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THE PERFORMANCE OF IRRIGATION ASSOCIATIONS IN TURKEY AFTER THE TRANSFER

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SUMMARY - Regional and cropping pattern diversities are the basic criteria used in selecting four irrigation associations in Turkey to trace the path of their post-transfer performance in operation and maintenance (O&M) activities. Results suggest that irrigation associations are able to fulfill irrigation tasks to a large extent with enhanced equipments. Fee collection rates are at improved levels despite delays in payments, mainly due to the mismatch of the financial and production calendars. Cotton dominant cropping patterns lead higher and increasing O&M expenditures compared to cereals. Although the transfers increased the adjustment ability of farmers to exogenous factors, the findings suggest that it is still too early to decide on the sustainability of the transfer program.

Key words: operation and maintenance, PIM, irrigation fee

INTRODUCTION

The legal framework allowing the transfer of management responsibility of public irrigation schemes to local control dates back to 1954. Some small-scale irrigation schemes, which were isolated and far from the operation and maintenance (O&M) units of State Hydraulic Works (DSI) had initially been transferred to users in the early sixties. These gradual, but pioneering steps formed the basis for the ongoing implementation of participatory irrigation management (PIM) concept in Turkey.

The principal aim of this study is to trace the path of several indicators for four irrigation associations (IAs) after the transfer. The IAs are selected from different regions with diverse cropping patterns. Next section is reserved for a quick overview of the transfers in Turkey. The characteristics of the selected IAs are presented in the third section. The progress in irrigation indicators is the topic of the forth section. In the subsequent two sections, the financial flows of the IAs are analyzed. The last section is reserved for the summary of findings and concluding remarks

TRANSFER OF IRRIGATION SCHEMES IN TURKEY

Water User Groups (WUGs), formed by the farmers in the 1960s, were the major contributing factor for an easy and effective transfer of O&M. WUGs had been active in 40 percent of the total DSI commanded area before the start of the accelerated transfer program (Uskay, 1999 and 1996). WUGs participated in minor operation and maintenance responsibilities in the schemes in return for a certain discount on water charges.

The policy of DSI before 1993 focused on transferring small and isolated schemes, and only 72,000ha was transferred until 1993 (Table 1). The economic crisis in 1994, coupled with long lasting fee determination and collection problems caused DSI to shift towards an accelerated transfer of large DSI managed schemes. The efforts of DSI were supported by the World Bank. The process continued without loosing momentum, reaching more than 90 percent of the planned transfer area, with an eventual size of 1.8 million hectares by the end of 2003.

Table 1. Transfer of Irrigation Schemes, 1992 – 2003 (Source: DSI, 2004a)

Years	PLANNED (Cumulative)		MODIFIED PLAN		REALIZATION (Cumulative)	
	Annual	Total	Annual	Total	Annual	Total
1992	-	-	-	-	1 552	62 620
1993	-	-	-	-	9 422	72 042
1994	103 958	176 000	103 958	176 000	195 320	267 362
1995	140 000	316 000	282 638	550 000	711 214	978 576
1996	120 000	436 000	171 424	1 150 000	211 758	1 190 334
1997	120 000	556 000	59 666	1 250 000	88 705	1 279 039
1998	120 000	676 000	70 961	1 350 000	204 892	1 483 931
1999	120 000	796 000	66 069	1 550 000	45 523	1 529 454
2000	120 000	916 000	70546	1 600 000	89 215	1 618 669
2001	84 000	1 000 000	31 331	1 650 000	45 061	1 663 730
2002	50 000	1 050 000	36 270	1 700 000	31 006	1 694 736
2003	50 000	1 100 000	55 264	1 750 000	131 509	1 826 245
2004	*50 000*	*1 150 000*	*43 755*	*1 870 000*		

The main underlying reason for the accelerated transfer program was unsustainable financial burden of the O&M to the DSI and eventually to the government budget. Fee collection rates were, for instance, on average at 38 percent between 1989 and 1994 (Svendsen and Nott, 1999). The start of privatization era and satisfactory performance of the transferred schemes were the reinforcing factors.

Village legal entities, municipalities, irrigation associations, and cooperatives are eligible organizations for the transfer. IAs dominate in terms of total and average irrigated area. They control 91 percent of total transferred area with an average of 5,129 ha, and the area for an IA may be as large as 30,000 hectares (Table 2).

Table 2. Organizational Distribution of Transferred Irrigation Schemes (Source: DSI, 2004a).

Organization	Number	Share (percent)	Area (ha)	Share (percent)	Average Area (ha)
Village Legal Entity	230	28.4	34,998	2.0	161
Municipality	145	17.9	57,288	3.2	430
Irrigation Association	365	45.0	1,612,904	91.0	5,129
Cooperative	67	8.3	65,661	3.7	1,156
Other	4	0.5	1,032	0.1	258
TOTAL	*811*	*100.0*	*1,771,883*	*100*	*2,473*

Irrigation associations are responsible for providing all services related to the operation and maintenance and for bearing the costs of providing these services. However, neither water rights nor ownership of facilities are transferred to the IAs, the property rights remain with the state.

GENERAL CHARACTERISTICS OF THE SELECTED IRRIGATION ASSOCIATIONS

Regional and cropping pattern diversities are the basic criteria used in selecting four irrigation associations. IAs with a relatively large area are preferred to have a better representation of the region. Another critical factor in the selection process was the subjective evaluation of the quality of data in the annual reports of the IAs to DSI. They all have relatively large net irrigation areas compared to other transferred schemes (Table 3).

Table 3. Main Features of Selected Irrigation Associations (Source: DSI, 2004b)

Name of IA	Start of Operation	Year of Transfer	Area (ha)	Region		Share in DSI region (%)
				Geographic	DSI	
Soke	1981	1998	26,000	Aegean	XXI	100.0
Cumra Plain	1912	1995	24,922	Central	IV	42.0
Tektek	1995	1998	15,841	East Med.	XV	13.4
Kosreli	1976	1995	18,300	Southeast	VI	20.6

Soke is located in the Aegean region covering 26,000 ha. Irrigation started in 1981 and it was transferred in 1998. The cotton is the dominant crop in the association area (Table 4). Cumra Plain with a net irrigation area of 24,922 ha constitutes 42 percent the DSI region in Central Anatolia. It is the first modern irrigation scheme in Turkey. It was transferred in 1995. Cereals cover most of the total area, with a declining share. Sugar beet comes as the second crop. Recently, beans and vegetable production have been gaining area. Tektek is in Southeast Anatolia Project (GAP) Region. It alone constitutes about 13.4 percent the region that has in total 15 IAs. It was transferred in 1998. Cotton is produced in the two thirds of the area, but recently cereal production is expanding. Lastly, Kosreli is located in the Cukurova Region with the possibility of obtaining two crops in one year. The cropping pattern reveals this possibility and indicates high substitutability of soybean and corn as second crops.

Table 4. Cropping Pattern of the IAs in % (Source: DSI, 2004b)

Year	Soke		Tektek		Cumra Plain			Kosreli		
	Cotton	*Sun Flower*	*Cotton*	*Cereal*	*Cereal*	*Sugar Beet*	*Beans & Vegetable*	*Soybean*	*Corn*	*Vegetable Garden*
1999	97	2	74	26	na			na		
2000	72	27	na		88	12	-	57	-	19
2001	99	-	91	9	85	11	1	16	70	4
2002	94	5	89	11	68	12	16	56	27	6
2003	94	3	75	23	77	12	7	27	59	4

Overall the covered area covered by the study adds up to about 85,000 hectares, constituting slightly higher than 5 percent of the area covered by all IAs in Turkey.

In the following sections, the performances of these irrigation associations are examined mainly with respect to their irrigation indicators, sources of revenues, and operation and maintenance expenditures.

IRRIGATION INDICATORS

There are mainly two types of irrigation indicators that are recorded in the Annual Reports of IAs (DSI, 2004b). Irrigation ratio simply indicates the area actually supplied with water over the commanded area of the association. However, associations may also support the irrigation of the land in the neighborhood, which is not included in their commanded area. Total irrigation ratio is the ratio of the total irrigated area by the association to the commanded area.

Soke shows slightly better performance with an average irrigation ratio of 93.8 percent after 1998 compared to the maximum ratio of 90 percent before the transfer (Table 5). Total irrigation ratios follow similar high percentages before and after the transfer with around 104 percent.

Table 5. Irrigation Ratios of the IAs in % (Source: DSI, 2004b)

	Soke		*Cumra Plain*		*Tektek*		*Kosreli*	
Years	Irrigation Ratio	Total Irrigation Ratio	Irrigation Ratio	Total Irrigation Ratio	Irrigation Ratio	Total Irrigation Ratio	Irrigation Ratio	Total Irrigation Ratio
1998	96.2	98.5	92	128.3	69.7	n.a.	95.2	97.7
1999	96.7	133.6	96	138.7	100	109.9	93.9	96.9
2000	92.1	94.5	96	144.5	87.1	97	92.2	94.7
2001	83	98.6	48.2	44.2	86.7	87	93.6	95.7
2002	94.7	96.5	92	140.6	93.6	94	93.7	94.9
2003	100	102.5	92	150.1	93.3	94.8	92	93.2
Av.	*93.8*	*104.0*	*86.0*	*124.4*	*88.4*	*96.5*	*93.4*	*95.5*

Cumra's irrigation ratios are like Soke with an average of 93.6 percent, excluding 2001. Low irrigation ratio in 2001 was due to a long-lasting drought from 1999 to 2001, and the amount of water in the reservoirs reached very low levels by the end of the drought. Farmers responded to the drought by increasing the share of cereals area in the total area. It can be noted that Cumra carries a big importance for its region. The high total irrigation ratios, except of 2001, reveal that Cumra irrigated on average more than 9,000 ha every year in addition to its commanded area.

Tektek displayed the typical gestation period characteristics of an irrigation scheme. It started with a relatively low ratio of 67 percent in the first year of the transfer, followed by the IRs of around 90 percent.

Kosreli displayed a stable trend in irrigation ratio ranging from 95 percent to 92 percent in the last six years. The range of total irrigation ratios were about two percentage points higher than irrigation ratios.

On the whole, associations are able to fulfill their irrigation responsibilities to a large extent except in case of drought conditions. However, it must be reminded that high irrigation ratios are not solely a consequence of the transfer of O&M, because transferred irrigation associations were the ones, which were already recording high irrigation ratios prior to the transfers (Doker, et. al, 2003).

REVENUES AND FEE COLLECTION RATES OF IAs

Revenues of the IAs.

The sources of revenue of the associations can be classified as: (1) Irrigation fees, (2) Membership fees; collected for once in purpose of having an initial capital after the transfer, (3) Revenues from the supply of goods and services, i.e. renting out machinery and equipment, (4) Fines and interest income from the late payments.

The total and per hectare revenues in 1994 prices are presented in Table 6. Table 7 provides the total revenues in US dollars. The total revenues from irrigation fees seem to rise by about 20 percent in Soke during the considered period. Drastic decline in 2001 is due partly to drought conditions, but mainly because of the economic crisis in 2001. In Soke, irrigation fees gain so much importance in time that in last three years all income consists of only them (Table 8). The US dollar figures have similar implications, as well. The association was able to recover from the 2001 economic crisis in two years' time since the revenue in 2003 (USD1.3 million) was almost as much as the pre-crisis level in

2000. It should be necessary to note that the long-lasting drought besides the economic crisis was another contributing factor in the decline of revenues in 2001.

Table 6. Revenues of IAs (in 1994 prices) (Source: DSI, 2004b)

	Soke		Cumra Plain		Tektek		Kosreli	
Years	Revenue per hectare (TL 1000)	Total Revenue Index	Revenue per hectare (TL 1000)	Total Revenue Index	Revenue per hectare (TL 1000)	Total Revenue Index	Revenue per hectare (TL 1000)	Total Revenue Index
1997			4.2	100.0			7.8	100.0
1998	8.4	100.0	3.7	115.6	4.2	100.0	9.0	112.2
1999	7.1	115.0	5.7	191.6	6.0	141.8	18.0	223.4
2000	12.9	148.2	5.0	177.5	8.2	184.8	11.2	136.0
2001	7.4	88.5	11.5	132.6	9.1	188.4	16.0	196.5
2002	9.1	106.8	5.9	199.0	11.3	252.7	7.5	91.9
2003	9.5	118.0	5.0	189.7	7.2	152.9	12.2	146.3

Table 7. Total Revenues of IAs (USD thousand)

Years	Soke	Cumra Plain	Tektek	Kosreli
1997	-	494.7	-	680.5
1998	1111.7	622.5	345.1	830.8
1999	1126.4	908.5	431.2	1456.4
2000	1347.4	781.6	521.6	823.7
2001	582.4	422.6	384.9	861.3
2002	894.4	807.1	657.2	512.9
2003	1335.1	1039.5	537.1	1102.5

Source: Annual Reports.

Table 8. Share of Fines and Interest Income in Total Income (Source: DSI, 2004b)

Years	Soke	Cumra Plain	Tektek	Kosreli
1997	-	14.6	-	7.9
1998	2.4	10.2	-	24.7
1999	11.6	10.7	14.1	4.9
2000	6.4	-	9.2	6.9
2001	-	27.0	5.5	3.9
2002	-	11.5	4.9	5.0
2003	-	12.9	3.1	3.8

A decline in the average irrigation fee was also observed due to the crisis. While the average real irrigation fee was TL8,034 per hectare in 1999, it declined by about 16 percent to TL6,782 in 2001 (Table 9). Lastly, it is worth to note that share of fines and interest income in total revenue was very

low. Compared to other regions, it seems that, the Aegean farmers respect the payment schedules more than the rest of the country.

Table 9. Average Fee of Irrigation Water (Source: DSI, 2004b)

	Soke		Cumra Plain		Tektek		Kosreli	
Years	TL/ha	USD/ha	TL/ha	USD/ha	TL/ha	USD/ha	TL/ha	USD/ha
1999	8034.2	36.7	2190.2	10.0	5738.5	26.2	na	na
2000	na	na	2342.8	10.0	na	na	5665.8	24.1
2001	6784	20.9	2532.8	7.8	9892.9	30.4	5976.8	18.4
2002	5782	22.6	4772.5	18.7	9438.5	36.9	6368.3	24.9
2003	6697.3	35.4	4835.1	25.6	6379.7	33.7	7240	38.3

In Cumra, in addition to irrigation fees, interest income and fines took a considerable share. For instance, fines and interest income constituted about 25 percent total income (Table 8). Until 1999, total income increased up to USD909 thousand (Table 7). After a decline of around 14 percent in 2000, the total revenue declined further to USD423 thousand in 2001, possibly because of the effective rain by the end of drought period, increasing rainfed cropping, and lastly, the economic crisis which made average fee of water decline from USD10 per hectare down to USD7.8. However, the recovery was quick. The total income was more than its pre-crisis level (USD807 thousand) in 2002. This recovery was mainly due to increase in total irrigated land (from 12,005 ha in 2001 to 35,052 ha in 2002) and increased average fee of water (from USD7.8/hectare in 2001 to USD18.7/hectare in 2002). It must be noted that the average fee of water in 2002 was almost doubled with respect to its pre-crisis level in 2000. At the end of six years' period, the Cumra Plain increased its real income by about 90 percent (Table 6).

In the budget of Tektek, fines and interest income kept its place in total income over the years with a declining trend. The effect of the economic crisis was quite limited in the association given real income figures in 2001 that even increased slightly with respect to year 2000. However, both figures reveal a quick rise in 2002.

In Kosreli, revenues from fines and interest income had significant contributions to the total revenue. While total revenue from irrigation fees was USD1,456 thousand in 1999, it declined drastically to USD824 thousand in 2000, despite with no significant change in total irrigated area. In contrast, the effect of the crisis seemed to be almost non-existent since total income increased more than 40% in 2001 (Table 6). Interestingly, the association experienced a loss in income in 2002 despite no significant change in total irrigated land and a real increase in average fee of water. However, total revenue recuperated in 2003.

Overall, irrigation fees constituted the main share in total income. Membership fees and revenues from the supply of goods and services stayed at negligibly low levels. Whereas, fines and interest income were able to take noticeably high shares in total income, implying considerable delays in fee payments. Changes in average fee of water, total irrigated land and economic crisis have been key factors determining the amount collected as irrigation fees.

Fee Collection Rates

Soke was able to collect on average 69% of the assessed fees in the same year. However, excluding the first year following the transfer, i.e. 1999 with a rate of 37.8%, the average climbs up to 76.7% (Table 10).

In fact, fee collection rates alone may be misleading to check the performance. It should be noted that payments in all selected associations are mostly due from October to December, i.e. in one installment towards the end of the accounting year. A delay of even a couple of weeks would shift the fee payment to the new accounting year. For instance, the payment is due by the end of December in Kosreli and it is due by the end of October or November in Cumra. In Soke, the payment is due by November or December. Payment dates may become more flexible depending on the prevailing cropping pattern in the commanded area, as well. In addition, there exist also irrigation associations that receive fee payments in advance.

Table 10. Collection Rates (per cent) (Source: DSI, 2004b)

	Irrigation Associations							
	Soke		Cumra Plain		Tektek		Kosreli	
Years	CR	TCR[a]	CR	TCR	CR	TCR	CR	TCR
1998			51.14	NA	55.6	NA	45	NA
1999	37.8	NA	10.6	63.6	65.4	80.5	0	132.1
2000	73.2	90.7	10.3	42.6	82	100	100	190.6
2001	80.3	102.9	15.17	93.2	79.5	100	44.8	209.6
2002	73.2	91.1	16.73	68.2	78.1	101.4	16.6	104.3
2003	79.9	95.2	40	58.8	80.4	96.4	37.7	44.0
Av.	*69*	*95*	*24*	*65.3*	*73.5*	*95.7*	*40.7*	*136*

Note: [a] Total collection rate (TCR) for year t = (fees collected in years t-1 and t)/(fees assessed in years t-1 and t).

Hence, given any probable shifts of payments into the following accounting period, collection rates are further calculated by dividing all fees collected in last two years to total fees assessed in the same last two years. The results are presented in TCR column in Table 8. The results for Soke are in such a manner that supports the fact that some payments were delayed to the following accounting period known that payments are due by the end of the year. For instance, it seems that Soke was able collect 90.7% of total fees assessed in years 1999 and 2000, together. However, it could only collect 38% of total fees assessed in 1999 and only 73% in 2000.

According to DSI staff, Cumra Plain was already a very good performing unit in fee collection rates even before the transfer. However, annual fee collection rates are in conflict with this fact. Low total collection rates in years 1999 and 2000 may be related with long-lasting drought that ended in 2001. The region has been already experiencing a significant change in the cropping pattern after the transfer, as well. Thus, such an effort by farmers to change the cropping pattern may be supported via providing some flexibility in collecting irrigation fees. Cumra could collect at most 93% of total fees assessed in years 2000 and 2001. Other TCR values are not more than 68%, however. It should be noted that fines have been an important item as a source of revenue (Table 8). All these results point to a low degree of success in collection rates even when extended delays in payments are taken into consideration.

Tektek displays obviously better performance having an average collection rate of 73.5%. Minimum collection rate was 55.6% and the recorded maximum was 82% in the last six years. However, Tektek has an important difference in fee payments schedule. Fee payments are done in two installments; one in between June and August and the other by November so that the possibility of a delay in payments into the next accounting period is alleviated considerably. In addition, TCR column for Tektek indicates that fee collections could be achieved fully in two years' time with values around 100%.

Kosreli does not have stable collection rates either. The yearly rates vary between 0 and 100%. Instead, total collection rates carry a better explanatory power in fee collection behavior. It seems that there always existed a considerable amount of fees uncollected that are accrued in previous years.

For instance, TCR rate of 132% for 1999 shows that a substantial part of total fees assessed in years 1998 and 1999 were left from years before 1998. Interestingly, rates exceed 100% at considerable levels in the following years. Thus, it can be concluded that Kosreli usually and repeatedly collected fees with significant delays. The fact that fines were the second important income item after irrigation fees supports this approach.

Generally speaking, selected associations reveal better performance in fee collection rates compared to pre-accelerated transfer period with an average of 38% (Svendsen and Nott, 1999). On the other hand, collection rate averages, according to DSI staff, were generally supposed to be more than 90% considering all associations in the country. Nevertheless, the sample in this study constitutes an area of only about 5% of total, being far from making firm generalizations. But still, further monitoring efforts at this issue seems to be necessary for an enhanced fee collection performance.

EXPENDITURES

Expenditure items are elaborated under three main sub-sections; operation and maintenance costs, vehicles and equipment purchases and lastly, personnel expenditures.

Operation and Maintenance Expenditures

In Soke, it is observed that total O&M costs increased continuously and quite severely until 2001 despite an abrupt depreciation of TL in the same year (Figure 1). The O&M costs then declined and became fairly stable in last two years. Lastly, a total value of USD1,037 thousand was recorded in 2003.

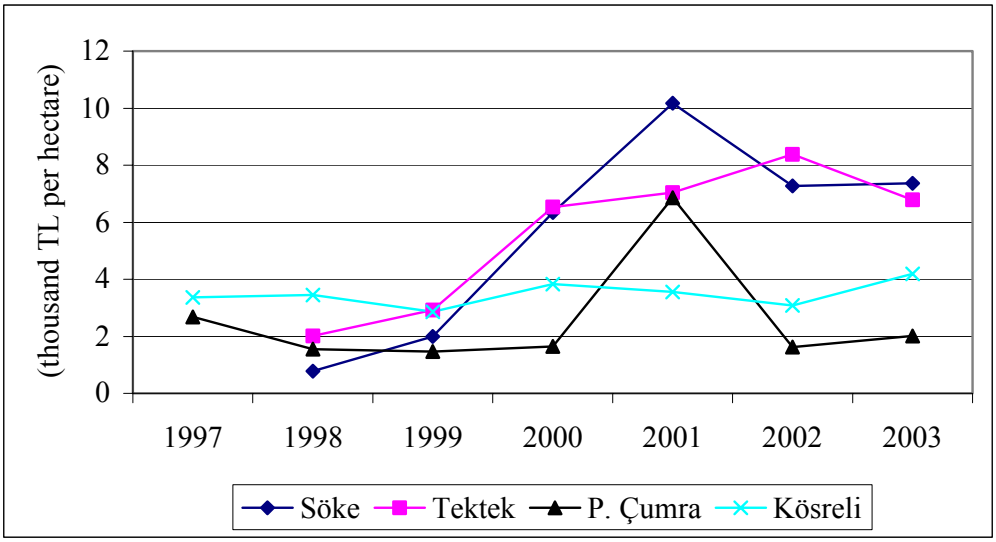

Figure 1. Operation & Maintenance Costs (per hectare) (Source: DSI, 2004b)

Operation costs took greater share in total O&M costs until 2001 and the opposite happened in the last two years (Figure 2 and 3). As the operation costs per irrigated hectare increased up to TL3.5 thousand in 2003 from TL0.7 thousand in 1998, the maintenance costs per irrigated hectare performed a drastic rise from TL0.1 thousand in 1998 to TL3.9 thousand in 2003. Correspondingly, the share of operation costs in total O&M costs decreased from 87% to 47%, while the share of maintenance costs increased from 13% to 53% in six years' term. The reversal of the shares did not show a regular trend, implying a restructuring period after the transfer process. It should be pointed that while the share of operation costs in total declined during the considered period, the operation

costs increased to USD0.5 million in 2003 from USD89,730 in 1998 while the maintenance costs increased up to USD549,457 in 2003 from USD13,924 in 1998.

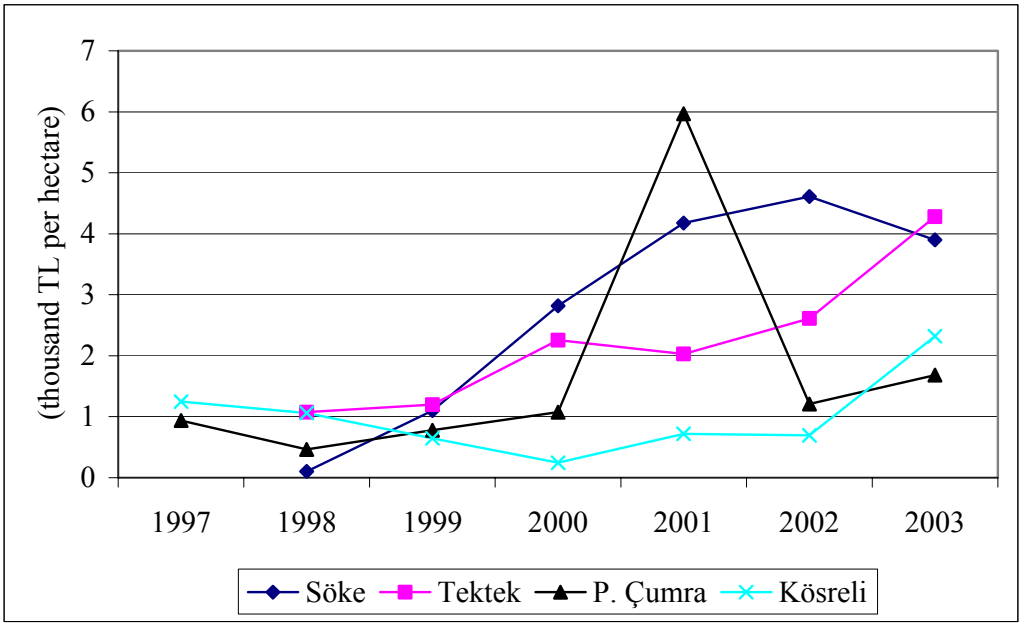

Figure 2. Maintenance Costs (per hectare) (Source: DSI, 2004b)

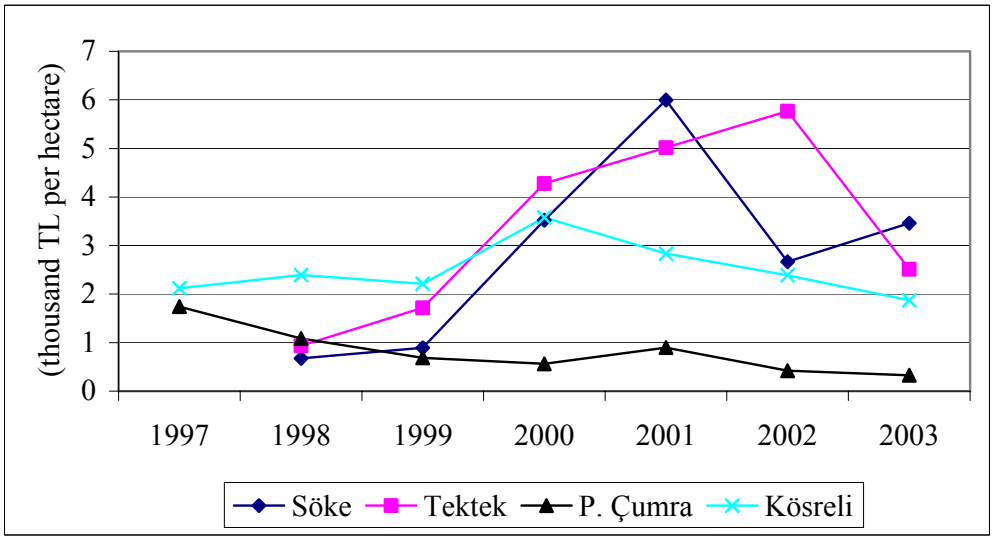

Figure 3. Operation Costs (per hectare) (*Source: DSI, 2004b)*

The rise in the share of maintenance costs may be considered as a normal process for the association towards taking over full responsibility of maintenance and repair that requires higher use of labor, machinery and equipment. It can be seen in Table 11 that Soke expanded its machinery and equipment availability. Hence, the rise in maintenance costs in amount and share in total O&M costs can be attributed to the fact that the transfer process has been proceeding properly. Yet, it would be

desirable to have the expansion of the maintenance costs coupled with no significant increase in operation costs to achieve a higher level of cost effectiveness in the transfer process. On the other hand, the increase in the revenue of the association was not at par with the increase in the costs. The total income of the association was about 10 times of the costs of O&M in 1998, but this figure declined to 1.29 times of O&M costs in 2003. Similar trend was observed in income over total expenses ratio, which was only 103.5% in 2002, meaning that income and total expenses were almost equal, while it was 434% in the first year of the transfer (Figure 4). The year 2003 revealed about 10% budget surplus, however. This is an improvement for Soke since these ratios were significantly lower than 100% in 1999 and 2000.

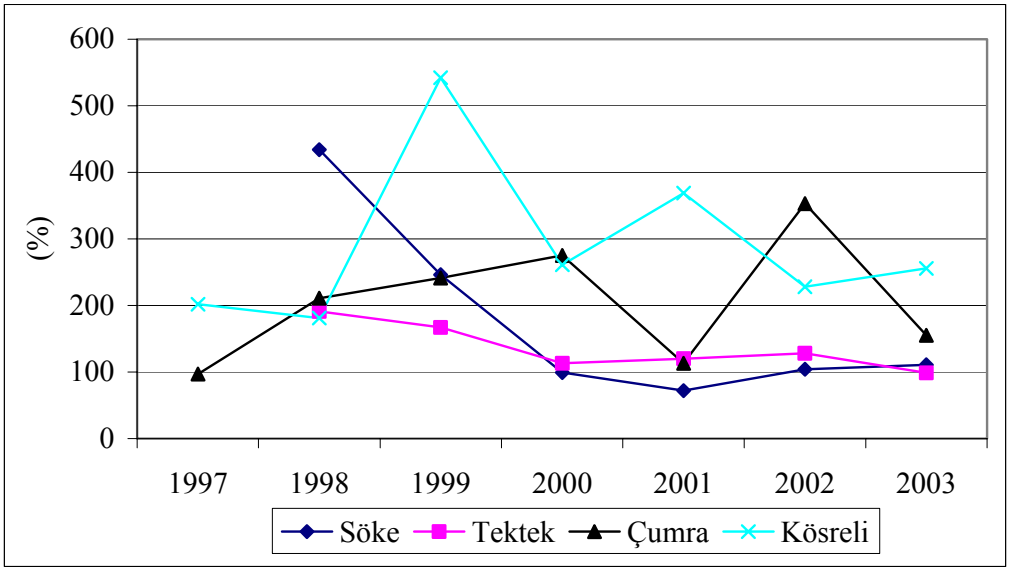

Figure 4. Income over Total Expenses (Source: DSI, 2004b)

Operation costs in Cumra decreased regularly both in real terms and the share of total O&M expenditures until 2001. Operation costs were USD207 thousand in 1997 while it reached USD33 thousand in 2001. It was doubled in 2003 with USD69 thousand, however. Maintenance costs also increased regularly both in real terms and share in total expenditures until 2001. Maintenance costs were USD111 thousand in 1997 while it was USD220 thousand in 2001. It was lastly USD351 thousand in 2003. On the other hand, in year 2002 share of operation costs rose to 26% from 13% in 2001, and declined in amount at 56%. In 2003, its share declined further with 10 percentile. Per irrigated hectare figures should also be mentioned. Operation costs per irrigated hectare declined considerably from an amount of TL1.7 thousand to TL0.3 thousand in 6 years' time. In contrast, maintenance costs per irrigated hectare increased from TL0.9 thousand in 1997 to TL1.7 thousand in 2003 (Figures 2 and 3). It must be noted that year 2001 is an exceptional case for Cumra since total irrigated land was merely 12,000 ha doubling all relevant ratios and, hence implying misleading results.

Income figures displayed better performance when compared to Soke. The ratio of income over total O&M costs showed an increasing trend in the considered period, indicating that income can compensate more of the total O&M costs over time. Similar observations can be made for the ratio of income over total expenses (Figure 4). Income could meet only 97% of total expenses in 1997 while the same figure was 353% in 2002, however, 155% in 2003. What distinguishes the Cumra Plain from Soke at the first glance was the decline in operation costs.

In Tektek, the share of operation costs in total O&M costs was still at a considerable level in 2002 with a value of 69%. It was USD336 thousand in 2002 being much higher than the 1998 level when operation costs were only USD77 thousand, and 46% of the O&M costs. However, operation costs declined immediately to USD186 thousand and 37% in share in 2003. In contrast, the share of operation costs in total O&M costs revealed, on the whole, lower shares and a declining trend in both Soke and Cumra since the beginning of the considered period.

Moreover, the share of maintenance costs in total O&M costs regularly declined from 53% in year 1998 to 31% in year 2002. Year 2003 displayed an inverse behavior with an increased share of 63%. Therefore the ability of income to satisfy total O&M cost and total expenses have fallen down in six years' time probably as the result of high share of operation costs (Figure 4). On the other hand, the association did not show a significant expansion of the machinery and equipment (Table 11). Figures 2 and 3 point to similar implications when year 2003 is excluded. Whilst operation costs per irrigated hectare increases 6.4 times in real terms from 1998 to 2002, the increase in maintenance costs per irrigated hectare stays at only 2.4 times of year 1998. Year 2003 with lower operation costs in total, however, may indicate the beginning of a more efficient operation management.

In Kosreli, maintenance costs item constituted generally quite above 20% of total O&M costs. But year 2003 recorded an immediate rise to 55% in the maintenance cost share. The association did spend more on operational costs till 2002. Operation costs declined further in 2003 whereas maintenance costs rose up to USD209 thousand. Decline in maintenance costs till 2002 was more severe (55%) than the decline in operation costs (16%). This was probably due to lack of ownership of vehicles and other equipment. Kosreli does not seem to expand much in equipment items although it seems to be able to generate sufficient funds to acquire more equipment of its own (Table 11). The association has on average the best rate of income over total expenses and income over total O&M costs ratios being 291% and 342%, respectively. It did not increase the total personnel expenditures since 2000, as well (Figure 5).

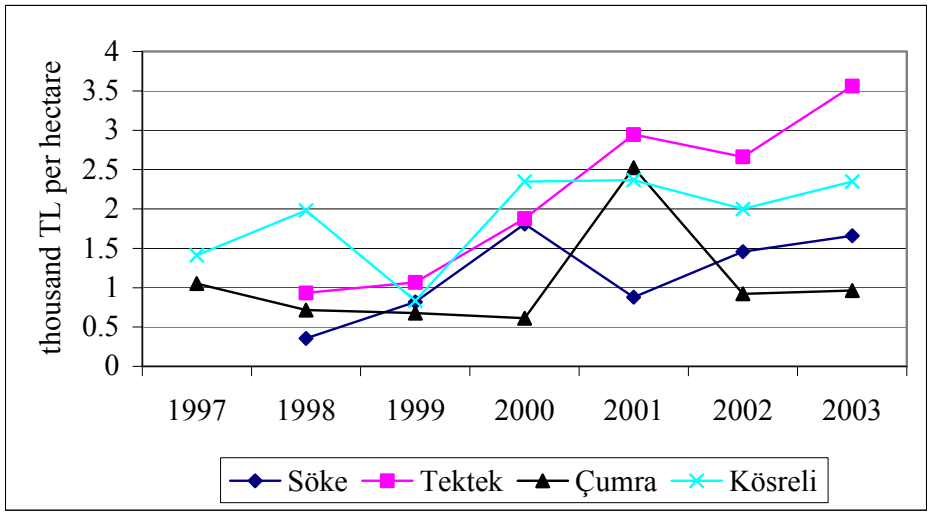

Figure 5. Total Personnel Expenditures (per hectare) (Source: DSI, 2004b)

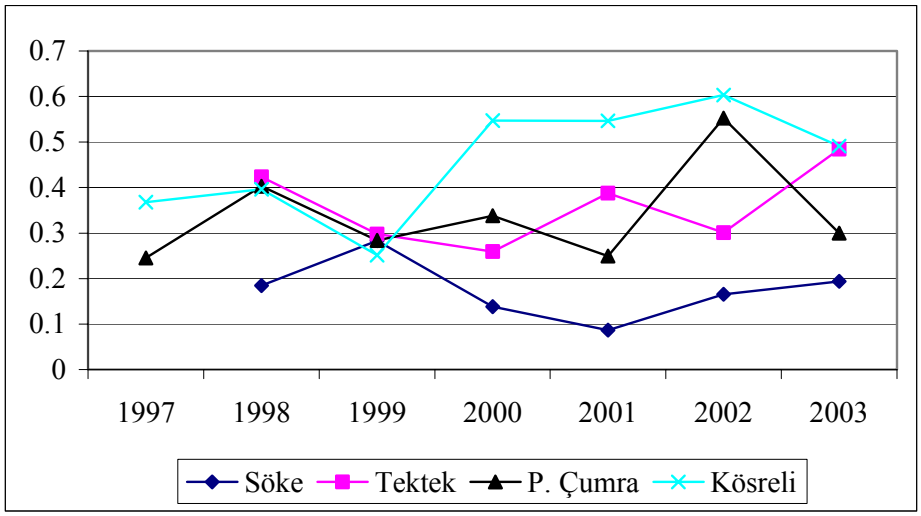

Figure 6. Total Personnel Expenditures over Total Expenses (Source: DSI, 2004b)

Overall, selected associations indicate generally two trends considering the O&M costs. The first one, which is observed in cases of Soke and Tektek, shows a continuous increase in O&M costs both in real and per irrigated hectare terms. The increase seemed to be disturbed slightly because of the economic crisis, however. The second trend can be ascribed to the other two irrigation associations that were on a stagnant or declining path in O&M costs. In case of Cumra, decline in operation costs; in case of Kosreli, decline in maintenance costs have been realized more severely.

Vehicles and Other Equipments

It seems that each association added new computers to their stock over the years (Table 11). Soke and Cumra did both expand in the ownership of heavy vehicles, i.e. excavators, graders, etc., to cope with tasks of lifting, transport, etc. on their own. Both associations use a heavy vehicle on average for 5,000 ha. They also expanded in numbers of tractors, automobiles and lorries under other vehicles item.

Table 11: Vehicles and Other Equipment (Source: DSI, 2004b)

Years	Soke				Cumra Plain			
	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computer & Other[a] Equipment	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computer & Other Equipment
1998	25615	NA			31980	1	4	8 & 35
1999	34751	1	2	1 & 32	34556	3	5	6 & 35
2000	24561	5	5	1 & 59	37020	4	8	6 & 42
2001	25735	5	5	1 & 62	12005	5	8	6 & 42
2002	25090	5	6	6 & 54	35052	5	8	8 & 42
2003	26649	5	6	7 & 54	39410	8	11	8 & 51
Years	Tektek				Kosreli			
	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computer & Other Equipment	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computer & Other Equipment
1998	15841	-	-	2 & 33	17870	2	5	3 & ----

1999	15773	1	1	3 & 42	17739	1	8	3 & 29
2000	14987	1	2	3 & 48	17328	2	5	3 & 28
2001	13780	1	2	4 & 47	17505	2	7	3 & 28
2002	14894	1	1	4 & 47	17365	2	8	3 & 28
2003	14019	-	2	4 & 47	17062	2	5	3 & 28

Note: [a] Other equipments include two-way radio systems, motorcycles, trailer, etc. Other vehicles are tractors, automobiles and lorries.

Kosreli and Tektek seem to be relatively stable in the number of vehicles and other equipment. Tektek increased its availability in number of motorcycles and radio system units under other equipment item, while Kosreli expanded only in tractors and lorries. It seems that Kosreli is not in crucial need of new heavy vehicles since it does not own new items despite its considerable budget surpluses (Figure 4).

In general, Soke and Cumra Plain tended to increase their self-maintenance capability through increasing their equipment availability while Tektek and Kosreli did not so. Nevertheless, the stable trend in ownership of equipment may be highly related with the relatively smaller net irrigation areas of Tektek and Kosreli compared to Soke and Cumra.

Personnel

All selected irrigation associations, except Soke, increased the number of permanent staff. On the whole, Soke followed just the opposite path in personnel policy from other associations. It decreased the number of permanent personnel, however, increased the average net salary in US Dollar terms. The rest, however, increases the number of personnel and decreases the average net salary at the same time. For instance, Soke paid USD329 in 2002. On the other hand, Tektek paid USD261; Cumra, USD233; and Kosreli, USD180. Soke paid the second highest (USD460) in 2003 after Cumra (USD523), however. Kosreli and Tektek paid USD243 and USD269, respectively.

Correspondingly, Soke is the most labor efficient among all. On average, Soke employs 1.25 persons per 1000 ha excluding year 1999 when over 400 temporary workers were employed for once. Cumra employs 1.31 persons; Tektek, 3.59 persons; and Kosreli employs 3.08 persons per 1000 ha. It can overall be stated that all irrigation associations are labor efficient with respect to Svendsen (2001)'s calculations for year 1999, which indicate that DSI and irrigation associations used 70.4 and 4.7 persons per 1000 ha, respectively.

Tektek experienced a clear increase in total personnel expenditures per hectare despite the economic crisis (Figure 5). USD4.84 per hectare was spent for personnel in 1998 and USD18.8 in 2003 making an average figure of USD9.3 per hectare for the last six years. The economic crisis, however, seems to disturb Soke's increasing path. Soke spent USD5.1 per hectare on average. Cumra moved in a narrow margin in TL terms whereas in a larger margin in USD terms. The association spent between TL1.1 thousand and TL0.6 thousand, and between USD2.6 and USD5.1 (USD3.9 on average) excluding year 2001, when its total irrigated area fell by more than 65%, and USD7.8 per hectare was spent. Kosreli has somewhat a high average at the end of seven years' period with USD9.7 per hectare. Moreover, an overall rise can be observed except the decline in 1999.

The share of total personnel expenditures (TPE) in total expenses indicates some further points (Figure 6). While the TPE over total expenses in Soke hardly exceeds 20%, the ratio reaches to 55% in Cumra, and 60% in Kosreli. Tektek is also on average over 30% levels.

On the whole, Soke and Cumra's personnel policy coincided with the fact that they expanded in machinery and equipment since they employed more of qualified workers, e.g. operators, technicians, etc. in time. These associations were accordingly the most labor efficient ones. Factor substitution

effect was clearer in case of Soke, however. Soke and Cumra also recorded the lowest personnel expenditure per hectare figures and lowest shares of TPE in total expenses.

CONCLUDING REMARKS

It is observed that irrigation associations of Soke and Tektek revealed more or less similar trends with respect to operation and maintenance costs per hectare. Cumra and Kosreli tended to form another group with respect to same ratios. It should be noted that the transfer date of Soke and Tektek is the same, which could serve as an explanation for such a formation. Cumra and Kosreli were both transferred in the same year, 1995, as well.

An important point is that the relatively older -with respect to the first operation date- associations, Cumra and Kosreli experienced a lower rate of increase or decline in maintenance costs per hectare. On the other hand, Soke increased its maintenance costs per hectare more than 30 times, and Tektek more than 3 times in six years' time. This could be highly related with the cropping pattern, in addition to the age of the irrigation system. For instance, Soke and Tektek, where cotton was the major crop, required a great deal of a costly item; maintenance of drainage canals, since irrigation was necessarily to be done more often.

Soke and Tektek both experienced a clear upward trend in operation costs during the first years after the transfer. Soke showed a considerable decline for years 2002 and 2003, while Tektek continued to increase its operation costs in 2002 whereas declined in 2003. The decline in operation costs per hectare may be attributed to the learning-by-doing factor that could enhance efficiency of operation tasks in time. Hence, an increase in operation costs just after the transfer could be regarded as a natural path.

On the whole, selected irrigation associations have implemented the irrigation management transfer so far successfully. All associations revealed positive signs of self-management capability considering revenue and expense together with the operation and maintenance management and further irrigation tasks. However, it must be reminded that the transfer is only the first step. The second step should be achieving the sustainability. The accountability and related governance structures will have crucial importance in testing the sustainability of the program. Therefore, more emphasis should be placed on any kind of monitoring activities.

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