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Irrigation Performance of Ilgın Plain Irrigation Association

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ABSRACT

Water, increasing interests day by day for all living creatures, is essential source. Large portion of water supply has been used in agriculture. Irrigation organizations having the rights to comment on irrigation management have very important role to play in agricultural water management. This study focused on assessment of irrigation performance of Ilgın Plain Pump Irrigation Association. The 13 performance indicators were researched between years of 2007 and 2015. Following results were obtained from the study: annual irrigation water delivery per unit command area as 1727 – 6334 m^3 ha^{-1}, annual relative water supply as 0.49 – 1.71, cost recovery ratio as 64.19%, Maintenance cost to revenue ratio 14.95 – 74.30%, Revenue collection performance as 83.54 – 146.97%, Total annual gross agricultural production as 1.19-1.596 tonnes, Output per unit irrigated area as 3145.9 – 9713.1 TL ha^{-1}, Output per unit irrigation supply as 0.9287 – 3.0087 TL m^{-3}.

1. Introduction

Water is one of the indispensable natural sources for the sustainability of agricultural activities since the early ages. In terms of sustainable agriculture, prevention of water loss caused by improper use of underground and surface waters and poor management irrigation systems are some of the important issues (Özdemir, 2009)

As mentioned above water is a strategic element and as about 2/3 of food production has been obtained from irrigated lands of Turkey. Water savings are very important role to play in conveying, distribution networks as well as water management. It has also great contributions on sustainable agriculture or rural development (Muslu, 2015).

Irrigation efficiency has to be improved for meeting the increasing population food demands, enhancing higher and qualified production especially in regions where water shortage are serious problems.

The assessment of performance in irrigation systems and the determination of the current success status are of great importance in terms of determining whether or not they have reached the purpose target of the assignment studies. For this purpose, performance evaluation studies should be done in all irrigation systems and the success of the irrigation method should be determined (Nalbantoğlu, 2006).

Efficient water use in agriculture is necessarily prerequisites in Konya basin where water resources are scant with large arable lands. In the present study, irrigation performance of Ilgın Irrigation Association was evaluated for the periods 2007-2015.

2. Material and Method

The performance evaluation was carried out for irrigation lands of Ilgın Plain Pump Irrigation Association located in the Ilgın district in of Konya. The Irrigation association was established in 1995.

The irrigation areas are within district of Konya-Ilgın with five towns namely Ağalar, Bulcuk, Eldeş, Mahmuthisar and Sadık. Those areas are about 90 km far away from Konya city center. Geographical position of study region is 38°15' north latitude and 31°57' east longitude with about 1030 m above sea level (Fig. 1).

The Irrigation Association serves to 5214 ha irrigation area. The irrigated areas between 2007 and 2015 are given in Table 1. As seen Table 1, average irrigation ratio is about 47%.

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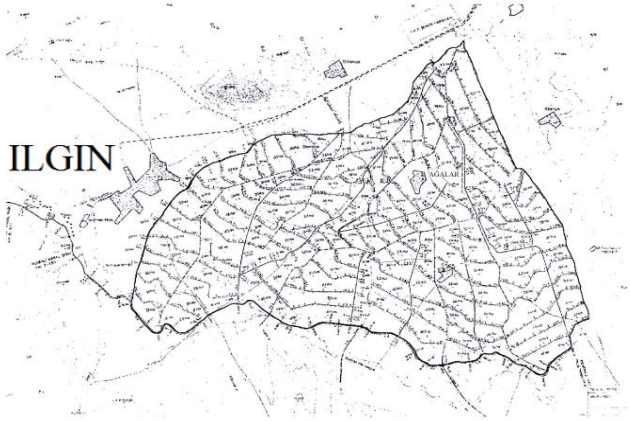

Figure 1
Irrigation area (Anonymous, 2016)

Table 1
Irrigation ratios of the area (Anonymous, 2017a)

Years	Irrigation Area (ha)	Irrigated Area (ha)	Irrigation Ratio (%)
2007	5214	3646	69.9
2008	5214	3683	70.6
2009	5214	1127	21.6
2010	5214	2837	54.4
2011	5214	1121	21.5
2012	5214	3193	61.2
2013	5214	2666	51.1
2014	5214	3316	63.6
2015	5214	1921	36.8
Average	5214	2612	46.8

Continental climate is dominant in the region. In the summer, day time is warm and the night is cool with cold winter. Average monthly temperature is 25.5 °C, the temperature is the highest in the months of July and August, and January is the lowest temperature (Şahin, 2010).Since the average annual rainfall is around 480 mm, and rain-fed agriculture is common in some parts of the research area but yield is low in such places (Özdemir, 2005).

The water source of the irrigation area is Ilgın Pump Irrigation storage. The irrigation water supply is obtained from Lake Çavusçu or known as Çavuşçu Gölü in national literature. That Lake is a freshwater supply and has opened for irrigation in 1970 (Dönmez, 2010).Farmers have received irrigation water from the open channels.

In examine the crop pattern of the area, cereals and sugar beets are main field crops in the study region. In addition to those two crops, corn and opium poppy are also common crops. The crop pattern for the irrigation areas is listed in Table 2.

The performance assessment was made by using 13 performance indicators as suggested by Malano and Burton (2001). Such assessment was classified in three groups namely as service delivery performance, financial performance, and productive efficiency performance (Table 3).

The data for assessment are provided from the records of IV. Regional Directorate of State Hydraulic Works and Ilgın Plain Pump Irrigation Association.

Table 2
Crop pattern of irrigation area (Anonymous, 2017a)

Year	Crop Pattern (ha)											
	Cereals	Legume	Water-Melon	Sugar Beet	Sunflower	Opium Poppy	Maize	Fruit	Vegetable	Potato	Other	Total
2007	2873.1	5.9	4.7	676.6	1.6	-	38.3	2.2	0.3	7.7	35.6	3646
2008	2410.6	8.5	2.2	1063.4	-	74.8	66.3	5.5	6.1	4.6	41.1	3683
2009	49.8	4.8	2.1	987.0	0.2	4.3	26.0	3.2	7.7	3.8	37.9	1127
2010	1755	18.3	3.9	841.4	0.3	140.4	29.1	7.0	5.0	7.2	29.7	2837
2011	263.4	3.7	6.2	675.9	0.3	16,1	95.8	5.8	0.8	7.7	45.3	1121
2012	1813.5	2.0	0.1	1101.2	3.0	65.0	124.4	9.3	3.5	7.9	62.7	3193
2013	885.6	4.4	-	1180.0	36.9	215.3	236.3	8.9	0.5	3.7	94.5	2666
2014	2135.5	4.6	-	721.8	21.9	180.3	145.5	6.7	0.7	0.4	99.0	3316
2015	655.6	11.8	0.4	750.2	3.3	195.0	174.7	7.6	4.0	16.9	101.0	1921

Table 3
Performance indicators in performance studies (Malano and Burton, 2001)

	Performance Indicators
Service Delivery Performance	Annual irrigation water delivery per unit command area (m^3 ha^{-1}) Annual irrigation water delivery per unit irrigated area (m^3 ha^{-1}) Annual relative water supply (%)
Financial Performance	Cost recovery ratio (%) Maintenance cost to revenue ratio (%) Total management, operation and maintenance (MOM) cost per unit area (TL ha^{-1}) Total cost per person employed on water delivery (TL $person^{-1}$) Revenue collection performance (%) Staffing numbers per unit area(person ha^{-1})
Productive Efficiency Performance	Total gross annual agricultural production (tones) Total annual value of agricultural production (TL) Output per unit serviced area (TL ha^{-1}) Output per unit irrigated area (TL ha^{-1}) Output per unit irrigation supply (TL m^{-3})

Table 4
Annual irrigation water delivery per unit command area (Anonymous, 2017)

Year	Total amount of water supplying the irrigation system (m^3 $year^{-1}$)	Total Irrigation Area (ha)	Annual irrigation water delivery per unit command area(m^3 ha^{-1})
2007	12350000	5214	2369
2008	5260000	5214	1009
2009	4400000	5214	844
2010	4900000	5214	940
2011	7100000	5214	1362
2012	13100000	5214	2512
2013	14800000	5214	2839
2014	8225000	5214	1577
2015	5040000	5214	967

3. Research results and discussion

3.1. Service Delivery Performance

3.1.1. Annual irrigation water delivery per unit command area

Annual irrigation water delivery per unit command area between 2007-2015 for the Irrigation Association are given in Table 4. This value was obtained by dividing the total amount of water supplying the irrigation system by the total irrigation area. The lowest value was as 967 m^3 ha^{-1} in 2015, and the highest value was as 2839 m^3 ha^{-1} in 2013. Kapan (2010) stated annual irrigation water delivery per unit command area was between 9546-14043 m^3 ha^{-1} for Asartepe Irrigation Association.

3.1.2. Annual irrigation water delivery per unit irrigated area

Annual irrigation water delivery per unit irrigated area between 2007-2015 for the Irrigation Association are given in Table 5.This value was obtained by dividing the total amount of water supplying the irrigation system by the total irrigated area. It was the lowest as 1428 m^3 ha^{-1} in 2010, and the highest value was as 6334 m^3 ha^{-1} in 2011. Kapan (2010) researched the irrigation performance in the Asartepe Irrigation Association and found the annual irrigation water delivery per unit irrigated area as 9546-14043 m^3 ha^{-1}.

3.1.3. Annual relative water supply

Annual relative water supply between 2007-2015 for the Irrigation Association are given in Table 6. This value was obtained by dividing the total amount of water supplying the irrigation system by the total irrigation water requirement. If this value is greater than 1, it means that more irrigation water has been diverted to the irrigation network (Beyribey, 1997). The lowest value was 0.49 in 2008, and the highest value was 1.71 in 2013.

Kaya and Çiftçi (2016) reported that value between 2.35 and 3.42 for Çumra Irrigation Association. Bulut and Çakmak (2001) assessed the irrigation perfor-

mance of Mersin gardens, they found that irrigation supply ratio was 1.43-1.69 before the period between 1990-1994 and 1.33-1.82 after the period between 1995-1998.

3.2. Financial Performance

3.2.1. Cost recovery ratio

Cost recovery ratio in the examine periods are given in Table 7. This value was obtained by dividing the total revenue collected from water users by the total management, operation and maintenance, MOM, cost. The lowest value was 64.19% in 2011, and the highest value was 153.96% in 2015. Şener and Kurç (2012) carried out performance assessments of 22 irrigation networks in Trakya Region in 2007 growing season and they found the cost recovery ratio as 20-205% with an average 81%.

3.2.2. Maintenance cost to revenue ratio

Maintenance cost to revenue ratio between 2007-2015 are given in Table 8. This value was obtained by dividing the total maintenance expenditure by the total revenue collected from water users. The lowest value was 14.95% in 2014, and the highest value was 74.30 % m^3 in 2011. Eliçabuk and Topak (2016) found that the maintenance cost to revenue ratio in Konya Gevrekli irrigation as about 32-51.9 during periods 2008-2013.

Table 5

Annual irrigation water delivery per unit irrigated area (Anonymous, 2017a)

Year	Total amount of water supplying the irrigation system (m^3 $year^{-1}$)	Total Irrigated Area (ha)	Annual irrigation water delivery per unit irrigated area (m^3 ha^{-1})
2007	12350000	3646	3387
2008	5260000	3683	1428
2009	4400000	1127	3904
2010	4900000	2837	1727
2011	7100000	1121	6334
2012	13100000	3193	4103
2013	14800000	2666	5551
2014	8225000	3316	2480
2015	5040000	1921	2624

Table 6

Annual relative water supply (Anonymous, 2017a)

Year	Total amount of water supplying the irrigation system (m^3 $year^{-1}$)	Irrigation water requirement ($m^3 ha^{-1}$)	Total irrigation water requirement (m^3 $year^{-1}$)	Annual relative water supply
2007	12350000	-	-	-
2008	5260000	2897	10669651	0.49
2009	4400000	-	-	-
2010	4900000	2659	7608834	0.64
2011	7100000	3772	4228412	1.68
2012	13100000	2855	9116015	1.44
2013	14800000	3252	8669832	1.71
2014	8225000	2545	8439220	0.97
2015	5040000	4195	8058595	0.63

Table 7

Cost recovery ratio (Anonymous, 2017b)

Year	Total revenue collected from water users (TL)	Management, operation and maintenance cost (TL)	Cost recovery ratio (%)
2007	501028	611564	81.93
2008	591342	540882	109.33
2009	321634	380531	84.52
2010	909715	590866	153.96
2011	375612	585200	64.19
2012	768123	848262	90.55
2013	768123	973710	78.89
2014	1272398	1066214	119.34
2015	1160995	863595	134.44

Table 8

Maintenance cost to revenue ratio (Anonymous, 2017b)

Year	Total maintenance expenditure (TL)	Total revenue collected from water users (TL)	Maintenance cost to revenue ratio(%)
2007	149680	501028	29.87
2008	249320	591342	42.16
2009	157700	321634	49.03
2010	139607	909715	15.35
2011	279080	375612	74.30
2012	266370	768123	34.68
2013	166378	768123	21.66
2014	190270	1272398	14.95
2015	224620	1160995	19.35

3.2.3.Total MOM cost per unit area

Total MOM cost per unit area between 2007-2015 for the Irrigation Association are given in Table 9. This value was obtained by dividing the total MOM expenditure by the irrigation area. The lowest value was 146.86 TL ha^{-1} in 2008, and the highest value was 513 TL ha^{-1}in 2011. Cin (2017), found that the total MOM cost per unit area in Ankara Beypazarı Başören Irrigation Cooperative was 10 TL ha^{-1} in 2015.

3.2.4. Total cost per person employed on water delivery

Total cost per person employed on water delivery between 2007-2015 for the Irrigation Association are given in Table 10. This value was obtained by dividing the total cost of MOM employees by the total number of MOM employees. The minimum value was 2615.38 TL $person^{-1}$in 2008, and the maximum value was 31094.58 TL $person^{-1}$ in 2015. Sönmezyıldız and Çakmak (2013) assessed the irrigation performance of Eskişehir Beyazaltın Village land consolidation area and found that total cost per person employed on water delivery was 10000 TL $person^{-1}$ for 2011.

3.2.5. Revenue collection performance

Revenue collection performance between 2007-2015 for the Irrigation Association are given in Table 11. This value was produced by dividing total revenues collected from water users by total service revenue due. Its lowest value was 83.54% in 2013, and the highest value was 146.97 in 2014. Chouhan et al. (2015), found the revenue collection performance 0.82-0.95% in the Bai Sagar Irrigation in India.

3.2.6. Staffing numbers per unit area

Staff numbers per unit area between 2007-2015 for the Irrigation Association are given in Table 12. This value was calculated by dividing total number of MOM employee employed by irrigation area. It was minimum as 0.0012 person ha^{-1}in 2009 and 2011, and the maximum value was as 0.0062 person ha^{-1}in 2015. Eliçabuk and Topak (2016) stated such value as 1.7-2.5 person 1000 ha^{-1}in the Konya-Gevrekli Irrigation.

Table 9

Total MOM cost per unit area (Anonymous, 2017b)

Year	Total MOM expenditure (TL)	Irrigation area (ha)	Total MOM cost per unit area (TL ha^{-1})
2007	611564	3646	167.74
2008	540882	3683	146.86
2009	380531	1127	333.21
2010	590866	2837	208.27
2011	585200	1121	513.11
2012	848262	3193	264.74
2013	973710	2666	365.23
2014	1066214	3316	321.54
2015	863595	1921	449.55

Table 10

Total cost per person employed on water delivery (Anonymous, 2017b)

Year	Total cost of MOM employees (TL)	Total number of MOM employees	Total cost per person employed on water delivery (TL person^{-1})
2007	123430	12	10285.83
2008	34000	13	2615.38
2009	146000	13	11230.77
2010	215437	13	16572.08
2011	82200	13	6323.08
2012	232203	13	17861.77
2013	321409	12	26784.08
2014	280187	12	23348.92
2015	373135	12	31094.58

Table 11

Revenue collection performance (Anonymous, 2017b)

Year	Total revenues collected from water users(TL)	Total service revenue due (TL)	Revenue collection performance (%)
2007	501028	495038	101.21
2008	591342	572532	103.29
2009	321634	311723	103.18
2010	909715	874795	103.99
2011	375612	327787	114.59
2012	768123	829108	92.64
2013	768123	919482	83.54
2014	1272398	865744	146.97
2015	1160995	841111	138.03

Table 12

Staff numbers per unit area (Anonymous, 2017b)

Year	Total number of MOM employees	Irrigation Area (ha)	Total number of MOM employees (person ha^{-1})	Service area of a employee (ha)
2007	12	3646	0.0033	303.8
2008	13	3683	0.0035	283.3
2009	13	1127	0.0012	86.7
2010	13	2837	0.0046	218.2
2011	13	1121	0.0012	86.2
2012	13	3193	0.0041	245.6
2013	12	2666	0.0045	222.2
2014	12	3316	0.0036	276.33
2015	12	1921	0.0062	160.1

3.3. Productive Efficiency Performance

3.3.1. Total gross annual agricultural production

Total gross annual agricultural production between 2007-2015 for the Irrigation Association are presented in Table 13 and it was found a total of 1191596 tones. In examine years, maximum production was obtained from 2013 with a total production of 89430 tons of products. That year, about 92% of the production was obtained from sugar beet. The lowest production was found in 2011 with a total of 37209 tones of products. By examine production, sugar beet was in the first rank with a great difference. The maximum sugar beet production was in 2013.

3.3.2. Total annual value of agricultural production

Total annual value of agricultural production between 2007-2015 for the Irrigation Association are given in Table 14. As seen in such table, the lowest value was 7112500 TL in 2011 and the highest value was 18800500 TL in 2014. Sönmezyıldız and Çakmak (2013) found that value as 9030000 TL in consolidated lands of Eskişehir Beyazaltın town.

3.3.3. Output per unit serviced area

Output per unit serviced area between 2007-2015 for the Irrigation Association are given in Table 15.

This value was obtained by dividing the total annual value of agricultural production by the irrigation area.

It was minimum was 1363.9 TL ha^{-1} in 2011, and the highest one was 3605.7 TL ha^{-1} in 2014. Değirmenci (2004) studied about performance of some irrigation networks in Kahramanmaraş and he demonstrated that value as 430-2573 $ ha^{-1}.

3.3.4. Output per unit irrigated area

Output per unit irrigated area between 2007-2015 for the Irrigation Association are given in Table 16. This value was obtained by dividing the total annual value of agricultural production by the irrigated area. Its lowest value was 3145.9 TL ha^{-1} in 2007, and the highest value was 9713.1 TL ha^{-1} in 2009. Cihan and Acar (2016) reported such value as about 3600 TL ha^{-1} at Konya-Çumra Ova Irrigated lands. Çakmak (2001) assessed the irrigation performances of Irrigation Associations in Konya and found that value as 359-6197 $ ha^{-1}.

3.3.5. Output per unit irrigation supply (TL m^{-3})

Output per unit irrigated supply between 2007-2015 for the Irrigation Association are listed in Table 17. This value was obtained by dividing the total amount of water supplying the irrigation system by the irrigated area. Its lowest value was 0.9287 TL m^{-3}in 2007, and the highest value was 3.0087 TL m^{-3}in 2015. Değirmenci (2003), assessed the performances of 12 irrigation networks located in Southeastern Anatolia Project area and found such output per unit irrigated supply was 0.12-2.16 $ m^{-3}.

Table 13

Total gross annual agricultural production (Anonymous, 2017a)

Crop	Total Production (tones)									Total annual production for every crop (tones)
	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Cereal	14337	12680	395	9670	1054	7254	3542	12813	2295	64040
Legume	16	13	18	78	19	8	9	16	38	215
Water-Melon	235	46	105	273	124	2	-	-	9	794
Sugar Beet	39899	47738	78960	50484	33795	66072	82600	57744	52476	509768
Sunflower	8	-	-	-	1	5	85	55	6	160
Opium poppy	-	21	4	197	158	65	193	153	195	986
Maize	383	2652	260	262	1054	1244	2363	1746	2621	12585
Fruit	14	-	32	84	38	93	89	67	76	493
Vegetable	5	195	154	140	6	74	5	7	84	670
Potato	462	110	190	288	231	198	111	11	465	2066
Onion and garlic	198	-	-	42	3	57	15	-	-	315
Forage plants	1740	822	379	334	726	238	418	440	447	5544
Total	57297	64277	80497	61852	37209	75310	89430	73052	58712	1191596

Table 14

Total annual value of agricultural production (Anonymous, 2017a)

Crop	Total annual value of agricultural production(TL.10^3)								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cereal	6451.6	6720.4	154.1	4351.5	579.7	4352.4	2302.3	9609.8	1721.3
Legume	31.2	26.0	36.0	109.2	46.4	16.0	63.0	32.0	76.0
Water-Melon	117.5	20.7	42.0	19.1	62.0	1.0	-	-	5,9
Sugar Beet	3989.9	5251.2	10264.8	6562.9	4731.3	9250.1	11564	8084.16	9445.7
Sunflower	6.4	-	-	-	1.3	8.9	76.5	82.5	10.1
Opium poppy	-	113.4	12.0	689.5	489.8	319.8	772.0	688.5	1265.5
Maize	172.4	2121.6	101.4	175.5	706.2	771.3	1536	1.2	1808.5
Fruit	14.0	-	9.6	66.4	57.0	93.0	89.0	67.0	76.0
Vegetable	5.0	76.1	55.4	65.8	5.4	36.6	5.0	7.0	66.4
Potato	231.0	53.9	142.5	216.0	173.3	132.7	44.4	8.3	465.0
Onion and garlic	103.0	-	-	25.6	6.0	111.2	22.5	-	-
Forage plants	348.0	493.2	128.9	163.7	254.1	119.0	167.2	220.0	223.5
Total	11470.0	14876.5	10946.6	12445.2	7112.5	15212.0	16641.9	18800.5	15163.9

Table 15

Output per unit serviced area (Anonymous, 2017a)

Crop	Output per unit serviced area(TL ha^{-1})								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cereal	1237.4	1288.9	29.5	834.6	111.2	834.8	441.6	1843.1	330.1
Legume	6.0	5.0	6.9	20.9	8.9	3.1	12.1	6.1	14.6
Water-Melon	22.5	4.0	8.1	3.7	11.9	0.2	-	-	1.1
Sugar Beet	765.2	1007.1	1968.7	1258.7	907.4	1774.1	2.217.9	1550.5	1811.6
Sunflower	1.2	-	-	-	0.2	1.7	14.7	15.8	1.9
Opium poppy	-	21.7	2.3	132.2	93.9	61,3	148.1	132.0	242.7
Maize	33.1	406.9	19.4	33.7	135.4	147.9	294.6	0.2	346.9
Fruit	2.7	-	1.8	12.7	10.9	17.8	17.1	12.9	14.6
Vegetable	1.0	14.6	10.6	12.6	1.0	7.0	1.0	1.3	12.7
Potato	44.3	10.3	27.3	41.4	33.2	25.5	8.5	1.6	89.2
Onion and garlic	19.7	-	-	4.9	1.2	21.3	4.3	-	-
Forage plants	66.7	94.6	24.7	31.4	48.7	22.8	3.1	42.2	42.9
Total	2199.8	2853.1	2099.3	2386.8	1363.9	2917.5	3192	3605.7	2908.3

Table 16

Output per unit irrigated area(Anonymous, 2017a)

Crop	Output per unit irrigated area (TL ha^{-1})								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cereal	1769.5	1824.7	136.7	1533.8	517.1	1363.1	863.6	2898.0	896.0
Legume	8.6	7.1	31.9	38.5	41.4	5.0	23.6	9.7	39.6
Water-Melon	32.2	5.6	37.3	6.7	55.3	0.3	-	-	3.1
Sugar Beet	1094.3	1425.8	9108.1	2313.3	4220.6	2897.0	4337.6	2437.9	4917.1
Sunflower	1.8	-	-	-	1.2	2.8	28.7	24.9	5.3
Opium poppy	-	30.8	10.6	243.0	436.9	100.2	289.6	207.6	658.8
Maize	47.3	576.1	90.0	61.9	630.0	241.6	576.1	0.4	941.4
Fruit	3.8	-	8.5	23.4	50.8	29.1	33.4	20.2	39.6
Vegetable	1.4	20.7	49.2	23.2	4.8	11.5	1.9	2.1	34.6
Potato	63.4	14.6	126.4	76.1	154.6	41.6	16.7	2.5	242.1
Onion and garlic	28.2	-	-	9.0	5.4	34.8	8.4	-	-
Forage plants	95.4	133.9	114.3	57.7	226.7	37.3	62.7	66.3	116.3
Total	3145.9	4039.2	9713.1	4386.7	6344.8	4764.2	6242.3	5669.6	7893.8

Table 17

Output per unit irrigated supply(Anonymous, 2017a)

Crop	Output per unit irrigated supply(TL m^{-3})								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cereal	0.5224	1.2776	0.0350	0.8881	0.0816	0.3322	0.1556	1.1684	0.3415
Legume	0.0025	0.0049	0.0082	0.0223	0.0065	0.0012	0.0043	0.0039	0.0151
Water-Melon	0.0095	0.0039	0.0095	0.0039	0.0087	0.0001	-	-	0.0012
Sugar Beet	0.3231	0.9983	2.3329	1.3394	0.6664	0.7061	0.7814	0.9829	1.8741
Sunflower	0.0005	-	-	-	0.0002	0.0007	0.0052	0.0100	0.0020
Opium poppy	-	0.0216	0.0027	0.1407	0.0690	0.0244	0.0522	0.0837	0.2511
Maize	0.0140	0.4033	0.0230	0.0358	0.0995	0.0589	0.1038	0.0001	0.3588
Fruit	0.0011	-	0.0022	0.0136	0.0080	0.0071	0.0060	0.0081	0.0151
Vegetable	0.0004	0.0145	0.0126	0.0134	0.0008	0.0028	0.0003	0.0009	0.0132
Potato	0.0187	0.0102	0.0324	0.0441	0.0244	0.0101	0.0030	0.0010	0.0923
Onion and garlic	0.0083	-	-	0.0052	0.0008	0.0085	0.0015	-	-
Forage plants	0.0282	0.0938	0.0293	0.0334	0.0358	0.0091	0.0113	0.0267	0.0443
Total	0.9287	2.8282	2.4879	2.5398	1.0018	1.1612	1.1245	2.2858	3.0087

4. Conclusion and recommendations

Due to some reasons such as population increase and climatic changes, water resources are gradually decreasing, and unconscious water use is also widespread. For these reasons, state policies and water utilization must be accordance with water saving. One of the possible applications for this is to analyze the existing situation in irrigation systems and to take precautions in this direction. By assessing the performance of the systems, the current situation can be determined and necessary measures can be taken.

According to the results of the present study annual relative water supply was found between 0.49 and 1,71, with an average of 1.08. This value is greater the average threshold level of 1, so more water has been allocated to the irrigation area.

Revenue collection performance is between 83,54 % and 146,97% with an average of 109,71%.This value indicates that this performance indicator is quite high in the irrigation association. Cost recovery ratio is between 64.19% and 153.44% with an average of 101,9%.This shows that the revenues collected from water users accounts for almost all of the total management, operating and maintenance cost.

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