 19	Feb. 20 - Mar. 20	
Wheat (low yield)	5	1,000	2,000	2,000				1,000	1,000					7,000
Wheat (high yield)	4	1,000	2,000	2,000					2,000	1,000				8,000
Wheat	5	1,000	2,000	1,000										7,000
Barely	4	1,000	2,000	2,000										6,000
Beetroot	14	2,000	2,000	2,500	3,500	3,500	2,000	1,000						16,500
Pea, Lentil	4	1,500	1,000	2,000	1,000									5,500
Maize	8			2,000	2,500	2,500	2,000	1,000						10,000
Corn	9			2,000	2,500	2,500	2,000	2,000						11,000
Potato	11		2,500	2,000	3,500	2,500	2,000							12,500
Tomato (seed)	14	1,000	3,000	2,000	3,000	3,000	2,000	2,000						16,000
Tomato (transplant)	13		3,000	3,000	2,000	3,000	2,000	2,000						15,000
Onion, Carrot	14	1,500	3,000	3,000	3,000	2,500	2,000							15,000
Sunflower	5		2,000	1,500	2,500	1,000								7,000
Black eyed cowpea	7		1,000	2,000	2,500	2,500	1,000							9,000
Sorgum	6		1,500	1,200	1,200	2,200	1,400							7,500
Cotton	8		2,000	1,000	2,500	2,500	2,000							10,000
Watermelon	5		1,000	2,000	1,500	1,500	1,000							7,000
Alfalfa	16	1,500	2,000	3,000	3,000	3,000	2,000	2,000						16,500
Castor beans	5		1,000	2,000	2,000	2,000								7,000
Cucumber	6		2,000	1,500	2,000	1,500								7,000
Young fruit garden	19	1,000	1,000	1,500	2,000	2,000	2,000	1,500	1,000					12,000
Old fruit garden	19	1,500	1,500	2,000	3,000	3,000	3,000	3,000	1,500					18,500
Vineyard	6		1,500		1,500	1,500								4,500
Traditional vineyard	6		3,000	2,000										5,000

Unit : m3/ha

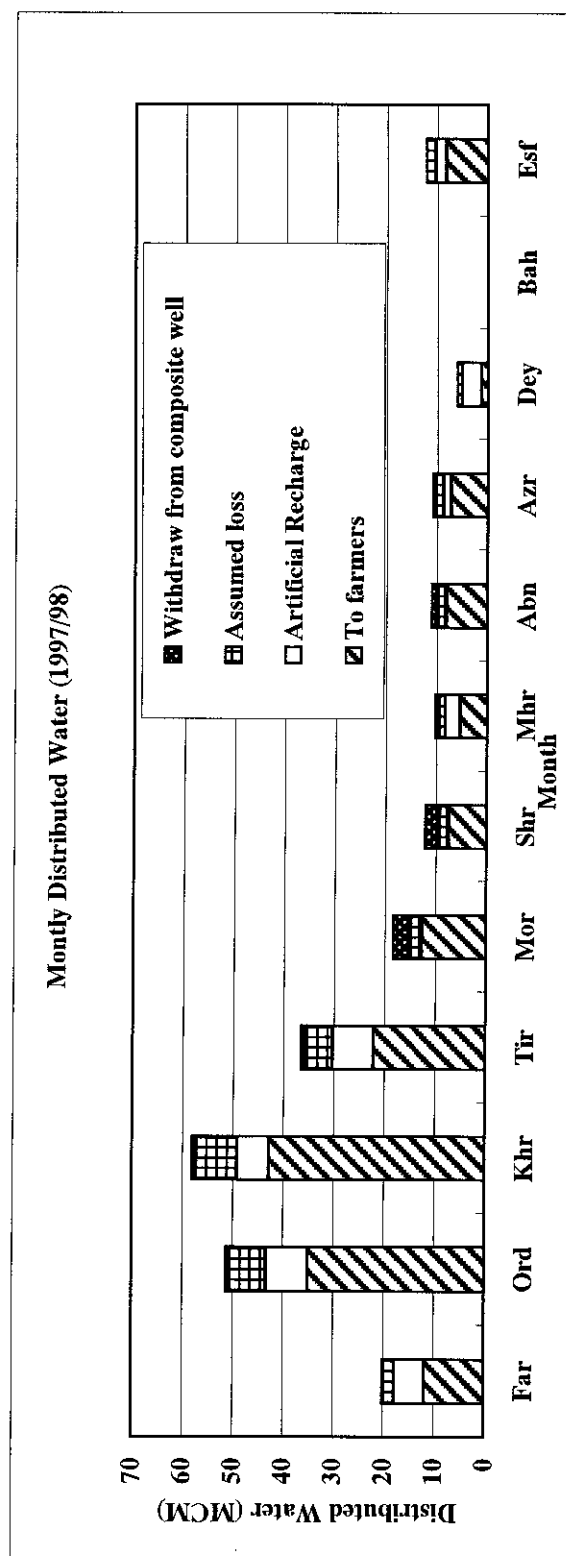
Source : Ghazvin Irrigation Company

Table 4.2.3.10 Monthly Water Use and Pumping Discharge (1977/98)

Month	Diversion water from Ziaran	Distribution of diverted water			Withdraw from
		To farmers	To recharge	Assumed loss	
Far	20.2	11.8	5.9	2.4	0.0
Ord	50.8	35.0	8.3	7.5	0.5
Khr	57.5	42.8	6.3	8.4	0.6
Tir	35.5	22.2	8.0	5.4	0.9
Mor	15.1	12.6	0.4	2.1	3.2
Shr	9.2	7.5	0.2	1.5	2.9
Mhr	9.4	5.3	2.9	1.2	0.9
Abn	9.8	8.1	0.3	1.3	1.3
Azr	10.2	7.2	1.5	1.6	0.4
Dey	5.9	1.3	3.8	0.8	
Bah					
Esf	12.1	8.2	2.2	1.7	
Total	235.7	162.0	39.8	33.9	10.7

Source : Qazvin Irrigation Company

Note: Assumed loss is included in evaporation and infiltration



CHAPTER 5 WATER OPERATION AND ALLOCATION

5.1 Surface Water Operation 5.1

Figure 5.1.1.1 Monthly Pattern of River Runoff, Irrigation Demand and Taleghan Water Diversion

Monthly Runoff of Major Rivers in the Study Area

(unit = MCM)

Station	MEHR	ABAN	AZAR	DAY	BAH.	ESF.	FAR.	ORD.	KHO.	TIR	MOR.	SHA.	ANNUAL
Taleghan at Galinak	11.1	15.3	14.2	12.1	12.4	22.7	73.1	118.6	94.3	41.1	17.8	11.3	443.8
Almout at Baghkalyeh	10.8	13.9	12.6	11.9	12.3	19.3	47.8	74.2	61.2	32.9	16.7	11.4	324.8
Shahrud at Siahdasht	17.8	30.0	34.7	30.1	33.8	68.7	146.1	176.1	145.3	77.8	30.7	13.6	804.6
Kharrud at Rahimabad	3.4	7.8	10.6	11.7	14.9	25.9	44.3	31.2	8.1	0.7	0.5	0.8	160.0
Abharrud at Poletakestan	0.3	0.9	1.5	2.8	3.8	8.7	16.3	5.6	2.0	0.0	0.0	0.0	41.9
Kordan at Dehsomeeh	1.3	3.3	4.7	4.8	6.5	14.9	32.7	31.6	12.4	3.7	1.5	0.8	118.1
Karaj at Karaj Dam	14.2	16.1	14.9	13.2	13.9	24.5	61.5	102.3	88.4	49.1	27.2	17.8	443.2
Total	58.9	87.3	93.2	86.6	97.6	184.7	421.9	539.6	411.6	205.4	94.3	55.6	2336.3
(%)	2.5	3.7	4.0	3.7	4.2	7.9	18.1	23.1	17.6	8.8	4.0	2.4	100.0

Monthly Irrigation Water Demand (1998)

(unit = MCM)

Area	MEHR	ABAN	AZAR	DAY	BAH.	ESF.	FAR.	ORD.	KHO.	TIR	MOR.	SHA.	ANNUAL
Buin-Qazvin	28	55	0	0	0	0	56	247	354	311	239	159	1449
Hashtgerd	14	3	0	0	0	0	8	50	58	49	41	26	249
Karaj	6	2	0	0	0	0	4	26	36	39	35	23	171
Tehran	50	8	0	0	0	0	23	150	149	144	130	84	738
Total	98	68	0	0	0	0	91	473	597	543	445	292	2607
(%)	3.8	2.6	0.0	0.0	0.0	0.0	3.5	18.1	22.9	20.8	17.1	11.2	100.0

Monthly Diversion of Taleghan Water to Qazvin Plain (1993/94 and 1994/95)

(unit = MCM)

Area	MEHR	ABAN	AZAR	DAY	BAH.	ESF.	FAR.	ORD.	KHO.	TIR	MOR.	SHA.	ANNUAL
97-98	6.30	9.30	8.60	4.90	0.00	0.60	20.20	50.80	57.50	35.50	15.00	9.20	217.90
98-99	9.30	9.80	10.20	5.80	0.00	12.00	24.90	41.10	24.20	10.70	4.50	3.00	155.50
Average	7.80	9.55	9.40	5.35	0.00	6.30	22.55	45.95	40.85	23.10	9.75	6.10	186.70
(%)	4.2	5.1	5.0	2.9	0.0	3.4	12.1	24.6	21.9	12.4	5.2	3.3	100.0

Monthly Pattern of River Runoff, Irrigation Demand and Taleghan Water Diversion

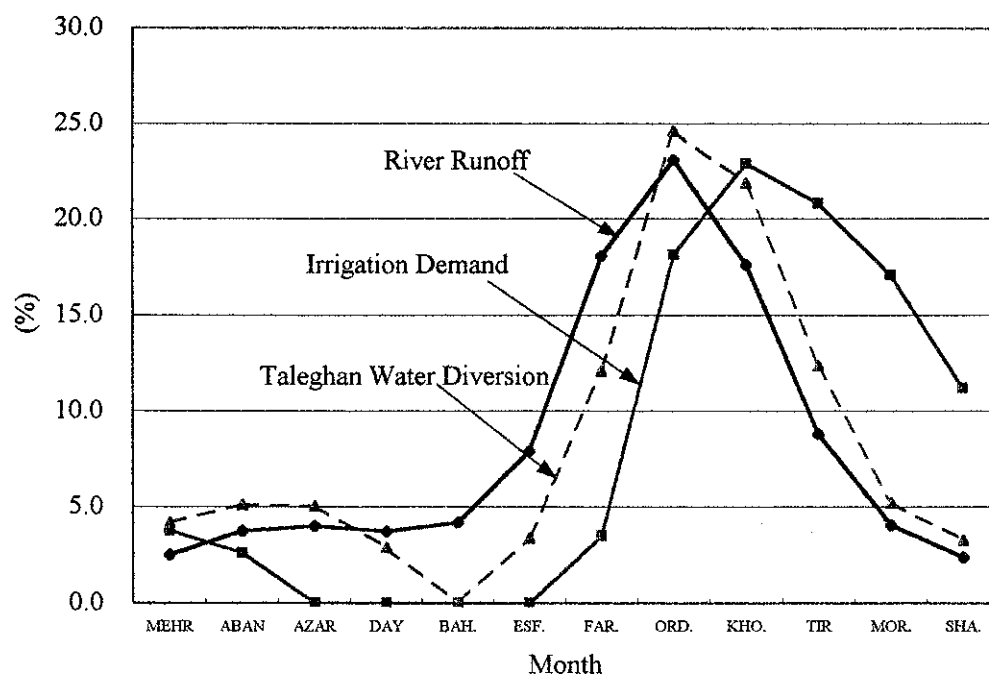


Figure 5.1.1.2 Karaj Dam Monthly Pattern of Inflow and Demand

(Unit=MCM)

Item	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr
Average Inflow	11.70	14.85	15.11	12.71	14.25	25.93	74.60	104.17	79.73	43.81	20.56	13.00
Minimum Inflow	8.95	9.11	10.92	10.45	9.12	28.98	52.00	52.44	44.36	22.56	13.96	8.95
Domestic Demand	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97
Agricultural Demand	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93

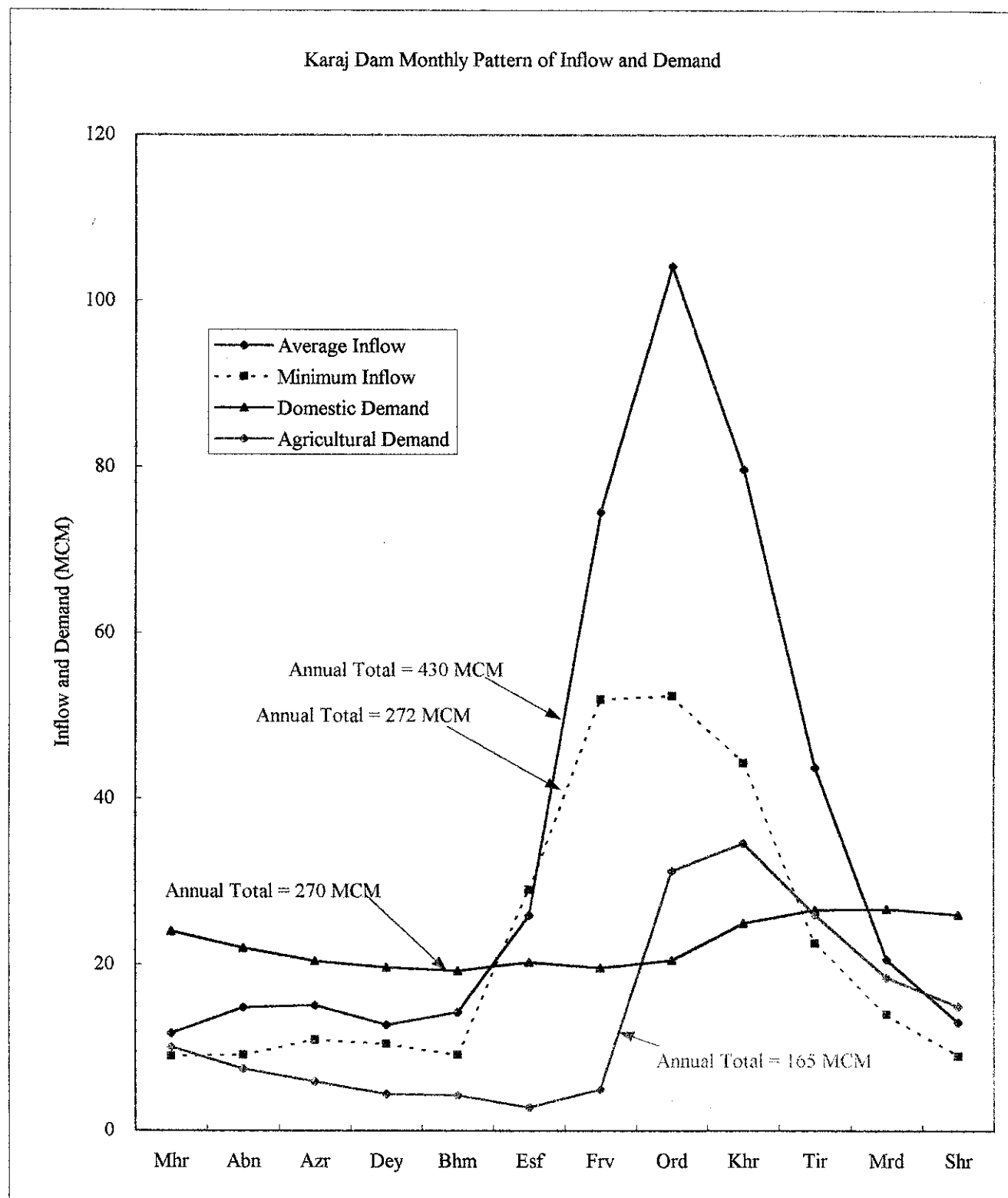


Figure 5.1.2.1 Karaj Dam Release for Water Supply Purpose

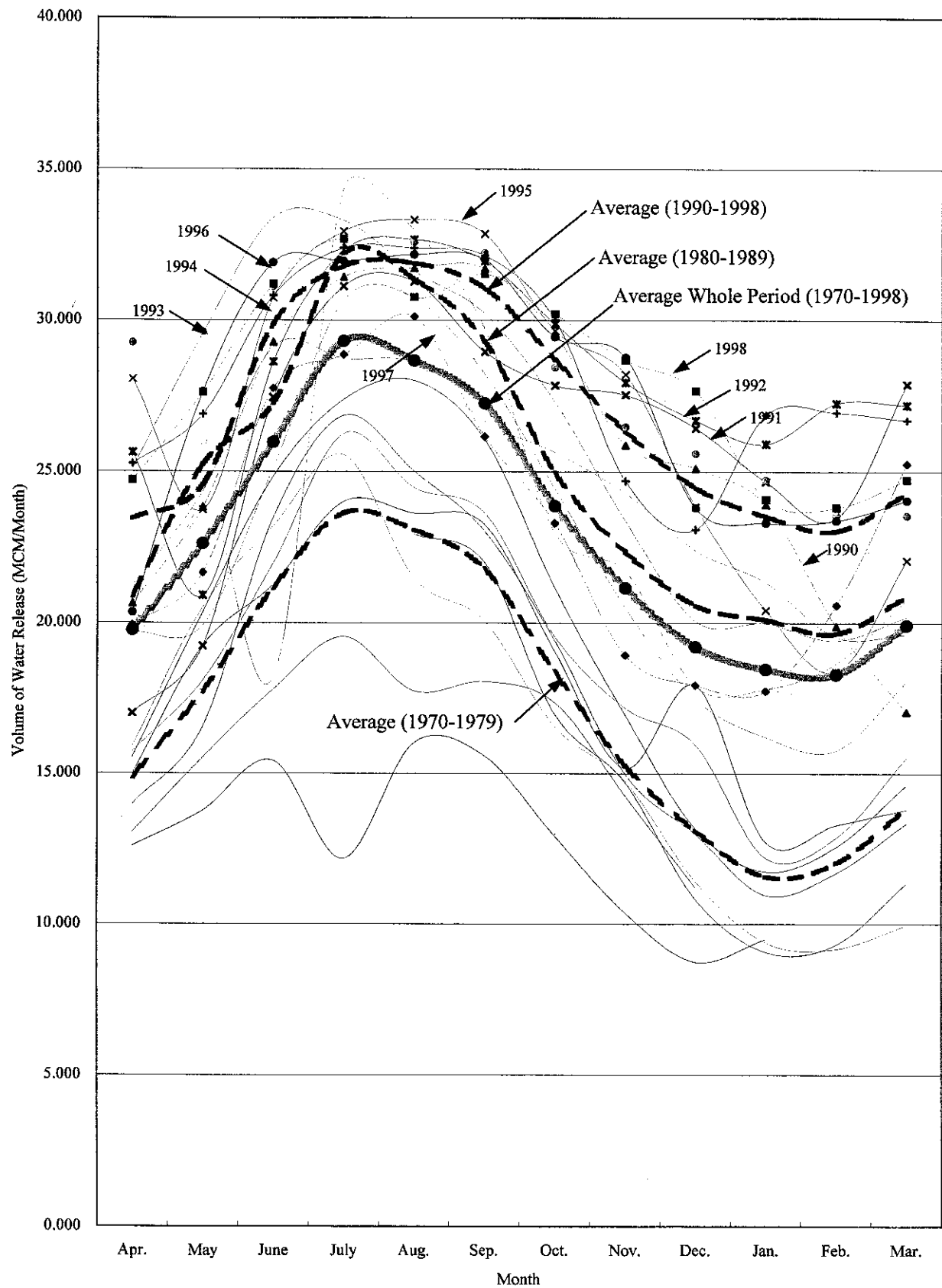


Figure 5.1.2.2 Karaj Dam Release for Irrigation Purpose

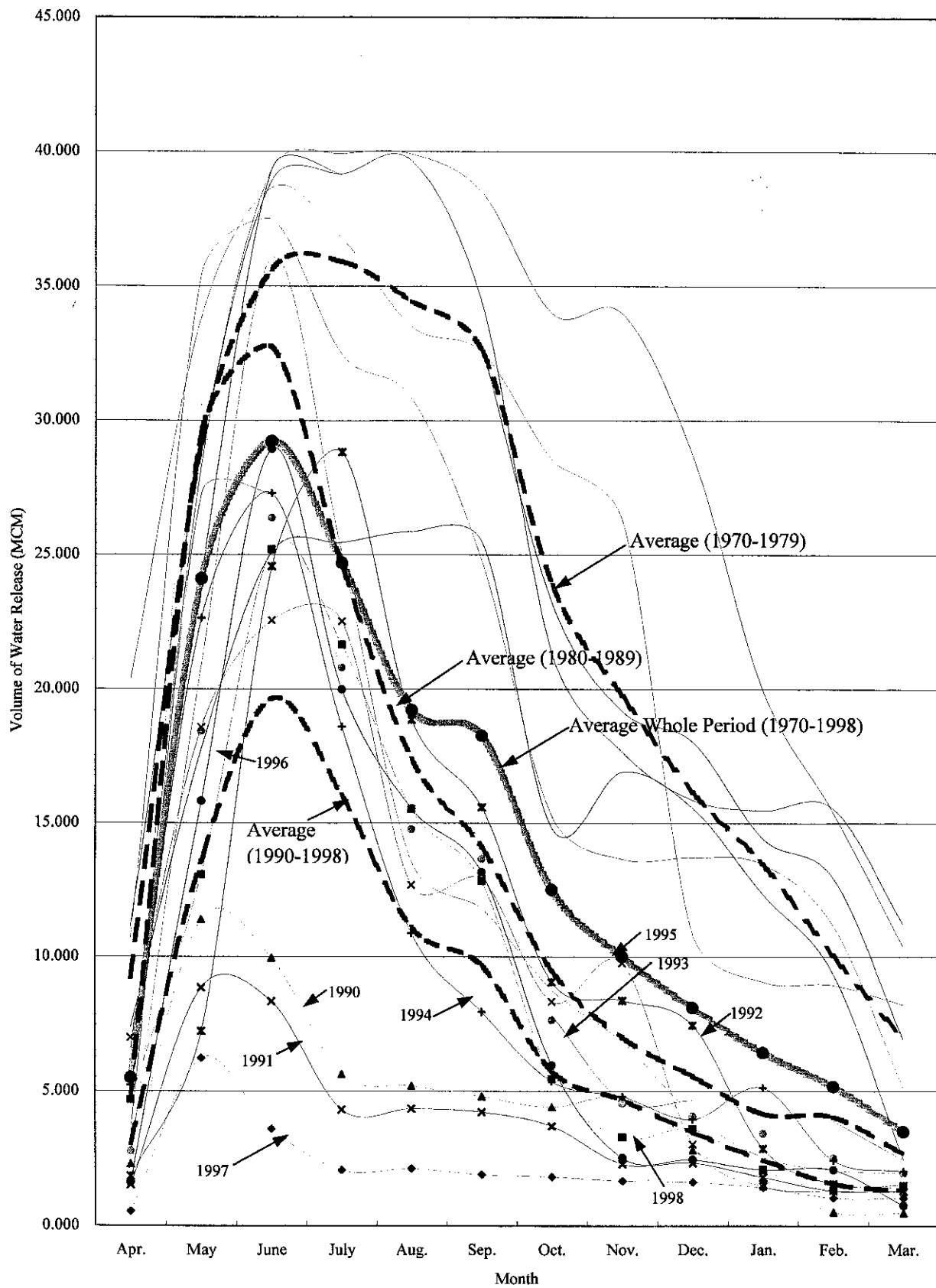


Figure 5.1.2.3 Karaj Dam Total Release

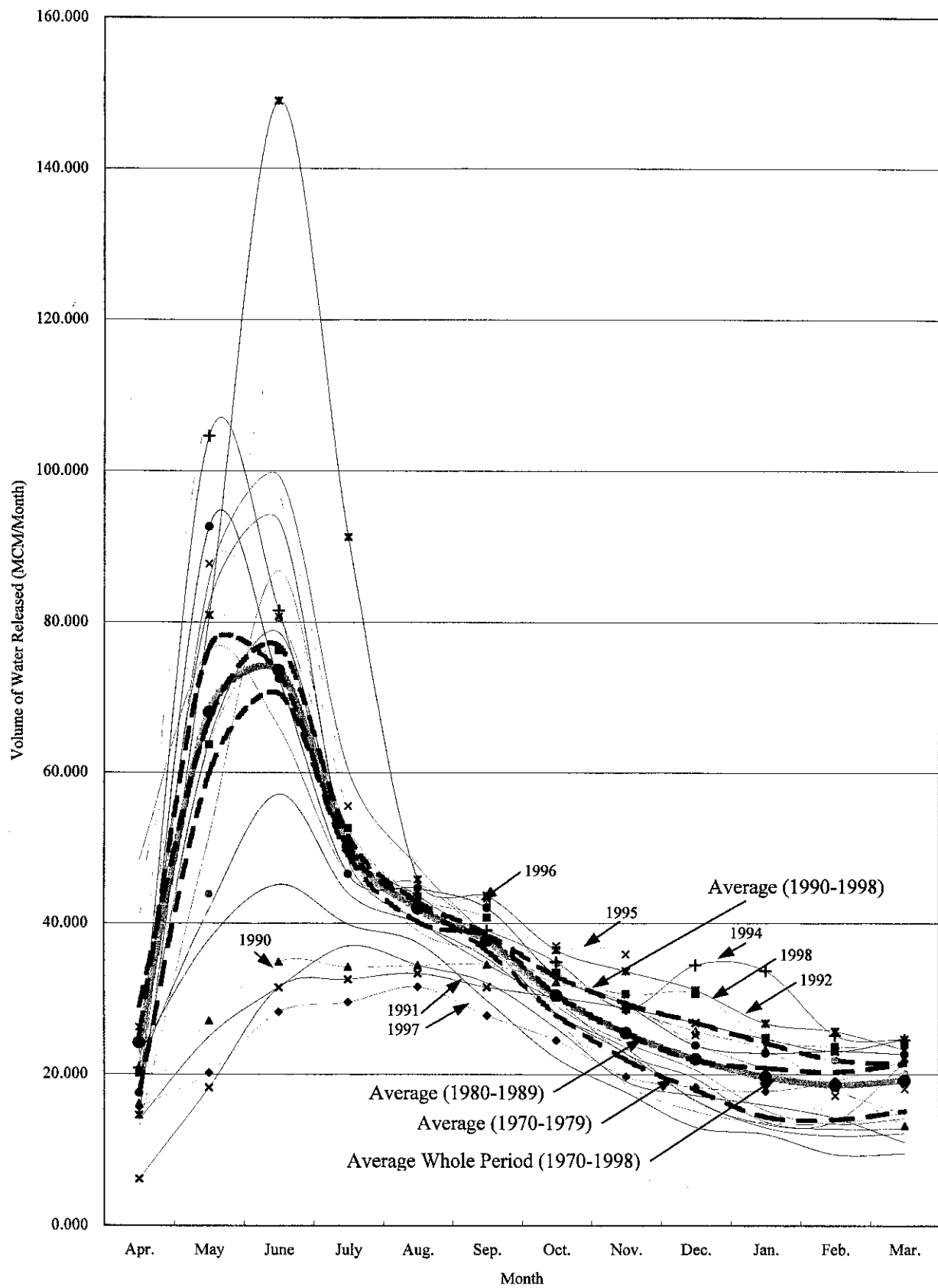


Table 5.1.2.1 Monthly Operation Record of Karaj Dam (Inflow into the Reservoir)

(Unit = cu.m/sec)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Average
1970	19.416	19.577	16.561	8.423	5.213	3.342	3.453	3.513	4.213	4.033	3.517	11.566	8.569
1971	23.668	47.697	35.058	15.803	7.523	4.794	4.147	4.857	5.173	4.190	4.357	8.410	13.806
1972	26.661	47.997	43.597	27.413	12.706	6.987	5.613	7.817	6.990	5.380	7.707	16.907	17.981
1973	26.703	42.432	31.419	15.755	7.335	4.813	4.107	3.703	4.070	3.467	3.770	11.600	13.265
1974	26.906	26.855	21.626	12.026	6.416	4.939	4.013	3.457	3.630	4.050	3.647	8.148	10.476
1975	24.303	41.894	29.074	14.171	6.645	4.361	3.820	3.630	3.493	4.307	5.293	5.437	12.202
1976	29.194	47.039	37.103	20.439	8.752	5.355	4.733	4.017	3.953	3.847	5.217	9.262	14.909
1977	14.374	20.358	21.803	9.755	5.697	4.174	5.323	9.623	7.730	6.583	8.533	15.452	10.784
1978	27.487	29.490	24.345	15.426	7.065	4.716	4.213	4.127	7.477	5.053	7.347	8.093	12.070
1979	35.042	46.132	35.984	21.342	9.658	5.871	4.450	4.457	4.427	3.867	4.260	7.533	15.252
1980	43.203	33.277	23.484	11.710	6.116	4.061	4.087	6.777	4.617	5.010	5.830	13.279	13.454
1981	29.239	47.224	31.923	21.726	9.206	5.539	5.100	4.377	3.673	3.300	3.250	6.317	14.240
1982	25.784	34.939	18.819	9.868	5.603	3.626	8.680	6.527	5.333	4.663	4.740	6.983	11.297
1983	25.465	33.438	30.223	15.232	6.842	4.490	4.123	4.283	5.850	4.223	5.510	8.507	12.349
1984	25.465	33.438	30.223	15.232	6.842	4.490	4.640	5.333	8.700	6.313	10.330	12.893	13.658
1985	40.313	41.558	30.313	16.252	7.219	5.055	3.870	3.847	6.060	5.517	5.163	8.359	14.461
1986	21.048	44.655	32.632	17.248	7.887	5.055	4.390	4.593	4.827	4.623	6.480	18.017	14.288
1987	35.965	57.206	38.084	20.913	10.294	5.694	6.710	17.030	8.193	8.460	7.513	15.897	19.330
1988	36.294	57.177	36.135	22.403	9.571	6.361	4.947	5.490	5.487	5.273	4.817	15.138	17.424
1989	26.426	29.658	23.213	11.252	5.800	3.881	3.363	3.790	4.670	4.043	4.580	10.034	10.893
1990	17.726	30.387	18.365	9.903	5.284	3.503	3.053	4.823	3.277	3.373	3.303	8.528	9.294
1991	31.965	25.332	15.400	8.206	4.606	3.368	3.090	3.197	4.213	4.087	4.027	7.567	9.588
1992	31.852	56.671	58.529	34.271	13.716	7.026	5.593	5.003	4.507	4.197	5.050	10.290	19.725
1993	31.900	35.568	32.148	17.426	8.503	4.877	4.197	9.493	12.087	11.770	8.207	11.714	15.658
1994	27.845	42.710	31.310	17.735	7.935	5.435	4.823	16.700	22.127	8.267	7.660	10.710	16.938
1995	21.881	37.304	31.219	20.652	9.397	5.584	4.747	4.157	3.643	3.207	5.290	8.407	12.957
1996	31.842	49.581	33.158	16.045	7.223	4.868	4.253	3.737	3.313	3.247	3.053	4.020	13.695
1997	12.532	25.985	19.645	10.452	4.532	3.265	3.100	4.164	3.670	3.594	6.598	12.030	9.131
1998	37.248	42.288	31.863	17.266	9.060	5.253	4.281	3.624	3.631	4.283	4.331	7.034	14.180
Mean	27.853	38.892	29.767	16.357	7.677	4.855	4.514	5.729	5.829	4.904	5.496	10.280	13.513
Maximum	43.203	57.206	58.529	34.271	13.716	7.026	8.680	17.030	22.127	11.770	10.330	18.017	19.725
Minimum	12.532	19.577	15.400	8.206	4.532	3.265	3.053	3.197	3.277	3.207	3.053	4.020	8.569

KarajMonthout.xls

Table 5.1.2.2 Monthly Operation Record of Karaj Dam (Inflow into the Reservoir)

(Unit = MCM/month)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1970	52.004	52.436	44.358	22.559	13.962	8.951	8.951	9.107	10.921	10.454	9.115	28.979	271.797
1971	63.392	127.751	93.900	42.327	20.148	12.839	10.748	12.588	13.409	10.860	11.292	21.799	441.053
1972	71.410	128.555	116.770	73.423	34.033	18.714	14.550	20.261	18.118	13.945	19.976	42.362	572.117
1973	71.522	113.651	84.154	42.198	19.647	12.891	10.644	9.599	10.549	8.986	9.772	29.065	422.678
1974	72.066	71.928	57.923	32.210	17.185	13.228	10.403	8.960	9.409	10.498	9.452	20.416	333.678
1975	65.094	112.208	77.872	37.956	17.798	11.681	9.901	9.409	9.055	11.163	13.720	14.092	389.949
1976	78.192	125.988	99.377	54.743	23.440	14.342	12.269	10.411	10.247	9.971	13.522	23.207	475.709
1977	38.500	54.527	58.398	26.127	15.258	11.180	13.798	24.944	20.036	17.064	22.118	38.716	340.666
1978	73.621	78.987	65.206	41.316	18.922	12.632	10.921	10.696	19.380	13.098	19.043	20.278	384.1
1979	93.856	123.561	96.379	57.162	25.868	15.725	11.534	11.552	11.474	10.022	11.042	19.526	487.701
1980	115.716	89.130	62.899	31.363	16.381	10.878	10.593	17.565	11.966	12.986	15.111	33.273	427.861
1981	78.313	126.484	85.501	58.190	24.659	14.835	13.219	11.344	9.521	8.554	8.424	15.828	454.872
1982	69.060	93.580	50.406	26.430	15.008	9.711	22.499	16.917	13.824	12.087	12.286	17.496	359.304
1983	68.204	89.560	80.948	40.798	18.325	12.027	10.688	11.102	15.163	10.947	14.282	22.049	394.093
1984	68.204	89.560	80.948	40.798	18.325	12.027	12.027	13.824	22.550	16.364	26.775	32.305	433.707
1985	107.974	111.309	81.190	43.528	19.336	13.539	10.031	9.971	15.708	14.299	13.383	20.943	461.211
1986	56.376	119.604	87.402	46.198	21.125	13.539	11.379	11.906	12.511	11.984	16.796	45.144	453.964
1987	96.327	153.222	102.004	56.013	27.570	15.250	17.392	44.142	21.237	21.928	19.475	41.204	615.764
1988	97.209	153.144	96.785	60.005	25.635	17.038	12.822	14.230	14.221	13.668	12.485	37.930	555.172
1989	70.779	79.436	62.173	30.136	15.535	10.394	8.718	9.824	12.105	10.480	11.871	25.142	346.593
1990	47.477	81.389	49.188	26.525	14.152	9.383	7.914	12.502	8.493	8.744	8.562	21.367	295.696
1991	85.614	67.850	41.247	21.980	12.338	9.020	8.009	8.286	10.921	10.593	10.437	19.613	305.908
1992	85.311	151.788	156.764	91.791	36.737	18.818	14.498	12.969	11.681	10.878	13.090	25.782	630.107
1993	85.441	95.265	86.106	46.673	22.775	13.064	10.878	24.607	31.329	30.508	21.272	29.350	497.268
1994	74.580	114.394	83.860	47.503	21.254	14.558	12.502	43.286	57.352	21.427	19.855	26.836	537.407
1995	58.605	99.915	83.618	55.313	25.168	14.956	12.303	10.774	9.444	8.312	13.712	21.064	413.184
1996	85.285	132.797	88.811	42.975	19.345	13.038	11.025	9.685	8.588	8.415	7.914	10.420	438.298
1997	33.566	69.598	52.618	27.994	12.139	8.744	8.036	10.793	9.512	9.315	17.101	30.141	289.557
1998	99.766	113.263	85.343	46.245	24.267	14.070	11.097	9.393	9.412	11.101	11.225	17.624	452.806
Mean	74.602	104.168	79.729	43.810	20.563	13.002	11.702	14.850	15.108	12.712	14.245	25.929	430.421
Maximum	115.716	153.222	156.764	91.791	36.737	18.818	22.499	44.142	57.352	30.508	26.775	45.144	630.107
Minimum	33.566	52.436	41.247	21.980	12.139	8.744	7.914	8.286	8.493	8.312	7.914	10.420	271.797

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Table 5.1.2.3 Monthly Operation Record of Karaj Dam (Reservoir Water Level)

(Unit = m, amsl)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Average
1970	1,756.61	1,760.76	1,760.57	1,755.64	1,748.27	1,741.25	1,736.34	1,732.86	1,732.01	1,731.34	1,731.21	1,739.05	
1971	1,752.57	1,764.94	1,765.05	1,763.66	1,758.36	1,751.84	1,745.75	1,742.32	1,740.23	1,739.20	1,738.27	1,738.35	
1972	1,748.78	1,765.10	1,764.80	1,764.39	1,761.17	1,756.06	1,751.12	1,749.04	1,746.14	1,744.16	1,743.38	1,748.21	
1973	1,755.66	1,765.18	1,764.89	1,761.57	1,754.92	1,747.93	1,742.78	1,738.66	1,736.91	1,735.87	1,735.02	1,741.13	
1974	1,757.44	1,765.14	1,765.11	1,762.33	1,756.04	1,749.18	1,743.35	1,738.47	1,735.69	1,734.75	1,733.78	1,737.07	
1975	1,753.01	1,765.23	1,765.06	1,762.09	1,754.83	1,746.74	1,740.54	1,735.21	1,732.15	1,731.18	1,731.60	1,732.16	
1976	1,754.08	1,765.20	1,765.17	1,763.90	1,757.56	1,750.25	1,744.75	1,740.05	1,736.11	1,733.98	1,734.02	1,737.60	
1977	1,746.18	1,755.48	1,763.02	1,760.28	1,754.82	1,748.26	1,744.16	1,746.09	1,747.02	1,747.39	1,749.94	1,758.06	
1978	1,764.52	1,765.24	1,765.15	1,763.85	1,756.86	1,749.07	1,743.57	1,740.80	1,742.19	1,742.02	1,743.93	1,745.73	
1979	1,761.60	1,765.21	1,764.65	1,764.29	1,758.57	1,749.35	1,742.47	1,738.47	1,735.49	1,732.80	1,730.99	1,732.73	
1980	1,758.63	1,765.31	1,765.02	1,762.07	1,754.35	1,745.84	1,740.24	1,738.98	1,735.78	1,733.72	1,733.32	1,740.56	
1981	1,761.09	1,764.97	1,765.27	1,764.69	1,759.26	1,750.64	1,744.80	1,740.38	1,735.61	1,731.07	1,726.40	1,724.82	
1982	1,747.16	1,762.43	1,763.27	1,759.27	1,751.45	1,743.22	1,742.04	1,741.50	1,740.03	1,737.01	1,732.92	1,730.45	
1983	1,752.42	1,764.63	1,765.02	1,763.38	1,756.79	1,748.95	1,743.71	1,739.23	1,737.80	1,734.73	1,732.74	1,733.96	
1984	1,752.42	1,764.63	1,765.02	1,763.38	1,756.79	1,748.95	1,742.50	1,738.43	1,738.92	1,737.17	1,740.36	1,743.33	
1985	1,761.83	1,765.05	1,765.24	1,763.95	1,757.94	1,749.91	1,742.49	1,736.11	1,733.76	1,731.22	1,728.33	1,729.15	
1986	1,745.69	1,764.98	1,765.14	1,764.49	1,760.00	1,753.40	1,746.62	1,740.69	1,736.24	1,732.65	1,732.24	1,743.71	
1987	1,764.60	1,764.19	1,765.10	1,764.91	1,761.36	1,754.82	1,749.42	1,753.94	1,751.70	1,750.42	1,746.86	1,747.03	
1988	1,760.28	1,764.85	1,765.17	1,764.85	1,759.46	1,751.94	1,745.15	1,739.69	1,735.61	1,731.97	1,727.79	1,734.42	
1989	1,751.94	1,761.87	1,765.06	1,762.20	1,755.16	1,746.63	1,739.46	1,733.71	1,729.31	1,724.12	1,721.28	1,725.62	
1990	1,738.79	1,756.50	1,760.51	1,758.40	1,752.32	1,744.18	1,735.36	1,728.53	1,720.16	1,712.04	1,706.21	1,711.13	
1991	1,746.09	1,761.05	1,763.49	1,760.84	1,754.87	1,747.81	1,740.29	1,732.23	1,725.17	1,717.85	1,710.74	1,707.75	
1992	1,741.49	1,763.03	1,764.94	1,765.08	1,762.98	1,756.24	1,749.48	1,742.62	1,735.40	1,728.70	1,722.83	1,724.08	
1993	1,748.99	1,763.75	1,765.03	1,764.25	1,758.91	1,750.03	1,742.12	1,740.55	1,742.64	1,745.25	1,745.07	1,748.11	
1994	1,763.64	1,764.68	1,765.23	1,764.74	1,759.58	1,752.34	1,745.16	1,749.93	1,756.95	1,753.25	1,751.56	1,752.26	
1995	1,761.59	1,764.56	1,765.20	1,765.14	1,760.90	1,752.64	1,744.69	1,735.59	1,728.90	1,723.27	1,721.52	1,723.03	
1996	1,749.36	1,761.21	1,765.12	1,764.28	1,757.68	1,748.73	1,741.33	1,733.91	1,727.30	1,720.26	1,711.78	1,704.46	
1997	1,715.09	1,738.47	1,746.88	1,746.46	1,739.80	1,732.28	1,725.09	1,720.64	1,715.84	1,711.05	1,709.87	1,714.69	
1998	1,748.22	1,762.82	1,765.09	1,763.85	1,759.05	1,751.23	1,744.07	1,736.51	1,727.56	1,720.85	1,713.97	1,710.30	
Mean	1,752.41	1,762.64	1,763.94	1,762.35	1,756.55	1,748.96	1,742.72	1,738.80	1,735.81	1,732.73	1,730.62	1,733.07	1,746.72
Maximum	1,764.60	1,765.31	1,765.27	1,765.14	1,762.98	1,756.24	1,751.12	1,753.94	1,756.95	1,753.25	1,751.56	1,758.06	1,765.31
Minimum	1,715.09	1,738.47	1,746.88	1,746.46	1,739.80	1,732.28	1,725.09	1,720.64	1,715.84	1,711.05	1,706.21	1,704.46	1,704.46

KarajMonthout.xls

Table 5.1.2.4 Monthly Operation Record of Karaj Dam (Reservoir Total Storage)

(Unit = MCM)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Average
1970	172.724	187.550	186.838	169.444	145.787	124.925	111.667	103.121	101.124	99.582	99.283	118.655	135.058
1971	159.424	204.730	205.225	199.089	178.778	157.088	138.150	128.028	122.006	119.150	116.666	116.878	153.768
1972	147.368	205.450	204.100	202.255	189.113	170.854	154.784	148.176	139.320	134.455	131.121	145.601	164.383
1973	169.511	205.810	204.505	190.673	167.040	144.736	129.362	117.699	113.120	110.475	108.350	124.577	148.822
1974	175.568	205.563	205.495	193.630	170.786	148.617	131.033	117.196	110.025	107.688	105.322	113.532	148.705
1975	160.833	206.035	205.270	192.710	166.748	141.120	122.889	108.825	101.453	99.214	100.180	101.476	142.229
1976	164.310	205.900	205.765	200.085	175.982	152.000	135.163	121.493	111.081	105.802	105.899	114.910	149.866
1977	139.440	168.908	196.433	185.750	166.715	145.756	133.422	139.170	141.961	143.089	151.011	177.713	157.447
1978	202.840	206.080	205.675	199.878	173.574	148.271	131.682	123.630	127.651	127.158	132.744	138.090	159.773
1979	190.790	205.945	203.425	201.805	179.523	149.152	128.463	117.195	109.525	102.980	98.777	102.815	149.200
1980	179.736	206.395	205.090	192.630	165.187	138.420	122.034	118.547	110.250	105.178	104.218	122.946	147.553
1981	188.801	204.865	206.215	203.605	181.999	153.248	135.310	122.433	109.825	98.961	88.330	84.972	148.214
1982	142.388	194.070	197.470	182.035	155.840	130.649	127.216	125.650	121.435	113.376	103.262	97.535	140.911
1983	158.944	203.335	205.090	197.927	173.336	147.895	132.094	119.232	115.430	107.638	102.839	105.754	147.460
1984	158.944	203.335	205.090	197.927	173.336	147.895	128.550	117.090	118.388	113.792	122.376	130.974	151.475
1985	191.687	205.225	206.080	200.292	177.293	150.917	128.521	111.081	105.274	99.306	92.659	94.545	146.907
1986	137.970	204.910	205.630	202.705	184.700	162.100	140.760	123.317	111.412	102.628	101.664	132.095	150.824
1987	203.200	201.355	205.450	204.595	189.854	166.715	149.373	163.855	156.640	152.544	141.480	141.961	173.085
1988	185.750	204.325	205.765	204.325	182.729	157.408	136.350	120.498	109.825	101.031	91.428	106.879	150.526
1989	157.408	191.843	205.180	193.150	167.836	140.790	119.865	105.154	94.913	83.502	77.882	86.652	135.348
1990	118.044	172.350	186.613	178.920	158.624	133.481	109.200	93.119	75.796	61.270	51.576	59.678	116.556
1991	139.170	188.645	198.384	187.850	166.878	144.371	122.177	101.641	85.707	71.580	59.008	54.000	126.618
1992	125.621	196.475	204.730	205.360	196.270	171.466	149.562	128.898	109.175	93.510	80.910	83.418	145.450
1993	148.019	199.463	205.135	201.625	180.731	151.296	127.448	122.918	128.956	136.650	136.110	145.291	156.970
1994	199.007	203.560	206.035	203.830	183.167	158.688	136.380	150.980	173.880	161.613	156.192	158.432	174.314
1995	190.751	203.020	205.900	205.630	188.075	159.648	134.986	109.775	93.970	81.790	78.338	81.310	144.433
1996	149.121	189.269	205.540	201.760	176.396	147.213	125.157	105.634	90.325	75.981	60.815	48.940	131.346
1997	66.312	117.195	141.540	140.280	120.800	101.758	85.539	76.684	67.962	59.537	57.529	65.907	91.754
1998	145.632	195.630	205.405	199.877	181.334	155.136	133.156	112.100	88.710	77.072	64.648	58.260	134.747
Mean	161.011	196.112	201.003	194.470	173.049	148.331	129.665	119.074	111.901	105.054	100.711	107.372	145.646
Maximum	203.200	206.395	206.215	205.630	196.270	171.466	154.784	163.855	173.880	161.613	156.192	177.713	206.395
Minimum	66.312	117.195	141.540	140.280	120.800	101.758	85.539	76.684	67.962	59.537	51.576	48.940	48.940

KarajMonthout.xls

Table 5.1.2.5 Monthly Operation Record of Karaj Dam (Release for Water Supply Purpose)

(Unit = MCM)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1970	12.606	13.772	15.431	12.182	16.010	15.595	12.951	10.385	8.744	9.478			127.154
1971	13.064	15.526	17.790	19.552	17.747	18.058	17.366	14.273	11.232		11.016		155.624
1972	12.329	15.483	16.243	20.045	20.641	17.919	16.381	13.746	11.362	12.381	12.554	14.085	183.169
1973	15.889	20.520	23.190	25.557	21.488	20.079	16.572	14.766	11.448	9.392	9.167	9.953	198.021
1974			22.179		22.922	21.997	16.978	14.714	10.852	9.072	9.305	11.336	139.355
1975	13.980	16.554	23.466	26.853	25.013	23.026	19.431	14.990	13.003	10.964	11.690	13.349	212.319
1976	15.725	18.084	21.954	26.257	24.468	23.630	19.561	17.185	15.967	12.217	12.865	15.526	223.439
1977	14.973	19.241	21.263	24.002	23.613	23.242	19.077	15.180	17.937	12.744	13.288	13.807	218.367
1978	15.535	20.347	24.831	27.389	28.011	26.067	21.168	16.952	13.193	11.750	12.563	14.619	232.425
1979	19.691	19.915	25.125	30.672	30.732	28.227	24.434	20.503	17.487	16.209	15.759	18.049	266.803
1980	18.792	24.270	29.255	31.147	31.717	28.866	23.492	18.904	18.377	17.945	16.554	17.332	276.651
1981	17.902	22.404	27.864	30.802	28.408	28.452	23.138	19.976	19.570	17.868	17.781	18.870	273.035
1982	18.973	24.114	27.130	31.363	31.493	28.011	21.868	17.911	16.813	19.008	21.557	23.155	281.396
1983	20.460	24.477	18.179	34.353	32.988	29.713	22.965	21.721	17.902	17.807	18.654	20.771	279.990
1984	20.460	24.477	18.179	34.007	32.988	29.713	25.212	21.643	20.961	21.799	23.993	25.151	298.583
1985	25.116	29.566	33.385	33.307	31.631	30.223	27.311	23.371	20.071	19.984	19.423	20.200	313.588
1986	21.211	24.348	29.125	28.728	28.581	26.663	25.644	24.287	22.386	21.341	19.535	19.621	291.470
1987	21.384	25.341	27.752	32.210	30.802	29.773	27.225	26.283	22.956	21.159	20.088	20.088	305.061
1988	18.732	25.644	31.761	33.221	32.642	31.164	27.899	25.937	24.624	22.213	20.961	24.866	319.664
1989	25.687	27.734	30.041	32.849	32.348	30.387	24.831	23.458	22.162	21.894	17.911	18.706	308.008
1990	20.641	23.820	29.272	31.432	31.726	31.717	29.532	25.877	25.108	23.890	19.889	17.047	309.951
1991	17.004	19.233	27.441	31.121	31.277	28.953	27.847	27.536	26.438	24.659	23.449	27.890	312.848
1992	25.626	20.900	28.624	32.305	32.676	31.959	29.877	27.942	26.689	25.911	27.251	27.199	336.959
1993	29.255	29.609	31.113	32.400	32.581	32.227	28.443	26.482	25.592	24.719	23.535	23.527	339.483
1994	25.255	26.888	30.819	32.400	32.391	32.149	30.015	24.684	23.077	26.879	26.948	26.698	338.203
1995	28.054	23.725	30.741	32.944	33.324	32.867	29.652	28.218	23.829	20.425	18.377	22.058	324.214
1996	20.339	27.638	31.908	31.954	32.175	32.014	29.445	28.763	23.793	23.287	23.366	24.035	328.717
1997	19.923	21.652	27.756	28.859	30.114	26.156	23.290	18.930	17.939	17.740	20.586	25.254	278.199
1998	24.713	27.614	31.194	32.676	30.760	31.529	30.204	28.674	27.668	24.079	23.795	24.728	337.634
Mean	19.761	22.603	25.966	29.307	28.664	27.254	23.855	21.148	19.213	18.458	18.281	19.923	269.322
1970-79	14.866	17.716	21.147	23.612	23.065	21.784	18.392	15.269	13.123	11.579	12.023	13.841	206.415
1980-89	20.872	25.238	27.267	32.199	31.360	29.297	24.959	22.349	20.582	20.102	19.646	20.876	294.745
1990-98	23.423	24.564	29.874	31.788	31.892	31.063	28.701	26.345	24.459	23.510	23.022	24.271	322.912

KarajMonthout.xls

Table 5.1.2.6 Monthly Operation Record of Karaj Dam (Release for Irrigation Purpose)

(Unit = MCM)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1970													0.000
1971											1.184		1.184
1972	7.638	31.795	36.876	38.448	36.884	37.394	29.670	23.587	19.596	16.096	7.672	6.549	292.205
1973	20.399	33.852	38.664	36.780	33.480	32.530	28.512	26.248	10.860	9.072	8.942	8.225	287.564
1974	6.601	24.278	39.355	39.139		32.676	23.181	19.181	18.032	14.429	12.960	6.921	236.753
1975	11.120	28.909	38.932	39.165	39.640	34.309	21.298	17.652	15.872	15.474	15.552	11.232	289.155
1976	5.141	28.339	39.364	39.917	39.908	38.474	33.972	33.964	28.668	19.958	15.405	10.394	333.504
1977	7.379	17.772	25.099	25.445	25.860	25.445	14.818	16.917	15.578	12.347	9.366	2.462	198.488
1978	10.683	35.424	37.498	32.452	30.802	24.728	15.258	13.668	13.729	13.478	11.172	5.132	244.024
1979	4.821	32.789	29.160			34.966	24.425	6.834	6.998	6.998	8.173	4.726	159.890
1980	4.406	30.828	33.549	20.252	20.088	15.932	15.552	15.552	14.135	12.182	10.670	4.234	197.380
1981	2.229	33.756	32.400	34.560	26.801	26.076	15.293	10.593		0.207	6.134	3.387	191.436
1982	3.525	27.259	27.233		15.371		7.836	4.657	4.666		3.897	2.436	96.880
1983	3.603	27.752	33.791	20.555	17.323	11.966	6.290	4.588	3.966	3.672	3.370	3.041	139.917
1984	3.603	27.752	33.791	21.177	17.323	11.966	7.240	5.383	4.847	3.214	3.551	3.257	143.104
1985	7.396	30.586	24.814	24.304	16.399	14.247	8.459	6.359	3.914	2.601	2.592	2.419	144.090
1986	2.678	20.926	36.037	25.030	13.565	11.820	8.770	6.852	4.156	2.549	2.074	1.953	136.410
1987	5.059	30.681	38.975	29.601	15.595	11.362	9.910	6.692	8.977	8.143	3.646	1.927	170.568
1988	11.845	35.977	40.833	33.143	19.837	14.757	8.631	6.895	3.136	2.808	2.333	2.186	182.381
1989	2.834	29.955	25.885	12.934	11.655	8.968	6.843	2.540	2.255	2.030	2.074	1.935	109.908
1990	2.290	11.396	9.953	5.642	5.210	4.804	4.406	4.743	2.808	1.711	0.510	0.484	53.957
1991	1.512	8.847	8.338	4.311	4.346	4.225	3.698	2.298	2.333	1.800	1.296	1.296	44.300
1992	1.840	7.232	24.564	28.823	18.861	15.595	9.055	8.381	7.456	2.860	1.555	1.503	127.725
1993	2.765	18.420	26.361	20.814	14.774	13.668	7.646	4.553	4.069	3.421	2.506	1.944	120.941
1994	5.219	22.654	27.294	18.602	10.886	7.949	5.365	4.804	3.957	5.124	2.428	2.022	116.304
1995	6.998	18.567	22.568	22.533	12.692	12.925	8.329	9.763	3.024	1.460	1.296	1.253	121.408
1996	1.598	15.828	28.940	19.991	15.546	13.173	5.970	2.520	2.454	2.074	2.074	0.757	110.925
1997	0.536	6.238	3.590	2.069	2.120	1.899	1.814	1.672	1.625	1.415	1.037	1.029	25.044
1998	4.683	13.081	25.184	21.658	15.520	12.828	5.455	3.295	3.592	2.079	1.317	1.464	110.156
Mean	5.496	24.107	29.224	24.694	19.219	18.257	12.507	10.007	8.104	6.431	5.171	3.488	151.228
1970-79	9.223	29.145	35.619	35.907	34.429	32.565	23.892	19.756	16.167	13.482	10.047	6.955	267.186
1980-89	4.718	29.547	32.731	24.617	17.396	14.122	9.482	7.011	5.561	4.156	4.034	2.678	156.053
1990-98	3.049	13.585	19.644	16.049	11.106	9.674	5.749	4.670	3.480	2.438	1.558	1.306	92.307

KarajMonthout.xls

Table 5.1.2.7 Monthly Operation Record of Karaj Dam (Total Release)

(Unit = MCM)

Year	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total
1970	22.628	37.809	45.179	39.908	37.437	29.773	22.170	17.652	13.012	12.070	9.366	9.547	296.551
1971	22.896	82.477	93.381	48.453	40.461	34.551	29.627	22.732	19.466	13.677	13.781	21.583	443.085
1972	41.040	70.546	115.620	74.589	47.261	37.005	30.612	26.767	26.965	18.818	23.855	27.907	540.985
1973	44.980	77.363	84.568	56.074	43.286	35.208	25.998	21.289	15.129	11.629	11.958	11.975	439.457
1974	21.082	41.878	57.197	44.055	40.055	35.381	27.985	22.818	16.589	12.925	11.854	12.200	344.019
1975	17.919	64.195	78.641	50.501	43.744	37.342	28.132	23.501	16.442	13.366	12.779	12.804	399.366
1976	16.952	85.666	99.360	60.411	47.624	38.327	29.108	24.244	20.632	15.224	13.418	14.187	465.153
1977	13.962	24.978	31.527	37.005	34.465	32.089	26.136	19.086	17.202	15.924	14.196	11.007	277.577
1978	48.427	76.300	66.122	46.483	45.334	37.964	27.363	18.723	15.120	13.599	13.496	14.956	423.887
1979	40.314	108.372	96.803	58.735	48.185	46.086	32.227	22.827	18.775	16.554	15.232	15.379	519.489
1980	39.372	62.450	63.798	43.710	43.788	37.619	26.974	21.082	20.261	18.032	16.036	14.714	407.836
1981	12.727	112.389	84.154	60.791	46.310	43.589	31.173	24.192	22.136	19.336	19.492	19.207	495.496
1982	11.655	41.947	47.580	41.852	41.213	34.957	25.946	18.464	18.058	20.114	22.352	23.216	347.354
1983	15.336	41.748	79.142	47.978	42.846	37.454	27.328	23.985	19.034	18.697	18.870	19.198	391.616
1984	15.336	43.304	79.212	47.978	42.936	37.454	31.355	25.281	21.298	20.892	18.239	23.734	407.019
1985	47.261	96.535	49.810	49.248	42.353	38.966	32.430	27.427	21.490	20.263	20.067	19.065	464.915
1986	12.957	51.632	86.772	49.904	39.070	36.176	32.607	29.557	24.088	20.762	17.772	14.748	416.045
1987	22.274	135.933	97.347	54.795	42.103	38.534	34.569	29.955	24.564	26.032	30.534	40.219	576.859
1988	55.944	134.508	95.221	61.439	47.236	42.379	33.877	30.102	24.849	22.490	22.067	22.507	592.619
1989	20.235	44.988	48.721	42.258	40.833	37.420	29.618	24.529	22.317	21.876	17.798	16.304	366.897
1990	16.114	27.086	34.888	34.197	34.439	34.500	32.167	28.590	25.756	23.293	18.265	13.202	322.497
1991	6.117	18.282	31.476	32.556	33.368	31.527	30.214	28.754	26.844	24.728	23.077	24.667	311.610
1992	14.567	80.948	148.945	91.195	45.827	43.692	36.461	33.670	31.147	26.749	25.704	23.268	602.173
1993	20.788	43.883	80.456	50.129	43.684	42.569	34.707	29.169	25.419	22.853	21.868	20.088	435.613
1994	20.822	104.665	81.536	49.689	41.930	39.053	34.845	28.676	34.448	33.661	25.186	24.589	519.100
1995	26.240	87.679	80.749	55.581	42.735	43.405	37.014	35.882	25.220	20.580	17.150	18.084	490.319
1996	17.505	92.598	72.496	46.557	44.687	42.052	33.050	29.191	23.856	22.790	23.102	22.651	470.535
1997	15.626	20.223	28.255	29.544	31.574	27.786	24.496	19.743	18.312	17.748	19.126	21.766	274.199
1998	20.130	63.697	76.260	52.627	43.593	40.741	33.436	30.608	30.680	24.852	23.650	23.994	464.268
Mean	24.180	68.072	73.628	50.284	42.013	37.710	30.401	25.465	22.038	19.639	18.631	19.199	431.260
1970-79	29.020	66.958	76.840	51.621	42.785	36.373	27.936	21.964	17.933	14.379	13.994	15.155	414.957
1980-89	25.310	76.543	73.176	49.995	42.869	38.455	30.588	25.457	21.810	20.849	20.323	21.291	446.666
1990-98	17.545	59.896	70.562	49.119	40.204	38.369	32.932	29.365	26.854	24.139	21.903	21.368	432.257

KarajMonthout.xls

Table 5.1.2.8 Karaj Dam Release for Domestic Use (Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr	Am
70-71	24.00	22.03	20.45	19.66	14.70	20.29	19.58	20.54	24.98	26.58	26.67	25.97	265.45
71-72	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
72-73	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
73-74	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
74-75	10.40	8.96	9.41	10.50	9.45	20.29	19.58	20.54	24.98	26.58	26.67	25.97	213.33
75-76	24.00	22.03	12.99	11.16	13.72	14.09	19.58	20.54	24.98	26.58	26.67	25.97	242.31
76-77	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	11.18	255.21
77-78	13.80	22.03	20.04	17.06	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	256.79
78-79	24.00	19.36	19.38	13.10	19.04	20.28	19.58	20.54	24.98	26.58	26.67	25.97	259.48
79-80	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
80-81	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
81-82	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
82-83	24.00	16.92	13.82	12.09	12.29	17.50	19.58	20.54	24.98	26.58	26.67	25.97	240.94
83-84	24.00	22.03	15.16	10.95	14.28	20.29	19.58	20.54	24.98	26.58	26.67	25.97	251.03
84-85	24.00	22.03	20.45	16.36	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	266.70
85-86	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
86-87	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
87-88	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
88-89	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
89-90	24.00	22.03	17.70	10.48	11.87	20.29	19.58	20.54	24.98	26.58	26.67	9.38	234.10
90-91	7.91	12.50	8.49	8.74	8.56	20.29	19.58	20.54	24.98	26.58	26.67	9.02	193.86
91-92	8.01	8.29	10.92	10.59	10.44	19.61	19.58	20.54	24.98	26.58	26.67	25.97	212.18
92-93	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
93-94	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
94-95	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
95-96	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
96-97	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
97-98	8.04	10.79	9.51	9.31	17.10	10.47	19.58	20.54	24.98	26.58	12.14	8.74	228.42
Mean	21.43	20.05	18.05	16.59	17.07	19.59	19.58	20.54	24.98	26.58	26.67	25.97	219.36
Maximum	24.00	22.03	20.45	19.66	19.25	20.29	19.58	20.54	24.98	26.58	26.67	25.97	270.00
Minimum	7.91	8.29	8.49	8.74	8.56	10.47	19.58	20.54	24.98	26.58	12.14	8.74	193.86

Table 5.1.2.9 Karaj Dam Release for Irrigation Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr	Ann
70-71	10.03	7.41	5.88	4.39	0.00	2.83	4.99	31.24	34.61	26.03	18.39	14.93	160.73
71-72	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
72-73	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
73-74	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.25	164.32
74-75	0.00	0.00	0.00	0.00	0.00	0.13	4.99	31.24	34.61	26.03	18.39	14.93	130.32
75-76	10.03	7.41	0.00	0.00	0.00	0.00	4.99	31.24	34.61	26.03	18.39	14.93	147.63
76-77	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	3.55	0.00	135.23
77-78	0.00	2.91	0.00	0.00	2.87	2.83	4.99	31.24	34.61	26.03	18.39	14.93	138.80
78-79	10.03	0.00	0.00	0.00	0.00	0.00	4.99	31.24	34.61	26.03	18.39	14.93	140.22
79-80	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
80-81	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
81-82	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
82-83	3.12	0.00	0.00	0.00	0.00	0.00	4.99	31.24	34.61	26.03	18.39	14.93	165.00
83-84	10.03	1.08	0.00	0.00	0.00	1.76	4.99	31.24	34.61	26.03	18.39	14.93	133.31
84-85	10.03	5.14	2.10	0.00	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	143.06
85-86	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	154.56
86-87	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
87-88	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
88-89	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
89-90	10.03	7.41	0.00	0.00	0.00	2.83	4.99	31.24	34.61	26.03	5.53	0.00	122.67
90-91	0.00	0.00	0.00	0.00	0.00	1.08	4.99	31.24	34.61	26.03	13.81	0.00	111.76
91-92	0.00	0.00	0.00	0.00	0.00	0.00	4.99	31.24	34.61	26.03	18.39	14.93	130.19
92-93	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
93-94	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
94-95	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
95-96	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
96-97	10.03	7.41	5.88	4.39	4.27	0.00	4.99	31.24	34.61	21.26	0.00	0.00	124.08
97-98	0.00	0.00	0.00	0.00	0.00	2.83	4.99	31.24	34.61	26.03	18.39	14.93	133.02
Mean	7.99	5.35	3.65	2.67	2.70	2.13	4.99	31.24	34.61	25.86	16.58	12.77	150.53
Maximum	10.03	7.41	5.88	4.39	4.27	2.83	4.99	31.24	34.61	26.03	18.39	14.93	165.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	4.99	31.24	34.61	21.26	0.00	0.00	111.76

Table 5.1.2.10 Karaj Dam Total Release (Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frw	Ord	Khr	Tir	Mrd	Shr	Ann
70-71	34.03	29.44	26.33	24.05	14.70	23.12	24.57	51.78	59.59	52.61	45.06	40.90	426.18
71-72	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
72-73	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
73-74	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.22	434.32
74-75	10.40	8.96	9.41	10.50	9.45	20.42	24.57	51.78	59.59	52.61	45.06	40.90	343.65
75-76	34.03	29.44	12.99	11.16	13.72	14.09	24.57	51.78	59.59	52.61	45.06	40.90	389.94
76-77	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	30.22	11.18	390.44
77-78	13.80	24.94	20.04	17.06	22.12	23.12	24.57	51.78	59.59	52.61	45.06	40.90	395.59
78-79	34.03	19.36	19.38	13.10	19.04	20.28	24.57	51.78	59.59	52.61	45.06	40.90	399.70
79-80	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
80-81	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
81-82	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
82-83	27.12	16.92	13.82	12.09	12.29	17.50	24.57	51.78	59.59	52.61	45.06	40.90	374.25
83-84	34.03	23.11	15.16	10.95	14.28	22.05	24.57	51.78	59.59	52.61	45.06	40.90	394.09
84-85	34.03	27.17	22.55	16.36	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	421.26
85-86	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
86-87	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
87-88	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
88-89	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
89-90	34.03	29.44	17.70	10.48	11.87	23.12	24.57	51.78	59.59	52.61	32.20	9.38	356.77
90-91	7.91	12.50	8.49	8.74	8.56	21.37	24.57	51.78	59.59	52.61	40.48	9.02	305.62
91-92	8.01	8.29	10.92	10.59	10.44	19.61	24.57	51.78	59.59	52.61	45.06	40.90	342.37
92-93	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
93-94	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
94-95	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
95-96	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
96-97	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
97-98	8.04	10.79	9.51	9.31	17.10	10.47	24.57	51.78	59.59	47.84	12.14	8.74	352.50
Mean	29.43	25.41	21.70	19.26	19.76	21.72	24.57	51.78	59.59	52.61	45.06	40.90	352.38
Maximum	34.03	29.44	26.33	24.05	23.52	23.12	24.57	51.78	59.59	52.61	45.06	40.90	435.00
Minimum	7.91	8.29	8.49	8.74	8.56	10.47	24.57	51.78	59.59	47.84	12.14	8.74	305.62

Table 5.1.2.11 Karaj Dam Storage at the End of Month (Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr	Ann
70-71	54.92	34.59	19.18	5.58	0.00	5.86	44.68	120.65	154.96	144.68	119.77	91.71	796.58
71-72	68.42	51.57	38.65	25.46	13.23	11.91	58.75	135.53	155.00	155.00	143.97	121.79	979.28
72-73	102.31	93.13	84.92	74.81	71.27	90.51	137.46	155.00	155.00	144.59	119.18	91.17	1319.35
73-74	67.78	47.94	32.16	17.09	3.35	9.29	56.79	76.93	75.27	54.87	26.99	0.00	468.46
74-75	0.00	0.00	0.00	0.00	0.00	0.00	40.52	100.95	119.23	104.58	77.32	48.10	490.70
75-76	23.97	3.94	0.00	0.00	0.00	0.00	53.62	127.83	155.00	155.00	133.38	106.82	759.56
76-77	85.06	66.03	49.95	35.87	25.87	25.96	39.89	42.64	41.44	14.96	0.00	0.00	427.67
77-78	0.00	0.00	0.00	0.00	0.00	15.60	64.65	91.85	97.47	86.18	60.04	31.77	447.56
78-79	8.66	0.00	0.00	0.00	0.00	0.00	69.29	141.07	155.00	155.00	135.81	110.63	775.46
79-80	88.14	70.25	55.39	41.37	28.89	25.29	116.44	153.79	155.00	133.75	105.07	75.05	1048.43
80-81	51.62	39.74	25.38	14.31	5.90	16.06	69.80	144.50	155.00	155.00	134.60	108.53	920.44
81-82	87.72	69.63	52.82	37.32	22.23	14.93	59.42	101.22	92.04	65.86	35.81	4.62	643.62
82-83	0.00	0.00	0.00	0.00	0.00	0.00	43.63	81.41	102.77	90.96	64.23	35.35	418.35
83-84	12.01	0.00	0.00	0.00	0.00	0.00	43.63	81.41	102.77	90.96	64.23	35.35	430.36
84-85	13.35	0.00	0.00	0.00	3.25	12.44	95.84	155.00	155.00	145.92	120.19	92.83	793.82
85-86	68.83	49.36	38.74	28.99	18.85	16.68	48.48	116.31	144.12	137.71	113.77	86.41	868.25
86-87	63.76	46.23	32.41	20.34	13.62	35.64	107.40	155.00	155.00	155.00	137.51	111.86	1033.77
87-88	95.22	109.92	104.83	102.71	98.66	116.75	155.00	155.00	155.00	155.00	135.57	111.71	1495.37
88-89	90.50	75.29	63.19	52.80	41.77	56.58	102.79	130.44	133.03	110.55	81.03	50.52	988.49
89-90	25.21	5.59	0.00	0.00	0.00	2.02	24.93	54.54	44.14	18.05	0.00	0.00	174.48
90-91	0.00	0.00	0.00	0.00	0.00	0.00	61.04	77.11	58.77	28.14	0.00	0.00	225.06
91-92	0.00	0.00	0.00	0.00	0.00	0.00	60.74	155.00	155.00	155.00	146.68	124.59	797.01
92-93	105.06	88.59	73.94	60.77	50.34	53.00	113.87	155.00	155.00	149.06	126.78	98.94	1230.35
93-94	75.79	70.96	75.96	82.41	80.17	86.40	136.41	155.00	155.00	149.89	126.09	99.74	1293.82
94-95	78.22	92.06	123.08	120.46	116.80	120.51	154.55	155.00	155.00	155.00	135.11	109.16	1514.95
95-96	87.44	68.77	51.88	36.15	26.34	24.28	85.00	155.00	155.00	145.37	119.65	91.79	1046.67
96-97	68.78	49.03	31.29	15.65	0.05	0.00	9.00	26.81	19.84	0.00	0.00	0.00	220.45
97-98	0.00	0.00	0.00	0.00	0.00	7.02	82.22	143.70	155.00	148.63	127.84	101.01	765.42
Mean	50.81	40.45	34.06	27.57	22.16	26.67	76.28	119.42	125.39	114.45	92.52	69.27	799.06
Maximum	105.06	109.92	123.08	120.46	116.80	120.51	155.00	155.00	155.00	155.00	146.68	124.59	1514.95
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	9.00	26.81	19.84	0.00	0.00	0.00	174.48

Table 5.1.2.12 Karaj Dam Spillage (Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr	Ann
70-71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71-72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.71	20.81	0.00	0.00	58.52
72-73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.33	24.56	0.00	0.00	0.00	68.89
73-74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74-75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75-76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.62	2.13	0.00	0.00	14.75
76-77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77-78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78-79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.86	4.55	0.00	0.00	27.41
79-80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.10	0.00	0.00	0.00	2.10
80-81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.41	5.58	0.00	0.00	20.99
81-82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82-83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
84-85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	21.60	0.00	0.00	0.00	21.97
85-86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86-87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53.84	42.41	3.40	0.00	0.00	99.65
87-88	0.00	0.00	0.00	0.00	0.00	0.00	34.39	101.36	37.20	7.40	0.00	0.00	180.35
88-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89-90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90-91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
91-92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	97.17	39.18	0.00	0.00	142.10
92-93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.36	26.52	0.00	0.00	0.00	28.88
93-94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.02	24.27	0.00	0.00	0.00	68.29
94-95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.68	24.03	2.70	0.00	0.00	74.41
95-96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.01	29.22	0.00	0.00	0.00	40.23
96-97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
97-98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.45	0.00	0.00	0.00	14.45
Mean	0.00	0.00	0.00	0.00	0.00	0.00	1.23	11.10	15.43	3.06	0.00	0.00	30.82
Maximum	0.00	0.00	0.00	0.00	0.00	0.00	34.39	101.36	97.17	39.18	0.00	0.00	180.35
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.1.2.13 Karaj Dam Shortage of Release for Domestic Use (Future Operation w/o Rule)

(Unit=MCM)

Year	Mhr	Abn	Azr	Dey	Bhm	Esf	Frv	Ord	Khr	Tir	Mrd	Shr	Ann
70-71	0.00	0.00	0.00	0.00	4.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.55
71-72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72-73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
73-74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
74-75	13.60	13.07	11.04	9.16	9.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.67
75-76	0.00	0.00	7.46	8.50	5.53	6.20	0.00	0.00	0.00	0.00	0.00	0.00	27.69
76-77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.79	14.79
77-78	10.20	0.00	0.41	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.21
78-79	0.00	2.67	1.07	6.56	0.21	0.01	0.00	0.00	0.00	0.00	0.00	0.00	10.52
79-80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80-81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81-82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82-83	0.00	5.11	6.63	7.57	6.96	2.79	0.00	0.00	0.00	0.00	0.00	0.00	29.06
83-84	0.00	0.00	5.29	8.71	4.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.97
84-85	0.00	0.00	0.00	3.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.30
85-86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86-87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
87-88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
88-89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89-90	0.00	0.00	2.75	9.18	7.38	0.00	0.00	0.00	0.00	0.00	0.00	16.59	35.90
90-91	16.09	9.53	11.96	10.92	10.69	0.00	0.00	0.00	0.00	0.00	0.00	16.95	76.14
91-92	15.99	13.74	9.53	9.07	8.81	0.68	0.00	0.00	0.00	0.00	0.00	0.00	57.82
92-93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
93-94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
94-95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95-96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96-97	0.00	0.00	0.00	0.00	0.00	9.83	0.00	0.00	0.00	0.00	14.53	17.23	41.59
97-98	15.96	11.24	10.94	10.35	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.64
Mean	2.57	1.98	2.40	3.07	2.18	0.70	0.00	0.00	0.00	0.00	0.52	2.34	15.74
Maximum	16.09	13.74	11.96	10.92	10.69	9.83	0.00	0.00	0.00	0.00	14.53	17.23	76.14
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00