Estimating the Value of Irrigation Scheduling

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Estimating the Value of Irrigation Water

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INTRODUCTION

The Northern High Plains (NHP) of Texas is home to more than a million acres of irrigated crop production. Corn is the most important crop in the region and accounts for almost 40% of the irrigated acreage (USDA NASS, 2015). Corn is also the major water user in the region with about 60% of the region’s total irrigation water being used for corn production (Freese and Nichols Inc., 2015). Since this area is dependent on the Ogallala Aquifer for irrigation water, the diminishing water availability from the Aquifer is making the adoption of more water efficient irrigation practices necessary. Management techniques such as irrigation scheduling and deficit irrigation are critical for sustaining irrigated agriculture in the region.

Although optimal irrigation scheduling can enhance profits, it also has some associated costs. Understanding the economic value of irrigation scheduling will enable the producers to assess the associated costs and returns and make informed decisions. Hence, the objective of this study was to estimate the value of irrigation scheduling for corn in NHP of Texas.

METHODOLOGY

- Irrigation quantity and corn yield data from the “200-12 Demonstration Project” during 2012-2014 were used for the analysis (NPGDC, 2015)
- The project had both demonstration plots (optimal irrigation scheduling followed) and side-by-side control plots (farmer’s practices followed) during these years
- Since the corn production function is approximately linear at the levels of irrigation used in the region (Marek et al., 2011), production per acre-inch of irrigation from the demonstration and control plots were compared to estimate the value of irrigation scheduling, assuming constant marginal productivity
- The increase in profitability was estimated from the increase in yield per ac-inch considering corn prices during those years and additional cost for harvesting and hauling
- The corn budgets for the respective years were used as guidelines for profit calculation (Texas A&M AgriLife Extension, 2015) and Returns Above Direct Expenses (RADE) per acre-inch from the demonstration and control plots were also compared

RESULTS

- Overall, the demonstration plots used 18.06 ac-in of irrigation to produce 182.63 bu. of corn per acre, while the control plots produced 201.20 bu. of corn per acre with 21.83 ac-in of irrigation (Table 1)
- On average, science-based irrigation scheduling resulted in a 9.72% increase in corn yield per ac-inch of irrigation water applied compared to the farmers’ practice (Table 1)
- Considering the average yield (182.63 bu./acre) and price ($5.57/bu.) over these years, a 9.72% yield increase translates to $91.22/acre revenue increase after adjusting for additional cost for harvesting and hauling ($0.41/bu.)
- The percentage increase in yield per ac-in for demonstration over control showed a decreasing trend for values above zero from 2012 to 2014. This suggests that producers may be learning about proper irrigation scheduling, and their practices became more efficient with respect to the control over the course of the trial (Figure 1)
- Return for the demonstration was 7.99% higher than control, and would increase to 10.88% if the unusually low value observed in 2014 were disregarded (Table 2)
- The average RADE, considering both the demo and control plots, was $434.75 per acre. Thus, a 7.99% increase in RADE translates to a gain of $34.73 per acre, while an increase of 10.88% would result in a gain of $47.30 per acre

CONCLUSIONS

Sound irrigation scheduling practices increased net returns for corn producers in Texas NHP. The value of irrigation scheduling depends on corn prices, the amount of irrigation water available, and the resultant yield. The producers seem to learn from the demonstration project and use the knowledge to refine irrigation scheduling.

REFERENCES


Table 1. Average irrigation, yield, and yield/ac-inch for demonstration and control plots

<table>
<thead>
<tr>
<th>Year</th>
<th>Irrigation (ac-inch)</th>
<th>Yield (lbs./acre)</th>
<th>Yield / unit irrigation (lbs./ac-inch)</th>
<th>% change in yield/ac-inch irrigation</th>
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<tbody>
<tr>
<td>2012</td>
<td>21.85</td>
<td>157.67</td>
<td>7.22</td>
<td>40%</td>
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<tr>
<td>2013</td>
<td>23.37</td>
<td>224.09</td>
<td>9.59</td>
<td>50%</td>
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<td>2014</td>
<td>20.12</td>
<td>215.20</td>
<td>10.70</td>
<td>40%</td>
</tr>
<tr>
<td>All data</td>
<td>21.83</td>
<td>201.20</td>
<td>9.22</td>
<td>5%</td>
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</tbody>
</table>

Table 2. RADE/ac-inch for demonstration and control plots

<table>
<thead>
<tr>
<th>Year</th>
<th>Returns/ac-inch (control)</th>
<th>Returns/ac-inch (demo)</th>
<th>Increase in returns (demo over control)</th>
<th>% increase in returns (demo over control)</th>
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<tr>
<td>2012</td>
<td>$23.34</td>
<td>$25.39</td>
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<td>2013</td>
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<td>2014</td>
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<td>$21.03</td>
<td>$22.71</td>
<td>$1.68</td>
<td>7.99%</td>
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Figure 1. Percentage increase in yield/ac-inch for demonstration over control plots

Figure 2. RADE/ac-inch for demonstration and control plots

Table 3. Average irrigation, yield, and yield/ac-inch for demonstration and control plots

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