

CONDUCTING ON-FARM RESEARCH

William R. Jepsen

To give you a little background, I farm in northeast Oregon near the town of Heppner. My farm is approximately 3500 acres in size and has 3000 tillable acres. The 41 year average rainfall is 12.19 inches. The wettest crop year recorded was 18.58 inches and the driest crop year was 6.46 inches. The majority of the annual precipitation falls in the winter and early spring months. The summers are warm and dry with very low humidity. This type of climate favors early season cereal crops, but makes it difficult to grow warm season summer crops. Our soils are silty clay loam loess soils with a depth of only 2-3 feet. Most slopes are gradual up to 25%.

This area was homesteaded in the 1890's and the farming practice has been almost exclusively a winter wheat, summer fallow rotation. Changes started taking place in the 1990's. I began experimenting with growing annual spring crops in 1993 and had my first experience with direct seeding in 1997. In 1999 the entire farm was converted to a one pass direct seed system using a combination of annual spring crops and chemical fallow, winter wheat. With this new system of farming came the need for a knowledge base on everything from fertility for annual crops, successful rotations, how to make chemical fallow work, etc. The list was long and answers were few. A lot of information was available from farmers in North Dakota, Montana and the Canadian prairies where direct seeding technology was 7 to 10 years ahead of us, but our climate was significantly different. There was a tremendous need for a large amount of practical applied research to be done by the professional research community and local farmers.

This paper is a summary of the types of on farm testing that have been used on my farm. In addition I hopefully have some tips on how to deal with common problems associated with on farm research. I will cover seven types of experiments. They are:

1. Professional
2. Visual
3. Side by Side Comparisons
4. One Year Full Drill Width Plots
5. Long Term Large Plot Trials
6. Equipment Trials
7. Observe your Neighbors



Professional Plot

The professional plot is one that is managed by an outside researcher. It is usually small in size, but is designed to gather statistically significant data that can stand up to a critical review by fellow researchers. An example of such a plot is on a neighbor's property. It is a fertility study of late fall seeded winter wheat on chemical fallow. The plot has a randomized complete block design with four replications. That means the entire experiment is repeated four times and the individual treatments within each block are in a random by chance order. This plot has six treatments that are 180 feet by 8 feet wide making the total number of individual plots to keep track of and harvest at 24. The plot takes up less than one acre. A statistical analysis can be applied to the harvest yields that can show if the results are actually valid. Even though the individual farmer will seldom undertake this type of project, there is a great opportunity to offer a small plot of land on your farm for one of these plots. Here in Oregon, research farm space is limited and there is demand for donated locations. It is worth visiting with your local research agencies or even chemical companies that may be interested in this type of activity. Make sure both you and the researcher have a good understanding of what is expected of each other before starting any trials.

Visual

This is the simplest form of experiment you can do. A common example is to tarp and flag a selective herbicide spray treatment. I try to put these out every time we spray selective herbicides. Over the years I would have been fooled in the interpretation of a spray job without this simple tool. Another example of a visual test I am using this year is trying to evaluate the effectiveness of a chemical called Spartan. Spartan is a new chemical to us that has potential use to control summer broadleaves (mainly Russian thistles) in chemical fallow. To create the plot our cereal crops extension agent and I simply filled a four wheeler sprayer tank with a 5 ounce/acre mix and started spraying a back and forth pattern until the tank ran out. Some skips and double overlaps were intentionally thrown in. The corners of the plot were flagged and observed the entire fallow period. Since there is potential for crop damage the following year, the four corners of the plot were reflagged and now have a good stand of winter wheat. Any crop damage can be observed during the rest of the growing season next year.

Side by Side Comparisons

This is probably one of the most common experiments and can be used to gather some very accurate data. This method works well for herbicide or fertilizer comparisons, variety trials, or comparing equipment. All you have to do is create a long strip that has treatments along side each other, the longer the strip the better. I like to use a full field length, many times a half a mile or more. The strips need to be wider than a full header width on your combine. When harvesting move over from the center line enough so that your header has an entire width at all times. You can pick up the little skip later. Use a weigh wagon, your own scale, or haul it to the local elevator for weights. The beauty of this type of trial is that any variation in soils is usually shared equally by each treatment making the results quite significant.

One Year Full Width Drill Experiments

This type of plot requires a little more time, but is an excellent way to compare several different crops or varieties at one time. It is a good way to compare several different fertilizer spray rate treatments. The example I am going to use was carried out in 1997. We had been experimenting with banding fertilizer with annual spring cropping for a few years. Since this was a new practice for our area, the local field men were uncertain on what to recommend. Much of their knowledge was based on a winter wheat, fallow rotation. We were being told that phosphorus was the most important element to deep band and that sulfur was adequate and not that important. To test this information our local extension agent and I set up a simple test. A winter wheat stubble field was chosen for the test. Twelve ounces of glyphosate was applied, the field was chiseled twice, and 50 lbs/acre of anhydrous ammonia was applied with the second chisel pass. The field was cultivated and the plot



was set out for 8 drill strips. Four of the strips were seeded to four different crops using 40 lbs/acre of 11-52 fertilizer and the other four strips were seeded to the same set of crops using 100 lbs/acre of 16-20-0-15. Both of these plots received the same amount of phosphorus, but the 16-20 plots also received 15 lbs/acre of sulfur and 11 lbs/acre more nitrogen. The differences at harvest time were tremendous! Below is a chart of the yield differences. This was a reasonably simple plot to manage, but had a major impact on starter fertilizer selection for spring crops in our area.

1997 Starter Fertilizer Trial		
Yield/acre		
Starter Fertilizer	11-52	16-20
Soft White Spring	46.6	52.2
DNS	35.4	44.4
Yellow Mustard	552 lbs	952 lbs
Baronesse Barley	1.2 tons	1.8 tons

Long Term Large Plot Trials

This type of trial is a lot more time consuming and is most likely carried out with some outside help and financing. The 27 acre plot that I still manage on this farm was originally sponsored by Monsanto corporation. You may remember a number of Monsanto trials with the name Center of Excellence. This was one of those types of plots. Since we lived in a winter wheat, traditional fallow area, the goal of this experiment was to compare winter wheat, full width tillage summer fallow with several other rotations. These included winter wheat, chemical fallow, continuous barley, DNS, soft white spring and several 3 year rotations with spring canola, mustard and pulse crops included. The plot had 16 different treatments that were 80 feet x 900 feet long. There was room at one end for additional 40 feet x 400 feet variety trials. To keep track of all activity I use a timeline sheet that I enter data into whenever any job is performed at the plot. At the end of each year all expenses and incomes are entered into a spreadsheet. Monsanto sponsored the plot for a period of five years. At that time Oregon State University picked up the responsibility and the plan is continue it for several more years.

Equipment Trials

I will briefly mention equipment trials because I think it is overlooked many times. If you are looking at purchasing a new piece of equipment or technology, it has been my experience that taking the time to thoroughly try the equipment out can be well worth it. For example this year I watched a Weed Seeker sprayer demonstrated. It is a chlorophyll sensing sprayer that only sprays when it detects a green weed. It has tremendous potential in our area for chemical fallow and after harvest burn down of summer weeds, but it is expensive. It is also a lot of fancy technology to hang on a spray boom and drag around a dirty field for hours on end. The dealer for this unit put a small demo rig together. I talked him into renting the unit to us for two weeks. After two weeks of use you really get the feel for the strengths and weaknesses of a particular piece of equipment and can make an informed decision on whether to purchase or not.

Observe your Neighbors

This one is self explanatory, but I mention it because most farmers miss out on a lot of valuable information by not paying close attention to what their neighbors are doing. There are other farmers out there doing on farm research and a lot of their results never get published. Take time to find these plots and visit them. I like to travel around and visit plots and observe fields at least twice during the crop year, once when the crop is



established and again between heading and harvest. I also make time to call neighbors when I see something particularly interesting and visit with them about it.

Tools, Problems, Solutions

When doing on farm research there have been a few items that have made the job much easier. A four wheeler sprayer has been extremely valuable in spraying individual plots. A weigh wagon is almost a must for multiple treatment plots. If the local research community is promoting on farm research these two items should be a priority to purchase and make available to farmers. GPS guidance systems are just ideal tools to set up a plot. It used to take hours to square up and measure out a large multiple treatment plot. Now all I have to do is have somebody plant flags while the GPS guides me in a straight line while each plot is seeded. Yield monitors on combines are becoming more commonplace. With a well calibrated yield monitor you could harvest all your plots of each grain class on the go and never have to use a weigh wagon.

One of the worst problems I have encountered with the long term plots is that of spray accuracy and drift. It is difficult to spray glyphosate right next to a winter wheat plot in the spring or to spray broadleaves next to a mustard or a pulse crop. This problem can also cause a weed build up over the years near the edge that you try to avoid when spraying. A four foot edge effect on each side of a plot is 10% of the 80 foot plot. This can cause a distortion of yields in that treatment. Last year I had the wind shift 180 degrees while spraying with my field sprayer and I damaged a third of a winter wheat plot. To overcome this problem I have done two things. I have switched from using 80 degree regular flat fan nozzles to using 110 degree air induction nozzles. The droplet size is larger with the air induction nozzle and it still provides adequate coverage for glyphosate applications. When spraying I also stay at least two to three feet from the edge of the sensitive plots. I come back later and spray the edges by hand. When high pressure dominates the weather pattern here we consistently have mild south breezes in the morning and north breezes in the afternoon. One side of the sensitive plots are sprayed in the morning and the other later in the day. When the wind is in your favor, you can spray 2,4-D amine or glyphosate within inches of a sensitive crop and not damage it.

When marking plots we use a lot of flags. I have not been able to find a good flag that will last a year without the flags ripping off. If you cover each of the vinyl flags with transparent packaging tape it will help get more time out of them.

On Farm Testing Advantages

There are many advantages to doing on farm testing. Some of these include:

1. Gain experience in growing new crops or new varieties of established crops
2. Learn how different tillage systems work.
3. Gain experience in using new herbicides
4. Fine tune fertility needs
5. Learn what works in your soils and climate, with your equipment, in your own hands
6. Mistakes are not as costly on a small scale

It takes some time and effort to do on farm research, but the information gained is well worth it. If you would like to contact me I would welcome comments or questions.

Contact:

Bill Jepsen

PO Box 188 Heppner, Or 97836

Phone: 541-676-5244

E-Mail: jepsenfarm@starband.net