# DECLINING AQUIFERS, INCREASING ELECTRICITY PRICES, AND CENTER PIVOT IRRIGATION IN SOUTHEASTERN WYOMING

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## INTRODUCTION

Irrigated acreage in Laramie County, Wyoming increased from 14,000 acres in 1960 (7 percent of the cultivated acres) to over 47,000 acres in 1977 (24 percent of the cultivated acres). This increase in irrigated acres coupled with low ambient precipitation and recharge to the aquifer has resulted in an annual decline of the water table up to four feet in some areas. The average annual decline is on the order of one to two feet over much of the irrigated acres in Laramie County (Crist, 1980).

The 1957 Wyoming State Legislature added Section 41-129 to the Wyoming Statutes establishing a framework for the designation of Ground Water Control Areas. The Pine Bluffs and Carpenter Control Areas were established on March 7, 1973 and consolidated September 2, 1981 to form the Laramie County Control Area. The Laramie County Control Area is an area of approximately 1,600 square miles in the southeastern corner of Wyoming. Ground water control areas are governed by the state engineer with recommendations from the State Board of Control and a local citizen advisory committee.

In February 1977, the state engineer, upon recommendation from the State Board of Control, imposed a moratorium on groundwater development in what is now the Laramie County Control Area. This moratorium prohibits the drilling of new wells with a capacity exceeding 50 gallons per minute. This moratorium has stabilized the rate of decline in the water table, but did not eliminate or decrease the rate of decline in that area.

The majority of producers in Laramie County use electricity to power their center pivot irrigation systems. Since 1977, the price of electricity in rural Laramie County has increased approximately 125 percent (Rural Electrification Annual Reports). During this period prices for all other factors of production have increased an average of 47 percent (U.S.D.A., 1976-1981). Prices received for the crops produced have increased about 28 percent (Wyoming Crop and Livestock Report Service, 1976-1981) over the same time period. As a result of the relative increases in electricity prices, producers in the study area have seen increasing amounts of their gross income being absorbed by electricity expenditures. Wholesale electricity prices have been projected to continue to increase at an annual rate of 10 percent through 1992 and up to 17 percent annually from 1993 through 2002 In nominal terns (Tri-State Generation and Transmission Annual Report, 1981).

The cropping area of the Laramie County Control area is typified by rolling hills and plains ranging in elevation from 5000 feet at Pine Bluffs to 6000 feet at Cheyenne. The average annual precipitation is 14 to 16 inches. Due to the high elevation and low precipitation, summer fallowed dryland wheat and grass hay are the primary crops grown without the aid of irrigation. The type of irrigated crops is also limited due to the relatively cool evenings characteristic of higher elevations in this region. Alfalfa hay, corn for silage, dry edible beans, feed barley and winter wheat are the irrigated crops included in this study. These irrigated crops account for only 24 percent of the cultivated acres, but over 50 percent of the crop sales in Laramie County, excluding potatoes. Because of limitations on crops produced, it is

hypothesized that energy costs could have a major impact on farm income and land use in Laramie County.

The objective of this study is to estimate the impacts of increasing energy prices and decreasing groundwater levels on land use and farm income for a case farm in Laramie County. An extension of the above objective is determining the sensitivity of these impacts to electricity prices, irrigation system and crop prices.

## PROCEDURE

A 500 acre grain-forage case farm model was designed to simulate a typical farm situation In the Laramie County Control Area. The case farm model is divided into four 125 acre center pivots. Crops are grown in units of one-quarter pivot. It is assumed that as the cost of irrigation increases, crops having a negative return will leave the solution and the land will revert to dryland wheat production. Irrigated acres are assumed to revert to dryland wheat production in units of whole center pivots.

A linear programming model is used to maximize returns to land and management by subtracting production costs and electricity expenditures from prices received for each crop subject to land, labor, water use, and yield constraints. The land use constraints are based on marketing and crop rotation assumptions. Feed barley and alfalfa are allowed to be greater than or equal to zero, however, feed barley is assumed to be a nurse crop for alfalfa and is constrained to be equal to one-third of the alfalfa acreage. Corn silage is limited to be less than or equal to one half pivot due to its dependency on the availability of a local forage market and the local livestock industry. Dry beans are

constrained to no more than one pivot because of the historical volatility in the price of beans. Irrigated winter wheat and summer fallowed dryland wheat are allowed to be greater than or equal to zero. All constraints are based on 1982 cropping information from the study area (University of Wyoming, 1975, 1979 and 1981).

The electricity coefficients in the objective function are the prices paid for electricity per kilowatt hour and the price paid for the connect charge per horsepower. These coefficients are increased a specified amount for each consecutive run of the linear program by an exogenous FORTRAN program. The increases represent the real annual increase in electricity prices. A second FORTRAN program increases the kilowatt hour coefficients a specified amount for each consecutive run of the linear program. The increase in the number of kilowatt hours used per crop represents the additional kilowatt hours required annually to pump the same quantity of water for an incremental decline of 1.5 feet in the aquifer per year. A third FORTRAN program combined the linear program with the previous two FORTRAN programs to give dynamic properties to the model. The third FORTRAN program allows the model to run four consecutive loops. Each loop represents a five year increment from the base year, 1982, through the year 2002.

The coefficients for fixed and variable costs of production were obtained by using the AGNET crop budget and pump cost programs with 1982 prices and physical data from the study area. The electricity coefficients were obtained directly from the Rural Electrification Association, REA, supplying power to the local producers. The expected crop price coefficients are based on a historical relationship between

prices paid and received for the period 1976-1981. The higher than expected crop prices are ten percent higher than the expected crop prices and the lower than expected crop prices are ten percent lower than the expected crop prices. The rate of increase in the electricity coefficients is based on a ten percent annual increase projected by the power wholesaler for that area, Tri-State Generation and Transmission, less various selected rates of inflation.

## RESULTS

Implementation of the model estimated the effects of increasing depths to water and increasing electricity prices on farm income and land use. The sensitivity of these effects to various crop prices and rates of increase in electricity prices are presented for the 500 acre case farm using high pressure center pivots in Table 1 and low pressure center pivots in Table 2. Base year, 1982, solutions for high and low pressure center pivots were obtained for three different sets of crop prices using the same production coefficients and constraints.

### High Pressure Center Pivots

The high pressure center pivot results (Table 1) using expected crop prices and constant electricity prices with a 1.5 foot annual decline in the water table shows a 9.9 percent decline in returns to land and management by the year 2002 from the 1982 base year solution. The 9.9 percent decline is a result of increased electricity requirements to draw water from 8 depth 30 feet greater than the base year. The cropping pattern is unaffected by the declining water table. All irrigated crops enter the solution irrigating all 500 acres. A

2 percent real annual increase in electricity prices results in a 23.6 percent and 38.0 percent decline in returns to land management by 1992 and 2002, respectively. Alfalfa and feed barley are replaced by an equivalent amount of dryland wheat by 1992 resulting in a crop mix that remains stable through 2002. A 4 percent real annual increase in electricity prices causes a 34.6 percent decline in returns to land and management by 1992 and a 55.3 percent decline by 2002. Alfalfa and feed barley are replaced with dryland wheat by 1992 and corn silage and irrigated winter wheat are replaced with dryland wheat by 2002. The crop mix in the year 2002 is 125 acres of irrigated dry beans and 375 acres of dryland wheat. A 6 percent real annual increase in electricity prices result in a decline of 44.5 percent in returns to land and management by 1992 and a decline of 77.4 percent by 2002. One pivot of irrigated dry beans and 375 acres of dryland wheat are the crops entering the 1992 and 2002 solutions. An 8 percent real annual increase in electricity prices results In a decline in returns to land and management of 52.2 percent and 78.3 percent by 1992 and 2002, respectively. One pivot of irrigated dry beans remains in the solution in 1992, but all irrigation ceases by 2002 and is replaced with dryland wheat. A decline of 61.2 percent and 78.3 percent in the returns to land and management by 1992 and 2002 are caused by a 10 percent real annual increase in electricity prices. Again, all irrigated activity is replaced with dryland wheat by the year 2002. even though 125 acres of irrigated dry beans enter the 1992 solution.

With lower than expected crop prices, one pivot of irrigated dry beans and 375 acres of dryland wheat are the only crops entering the

various solutions. Ail irrigation ceases by 2002 for the 6 percent and 8 percent real annual rates of increase in electricity prices and by 1992 for the 10 percent rate of increase.

For higher than expected crop prices, all 500 acres are irrigated in year 2002 for constant electricity prices and a 2 percent real annual increase in electricity prices. A 4 percent real annual increase in electricity prices forces alfalfa and feed barley acreage to be replaced with dry land wheat by 2002. An 8 percent real annual increase in electricity prices forces alfalfa and feed barley to be replaced by dryland wheat by 1992 and all irrigated acreage to dryland wheat by 2002. A 10 percent real annual increase in electricity prices leaves 125 acres of Irrigated dry beans as the only Irrigated crop with 375 acres of dryland wheat by 1992. All irrigation is replaced with dryland wheat by the year 2002.

Low Pressure Center Pivots

The low pressure center pivot results (Table 2) using expected crop prices and constant electricity prices with a 1.5 foot annual decline in the water table shows a 5.7 percent decline in returns to land and management by the year 2002 from the 1982 base year solution. The 5.7 percent decline is a result of increased electricity requirements to draw the same amount of water from a depth 30 feet greater than the base year depth. The cropping pattern is unaffected by the declining water table. All irrigated crops enter the solution irrigating all 500 acres. A 2 percent real annual increase in electricity prices results in a 12.6 percent and a 29.0 percent decline in returns to land and management by 1992 and 2002, respectively, with no change in the

cropping pattern from the base year solution. A 4 percent real annual increase in electricity prices causes a 24.5 percent decline in returns to land and management by 1992 and a 50.7 percent decline by 2002. Alfalfa and feed barley acreage are forced to dryland wheat production after 1992. A 6 percent real annual increase in electricity prices result in a decline of 38.3 percent in returns to land and management by 1992 and a decline of 64.3 percent by 2002. The cropping pattern remains unaffected through 1992, but by 2002 one pivot of irrigated dry beans is the only irrigated crop in the solution with 375 acres of dryland wheat. An 8 percent real annual increase in electricity prices results in a decline in returns to land and management of 47.3 percent and 79.1 percent by 1992 and 2002, respectively. Alfalfa and feed barley are forced to dryland wheat production by 1992 and corn silage and irrigated winter wheat are replaced with dryland wheat by 2002. A decline of 55.6 and P4.2 percent in returns to land and management by the year 1992 and 2002 are caused by a 10 percent real annual increase in electricity prices. Alfalfa and feed barley are replaced with dryland wheat by 1992 and all irrigation is forced to dryland production by 2002.

With lower than expected crop prices, all irrigated crops enter the base year solution with all 500 acres being irrigated. A declining water table has no effect on the crop mix. Alfalfa and feed barley do not enter the 1992 solutions for 2 percent and 4 percent real annual increases in electricity prices. All other solutions for 1992 have 125 acres of dry beans being irrigated and 375 acres of dryland wheat.

All irrigation ceases by 2002 for 8 and 10 percent annual increases in real electricity prices.

For higher than expected crop prices, all 500 acres are irrigated and all specified irrigated crops enter the base year solution. A declining water table, 2 percent, and 4 percent real annual increases in electricity prices have no effect on the crop nix through 2002. The base year crop nix enters the 1992 solutions for the 6, 8 and 10 percent real annual increases in electricity prices. Alfalfa and feed. barley acreage is forced to dryland wheat by 2002 for a 6 percent real annual increase in electricity prices. The 2002 solution for an 8 percent real annual increase in electricity prices consists of 125 acres of irrigated dry beans and 375 acres of dryland wheat. All irrigation is replaced with dryland wheat by 2002 for a 10 percent real annual increase in electricity prices.

## CONCLUSION

The impacts of a declining water table and increasing electricity prices on the case farm model for high pressure pivots versus low pressure pivots is significant for all crop price scenarios. Returns to land and management are significantly higher under low pressure than under high pressure identical cropping patterns due to the lower electricity requirements and lower connect charges. Crops under irrigation are continued longer under low pressure center pivots with fewer scenarios resulting in dryland wheat by 2002 than under high pressure center pivots.

The cost of electricity for this case farm in 1983 has increased 15.5 percent for high pressure systems and 17.8 percent for low pressure

systems over 1982 costs. The inflation rate was approximately 4 percent in 1982. This 1s a real annual increase in electricity prices of 11.5 percent and 13.8 percent for high pressure and low pressure systems, respectively. Ramifications of increases of this magnitude can be seen by examining the results presented In Tables 1 and 2. Converting systems that were high pressure in 1982 to low pressure systems in 1983 for this case farm model would result in a 25.3 percent decrease in electricity expenditures from 1982 or a decrease of $11.19 per acre due to lower electricity requirements and lower connect charges. The cost of conversion is approximately $4.89 per acre over ten years.

Table 1. High Pressure Center Pivot System.

| | Annual Increase in Electricity Prices | Returns to Land and Manage. | Percent Change in Returns From Base Year | Price of Electric. c/Kwh | a/ Connect Charge in /Horse Power | Annual Consump. of Kilowatt Hours | Total Annual Labor Hours | Total Annual Water Use in Acre Feet | Crop Acreage Alfalfa Hay | Feed Barley | Corn Silage | Dry Beans | Winter Wheat | Dryla Whea |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower Than Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 9074.81 | | 3.41 | 15.91 | 92056.32 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 0% | 8823.39 | -2.8 | 3.41 | 15.91 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 8558.86 | -4.2 | 3.41 | 15.91 | 101915.28 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 2% | 7730.34 | -14.8 | 4.15 | 19.30 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 6001.07 | -33.9 | 5.06 | 23.41 | 101915.28 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 4% | 6408.60 | -29.4 | 5.05 | 23.35 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 2265.35 | -75.0 | 7.48 | 34.28 | 101915.28 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 6% | 4862.16 | -46.4 | 6.10 | 28.12 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 1984.92 | -78.1 | 10.92 | 49.71 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 1992 | 8% | 3013.16 | -66.8 | 7.36 | 37.79 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 1984.92 | -78.1 | 15.88 | 71.74 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 1992 | 10% | 1984.92 | -78.1 | 8.84 | 40.51 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 2002 | | 1984.92 | -78.1 | 22.94 | 103.14 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 24011.57 | | 3.41 | 15.91 | 452358.72 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 0% | 22856.17 | -4.8 | 3.41 | 15.91 | 475965.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 21640.52 | -9.9 | 3.41 | 15.91 | 500804.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 2% | 18338.97 | -23.6 | 4.15 | 19.30 | 193356.96 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 14884.67 | -38.0 | 5.06 | 23.41 | 203447.60 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 1992 | 4% | 15698.75 | -34.6 | 5.05 | 23.35 | 193356.96 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 10737.85 | -55.3 | 7.48 | 34.28 | 101915.28 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 6% | 13334.66 | -44.5 | 6.10 | 28.12 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 5429.72 | -77.4 | 10.92 | 49.71 | 101915.28 | 669.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 8% | 11485.66 | -52.2 | 7.36 | 37.79 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 5214.92 | -78.3 | 15.88 | 71.74 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 1992 | 10% | 9307.77 | -61.2 | 8.84 | 40.51 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 5214.92 | -78.3 | 22.94 | 103.14 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| Higher Than Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 42755.83 | | 3.41 | 15.91 | 452358.72 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 0% | 41600.43 | -2.7 | 3.41 | 15.91 | 475965.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 40384.78 | -5.5 | 3.41 | 15.91 | 500804.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 2% | 36573.17 | -14.5 | 4.15 | 19.30 | 475965.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 28616.70 | -33.1 | 5.06 | 23.41 | 500804.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 4% | 30489.47 | -28.7 | 5.05 | 23.35 | 475965.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 19541.27 | -54.3 | 7.48 | 34.28 | 203447.60 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 1992 | 6% | 24728.46 | -42.2 | 6.10 | 28.12 | 193356.96 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 13902.22 | -67.5 | 10.92 | 49.71 | 101915.28 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 8% | 21035.04 | -50.8 | 7.36 | 37.79 | 193365.96 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 8444.92 | -80.2 | 15.88 | 71.74 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 1992 | 10% | 17778.27 | -58.4 | 8.84 | 40.51 | 96860.44 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 8444.92 | -80.2 | 22.94 | 103.14 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |

a/ The high pressure connect charge assumes the producer is on a one way voluntary shut-off. The connect charge is paid only when there are irrigated acres.

Table 2. Low Pressure Center Pivot System.

| | Annual Increase in Electricity Prices | Returns to Land and Manage. | Percent Change in Returns From Base Year | Price of Electric. c/Kwh | a/ Connect Charge in /Horse Power | Annual Consump. of Kilowatt Hours | Total Annual Labor Hours | Total Annual Water Use in Acre Feet | Crop Acreage Alfalfa Hay | Feed Barley | Corn Silage | Dry Beans | Winter Wheat | Dryla Whea |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lower Than Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 14328.96 | | 3.41 | 9.28 | 328621.92 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 0% | 13412.48 | -6.4 | 3.41 | 9.28 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 12433.36 | -13.2 | 3.41 | 9.28 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 2% | 11243.28 | -21.5 | 4.15 | 11.27 | 143144.70 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 9111.54 | -36.4 | 5.06 | 13.67 | 76887.64 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 4% | 9576.10 | -33.2 | 5.05 | 13.65 | 143144.70 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 6722.89 | -53.1 | 7.48 | 20.09 | 76887.60 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 6% | 8448.76 | -41.0 | 6.10 | 16.46 | 71707.04 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 3327.16 | -76.1 | 10.92 | 29.19 | 76887.64 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 8% | 7280.37 | -49.2 | 7.36 | 19.79 | 71707.04 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 1984.92 | -86.1 | 15.88 | 41.20 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| 1992 | 10% | 5904.51 | -58.8 | 8.84 | 23.75 | 71707.04 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 2002 | | 1984.92 | -86.1 | 22.94 | 60.77 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 33062.91 | | 3.41 | 9.28 | 328621.92 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 0% | 32146.44 | -2.8 | 3.41 | 9.28 | 352353.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 31167.81 | -5.7 | 3.41 | 9.28 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 2% | 28905.66 | -12.6 | 4.15 | 11.27 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 23478.06 | -29.0 | 5.06 | 13.67 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 4% | 24976.63 | -24.5 | 5.05 | 13.65 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 16299.35 | -50.7 | 7.48 | 20.09 | 153486.44 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 1992 | 6% | 20384.97 | -38.3 | 6.10 | 16.46 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 11799.66 | -64.3 | 10.92 | 29.19 | 76887.64 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 8% | 17412.53 | -47.3 | 7.36 | 19.79 | 143144.70 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 6912.43 | -79.1 | 15.88 | 41.20 | 76887.64 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 10% | 14664.79 | -55.6 | 8.84 | 23.75 | 143144.70 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 2002 | | 5214.92 | -84.2 | 22.94 | 60.77 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |
| Higher Than Expected Crop Prices | | | | | | | | | | | | | | |
| 1982 Base | | 31807.18 | | 3.41 | 9.28 | 328621.92 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 0% | 50890.70 | -1.8 | 3.41 | 9.28 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 49911.57 | -3.7 | 3.41 | 9.28 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 2% | 47649.93 | -8.0 | 4.15 | 11.27 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 42222.33 | -18.5 | 5.06 | 13.67 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 4% | 43720.90 | -15.6 | 5.05 | 13.65 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 30967.22 | -40.2 | 7.48 | 20.09 | 369820.86 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 1992 | 6% | 39129.24 | -24.5 | 6.10 | 16.46 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 21363.57 | -58.2 | 10.92 | 29.19 | 153486.44 | 1020.0 | 291.7 | 0 | 0 | 62.5 | 125.0 | 62.5 | 250.0 |
| 1992 | 8% | 33629.93 | -35.1 | 7.36 | 19.79 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 15384.95 | -70.3 | 15.88 | 41.20 | 76887.64 | 667.6 | 145.8 | 0 | 0 | 0 | 125.0 | 0 | 375.0 |
| 1992 | 10% | 27156.55 | -47.6 | 8.84 | 23.75 | 352363.74 | 1950.0 | 718.8 | 187.5 | 62.5 | 62.5 | 125.0 | 62.5 | 0 |
| 2002 | | 8444.92 | -83.7 | 22.94 | 60.77 | 0 | 210.1 | 0 | 0 | 0 | 0 | 0 | 0 | 500.0 |

a/ The low pressure connect charge assumes the producer is on a one way voluntary shut-off. The connect charge is paid only when there are irrigated acres.

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