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USING AN ON-FARM TEST FOR VARIETY SELECTION
INTRODUCTION

Varieties of wheat, barley, and other crops differ in yield, disease resistance, frost tolerance, drought tolerance, and other traits. The varieties you grow on your farm are probably based largely on published characteristics and yield reports from regional trials. Widespread adoption of a new variety normally takes several years, or a disaster with an existing variety. This time lag between an improved variety's availability and acceptance can result in profit losses for growers.

Management factors, such as crop rotation, herbicide use, fertilizer use, tillage intensity, as well as local soil and climatic conditions can influence the performance of varieties. For example, a disease resistant variety may have consistently greater yields in fields with a high level of the disease, even though it does not normally rank among the top yielders in published tests.

On-farm tests allow you to measure the performance of new varieties in your own fields in order to make the most profitable choices for your farm.

There are two types of on-farm tests:

1) Coordinated regional tests with one replication per farm. This type of test involves many growers within a particular zone. Each grower agrees to put out one strip of each test variety, and the data from all farms are combined to produce the replication needed to draw statistically valid conclusions. The regional test gives a good estimate of the relative performance of each variety under different growing conditions. In order to be successful, this type of test requires a well-planned effort and a minimum of four to six farmers. Results from only one unreplicated location can be very misleading, so it is essential that data from all of the locations are scrutinized together. Your county Extension agent can help you become involved in a coordinated, regional test.

2) On-farm test with multiple replications. If you are working as an individual farmer you need four replications of each test variety in order to produce reliable results. This is the type of test that will be discussed in this fact sheet.
DESIGNING AN ON-FARM TEST OF VARIETIES

The main objective in any on-farm test is to give the treatments being compared (varieties in this case) an equal chance of performing well. Long, narrow, side-by-side strips provide the most accurate results. The strips should be positioned across the landscape so that there is little chance that one strip is in a more productive location than the others. For example, the strips in the photo run across the hills. If strips are placed on the contour near the bottom or top of a slope, the varieties on the bottom or top will be growing in different soil and moisture conditions than the varieties closer to midslope, causing a biased test. On land leveled for irrigation, try to avoid placing one strip where topsoil has been removed if its comparison strip is where topsoil has not been removed.

It is best to plant strips wide enough to allow one full combine cut down the middle for yield determination. However, some farmers have put one variety in each drill box, and plugged the end opener so there is an extra space between strips. At harvest they carefully cut each variety separately, working from one side. In either case, weigh wagons or portable truck scales make it easy to weigh the grain harvested from each strip.

**Number of varieties.** To keep the test practical and maximize accuracy, the number of varieties tested should be kept small—two to four is best. The more varieties tested, the wider each replication becomes, increasing the likelihood that different varieties will be growing in different soil conditions.

**Length and width of strips.** In general, the longer the strips, the more accurate the test. In some very uniform fields, successful tests have been performed in strips as short as 300 feet, but strips of 700 to 1,000 feet or more will ensure that you are able to detect differences between varieties accurately. If the seed supply is too small for long, combine-width strips, it is better to make the strips narrower instead of shorter.

**Number of replications.** We strongly recommend four replications, that is, repeat the side-by-side comparison of all varieties in four places. Replications can be next to each other in one field, in different locations in a field, or even in neighboring fields. Replication is the key to confidence in your results.

**Randomization.** After you have picked a place to put one replication, assign varieties randomly to each strip within the replication. This helps insure that some soil pattern affecting crop growth does not bias the results. For example, if you are comparing three varieties, find a place where you can place three strips side-by-side and expect that they are in equally productive soil conditions. Then draw names from a hat to decide which variety goes in which strip. Repeat this process for each replication.

**Data collection.** Harvest each strip separately and record the weight. Measure the length of each strip so you can accurately calculate the area harvested. A wheel counter on the combine can save time measuring distances. Make sure the moisture in the grain of each variety is similar, or test grain from each strip for moisture to allow correction of the yield results. Test weight information is often helpful, so collect representative samples for test weight determination. Any observations of
differences in germination, winterkill, lodging, disease, or insect damage (or the lack of differences) should be written down for future reference.

**Analyzing your results.** A careful look at how the varieties compare across all four replications will often reveal much about the relative performance of the varieties. Are the differences between varieties, averaged over replications, greater than the differences from replication to replication? Some basic statistics will help you decide whether small or inconsistent differences should be taken seriously or not. Your county Extension agent can do the statistics for you or you can obtain a simple computer program from Oregon State University (see “Resources”).

A change in varieties is not as risky or costly as other changes in farming practices. This means we do not need to have as high a level of confidence in our conclusions. For example, let’s say we did a test and the average yield of a new variety was three bushels higher than our normal variety. There may have been enough variation from strip to strip so that our Least Significant Difference (LSD) at a 5% confidence level was four bu/ac. This means that there was more than a 5% chance that the three-bushel difference we measured between varieties was only due to natural variability between strips. Now suppose we calculate the LSD at a 20% confidence level and find it is two and one-half bu/ac. This tells us that there is less than a 20% chance that the three-bushel difference in yields we measured was just due to normal variability between strips. (In other words, an 80% chance the difference was really due to differences in varieties.) This might be enough confidence to plant a sizable acreage of the new variety (after considering disease resistance, winterhardiness and other characteristics) with the expectation that there probably is a yield advantage. If you find the above confusing, remember help is available from your county Extension agent.

**RESOURCES**

**AGSTATS.** A statistics program for simple field trials written for IBM compatible computers. Send disk and postage return mailer, or check for $5.00 made out to Oregon State University, addressed to Russ Karow, Crop Science Building 131, Oregon State University, Corvallis, OR 97331-3002.

**Annual Pacific Northwest On-Farm Test Results.** Data and conclusions from tests are compiled at the end of each year. Call the WSU Crop and Soil Sciences Extension Office (509-335-2915).


**On-Farm Test Record Form, PNW487.** 1995. $1.50. Order from WSU Cooperative Extension Bulletin Office (509-335-2857). A convenient form to simplify planning and record keeping for on-farm tests.
This Fact Sheet was produced as part of the STEEP II On-Farm Testing Project by Stewart Wuest, project coordinator, Washington State University and University of Idaho; Russ Karow, Extension Agronomist, Oregon State University; Stephen Guy, Crop Management Specialist, University of Idaho; Baird Miller, Extension Agronomist, Washington State University; Roger Veseth, Extension Conservation Tillage Specialist, Washington State University and University of Idaho; and Don Wysocki, Extension Soil Scientist, Oregon State University.

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