Agricultural and Marine Sciences, 11 S.I., 1-9 (2006)

Financial Performance of Irrigation Associations: Selected Cases from Turkey

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دراسة الجدوى المالية لعينة من الجمعيات المائية في تركيا

إرول شاكماك و فاروق إردوغان ومحمد ساتيك

الخلاصة: تهدف هذه الدراسة إلى تحليل الجدوى المالية لأربعة جمعيات مائية بعد تحويل السلطة لها من طرف الدولة في مجال الصيانة وإدارة المنشئات المائية. تمثل المساحة المرورية تحت سلطة هذه الأربع جمعيات نحو ٥ بالمائة من مجموع المساحة التي تم تحويل إشرافها إلى الجمعيات.

المعطيات التي تم تحليلها مقتبسة من التقارير السنوية للجمعيات. تظهر النتائج أن الجمعيات قادرة على تحمل مسؤولية إدارة المياه وذلك بإستخدام معدات متقدمة. مساهمة المزارعين في دفع مستلزماتهم مقابل الخدمات إرتفعت مقارنة لما قبل تحويل السلطة إلى الجمعيات. لكن رغم أن تحويل السلطة يظهر تحسن تعامل المزارعين مع المعطيات الخارجية يبقى من المبكر الحكم على ما إذا ستكون التجربة مستديمة.

ABSTRACT: The objective of the study was to trace the performance of selected irrigation associations after the transfer of operation and maintenance (O&M) activities from the state to the farmers. Four irrigation associations were selected according to the regional and cropping pattern diversity. The area of the selected associations made up slightly more than 5 percent of the total transferred area. The data for the different types of revenues and expenses of the associations were obtained from the annual reports of the associations to the State Hydraulic Works. Results suggest that irrigation associations are able to fulfill irrigation tasks to a large extent using enhanced equipment. Fee collection rates are at improved levels, despite delays in payments, mainly due to the mismatch of the financial and production calendars. Dominant cropping patterns for cotton lead to 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.

Keywords: Irrigation, management transfer, fee collection, ex-post evaluation.

Introduction

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

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Table 1. Transfer of irrigation schemes, 1992 – 2004 (ha).

Years	Planned		Modified Plan		Realization	
	Annual	Cumulative Total	Annual	Cumulative Total	Annual	Cumulative 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	70,546	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	34,724	1,860,969

Source: DSI, 2005.

The principal aim of this study was to trace the path of several indicators for four irrigation associations (IAs) after the transfer. The IAs were selected from different regions with diverse cropping patterns. The next section provides an overview of O&M 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 fourth 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 conclusions.

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-controlled area before the start of the accelerated transfer program (Uskay, 1999). WUGs participated in minor O&M 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 72,000 hectares (ha) were 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 1.9 million ha by the end of 2004.

The main underlying reason for the accelerated transfer program was an 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 the 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, controlling 91% percent of total transferred area, with an average of 5,108 ha (Table 2). The area of an IA may be as large as 30,000 ha.

Irrigation associations are responsible for providing all services related to 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 and the property rights remain with the state.

Table 3. Main features of selected irrigation associations.

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

Source: DSI, 2004.

General Characteristics of the Selected Irrigation Associations

The selected IAs have relatively large areas compared to other transferred schemes and have a better representation of the region (Table 3). 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.

Cotton is the dominant crop in both Soke and Tektek (Table 4). Cumra Plain is the first modern irrigation scheme in Turkey. Cereals cover most of the total area, though with a declining share. Recently, the cultivation of beans and vegetables has been increasing. Tektek is in the Southeast Anatolia Project (GAP) Region. Kosreli is located in the Cukurova Region and has 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. The area covered by this study totals 85,000 hectares, constituting slightly higher than 5 % of the area covered by all IAs in Turkey.

Two main types of irrigation indicators are recorded in the Annual Reports of IAs (DSI, 2004). The irrigation ratio simply indicates the area actually supplied with water over the area controlled by the association. However, associations may also support the irrigation of the land in the neighborhood, which is not included in their controlled area. The total irrigation ratio is the ratio of the total area irrigated by the association divided by the controlled area. Both ratios are reported in Table 5. All four associations were able to irrigate more than 90 % of the controlled area. In addition, two of the associations, namely Soke and Cumra Plain were able to provide water outside the controlled area. The impact of the drought can be easily seen in the irrigation ratios in 2001, especially under the low precipitation conditions in the Central Anatolia, only 48 percent of the irrigable area were irrigated.

On the whole, the associations were able to fulfill their irrigation responsibilities to a large extent, except in the case of drought conditions. However, it must

Table 4. Cropping pattern of the IAs (%).

Year	Soke		Tektek		Comra Plain			Kosreli		
	Cotton	Sun-flower	Cotton	Cereal	Cereal	Sugar Beet	Beans & Vegetable	Soy-bean	Corn	Vegetable Garden
1999	97	2	74	26	na	na	na	na	na	na
2000	72	27	na	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

Source: DSI, 2004.

Table 5. Irrigation ratios of the IAs (%).

Year	Soke		Cumra Plain		Tektek		Kosreli	
	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	92.0	128.3	69.7	n.a.	95.2	97.7
1999	96.7	133.6	96.0	138.7	100.0	109.9	93.9	96.9
2000	92.1	94.5	96.0	144.5	87.1	97.0	92.2	94.7
2001	83.0	98.6	48.2	44.2	86.7	87.0	93.6	95.7
2002	94.7	96.5	92.0	140.6	93.6	94.0	93.7	94.9
2003	100.0	102.5	92.0	150.1	93.3	94.8	92.0	93.2
Ave	93.8	104.0	86.0	124.4	88.4	96.5	93.4	95.5

Source: DSI, 2004.

be borne in mind that high irrigation ratios are not solely a consequence of the transfer of O&M, because transferred irrigation associations were already recording high irrigation ratios prior to the transfers (Doker *et al.*, 2003).

Revenues and Fee Collection Rates of IAs

The sources of revenue of the associations can be classified as: i) irrigation fees; ii) membership fees collected only once as the start-up capital of the association after the transfer; iii) revenues from the supply of goods and services, i.e. renting out machinery and equipment; and iv) and fines and interest income for the delayed fee payments.

The total and per ha revenues in 1994 prices are presented in Table 6 to reflect the changes in real terms. The nominal figures converted to US dollars are also provided in Table 7 to provide an idea about the size of operations that the associations are involved in. Table 7 provides the total revenues in US dollars. The total revenues from irrigation fees rose by about 20% in Soke during the considered period. The drastic decline in 2001 was due partly to drought conditions, but mainly because of a major macroeconomic crisis, followed by a strict implementation of a structural adjustment and stabilization program backed by IMF in 2001. The US dollar figures have similar implications as well, but with different rates of changes due to the floating exchange rate regime in Turkey. Apart from Kosreli which had a lagged impact, the associations were able to recover the drop in revenues in 2001 by 2003. The association was able to recover from

Table 6. Revenues of IAs (in 1994 prices).

Year	Soke		Cumra Plain		Tektek		Kosreli	
	Revenue per ha (TL 000)	Total Revenue Index	Revenue per ha (TL 000)	Total Revenue Index	Revenue per ha (TL 000)	Total Revenue Index	Revenue per ha (TL 000)	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

Source: DSI, 2004.

Table 7. Total Revenues of IAs (US$ thousand).

Year	Soke	Cumra Plain	Tektek	Kosreli
1997	-	494.7	-	680.5
1998	1,111.7	622.5	345.1	830.8
1999	1,126.4	908.5	431.2	1,456.4
2000	1,347.4	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	1,335.1	1,039.5	537.1	1,102.5

Source: DSI, 2004.

the 2001 economic crisis in 2003. It should be noted that, in addition to the macroeconomic crisis, the long-lasting drought was another factor contributing to the decline of revenues in 2001.

The principal objective of the stabilization program which started in 2001 was to achieve budget discipline, and hence the budgetary expenditures were severely constrained. The implication of the program for the agricultural sector was a drastic decline of the government intervention to the agricultural markets. The associations response to the decline in commodity prices as a result of diminished government intervention was to decrease the average irrigation fee by about 15% from 1999 to 2001, (Table 8). Lastly, it is worth noting that the share of fines and interest income in total revenue was very low. Compared to other regions, it seems that the farmers of the Soke Irrigation Association (in the Aegean county) respect the payment schedules more than those in the rest of the country.

In Cumra, in addition to irrigation fees, interest income and fines constitute a considerable share (up to 25%). The impact of the drought period was heavily felt in Cumra, and rainfed agriculture increased in 2001. The average fee for water declined from US$ 10 to US$ 7.8 per ha. However, the recovery was quick. The total income was more than its pre-crisis level in 2002. The increase was mainly due to an increase in total irrigated land (from 12,005 ha in 2001 to 35,052 ha in 2002) and increased average fee for water (from US$7.8 in 2001 to US$ 18.7 per hectare in 2002). The effect of the economic crisis on Tektek was quite limited. The association's real income increased in 2001. In Kosreli, fines and interest income had a significant share in the total revenue. Revenue from the irrigation fees declined drastically from 1999 to 2000, 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 by more than 40% in 2001 (Table 6). Interestingly, the association experienced a loss in income in 2002, despite no significant change in total land irrigated and a real increase in average fees for water. However, total revenue recuperated in 2003.

Overall, irrigation fees constituted the major item in the total income. Membership fees and revenues from the supply of goods and services stayed at negligibly low levels. In some associations, fines and interest income had noticeably high shares in total income, implying considerable delays in fee payments. Changes in average fees for water, total irrigated land and the economic crisis have been key factors determining the amount collected as irrigation fees.

Yearly fee collection rates alone may be a misleading criterion by which to evaluate the

Table 8. Average cost of irrigation water.

Year	Soke		Comra Plain		Tektek		Kosreli	
	TL/ha	US$/ha	TL/ha	US$/ha	TL/ha	US$/ha	TL/ha	US$/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	6784.0	20.9	2532.8	7.8	9892.9	30.4	5976.8	18.4
2002	5782.0	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	7240.0	38.3

Source: DSI, 2004.

Table 9. Irrigation fee collection rates (%).

Year	Irrigation Associations							
	Soke		Comra Plain		Tektek		Kosreli	
	CR	TCR[a]	CR	TCR	CR	TCR	CR	TCR
1998	-	-	51.14	na	55.6	na	45.0	na
1999	37.8	na	10.60	63.6	65.4	80.5	0	132.1
2000	73.2	90.7	10.30	42.6	82.0	100.0	100.0	190.6
2001	80.3	102.9	15.17	93.2	79.5	100.0	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	40.00	58.8	80.4	96.4	37.7	44.0
Ave	69.0	95.0	24.00	65.3	73.5	95.7	40.7	136.0

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

Source: DSI, 2004.

performance. It should be noted that payments in the 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. Hence, given any possible shifts of payments into the following accounting period, collection rates are further calculated by dividing all fees collected in the last two years by total fees assessed in the same two years. The results are presented in the TCR (Total Collection Rate) column in Table 9. The results for Soke support the fact that some payments were postponed to the following accounting period.

The selected associations reveal better performance in fee collection rates than in the 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 the total. Nevertheless, further monitoring efforts regarding this issue seems to be necessary for 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

Per hectare O&M expenditures are presented in Figure 1. O&M costs increased continuously and quite severely until 2001 in Soke, despite an abrupt depreciation of the domestic currency in the same year. The O&M costs then declined and became fairly stable in last two years.

Operation costs took greater share in total O&M costs until 2001, with the opposite occurring in the last two years. The operation costs per irrigated hectare increased by almost four fold while the maintenance costs increased even faster. As a result, the share of operation costs in total O&M costs decreased from 87

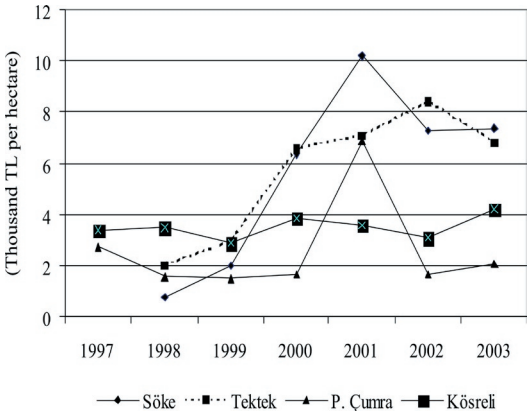

Figure 1. Operation and maintenance expenditures per ha. *Source: DSI, 2004.*

Table 10. Vehicles and other equipment.

Year	Soke				Cumra Plain			
	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computers & Other[a] Equipment	Total Irrigation Area (ha)	Heavy Vehicle	Other Vehicle	Computers & Other[a] Equipment
1998	25615	na	na	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
	Tektek				Kosreli			
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

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

Source: DSI, 2004.

to 47%, while the share of maintenance costs increased from 13 to 53% in six years. The reversal of the shares did not show a regular trend, implying a restructuring period after the transfer process.

The rise in the share of maintenance costs may be considered to be 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 10 that Soke expanded its machinery and equipment availability. Hence, the rise in maintenance costs in amount and share of total O&M costs can be attributed to the fact that the transfer process has been proceeding properly. However, 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 the costs of O&M in 1998, but this figure declined to 1.29 times the O&M costs in 2003. A similar trend was observed in the ratio of income over total expenses (Fig. 2).

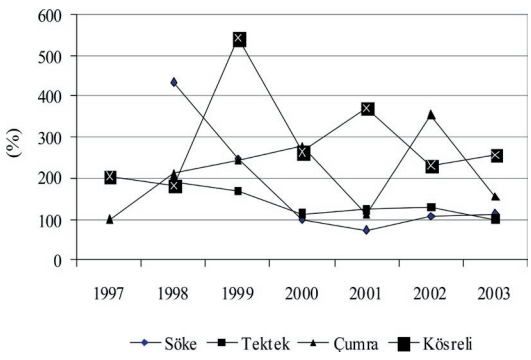

Figure 2. Income over total expenses.
Source: DSI, 2004.

Operation costs in Cumra decreased regularly, both in real terms and in terms of the share of total O&M expenditures, until 2001. Operation costs per irrigated ha in 2003 were almost a fifth of those in 1997. In contrast, maintenance costs per irrigated ha almost doubled during the considered period; 2001 was an exceptional year for Cumra since total irrigated land was merely 12,000 ha, doubling all relevant ratios. Income figures for Cumra displayed better performance than to Soke. The ratio of income over total O&M costs showed an increasing trend in the considered period, indicating that income can cover more of the total O&M costs over time.

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%, but declined thereafter. The share of maintenance costs in total O&M costs declined until 2002, but increased in 2003. Due to a tight budget, the association was not able to expand its machinery and equipment (Table 10).

In Kosreli, maintenance cost items generally constituted above 20% of total O&M costs. Kosreli did not expand its equipment, although it was able to generate sufficient funds to acquire more equipment of its own (Table 10). The association has, on average, the best rate of income over total expenses and income over total O&M costs ratios (291 and 342 %, respectively). Further, the association did not increase its personnel expenditures since 2000 (Fig. 3).

Overall, the selected associations indicate generally two trends in the O&M costs. The first one, which is observed in Soke and Tektek, shows a continuous increase in the O&M costs, both in real terms and per irrigated hectare, but this was disturbed slightly because of the economic crisis. The second trend can be ascribed to the remaining two irrigation associations that were on a stagnant or declining path in the O&M costs; in Cumra, operation costs and in Kosreli, in maintenance costs declined more severely.

Vehicles and other equipment expenditures

All associations acquired new computers over the years (Table 10). Soke and Cumra both expanded their ownership of heavy vehicles (excavators, graders, tractors, automobiles and lorries) to cope with the tasks of lifting, transport, etc. on their own. Both associations use, on average, one heavy vehicle for 5,000 ha.

Kosreli and Tektek seem to be relatively stable in the number of vehicles and other equipment. Tektek increased the number of motorcycles and radio system units, while Kosreli expanded only in tractors and lorries.

In general, Soke and Cumra tended to increase their self-maintenance capability through increasing their equipment availability, while Tektek and Kosreli did not choose to do 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.

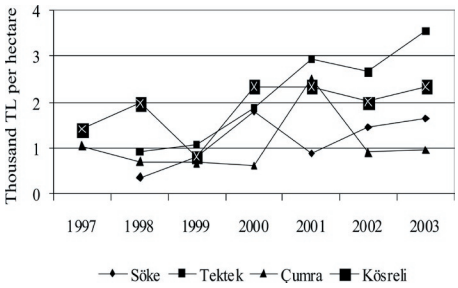

Figure 3. Total personnel expenditures (per ha).
Source: DSI, 2004.

Personnel expenditures

The personnel expenditures per ha and the share of the personnel expenditures in total are presented in Figures 3 and 4, respectively. All selected irrigation associations, except Soke, increased the number of permanent staff. Soke decreased the number of permanent personnel but increased the average net salary (in US$). However, the other associations increased the number of personnel and decreased the average net salary (in US$).

Correspondingly, Soke is the most labor efficient association studied. On average, Soke employs 1.25 persons per 1000 ha, excluding the year 1999, when over 400 temporary workers were employed. Cumra employs 1.31 persons; Tektek, 3.59 persons; and Kosreli 3.08 persons per 1000 ha. Overall, it can be stated that all irrigation associations are labor efficient with respect to Svendsen's (2001) calculations

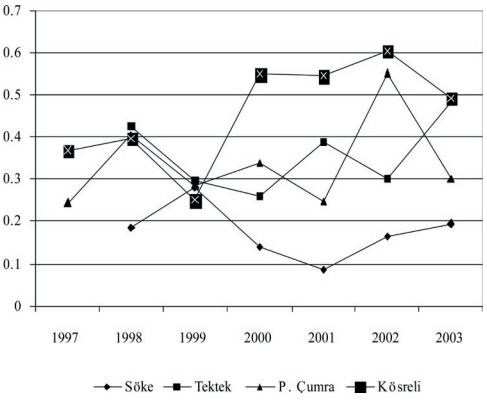

Figure 4. Total personnel expenditures over total expenses.
Source: DSI, 2004.

for 1999, which indicated that DSI and irrigation associations used 70.4 and 4.7 persons per 1000 ha, respectively.

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. These associations were, accordingly, the most labor efficient ones. Factor substitution effect was clearer in Soke. In addition, Soke and Cumra also recorded the lowest personnel expenditure per ha (Fig. 3), and the lowest share of personnel expenditure in total expenses (Fig. 4).

Conclusions

It is observed that the irrigation associations of Soke and Tektek revealed more or less similar trends with respect to O&M costs per ha. Cumra and Kosreli tended to form another group. It is clear that the relatively older Cumra and Kosreli experienced a lower rate of increase 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 during the six-year period. This could be closely related to the cropping pattern, in addition to the age of the irrigation system. For instance, cotton is the major crop in Soke and Tektek and cotton cultivation requires more frequent maintenance of the irrigation and drainage canals.

Soke and Tektek both experienced a clear upward trend in operation costs during the first years after the transfer, but eventually the operation expenditures declined. The decline in operation costs per hectare may be attributed to the learning-by-doing factor that can enhance efficiency of operation tasks in time. Hence, an increase in the operation costs following the transfer could be regarded as a natural path.

On the whole, selected irrigation associations have implemented the irrigation management transfer successfully so far. All associations revealed positive signs of self-management capability, considering both revenue and expenditure management. The associations were able to supply the necessary operation and maintenance activities. However, it must be borne in mind that the transfer is the first step, the second step should be achieving sustainability. Accountability and appropriate governance structures will have crucial importance in testing the sustainability of the program. Therefore, more emphasis should be placed on technical and financial monitoring activities.

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