Irrigation Effect on Soybean Yield

Many growers question the effect of differing amounts of irrigation on soybean yield and how various products respond differently to amounts of water applied. Proper irrigation management and product selection are both critical components of optimizing soybean yield potential. In 2012, a trial was designed to help determine how selected products respond to different irrigation amounts.

Study Guidelines

Previous studies conducted at the Monsanto Learning Center at Gothenburg, NE evaluated the effects of the amount and timing of irrigation on yield potential of different soybean products. In 2012, a trial was designed to determine how specific products respond to different irrigation regimes.

The study looked at six different Genuity® Roundup Ready 2 Yield® products planted under dryland conditions and three different irrigation regimes. The six products were planted at 140,000 seeds/acre on May 2 in 30-inch rows into corn-soybean rotated ground. Dryland plots measured 115 feet by 2 rows and irrigated plots measured 150 feet by 2 rows. This study included three replications of each product used.

Strip tillage was performed and 80 lbs of phosphorus were applied on April 2. Dryland plots were harvested September 27 and irrigated plots were harvested on October 1. Between April 2 and September 27, plots received 5 inches of rainfall. The three irrigation regimes were based on crop evapotranspiration (ET): 50% ET – 8.25 inches of water applied, 100% ET – 16.50 inches, and 125% ET – 19.75 inches.

It is important to note that SoyWater, a web-based irrigation tool hosted by the University of Nebraska-Lincoln, recommended 22 inches which is even more than the 125% ET rate. Therefore, these levels do not reflect SoyWater recommendations.

Weed management across the trial included a pre-plant application of Enlite® herbicide (2.8 oz/acre), Roundup PowerMAX® herbicide (28 oz/acre), and Sharpen® herbicide (2 oz/ acre) sprayed on April 23. Post-emergence weed control consisted of an application of Roundup PowerMAX® herbicide (28 oz/acre) and Warrant® Herbicide (2 pints/acre) sprayed on July 2. No fungicides or insecticides were used in this trial.

Results

Average soybean yields under dryland conditions were less than half the yields of those in irrigated situations (Figure 1). Yield also increased from the 50% to 100% ET levels, but leveled off with only a slight increase from 100% to 125% ET. Figure 2 examines irrigation effects on yield, as well as average plant height and average number of nodes. The trend in yield increase is also apparent for the plant height and number of nodes with a larger increase recognized between the 50% and 100% ET than between 100% and 125% ET levels.

Three out of 6 soybean products demonstrated increased yield with increased irrigation at each level (Figure 3). In the rest of the products, yield increased with increased irrigation up to 100% ET, after which the yield either remained stable or decreased slightly. This shows the importance of applying the required quantity of water to avoid the negative effects of overwatering and to save
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money by not applying an excess of water. Table 1 lists net return information and supports 100% ET as the most profitable irrigation level.

Summary

Comments

The 2012 results were in concurrence with what has been found previously in trials conducted at the Monsanto Learning Center at Gothenburg. In a 2011 trial evaluating irrigation results in soybeans, there was a positive yield response to irrigation versus no irrigation. During that trial, average soybean yields increased from 66 bu/acre to 74 bu/acre from dryland to 50% ET and then decreased to 71.6 bu/acre at 100% ET. The 2012 yields for dryland or little irrigation were comparatively lower than 2011 which may be a result of less rainfall received this year (5 inches) as compared to last year (14.6 inches).

A 2010 trial on soybean irrigation also showed that higher amounts of irrigation positively affected the yields. Yield results in 2010 ranged from 74 bu/acre to 26 inches of water (including both rainfall and irrigation) to 80 bu/acre at 31 inches of water. The control treatment during the 2010 trial received 23 inches of rainfall (much more than amount received in 2012).

The findings of this study confirm that irrigation, applied at the proper amount, is not only beneficial from an overall yield advantage standpoint, but can affect net return as well. It is also important to reemphasize that overwatering can have a direct, negative impact on potential profitability.

Table 1. Cost analysis of soybean irrigation levels.

<table>
<thead>
<tr>
<th>ET</th>
<th>Seed price/acre</th>
<th>Avg Yield (bu/acre)</th>
<th>Gross return ($)</th>
<th>Irrigation cost ($) (inches * cost/inch)</th>
<th>Net return ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>64.30</td>
<td>31</td>
<td>446.06</td>
<td>0.00</td>
<td>446.06</td>
</tr>
<tr>
<td>50%</td>
<td>64.30</td>
<td>69</td>
<td>985.64</td>
<td>82.50</td>
<td>903.14</td>
</tr>
<tr>
<td>100%</td>
<td>64.30</td>
<td>79</td>
<td>1136.72</td>
<td>165.00</td>
<td>971.72</td>
</tr>
<tr>
<td>125%</td>
<td>64.30</td>
<td>80</td>
<td>1151.11</td>
<td>197.50</td>
<td>953.61</td>
</tr>
</tbody>
</table>

**Figure 3. Soybean irrigation effect on yield by product.**

The information discussed in this report is from a single site, replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

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