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WATER RIGHTS AND LAND VALUES IN THE WEST-CENTRAL PLAINS

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ABSTRACT—Irrigation is vital to the economic activity of the west-central Great Plains. The crops grown, the distribution of center-pivot irrigation systems, and the basic transportation infrastructure is the same in northwest Kansas, northeast Colorado, and southwest Nebraska. But buyers of agricultural land face a different price for irrigated cropland in each of the states, even when the production characteristics of the land are similar. After accounting for factors like productivity and local property tax differences, we argue that it is the difference in water marketing rights between the three states that explains the price difference. The link between land values and water marketing rights is statistically developed by using Ordinary Least Squared (OLS) regression techniques. After adjusting for differences in property taxes, the analysis reveals that the implicit value of full water-marketing rights in the region is approximately \$1,026 per acre. This valuation is within the range of estimates provided by other comparable studies across the country.

Key Words: irrigation, land values, water rights

INTRODUCTION

On the Great Plains water presents the classic economic situation—a scarce resource with competing uses. In the west-central Plains, where Nebraska, Colorado, and Kansas adjoin, the demand for water is currently increasing.

The expansion of irrigation, population growth along the Front Range, and the allocation of water to meet habitat needs for endangered species using the Platte River have increased the demand for water. Water law in the three states, created long before these conditions existed, is facing unexpected pressures. As the states wrestle with water-related issues, a central issue that emerges is the question,

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“How valuable is a defined property right for groundwater?” This is an important question because more than 90% of water consumption in the western United States is attributed to irrigation. Irrigation is responsible for 91% of the groundwater withdrawn from the Ogallala High Plains Aquifer (Ashley and Smith 1999).

All three states rely heavily on groundwater. While the majority of Colorado’s population is now urban, irrigation accounts for 92% of groundwater withdrawals. Rural areas depend almost entirely on groundwater for domestic supply. Because surface water is fully appropriated in the state, all recent irrigation growth has come from groundwater. Nebraska is the third most irrigated state in the nation with nearly seven million irrigated cultivated acres. Groundwater provides the irrigation for approximately 90% of these acres. Like its neighbors, Kansas is very dependent on groundwater for irrigation. Groundwater accounts for 95% of all water used for irrigation in Kansas.

The groundwater valuation question is particularly important for Nebraska because policy makers are beginning to consider a redefinition of water rights that would allow a defined market for water to develop (Jess 2003). To answer this question, information on actual water-sale transactions in the three states would seem to provide the appropriate information. Unfortunately, this straightforward approach faces significant problems. First, there is no systematic collection of data on such transactions across the region. Second, it is not clear that all transactions are truly arm’s-length, as many transfers occur between related parties. Third, the transfer of water is much fuzzier than one would first imagine, with some “informal” transfers taking place. Fourth, only Colorado now has a developed water market, leaving the other two states with no direct water-sales information. Given these limitations, it is appropriate to take a hedonic approach that involves the estimation of implicit, shadow prices of water marketing rights. To help the reader better understand the situation, we begin with an overview of the differences in the water law for the three states.

WATER LAW IN NEBRASKA, COLORADO, AND KANSAS

Geographic characteristics influenced the development of water rights in the United States. The eastern half of the country generally adopted the doctrine of riparian rights while the western half adopted the doctrine of prior appropriation. The riparian rights doctrine had its origins in English common law; it provides that landowners along

a river, stream, lake, or watercourse have the right to reasonable use of the water. All riparian landowners have an equal right to use the water. One landowner’s reasonable use of the water was not to cause harm to competing users (Trelease 1974). As settlement moved west of the 98th meridian, the increasingly arid conditions made the riparian rights doctrine unworkable. In early settlement days, settlers quickly learned that it was best to get water to their land using any method possible, including digging canals, constructing stock ponds, and building dams to create reservoirs (Wolfe 1996). The prior appropriation system provided that whoever used the water first had the most senior rights. Typically, a registration system was established that granted a permit to use water from the river. Priority was based on the date of the permit. The older or “senior” appropriators would have priority over newer or “junior” users. In times of shortage, junior users can be required to stop diverting water until the senior users’ needs have been met.

Both Nebraska and Kansas are bisected by the 98th meridian, with roughly one-third of the each state lying to the east and two-thirds west of the line. The riparian rights doctrine came to Nebraska as part of the common law, but as settlers moved west and began to divert water to irrigate their property it became clear that the riparian rights doctrine would not work. In 1895 legislation was passed creating the doctrine of prior appropriation in Nebraska. Subsequent court cases held that riparian rights were not abolished, leaving Nebraska with the unusual distinction of having dual systems for surface-water usage. Realistically, though, prior appropriation is the doctrine in primary use in Nebraska today, as only those riparian uses that existed prior to 1895 and have not been lost are valid today.

Kansas also uses a prior appropriation system, requiring a permit to initiate a nondomestic water use. Kansas is similar to Nebraska in having a history of riparian rights that predates the prior appropriation system. Prior appropriation legislation for irrigation use was enacted in 1886, but narrow court interpretations resulted in the riparian system maintaining its dominance in the water law arena until Kansas adopted a comprehensive water code in 1945. Since then, a water right can be obtained only through a permit application procedure. Kansas has statutory procedures that apply to both surface and ground water. In Kansas, application for a permit is made to the Division of Water Resources, whose chief engineer considers whether the new use will impair an existing right or adversely affect the public interest. In order for the request to not adversely affect the public interest, it

must be a “safe yield,” that is, a balancing of water yield with restoration to the water supply. Obtaining a new permit is difficult, as much of the state’s water is classified as either fully appropriated, overappropriated, or very near safe yield (Wolfe 1996).

Colorado briefly recognized the riparian rights doctrine for agricultural water use; however, state laws and court decisions quickly ruled out the doctrine. The Colorado Constitution mentions the appropriation of water (Radosevich 1976), and subsequent legislation makes it clear that Colorado adopted the prior appropriation doctrine to allocate surface water (Wolfe 1996). Groundwater usage in Colorado went largely unregulated until legislation requiring well registration was passed in 1953. In 1965 the Colorado Groundwater Management Act was passed, applying the prior appropriation doctrine to all Colorado waters, including groundwater.

WATER RIGHT TRANSFERS

Water located within a state is viewed as public property and thus part of the public domain. For example, article 16, section 5, of the Colorado Constitution provides that all surface and underground water within the state is the property of the public and is “dedicated to the use of the people of the state.” Assuming access can be gained to surface water without trespassing on private property, the general public is free to boat or canoe on the water. While the water is considered public property, a water right or permit is generally considered a private property right. Once a permit is obtained to take water from the watercourse and put it to beneficial use, a property right is created.

There are substantial differences in how each state treats a water right and allows transfers of the right. Early court decisions in Colorado differentiated that state from Nebraska and Kansas. In Colorado, early court decisions recognized water rights as a type of private property right and ruled that the water rights could be alienated and severed from the land. A water right in Colorado is not considered an appurtenance to the real estate, so water rights may be bought, sold, leased, or transferred separately from the land. A water judge must approve the transfer, on the condition that it will not injure other vested water rights (Dewsnup and Jensen 1973). The legal status of a water right in Colorado has facilitated the development of water markets within the state. Population growth has fueled the need for water on the eastern slope of the Rocky Mountains, with cities buying water rights to meet population needs.

In Nebraska, a water right was traditionally attached to the real estate and could not be sold separately (Harnsberger and Thorson 1984). Irrigation permits required a description of the land to be irrigated, so the only way to acquire water rights in locations where water was fully or overappropriated was to acquire real estate that already had irrigation permits with early priority dates. Historically, water rights attached or were appurtenant to the land. In 1983 the legislature passed LB21, which allowed the transfer in location of surface-water appropriations. This law has since been modified but does not prevent a change in location of water appropriations from one place to another. Court decisions also shaped policy by initially prohibiting interbasin diversions of surface water and the transfer of groundwater across the state line. The latter decision was overturned by the U.S. Supreme Court in *Sporhase v. Nebraska ex rel. Douglas*, 458 U.S. 941 (1982), on the grounds that water was an article of commerce, and Nebraska’s denial of the transfer across the border was an unconstitutional restriction on interstate commerce. These legal barriers and the lack of a comprehensive water management plan prevented the development of water markets within Nebraska. Recent legislation has altered this doctrine and now specifically permits both interbasin and intrabasin transfer of groundwater off overlying land and the use of water in another state. This legislation may lead to the development of water markets in Nebraska.

Kansas is similar to both Nebraska and Colorado in that it is very difficult to obtain a new water permit in those geographical portions of the states subject to this study. The Kansas water code defines a water right as a real property right appurtenant and severable from the land to which the permit was issued. In contrast, as mentioned previously, Colorado treats the water right as an item of personal property separate from the land, while Nebraska until recently treated the water right as an appurtenance not severable from the land. However, the distinction from Colorado law may be immaterial in practical application, since Kansas recognizes that the water right is severable from the land. Thus, water rights in Kansas may be bought, sold, or leased, but any such change in the type or place of use is subject to approval by the chief water engineer.

Of the three states in this study, Colorado clearly has the most highly developed water market. Water rights in Colorado are more easily transferred than in Nebraska or Kansas. In contrast, there has been essentially no water market in Nebraska due to the legal constraints placed on the transfer of permits. Kansas water law allows the

TABLE 1
AVERAGE DOLLAR VALUE OF IRRIGATED LAND, PER ACRE, IN THREE STATES

	2000	2001	2002	2003	2004	2005	2006	Percent change
Kansas	1,040	1,060	1,080	1,080	1,110	1,240	1,300	25.00
Nebraska	1,580	1,600	1,630	1,650	1,750	1,940	2,150	36.08
Colorado	1,800	1,870	1,910	2,000	2,100	2,500	2,800	55.56

Source: USDA-NASS 2002, 2006.

transfer of water rights; however, much of the water in the western half of the state is fully appropriated or over-appropriated, effectively limiting the actual development of a water market in Kansas.

VALUE OF WATER MARKETING RIGHTS

Given that Colorado has a more developed water market than Kansas or Nebraska, the value of a water marketing right should be discoverable by examining property value differences between the three states. At the state level, the data indicate that irrigated land is increasing in value in all three states and is increasing most rapidly in Colorado (see Table 1).

The state-level data seem to support the hypothesis that the developed water market in Colorado has a discernible value. However, the state-level data are actually of limited use in determining the value of water marketing rights because of the wide intrastate variations in factors influencing land value. There are many factors in play at the state level beyond water marketing rights. Productivity, transportation costs, soil type, depth to available groundwater, and development opportunities are among the many factors that vary widely across the entire state.

Given the limited usefulness of state-level data, it seems logical to move to the county level for analysis. Unfortunately, this too is problematic. Part of the problem is geographic, as there is considerable variation in soil type, depth to water, and availability of water even within counties. This is particularly true in Colorado, which tends to have very large counties. A second problem is that the Census of Agriculture does not report data on irrigated land in sufficient detail to allow county-level analysis.

To accurately calculate the value of water marketing rights, we must go to the individual tract level. The area where Colorado, Kansas, and Nebraska adjoin presents an opportunity to determine the value of the water mar-

keting rights by looking at individual tracts of land. This area contains tracts that are similar in characteristics but located in different states. Since Mother Nature pays no attention to political boundaries, and the political boundaries here were not defined by a natural barrier or sharp change in landscape, tracts in this area have similar production characteristics but different legal environments. Thus, once we determine that production characteristics and costs are in fact similar, and after we account for differences in state and local taxes, the differences in land prices would represent the value of the water marketing right.

County-level data are useful in developing a general model of the relationship between land prices and value of output. We chose 41 counties along the tri-state boundary of Nebraska, Colorado, and Kansas for the purpose of developing the general model (see Fig. 1). These counties were selected due to their proximity to the border, economic involvement with agricultural, and homogenous physical characteristics. After the general model is developed, particular focus will be placed on the three counties immediately adjacent to the border: Yuma County, CO; Cheyenne County, KS; and Dundy County, NE.

Mean precipitation for the 41-county study area falls within the 15 to 22.5 inch range, with counties immediately adjacent to the tri-state border averaging below 17 inches (Fig. 2). Annual rainfall for the entire study area is below the critical 20-inch isohyet at which mixed-grain crop farming becomes marginal without the aid of irrigation (USDA-NRCS 2004). Officially, then, the region is defined as semiarid or a midlatitude steppe climate (USDI 2004).

Augmenting this marginal precipitation for agriculture is the High Plains Aquifer. Commonly referred to as the Ogallala Aquifer, this vast underground resource underlies 176,000 square miles stretching from South Dakota to Texas and contains an estimated 3.3 billion acre-feet of water, making the farmland above it the largest irrigation-sustained cropland in the world (McConnell

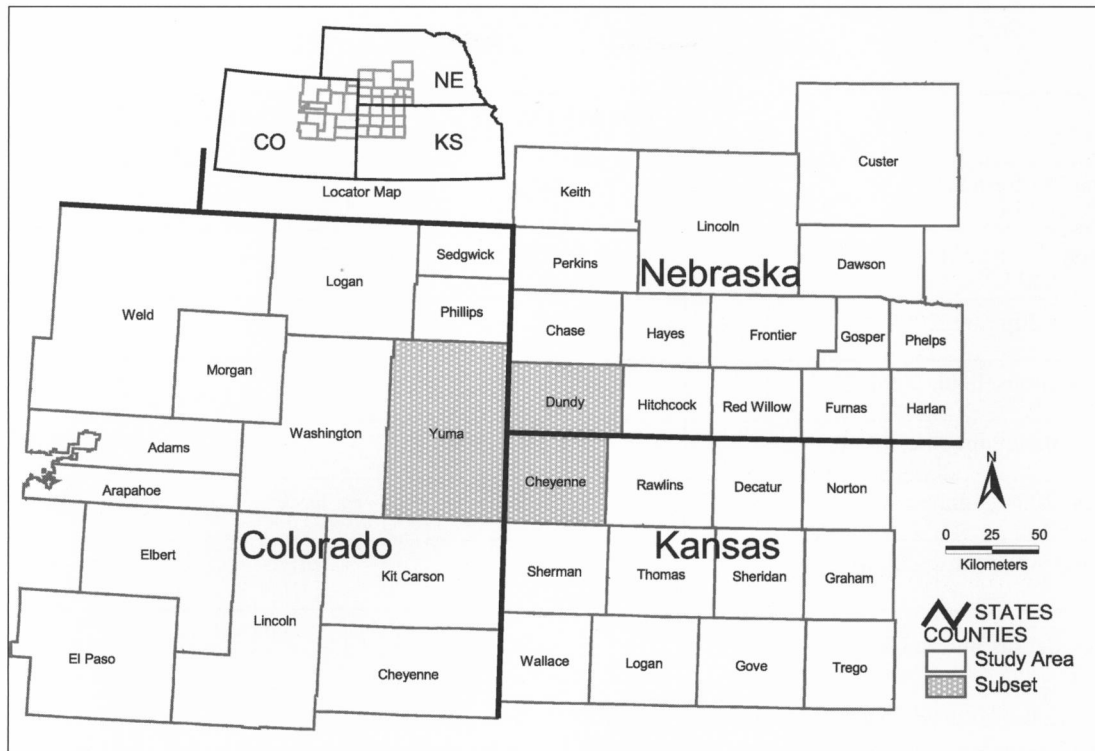


Figure 1. Study area.

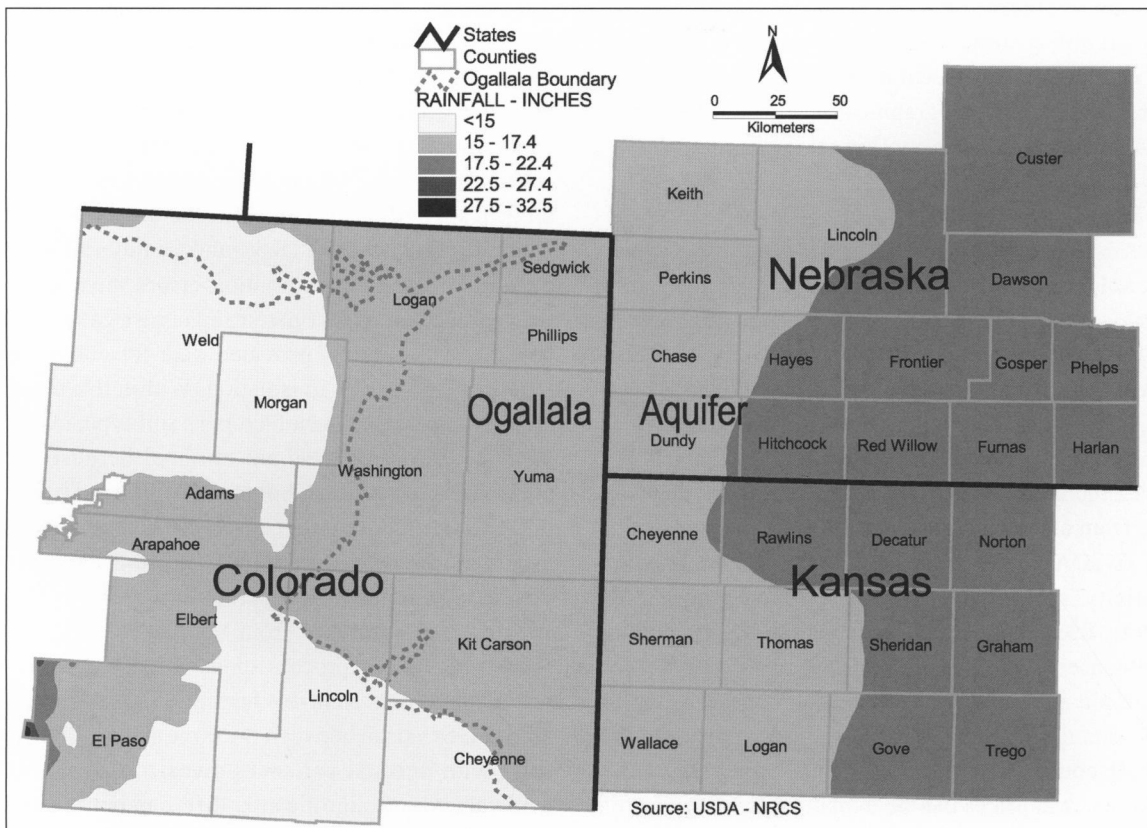


Figure 2. Average annual rainfall, 1961-1990. Source: USDA-NRCS 2004. Western boundary of Ogallala Aquifer shown by dotted line.

TABLE 2
COMPARISON OF THREE FOCUS COUNTIES

	Dundy County	Cheyenne County	Yuma County
Population, 2005 estimate	2,133	2,946	9,789
Population change, April 1, 2000, to July 1, 2005	-6.90%	-6.90%	-0.5%
Homeownership rate, 2000	72.70%	77.20%	70.80%
Persons per household, 2000	2.29	2.29	2.55
Per capita money income, 1999	\$15,786	\$17,862	\$16,005
Land area, 2000 (square miles)	920	1,020	2,366
Persons per square mile, 2000	2.5	3.1	4.2

Source: U.S. Census Bureau 2006

2004). While the High Plains Aquifer does not underlie the entire 41-county study area, it does underlie the three focus counties of Yuma, Cheyenne, and Dundy. The existing political boundaries were drawn without regard to the aquifer, so tracts in the three adjacent counties have similar rainfall patterns and similar access to the High Plains Aquifer. As illustrated by Table 2, the three focus counties are similar demographically. Furthermore, they are also similar agriculturally (Fig. 3).

DATA AND METHODS

The value of agricultural land is determined by factors such as location, soil type, and irrigation potential, which collectively determine the land's productivity. Conventional economic theory suggests the value of land largely comes from the discounted expected future earnings of the crops and/or livestock produced (USDA-ERS 2001). However, there is evidence that estimating land values on income from crops and livestock alone gives inconsistent results (USDA-NASS 2003). Components unrelated to productivity, such as low interest rates, poor returns to alternative uses, and government commodity programs, also influence land prices.

A simple regression of the "average market value of farm production per acre" on the "average value of land" for the 41-county sample reveals that only 32% of the variation in land prices can be explained by the value of farm production, which is a proxy for farm productivity. This clearly leaves room for other factors that influence

the variation in land prices, factors like water marketing rights, government payments, and local property taxes.

Analysis of county-level data indicates that there are factors beyond productivity that account for land price differentials, but these results can be made more meaningful by focusing on land values at a micro-level. To overcome the "noise" in statewide or even countywide data, we collected information on individual land-sale transactions in the tri-state area. Working directly with county assessors, we obtained recent sales information on arm's-length transactions in the adjacent counties of Yuma (CO), Cheyenne (KS), and Dundy (NE). This not only eliminated the estimation errors created by using the average value of irrigated and nonirrigated land at the county level but also provided data for considering the irrigated land values in isolation. Within this small study area, differences in such factors as soil type, rainfall, and depth to the water table are minimal because all tracts are close to the political border. We obtained information on land transactions that involved an arm's-length sale of irrigated land between 2001 and midyear 2004. This yielded a sample of 51 observations: 10 from Colorado, 10 from Kansas, and 31 from Nebraska.

We began the process of isolating the value of the water marketing right by testing whether the irrigated land values varied between the three states. A two-sample t-test with unequal variances revealed that the irrigated land values were significantly different between the state pairs of Nebraska-Colorado and Kansas-Colorado. The results are presented in Table 3.

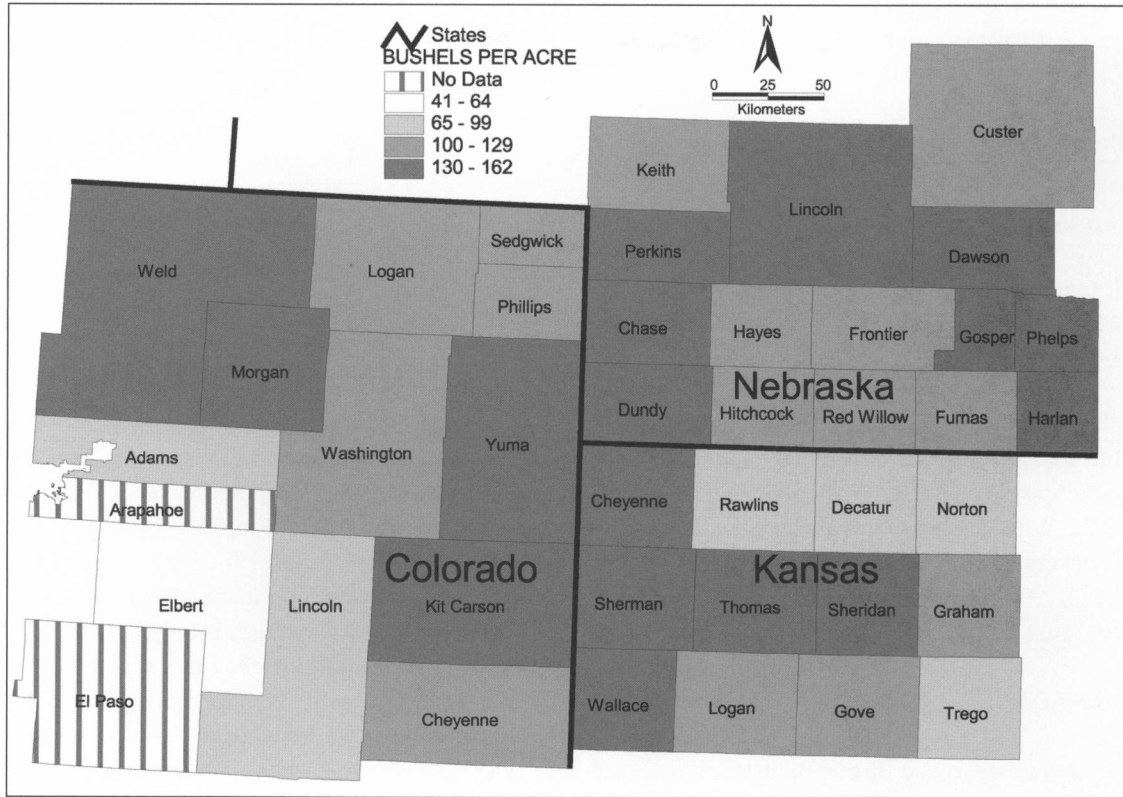


Figure 3. Corn production (1997) in the study area.

TABLE 3
T-TEST: TWO-SAMPLE ASSUMING UNEQUAL VARIANCES

	Nebraska	Colorado	Kansas	Colorado
	Variable 1	Variable 2	Variable 1	Variable 2
Mean irrigated land value (dollars)	683	1,859	910	1,859
Variance	9,820	304,211	65,596	304,211
Coefficient of variation	14	164	72	164
Number of observations	31	10	10	10
Hypothesized mean difference	0		0	
Degrees of freedom	9		13	
t Statistic	-6.71	**	-4.94	**

**Significant at 5% level.

The results of the t-test support the idea that there is a value to the water marketing right in Colorado that is not present in Nebraska or Kansas. Further, the difference between Nebraska and Colorado was greater than the difference between Kansas and Colorado. We expected this because Colorado has the greatest water transferability, Kansas less transferability, and Nebraska even less than

Kansas. To further isolate the influence of water marketing rights on irrigated land values, we performed an Ordinary Least Squared regression with a constant and a dummy variable representing the water marketing rights (Colorado = 1; Nebraska and Kansas = 0). Results of the analysis (see Table 4) reveal that water marketing rights significantly influence the irrigated land values across the tri-state border.

TABLE 4
ORDINARY-LEAST-SQUARES ESTIMATION
OF IRRIGATED LAND VALUE FUNCTION

Variable	OLS estimate
Intercept	738.05 (16.51)**
Water marketing rights (dummy)	1121.22 (11.11)**
R-squared	0.71

Note: t-values are in parentheses.

**Significant at 5% level.

Results from Table 4 show that the average irrigated land value across the tri-state border is \$738.05. Having water marketing rights improves the irrigated land value by \$1,121.22. Within the small area where the three states adjoin, the average irrigated land value is \$1,859 in Yuma County (CO), \$910 in Cheyenne County (KS), and \$683 in Dundey County (NE).

TAX IMPACT

We needed to make one further adjustment in isolating the value of the water marketing right. Differences in state and local taxes will influence land prices. The higher the tax payment by the owner, the smaller the annual net income for the owner. Thus, higher taxes will reduce the rate of return, which will decrease the price investors are willing to pay for the property. At the state level, Nebraska has the highest tax burden of the three states and Colorado the lowest (see Table 5).

While differences in the total tax burden influence the selling price of an asset, the tax with the most direct impact on land prices is the property tax. For example, a landowner could live in Nebraska but buy property across the border in Kansas or Colorado.

Each of the states takes a different approach to taxing irrigated land. In Colorado, the assessed value for agricultural land is based on the earning or productive capacity of the land regardless of the property's market value or its highest and best use. As a result, agricultural property is valued much lower than its actual market value. In 2004, there were 260,931 sprinkler-irrigated acres in Yuma County. Because the assessed value varies according to productivity, it also varies from place to place within the county. The average assessed value per acre was \$66.74, even though the countywide current selling price averaged more than \$1,800 (Colorado Department of Local Affairs 2006). The Yuma County average levy was .066479, so the average property tax per acre was \$4.44.

TABLE 5
STATE TAX BURDEN IN 2004

	Individual income tax per capita	Total tax per capita	National ranking in total tax
Colorado	\$741.83	\$1,532.26	48th
Kansas	\$700.63	\$1,932.58	27th
Nebraska	\$710.87	\$2,082.27	18th

Source: U.S. Census Bureau 2004

Beyond this traditional property tax, Yuma County irrigators pay one other important fee that effectively has the same impact as a property tax. Irrigators here are affected by the Republican River Compact settlement. On May 26, 1998, Kansas filed a complaint in the U.S. Supreme Court claiming that Nebraska had violated the Republican River Compact originally signed in 1942. Kansas contended that Nebraska had allowed the unimpeded development of irrigation wells that had a hydraulic connection with the Republican River and its tributaries. Thus, Nebraska was using more water than its allocation under the compact and was depriving Kansas of its full entitlement. Colorado was included in the Republican River Compact because the headwaters of the Republican arise in that state. The U.S. Supreme Court approved the Final Settlement Stipulation on May 19, 2003. Both Nebraska and Colorado agreed to allow more water down the Republican than they had in recent years. Colorado responded by creating an administrative body to identify and fund compact compliance measures to ensure that it meets the terms of the Republican River Compact and settlement stipulation. All irrigation that began after the compact was signed in 1942 is now subject to a \$5.50 fee per acre (Colorado Division of Water Resources 2006). Any new purchaser of irrigated land would consider the fee similar to a tax, so the effective tax burden would be approximately \$9.94 per acre.

Like Colorado, Kansas values each parcel of agricultural land on the basis of the agricultural income or productivity derived from the land in its current usage. Land devoted to agricultural use is assessed at 30% of its appraised use value. To determine the property tax liability, the assessed value is then multiplied by the mill rate for Cheyenne County. Even though the average selling price for irrigated land in 2004 was nearly \$1,000, the assessed value was less than \$60 per acre. In 2004 the average property tax per acre of irrigated land was \$5.50 (D. Smith, Cheyenne County Appraiser's Office, pers. comm. 2006).

In Nebraska, agricultural land is valued at approximately 80% of its market price. There was variation across the county, but the 2004 countywide average selling price was approximately \$800 per acre. In Dundy County, the 2004 average tax rate was .016648 (Nebraska Department of Property Assessment and Taxation 2006). Irrigated land in the county was assessed an average property tax of \$11.50 per acre (Dundy County Assessor's Office 2006).

For the three states, Nebraska had the highest property tax. Colorado had the lowest tax, but the \$5.50 Republican River Compact assessment increased the effective tax burden to just below Nebraska's. Kansas landowners enjoyed the lowest effective property tax of the three states. To control for these differences and isolate the value of the water marketing rights, the actual land prices must be adjusted to remove the impact of variance in property taxes. Adjusting for tax differences will increase the difference between Kansas and Colorado land values but will decrease the difference between Nebraska and Colorado values.

Given that Colorado has a fully developed market for water rights and Nebraska has the most restrictions on water transfers, we use these two states to determine the full value of the water marketing right. The differences between Nebraska and Kansas or Kansas and Colorado would reflect a partial, not a full, water marketing right. The average annual property tax differential between Dundy County and Yuma County is \$1.56 per acre. While this amount seems rather small, one must remember that many of the farms in the region are several thousand acres. Land purchasers have to consider tax implications as they decide on a rational land valuation. Valuation of any asset ultimately depends upon the timed series of after-tax cash flows the asset is expected to produce and the risk-appropriate discount rate needed to express expected cash flows in present-value terms. Determining the appropriate discount rate is challenging. Financial economists have developed three fundamental approaches to make the discount rate determination: (1) the Capital Asset Pricing Model, which seeks to establish a normative model for the market pricing of risk; (2) the Discounted Cash Flow analysis model, which relates expected cash flows to current market prices to infer an expected rate of return on a class of assets; and (3) the Risk Premium approach that utilizes broad market risk premiums-over-debt to estimate the slope of the Capital Market Line, and therefore the risk-appropriate rate of return on a capital investment.

In the corporate world, a combination of all three approaches is used to estimate a company's cost of equity

as a component of a weighted average cost of capital. But agriculture's structure makes the combination approach unusable for two reasons. Though it is certainly true that farms are growing larger and often operate in a corporate form, they are not publicly traded, offering no market pricing mechanisms for risk and no proxy valuations. The third approach, which seeks a market-based proxy for risk, is the appropriate method to estimate the discount rate. With no actual market transactions actually setting a price for risk, we needed to find a proxy that best represents the variance in the expected cash flow being discounted. Property taxes paid by an individual landowner represent a shared responsibility to pay the obligations of the taxing authority in question, and may be expected to vary with those underlying obligations. Therefore, the best market proxy is the market rate for the taxing authority's long-term bond issues.

Currently, both Dundy and Yuma counties have outstanding long-term bond issues. In 2006 Yuma County's current long-bond rate was 4.00% and Dundy's was 3.35%. Dundy County's \$11.50 property tax, discounted at 3.35% for perpetuity, was worth \$343.28, and Yuma County's \$9.94 property tax, discounted at 4.0% for perpetuity, was worth \$248.50 for a difference of \$94.78. To adjust for the tax impact, the OLS estimate of \$1,121.22 (Table 4) for the full water-marketing right in Colorado would be adjusted down by \$94.78 to \$1,026.44.

The implicit value of water marketing rights obtained from this study is similar to earlier approximations from other studies. For example, Aiken (2002) used the difference between irrigated and dryland values in the South Central Crop Reporting District in Nebraska to estimate the value of water marketing rights between \$1,053 and \$1,085. In fact, these numbers were used by Wyoming in the Nebraska vs. Wyoming lawsuit. Other studies, using different methods and assumptions, have identified differing values for water marketing rights in other parts of the country. These results are summarized in Table 6.

The implicit value of water marketing rights obtained from this study is within the reasonable range provided by estimates from other studies mentioned in Table 6. Further, it is reasonable to expect a range in values for water marketing rights, given the diverse regions of study, the differences in actual state-defined marketing rights, and the different methodological approaches to valuation.

CONCLUSION

The results of the analysis clearly establish the link between well-defined water marketing rights and the

TABLE 6
COMPARABLE STUDIES OF THE VALUATION OF WATER MARKETING RIGHTS

Study	Study region	Approach used	Value of water marketing right
Golden 2004	Western Kansas	Land value is determined by discounted net present value of future income stream. Value of water on 8% capitalization rate. Value of marketing rights varies by location and well capacity.	\$281 to \$879
Carey and Zilberman 2002	Westland Water District of California	Actual transactions in dollars per acre foot per year leases. The transactions have been converted into a dollar value of the water marketing right by discounting the lease income stream for 30 years at 8% discount rate.	\$496 to \$1,295
Jaeger 2004	Upper Klamath Basin, Oregon	The long run value of irrigation water is estimated by looking at market values of irrigated and non-irrigated land with similar soil types.	\$550 to \$2,300 differences in land market price.
Aiken 2002	South Central Crop Reporting District	Difference in prices of irrigated and dryland was used as the value of water marketing right.	\$1,053 to \$1,085

value of land in the tri-state area. At a macro-level, productivity of the land tract and local property taxes significantly drive the value of land. Although the effect of water marketing rights on land values was obscured when analysis was done using county-level data, micro-level analysis using individual land-sale transactions clearly establishes the link between water rights and land values. Micro-level data analysis reveals that the implicit value of a full water-marketing right in the tri-state region is \$1,026.44. The result is extremely valuable in settling water disputes in the region and also in providing a comparable basis for the value of the water rights in a policy context, especially when Nebraska is actively considering the development of a market for water rights.

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