Costs, Comparisons, and Effectiveness of Chlorophyll Sensing Sprayers in a Chemical Fallow Operation

Guest Article by Bill Jepsen

During the 1990's there was a lot of interest in direct seeding or no-till farming where the only tillage was performed with a single pass of a drill. Along with direct seeding, there was a renewed interest in annual cropping. In Morrow County, annual cropping has met with very limited success. Over the last several years, there has been a movement back to summer-fallow/winter wheat as the mainstay rotation. If the benefits that come from direct seeding are to be continued, the summer-fallow has to be accomplished using a chemical fallow system with no tillage. There were approximately 175,000 acres of summer fallow in Morrow County last year. Of these acres, it was estimated that 30,000 acres were chemical fallow. For chemical fallow to be successful, two main criteria have to be met. First, chemical fallow has to compete cost-wise with traditional fallow. Second, there must be adequate summer broad leaf weed control. Summer weeds such as Russian thistle, kochia, prickly lettuce, tumble pigweed, and marestail make up the bulk of weeds to deal with. Problems with low humidity, high temperatures, and dust have made summer ground sprayer applications difficult. Currently most summer glyphosate applications are applied by air. An alternative to aerial spraying is to use a chlorophyll sensing sprayer also known by its brand name—the WeedSeeker. In March of 2006, I was granted a Western Sustainable Agriculture Research and Education grant to look at the cost and effectiveness of using a WeedSeeker verses aerial spraying for summertime applications in chemical fallow. In addition, I kept track of operations and costs of two nearby farms that had very typical conventional fallow practices.

The first step in the project was to select two adjacent 100 acre plots in a single field. The cropping history of the field was chemical fallow in 2004 and winter wheat in 2005. Fall and spring herbicide applications were identical in both parcels. After the middle of June, all applications were aerially applied on one side, and the chlorophyll sensing sprayer was used on the other. Since this was a demonstration plot, there was no need to replicate the experiment. Good weed control was accomplished with both treatments, so yield differences the following harvest were expected to be negligible and were not measured. Costs for all operations were entered in a spreadsheet and totaled for each year. The two-year project was performed during the 2006 and 2008 fallow year using the same location.

Refer to the spreadsheet (page 3). Notice that the first glyphosate application was in November for both years. I have become a real fan of fall glyphosate applications. Fall applications are usually made with ideal spraying conditions which consist of low temperatures, high humidity and no dust. Low rates of 10 to 15 ounces/acre do an excellent job of killing fall volunteer growth. The fields are bare over the winter, effectively stopping any green bridge diseases that can hinder the next crop. On my farm, if the winter precipitation is above average, the decision to annual crop may be made. When a fall application has been made, I can spray early in the spring with 16-20 ounces of glyphosate/acre and start seeding the next day. If chemical fallow is made, the first spring spraying can be delayed until early to mid May. At that time, cheatgrass and rattlefescue can be easily killed before going to seed, and the first flush of Russian thistles has usually emerged. Notice from the year one spreadsheet (page 3) that the first spring spraying was earlier than it should have been for chemical

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fallow. I had planned to annual spring crop that field, but was notified that I had received the Western SARE grant and needed a location for chemical fallow. The February spraying pushed my second ground rig broadcast to June 3rd. The rest of the fallow period was completed using two passes with the WeedSeeker. During most years, two passes with the WeedSeeker are needed for good weed control. There are always a few small weeds the chlorophyll sensing sprayer will miss. The first application is just before our harvest season, and the second is right after harvest is completed. When using the Weed Seeker, I spray a 4% glyphosate solution. This translates to a total spray volume of 25 gallon/acre, and a rate of one gallon/acre glyphosate when one nozzle fires on one weed.

If you look at the year two spreadsheet (page 4), the timing of all applications was pretty typical for my operation. The only variation came in not needing a second WeedSeeker treatment. Weed populations in August were low enough that a few hours on the four wheeler sprayer was all that was needed.

Another big difference between year one and year two was in the price of glyphosate. All year one applications were made with glyphosate costing $10.34 to $12.41/gallon. In year two, the fall application was made with leftover $10.92/gallon glyphosate, but the spring and summer applications were made with $30.00/gallon glyphosate. The aerial applied glyphosate for year two cost $33.00/gallon.

The different tillage trips for two conventional fallow systems from nearby neighbors are also listed. Assigning costs to these operations is difficult. I have interviewed multiple farmers and economists and have received tillage costs that vary as much as 100%. The 2008 Doane’s report lists a cost of $14.00/acre for chisel plowing and $5.25/acre for broadcast spray applications. I have tried to come up with a reasonable price for tillage trips. Year two of the study in 2008 had tremendous increases in fuel and equipment prices. Sprayer costs were increased by $0.25/acre and tillage trips were increased by $1.00/acre. If you are uncomfortable with these tillage costs, just replace them with your own, and see what you come up with. Conventional fallow costs the first year were overall similar to the chemical fallow, but in year two both conventional fallow treatments were more expensive than either chemical fallow treatment.

In summary, when glyphosate prices were low as it was in year one, the WeedSeeker and aerial treatments had almost identical costs. On year two with glyphosate running $30.00/gallon or more, the WeedSeeker treatment had a $7.83 advantage. Both year one and year two had below average summer precipitation. If the summer precipitation had been above normal, there would have to be some extra applications to cover the extra weed flushes. The need for one extra aerial treatment with 50 ounces of glyphosate in year two would have added an additional $18.64/acre! Every year is different and there is still a lot to learn in making chemical fallow. Overall, the Weed Seeker did an adequate job of replacing aerial applications for summertime glyphosate applications. Every new technology has its strong points and weaknesses. The WeedSeeker has a long list of both positive and negative characteristics to consider before purchasing a unit. If you are interested in building a WeedSeeker sprayer feel free to contact me, and I can share what I have learned in the four years of using the unit.