

A Diagnosis of Farmer-Managed Irrigation Systems' Performance in Mendoza, Argentina

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ABSTRACT

This paper deals with the water management system in Mendoza, Argentina, with special reference to users' participation in water administration and management.

Mention is made of the legal and administrative aspects on which the current participatory administrative system is based and which has been in operation for over a century. The system comprises 90,000 users who use water for multiple purposes, in three oases that cover an area of 360,000 hectares. A brief socioeconomic description of the agricultural and industrial activities conducted in the command areas of the users' associations is also made.

The diagnosis of the performance of users' associations was carried out through a survey. The characteristics described are location, number of hectares, number of users, infrastructure managed and level of organization attained. Water costs are discussed in relation to organizational level and size of the administered area. Finally, a description is given of their present operation and of the perspectives for improvement.

BACKGROUND INFORMATION

Water Administration in Mendoza

The Mendoza Province has a long tradition of irrigated agriculture. The colonization process in the region began with the arrival of the Spaniards by the end of the 16th century. The Indian communities in the area learned irrigation management techniques from the Incas: they had built diversion and conveyance works from the Mendoza River on which their subsistence irrigated agriculture was dependent.

The ensuing conquest of territories and the blend of cultures gave rise to one of the most remarkable transformation processes of desert areas in Argentina. This rugged region with scarce rainfall, water resources drawn from low flow rivers of marked seasonal variations and difficult to regulate, was shortly transformed into an important economic and political settlement.

The numerous immigrations from Spain, Italy and France during the 19th and 20th centuries gave shape to an agricultural culture characterized by hard work and a vast experience in water management and administration. An economic model — similar to the one prevailing in the

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Mediterranean Basin — based on the intensive cultivation of vineyards, fruit trees and vegetables and their associated industries was developed. Three main oases were developed on an irrigated area of 359,523 hectares.

One of the most relevant aspects of this process is the way in which farmers shaped the structures necessary to administer as scarce a resource as water. Thus, a system was set up in which the farmers themselves assume responsibility for building and maintaining the irrigation works as well as for the administration and equitable distribution of the water. Records show that during the 18th and 19th centuries there were users' associations headed by a democratically elected Tertiary Canal Judge (Juez de Hijuela). A General Water Judge was in charge of administering the provincial water resources with the collaboration of delegates from each association.

The General Irrigation Department

Law 322 of 1905 defines the structure of the General Irrigation Department (DGI) as a decentralized and autarchic agency in charge of administering water for irrigation and other uses. The DGI is headed by a Superintendent, who is assisted by a Council composed of five members. Both the Superintendent and the members of the Council are appointed by the Provincial Executive with the approval of the Senate and remain in office for a five-year period. The Superintendent is the highest executive authority and is responsible for all matters pertaining to the management of provincial water resources and their protection from harmful effects. The Appeals Council is a collegiate body with jurisdictional powers and is considered an administrative Court of last resort in matters related to water use and distribution. There is also an Administrative Tribunal made up of the Members of the Council and presided over by the Superintendent. The Tribunal has "legislative" powers: it approves the DGI's annual budget, determines the irrigation water rates and approves the election procedures of the Users' Associations. It may also issue regulations for the operation of the DGI itself as well as regulations to be complied with by all irrigators in the province.

The DGI administers the resource at basin level through Subdelegates, who are responsible for managing the rivers on behalf of the Superintendent. At present there is one Water Subdelegation for each of the main rivers (Mendoza, Lower Tunuyán, Upper Tunuyán, Diamante and Atuel) and Area Headquarters for both the Tupungato and Malargue Rivers. The Subdelegations carry out O&M activities in the dams and distribution systems up to primary canal level. At secondary canal level the water is managed by the users' associations. The DGI has a staff of 640 and its annual budget is in the order of US\$6,000,000.

Users' Associations

The 1894 Provincial Constitution ratified the canal users' right to elect their authorities and administer their income. The users' active participation in water management was finally adopted in the 1916 Provincial Constitution and in the General Water Law.

Users of the same canal have both the right and the obligation to participate in water management and distribution and in the maintenance of the irrigation system. The setting up of the users' associations, known as Canal Inspections, is a right recognized by law; i.e., a user belongs to an association by virtue of the water rights he holds in a given canal.

Canal inspections enjoy a considerable degree of independence, which enables them to elect their own authorities, draw up and administer their own budget, perform maintenance activities

and organize their water distribution schedule. Until 1949 they also collected the irrigation water rates, part of which was allotted to the operation of the primary infrastructure and the DGI. Since 1949, it is the DGI itself that collects the irrigation water rates and allocates the funds required by the Canal Inspections.

The users' association is managed by one of its members, the Canal Inspector, an unpaid official who is elected by the users for a three-year period. He is assisted by a Board of Delegates and a Users' Advisory Commission. The organization structure described is a case of "dual decentralization," the DGI being autonomous from the Provincial Government and the Canal Inspections being autonomous from the DGI.

DEVELOPMENT

Users' associations in Mendoza are examined here by means of performance indicators:

Geographical Distribution

There are 366 Canal Inspections in Mendoza. Their distribution is not proportional to the area they irrigate. The northern oasis covering the Lower Tunuyán and Mendoza Rivers, represents 46.4 percent of the area. It is administered by Canal Inspections in the province and contains 77.3 percent of the associations (see Table 1, columns 2 and 4).

Size of the Canal Inspections

Since water is delivered according to registered area, the unit for water concessions is the hectare. For administrative reasons, the hectare is the unit used even when calculating flows for nonagricultural uses. This of course, is done after performing the respective conversion.

The total registered rights, including nonagricultural uses, amounts to 783,780 ha. Registered irrigation water rights for 1991 are equivalent to 594,792 ha. Of these, 438,915 ha are administered by Canal Inspections. Table 1, column 3 shows the area in each of the seven districts. Greater land subdivision along the Mendoza and Lower Tunuyán River basins account for the large number of users and small size of users' associations.

Table 2 classifies the canal inspections according to area and irrigation districts. The columns contain the number of inspections in each area stratum for each irrigation district. The last column shows the total inspections for each area stratum.

There are 182 associations, i.e., 50 percent of the total number of associations, that administer less than 400 ha each. Of these, 94 percent are to be found in the northern oasis (columns 1 and 2). However, the area administered by this first group is 25,873 ha, which represents only 5.9 percent of the total.

Table 1. Area (ha) administered by canal inspections per subdelegation (number of inspections, average area and number of users).

District	Number	%	Area	%	Average area	Users	Area/user
Mendoza	171	46.7	124,987	28.5	731	21,694	5.8
Tunuyán Lower	112	30.6	78,514	17.9	701	16,075	4.9
Tunuyán Upper	17	4.6	33,291	7.6	1,009	3,338	10.0
Tupungato	8	2.2	4,183	0.9	523	678	8.0
Diamante	33	9.0	78,993	18.0	2,394	10,904	7.2
Malargue	1	0.3	5,386	1.2	5,386	136	
Atuel	24	6.6	113,561	25.9	4,732	9,676	11.7
Total	366	100%	438,915	100%	1,199	62,501	7.02

Table 2. Number of inspections per area stratum on each of the main rivers.

Area range (ha)	Mza.	TLow.	TUp.	Tup.	Dia.	Mal.	Atu.	Total
0 – 400	91	80	3	4	1	–	3	182
400 – 800	32	10	5	1	5	–	1	54
800 – 1,500	18	6	3	3	9	1	3	43
1,500 – 3,000	11	4	3	–	8	–	5	31
3,000 – 6,000	15	5	1	–	4	–	6	31
6,000 – 12,000	4	5	2	–	6	–	4	21
+ 12,000	–	2	–	–	–	–	2	4
	171	112	17	8	33	1	22	366
%	46.9	30.8	4.7	2.2	9.1	0.3	6.0	100

Within the 0–400 ha range, there are canal inspections that administer tertiary or quaternary canals. In general, these associations are dependent on larger inspections. This occurs in 119 associations, which represents 65 percent of the inspections in this stratum.

These inspections can be classified into:

- * First degree inspections: receive water directly from the DGI.
- * Second degree inspections: receive water from first degree inspections.
- * Third degree inspections: receive water from second degree inspections.

Table 3 shows the number of different degree inspections for each of the main rivers and the area they administer.

Table 3. Different degree canal inspections.

District	Total number	Degree			Area per degree			Area (ha)
		1°	2°	3°	1°	2°	3°	
Mendoza	171	70	91	10	82,026	34,984	7,977	124,987
Tunuyan Lower	112	38	40	34	38,396	32,146	7,972	78,514
Tunuyan Upper	17	17	-	-	32,290	-	-	33,291
Tupungato	8	8	-	-	4,183	-	-	4,183
Diamante	33	25	8	-	66,269	12,724	-	78,993
Malargue	1	1	-	-	5,386	-	-	5,386
Atuel	24	23	1	-	112,416	1,145	-	113,561
Total	366	182	140	44	340,966	80,999	15,949	438,915

The small number of inspections in the last five districts makes it easier to coordinate activities, schedule canal maintenance, discuss expenditures, etc.

Users

There are 62,501 users under the Canal Inspections Management Organization. Users of private waters for hydroelectric and drinking water supply purposes are not included.

This is shown in Table 1, columns 6 and 7. Reference here is made to the area with irrigation rights and not to the total area. Users owning more than one farm within a given inspection are counted only once.

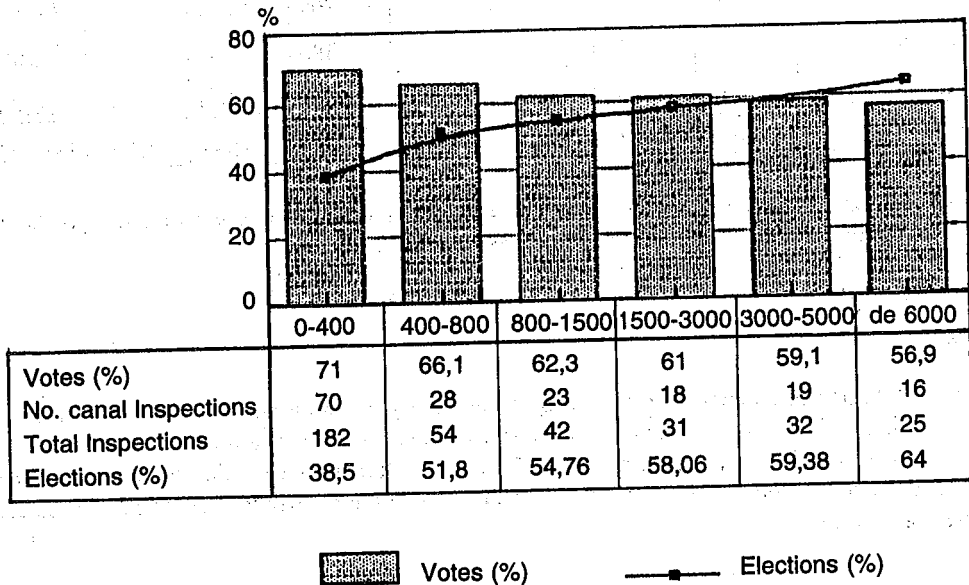
Users' Participation

The participation of canal inspections in the decision-making process varies among the Subdelegations. Only a few inspections with more than 3,000 ha on the Mendoza River participate in monthly meetings and regular discussions. On the Lower Tunuyán River, the consolidated inspections of over 4,000 ha have an active participation and they even demand innovations and improvements from the Subdelegation. Participation levels on the Upper Tunuyán and Diamante Rivers coincide with the mean levels, but participation is somewhat tutored. In the case of the Tupungato River, with a considerable administrative structure and small inspections, the Area Headquarters (DGI) carries out the activities of the Inspection. On the Atuel River, inspectors do participate, but as their level of education is usually lower, there is little that they can contribute to management.

Users' participation in management of the Inspection is usually limited to canal cleaning and maintenance. Few of the users feel that they belong to the inspection: their main concern is a reliable supply of water.

In December 1990, users elected their present authorities. Figure 1 shows the relationship between inspection size and the degree of user participation in the elections. Each column gives the values for each area stratum. The first row shows the percentage of votes cast at each area stratum. The data show it decreases (from 71 to 57 percent) as the size of the inspection increases. At the same time, the percentage of inspections that held elections (fourth row) increased with the size of the inspection (from 38.5 to 64 percent). Only in a few of the smaller inspections was there a higher percentage of votes. On the other hand, the larger the area the better the organization and the greater the capacity to hold elections.

Figure 1. Election of authorities users' participation.



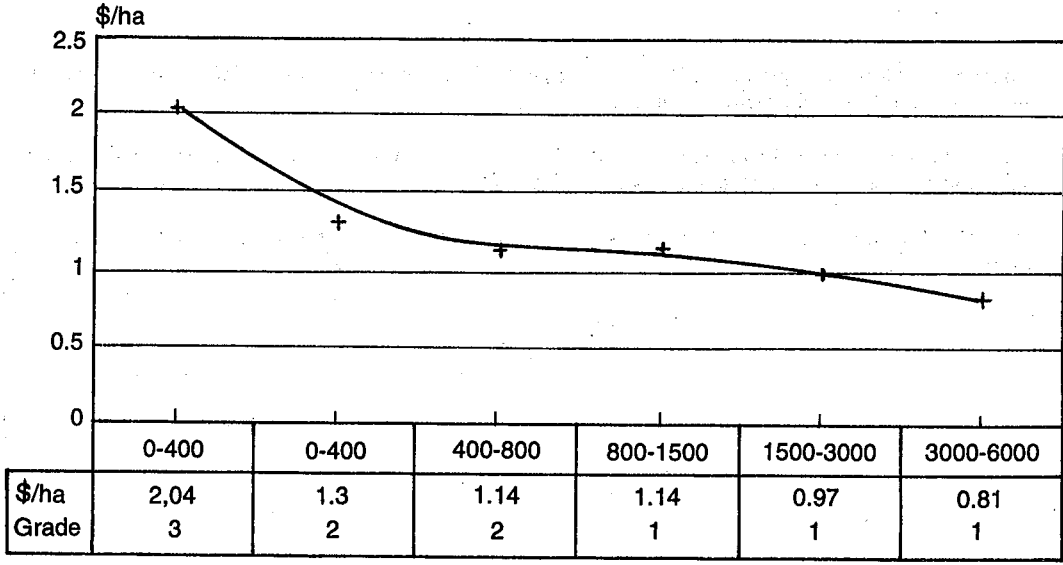
Irrigation Water Rates

Eighty-five percent of the inspections prepare a budget. Inspection budgets are submitted to the DGI which includes them in its annual budget. The budget is financed by the rates paid by the users in six annual installments. The DGI allots funds to the inspections according to their budgets. The share of the irrigation water rate corresponding to the inspection is called the "canal prorate." Inspections that do not prepare a budget are usually very small, with a mean area of 248 ha.

The canal prorate may be divided among the different Inspections. Second and third degree inspection users pay their rates to the corresponding higher level inspection. Figure 2 shows the average canal prorate for different degree and different size inspections. It may be observed that the prorate decreases as the area increases and when the inspections are of the first or the second degree.

Besides reducing the prorata, the degree of the inspections complicates the operation, organization and coordination of activities.

Figure 2. Inspections water costs variation.



—+— \$/ha

CONCLUSIONS

The participatory management system in the Mendoza Province has been described. The use of some simple performance indicators is proposed to account for the different behavior of users' associations. The decentralized administration and the large number of associations restrict the scope and depth of this analysis.

The size and degree of the inspections affect their performance. Small inspections lack the financial capacity and have both higher costs and greater difficulty in attaining user participation in management activities as well as in the election of authorities.

In the older irrigation areas situated near urban centers, the inspections are smaller in size. They represent 50 percent of the total and most of the DGI's efforts are directed towards them. There are more inspections depending upon higher level ones (second and third degree inspections), their water costs are higher and the quality of service is poorer.

The monitoring system for a large number of users' associations' performance could be improved by a closer relationship with DGI's accounting system. This would make it possible to carry out historical analyses for better administrative policy planning and to improve productivity.

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