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The Irrigation Water Rental Market: A Case Study

By Raymond L. Anderson

Research on the market for irrigation water has been initiated to examine the institutional arrangements that have developed in certain areas to make irrigation water more readily transferable between farmers who have varying seasonal needs for water. This article outlines the manner and extent that farmers and irrigation companies in the South Platte Basin have developed arrangements for transferring water during a single crop season.

INTENSIVE AGRICULTURE in the semiarid West depends upon an adequate water supply. Even in areas where water is generally considered adequate, problems arise as to allocation of water among farms in most crop seasons.

During the last 60 years, the irrigation companies in the South Platte Basin have developed a rental procedure for transferring irrigation water from one user to another. The rental market evolved because of varying needs for available water and varying ownership of irrigation company stock.

The many reasons why water users may have insufficient or excess water include changes in crop patterns, development of irrigation wells, acquisition of additional water stock for insurance against short-water years, water stock split off when land was sold, development of additional land for irrigation, and need for more water stock than was originally anticipated.

Irrigation in the South Platte Basin was developed by privately owned irrigation companies. These companies are organized mainly as mutual companies in which the water users own the stock. Though the area has about 100 irrigation firms, 10 or 12 major companies cover a substantial part of the irrigated land.

Under strict appropriation doctrine, water is attached to the land by prior development of irrigation works. Whenever the appropriator fails to use the water or allows others to use it the right can be lost to another. Beneficial use is a requirement for retaining an appropriative right, but the question of what constitutes beneficial use is difficult to determine with any degree of precision, as any level of beneficial use is permissible. Modification of the appropriation doctrine through the evolution of a rental system under which water can be transferred to those who can make higher economic use of it allows a much more efficient use

of limited water supplies. In this paper, "water rental" means seasonal transfer of water between water users.

Water rental is possible in this region because of (1) company ownership of water rights; (2) development of privately owned storage reservoirs; and (3) availability of supplementary water supplies from the Colorado-Big Thompson Project.

The importance of company ownership of the water right lies in the fact that water rights are not attached to any specific tract of land, as is common under the appropriation doctrine. Under the company-ownership arrangement, the water users own stock in the ditch company. They receive water dividends according to the amount of stock owned without regard to the amount of land under the ditch. These stocks are treated as personal property that can be bought, sold, or rented at will.

The development of privately owned reservoirs is the second factor that makes rental of water possible. Farmers own stock in these reservoirs and receive water according to stock held. This water can be delivered on a demand basis; it is particularly valuable for late-season irrigation.

The third factor permitting the rental of water is the Colorado-Big Thompson Trans-Mountain Diversion Project. Water delivered by the project is administered by the Northern Colorado Water Conservancy District and is freely transferable among water users anywhere in the conservancy district. The area in which effective water transfers can be made is bounded by Boulder on the south, Fort Collins on the north, and Fort Morgan on the east—a triangular area 70 miles wide at its western base and tapering to the northeast approximately 100 miles.

Rental Arrangements

Individual allotment holders of project water can readily transfer water for a season to anyone who wishes it by sending a water-transfer order to the conservancy district office. This office then turns the water to the renter's ditch on the day desired.

Municipalities and irrigation companies also rent water to water users from their allotments of project water.

Water rental practices vary by irrigation companies according to the size and historical development of the company. Rental procedures for representative companies in the South Platte Basin are presented in table 1. The smaller companies keep no record of transfers. Any exchange of water is an arrangement between individuals. The ditch rider is informed of changes to be made in water deliveries.

The large irrigation companies with from 100 to 300 stockholders maintain a rental service in the company office. Typically, water users who have excess water list it with the secretary, and those who need additional water contact the secretary to obtain it. In some companies, the rental price of water is set by the board of directors. Everyone who buys or sells water does so at the established price.

Other companies list the water available, together with the asking price. Users who need additional water take the lowest priced water, or haggle with the owner for a still lower price. If the season turns hot and dry, the price rises and more shares of water are likely to appear on the market. As the rental price rises, farmers who have low-return uses for water, such as pasture or hay land, will obtain a higher return by renting water to farmers who need water for such high-value crops as corn or sugar beets.

Most companies have water available for rent from different sources. One type is irrigation-company stock for a season—this is direct-flow and some reservoir water, depending on the company. The exact quantity of water delivered depends upon the flow of the river and must be used when available, or it is lost.

Another type of rental water is reservoir-company stock delivering a specified quantity of water from a privately owned reservoir. This water can be rented by day's run, which is normally 2 or 3 acre-feet, or by the share, which can vary in quantity from 10 to 100 acre-feet and is delivered on a demand basis. In certain instances, reservoir water can be transferred between adjacent companies.

Farmers can also rent project water to be delivered to their farms, independent of the parent company's water supply. Transfer of project water was described earlier. Water is commonly priced the same regardless of source.

TABLE 1.—*Representative water-rental procedures in the South Platte Basin*

Company	Method of renting	Method of pricing	Kind of water rented
Larimer and Weld Ditches, Eaton, Colo.	Available water is listed in company office. Secretary allocates to those wanting additional water.	Board of Directors sets price for season.	Reservoir water rented by day's run.
New Cache La Poudre Irrigating Co., Greeley, Colo.	Available water is listed in company office. Buyers contact secretary for water.	Secretary and Board of Directors set price for season.	Reservoir water rented by day's run. Few shares of direct-flow water rented each season.
Water Supply and Storage Co., Ft. Collins, Colo.	Shares of seasonal water are rented from the office. Small daily transfers are traded between farmers. No office record is kept.	Farmers set the price of both seasonal and daily rentals.	Both direct-decree water and reservoir water are rented by the day and the share.
North Poudre Irrigation Co., Ft. Collins, Colo.	Water for rent is listed on a board in office. Farmers who need water contact one of those listing water.	Asking price quoted along with number of shares each individual has for rent.	Shares of stock including both direct-decree and reservoir water are rented.
Greeley and Loveland Irrigation Co., Greeley, Colo.	Lists water only if requested. Most rentals are between farmers	Farmers set the price.	Mostly Colorado-Big Thompson water is transferred.
Bijou Irrigation District and Riverside Irrigation Co., Ft. Morgan, Colo.	Farmers arrange for transfers. Transfer orders are recorded in office.	Farmers negotiate price when arranging transfer.	Mostly reservoir water by the share, but some direct-decree water when farmer has well.
Farmers Reservoir and Irrigation Co., Denver, Colo.	Most water rented between farmers. Must submit water transfer order to company office to effect transfer.	Farmers set price.	Rent stock or acre-feet. Most rentals are reservoir water.

Size of the Water Rental Market

The Northern Colorado Water Conservancy District and five major companies in the area have made their water-rental records available for study. These records indicate that rental water is an important feature in the irrigated agriculture of the South Platte Basin.

During the 1959 season, 645 transfers of irrigation water took place in these companies, thus shifting the use of 16,353 acre-feet of water. In the conservancy district, 376 transfers totaling 73,967 acre-feet of water were completed. Although water is rented from March to October, the greatest activity occurs in July, August, and September (table 2).

Most rental transfers involve relatively small quantities of water. As shown in table 3, 88 percent of the transfers in 5 irrigation companies were below 50 acre-feet of water per transaction, and almost 75 percent below 30 acre-feet. The conservancy district records (table 4) show that

about 80 percent of the transfers were below 80 acre-feet in quantity and that 72 percent were below 60 acre-feet.

About 70 percent of the water volume transferred within mutual companies was in units of less than 60 acre-feet, while rentals of less than 60 acre-feet accounted for only about 9 percent of the water shifted in the conservancy district.

Rentals of more than 2,000 acre-feet per transaction account for 65.8 percent of the water transferred in the conservancy district, but only 3.2 percent of the transactions. These large transfers involve water allotted to municipalities by the conservancy district but which the cities do not now need. The cities rent large blocks of water to irrigation companies to supplement their water supplies. Cities can transfer the water to their own uses as need arises. This flexible arrangement allows for ease of transfer whenever domestic or manufacturing users require additional water.

TABLE 2.—*Water rentals by months for five irrigation companies and the Northern Colorado Water Conservancy District, 1959*

Month	5 irrigation companies			N.C.W.C.D.		
	Transactions		Amount of water	Transactions		Amount of water
	No.	Pct.	Acre-feet	No.	Pct.	Acre-feet
March.....	3	0.5	69	2	0.5	228
April.....	8	1.2	476	11	2.9	3,659
May.....	20	3.1	1,064	14	3.7	9,180
June.....	45	7.0	1,877	22	5.8	11,975
July.....	149	23.0	4,115	105	28.0	14,777
August.....	220	34.1	4,391	131	34.9	22,745
September.....	196	30.4	4,332	88	23.4	9,166
October.....	4	.7	29	3	.8	2,237
Total.....	645	100.0	16,353	376	100.0	73,967

Rental Rates and Value of Water

Under the assumptions of marginal theory, the allocation of resources in a competitive industry will be such that the value of marginal product of any factor is equal between firms. When water is distributed under the appropriation doctrine, the returns to water can vary considerably between firms. Rental provisions help to adjust this mallocation of water. In the process of reallocation, the price of rental water should reflect the value of the marginal product of water to both the renter and the rentee.

In 1959, much of the water was rented at a price that covered the yearly stock assessment plus interest on the market value of the stock. Two companies set the price of water for the season at \$2.70 and \$3.25 per acre-foot. For the companies that let the farmers set the price, the charge ranged from \$2.50 to \$5 per acre-foot at the beginning of the season and from \$4.20 to \$8 late in the season (table 5).

In dry years, when the supply of water is short, the price is reported to go as high as \$30 per acre-foot. Most irrigation officials and farmers think this is too high. Community pressure does not allow the market price to reach the level that farmers short of water would be willing to pay. Institutional restraints are one of the peculiarities

of the water-rental market. The customary price of rental water probably limits the quantity of water that is available in some years.

The economic value of this rental water is not known because use of the water transferred was not ascertained, but it is possible to estimate its value from the returns to irrigation water in this region. A recent linear programming study made at Colorado State University¹ showed marginal values of irrigation water varying from \$50 per acre-foot with a short water supply to \$15 per acre-foot with a full supply. These values were ascertained for typical irrigated crop systems. A second stage of this study found the value of marginal product with adequate water supplies ranging from \$32 per acre-foot on farms with soils of high productivity and high-value crops, down to \$9 per acre-foot on farms with poor soils and low-value crops.

Another study² on the average gross return from an adequate water supply on various crops gave gross values of \$72 per acre-foot when applied to sugar beets, but only \$10 when applied to oats.

¹ Whittlesey, Norman. Economics of Irrigation, Uncompahgre Project, Unpublished MS. Thesis, 1959.

² Unpublished data from the Northern Colorado Water Conservancy District.

TABLE 3.—Number and amount of water-rental transfers in five irrigation companies,¹ South Platte Basin, 1959

Size of transfer (acre-feet)	Transfers	Cumulative percentage	Amount of water	Cumulative percentage
	<i>Number</i>	<i>Percent</i>	<i>Acre-feet</i>	<i>Percent</i>
0 to 9.9	175	27.1	977	6.0
10 to 19.9	180	55.0	2,430	20.9
20 to 29.9	126	74.5	3,084	39.6
30 to 39.9	56	83.2	1,872	51.2
40 to 49.9	33	88.3	1,426	59.9
50 to 59.9	29	92.8	1,604	69.7
60 to 69.9	9	94.2	564	73.1
70 to 79.9	10	95.8	759	77.7
80 to 89.9	5	96.6	420	80.3
90 to 99.9	1	96.8	96	80.9
100 to 149.9	14	99.0	1,774	91.6
150 to 199.9	4	99.6	681	95.9
200 plus	3	100.0	666	100.0
Total	645		16,353	

¹ North Poudre Irrigation Company, New Cache La Poudre Irrigation Company, Larimer and Weld Ditch Companies, Farmers Reservoir Company, and Bijou Irrigation Company.

Conclusions

It can be assumed that the water transferred moves to a higher value use. If, for example, the water transferred returned \$20 per acre-foot more at the new location and 60 percent of the water actually reached the farm, water rentals in the conservancy district and the five companies would add around \$1,000,000 to the gross return of the area. More water is actually rented in this area, but data cannot be obtained from some companies. These estimates indicate, however, that substantial returns are gained from seasonal transfers of water.

By using a market mechanism to allocate water within a framework of the appropriation doctrine, considerable losses in crop production have been avoided. The rental system also reduces the waste that occurs when water rights become involved in costly, time-consuming legal battles. One water user cannot bring suit against another for nonuse and transfer of irrigation water. Under the rental procedures used in the South Platte Basin, water can be transferred within irrigation companies by rental of stock and between or within irrigation systems by transfers of Northern Colorado Water Conservancy District water allotments.

These rules and customs, which developed during the last 60 years for company rentals and the

TABLE 4.—Number and amount of water-rental transfers in the Northern Colorado Water Conservancy District, 1959

Size of transfer (acre-feet)	Transfers	Cumulative percentage	Amount of water	Cumulative percentage
	<i>Number</i>	<i>Percent</i>	<i>Acre-feet</i>	<i>Percent</i>
0 to 19.9	102	27.1	1,082	1.5
20 to 39.9	101	54.0	2,726	5.2
40 to 59.9	67	71.8	3,130	9.4
60 to 79.9	30	79.8	1,953	12.0
80 to 99.9	8	81.9	658	12.9
100 to 149.9	27	89.1	2,888	16.8
150 to 199.9	3	89.9	503	17.5
200 to 499.9	17	94.4	4,913	24.1
500 to 999.9	7	96.3	4,882	30.7
1,000 to 1,999.9	2	96.8	2,602	34.2
2,000 to 2,999.9	3	97.6	6,141	42.5
3,000 to 4,999.9	6	99.2	18,780	67.9
5,000 plus	3	100.0	23,709	100.0
Total	376		73,967	

TABLE 5.—Variable cost and rental price of water per acre-foot, representative irrigation companies, 1959

Company	Cash cost per acre-foot ¹	Rental price per acre-foot	
		Early season	Late season
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
North Poudre Irrigation Co.	2.50	2.50	4.20
New Cache La Poudre Irrigation Co.	2.50	3.25 all season	
Greeley and Loveland Irrigation Co.	2.87	3.00	5.00
Water Supply and Storage Co.	1.92	5.00	8.00
Farmers Reservoir and Irrigation Co.	4.04	4.60	6.00
Larimer and Weld Irrigation Co. and Windsor Reservoir Co.	{1.03 3.72	2.70 all season	

¹ The cash assessment divided by water delivered per share.

last 10 years for Conservancy District transfers, make possible a better adjustment of the land-water relationship than is normally found in western irrigated agriculture. They might well serve as examples for other areas in adjusting for the varying needs of water users.