NC STATE UNIVERSITY

KNOWING YOUR FIELD

A Guide to On-Farm Testing for Peanut Growers

To maximize profit when growing peanuts, farmers rely on recommendations for variety selection, fertility and liming, selection and timing of pesticide applications, and harvesting. Printed recommendations are often too general. They must be tested on the farm to find out what works and what does not. On-farm testing can be exciting and the results conclusive if a scientifically sound approach is used. This publication offers suggestions on testing new practices on your farm.

The system of on-farm testing will allow you to make the most informed decisions about production and pest management practices. You already know your farm better than anyone else. You also know the type and degree of risk you are willing to take. The five examples in this publication will show you how the knowledge you gain from on-farm testing can allow you to come up with the best answers—answers that will allow you to maximize profit on your farm.

The "knowing your field" technique of on-farm testing simply involves dividing the field in question into at least three strips for each practice, pesticide, or other component that you're interested in. The size of each strip can vary. It depends on your equipment and how comfortable you feel with the inputs or practices you are testing. Say you are considering reducing the amount of fumigation or eliminating it completely. To test this, you will have to eliminate fumigant on part of the field. Will you leave several passes without fumigation? Or, will you not fumigate the equivalent of half of the field?

The "knowing your field" approach is more accurate than testing based on splitting fields in half, which compares one side of the field to the other. One side may have different soil characteristics or levels of pest infestation. Consequently, the two treatments may not have an equal opportunity to succeed or fail. Testing by splitting such a field in half can lead you to a false conclusion about a treatment.

STEP 1. When testing disease, insect, or weed control practices, your first step is to accurately identify the pest in question. Cooperative Extension, through your local Extension agent, can provide excellent resources for pest identification.

STEP 2. Then, select sections for your "knowing your field" test to determine how a production or pest management practice will impact pest populations and peanut yield. Choose your sample strips. It's easiest if you choose strips that run in the same direction as the peanut rows for the entire length of the field.

Carefully mark the strips and prepare an accurate map to identify treatments. Flags or wooden stakes are often used, and depending upon the treatments, measurements from a permanent object may be important. Record the number of rows from that permanent object on your field map.

STEP 3. Monitor plant and pest reaction throughout the season and accurately document differences between strips (treatments). Because soil characteristics or pest pressures may vary within the row, choose at least three "stops," locations where you will collect pest data. The average from these three stops will give you the average pest population for the strip. Repeat this procedure for each strip across the field. Yield data should be recorded for the entire strip, not just the stops. A sample data collection sheet is provided in Figure 1.

Data Collection Sheet (Sample)

Field name or identification number: _____

Date: _____

Evaluator: _____

Measurement and procedure: _____

_____

Strip	Treatment	Stop 1	Stop 2	Stop 3	Average

Figure 1. Sample Data Collection Sheet.

For some treatment comparisons, yields are not critical. However, the ultimate measure of a treatment's success is yield and economic return. In addition to pest reaction, other important indicators of treatment differences are plant damage, pod yield, and market grades, and maturity determination. Determining peanut yield and market grades can be challenging. Your county agent can help with this.

STEP 4. Use the information you've collected to draw conclusions about the best procedures for your farm from your on-farm test.

The following examples use the "knowing your field" technique to design tests that answer common questions. The final section looks at interpreting results.

Example 1. Should I fumigate to control CBR (black root rot)?

1. Identify the pest. It can be difficult to distinguish between CBR and tomato spotted wilt virus late in the season. Although the presence of red perithecia or fruiting bodies (Figure 2) is an obvious indicator of CBR, they are not always present.

In many cases, the only sure way is to examine seeds of diseased plants. Cinnamon-colored speckles on seeds are characteristic of CBR (Figure 3), while tomato spotted wilt sometimes causes a deep reddening on one end of the seed and cracked seed coats (Figure 4).

Figure 2. Red parathecia indicate that the plant is infected by CBR.

Figure 3. Speckled seed (top row) from plant with CBR, healthy seed (bottom row) without speckles.

Figure 4. Seed from a plant with tomato spotted wilt virus are misshapen with cracked seed coats. There are no speckles on seed from plants infected by tomato spotted wilt virus.

Data Collection Sheet for Field *A24.*
Field identification number: *A24*
Date: *September 27, 2000*
Evaluator: *Johnson*
Measurement and procedure: *Number of plants in a 100-foot section with CBR.*

Strip	Fumigation	Stop 1	Stop 2	Stop 3	Average
1	No	21	35	19	25
2	Yes	4	2	6	4
3	No	14	5	6	8
4	Yes	1	2	1	2
5	No	0	0	2	1
6	Yes	1	0	1	1
7	No	1	1	2	2
8	Yes	0	1	0	1

Figure 5. Data Collection Sheet for Field *A24.*

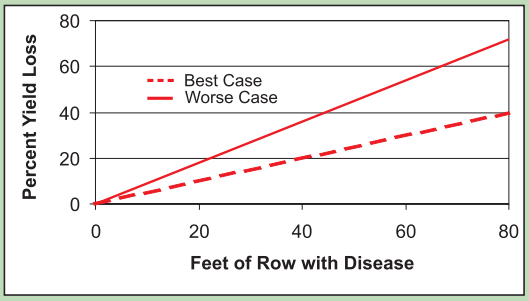

Figure 6. Relationship of Disease to Yield Loss from Soil-Borne Diseases. This relationship of percent yield loss and percent disease has been developed from many years of research.

2. Design your on-farm test using the "knowing your field" technique. This grower marked and mapped three 100-foot-long sections at three stops within each of the eight strips. He prepared a data collection sheet.

3. Monitor plant and pest reaction throughout the season and accurately document differences between strips (treatments). Record results on your data collection sheet. This grower determined the percentage of plants showing CBR symptoms, and filled in his data collection sheet (Figure 5). He fumigated strips 2, 4, 6, and 8.

After recording diseased plants at three stops along each strip, he used the percentages to estimate yield loss from that amount of disease (Figure 6).

If you look back at the collection data sheet, you'll see how data derived from splitting the field would have mislead the grower. First, let's compare the strips without fumigation. The percent of disease in Strips 1 and 3 have considerably more disease (an average of 17) than Strips 5 and 7 on the opposite side (an average of 2). If the half of the field containing Strips 1 through 4 was fumigated, the amount of CBR would be 3. If Strips 5 through 8 were not fumigated (an average of 2), the conclusion drawn from splitting the field would be that fumigation was of little benefit. By using the "knowing your field" technique, the average percent of CBR without fumigation is 9 percent, compared with 2 percent when fumigation was included. Fumigation pays in this field.

Another advantage of "knowing your field" technique is that you have a good map of CBR pressure in the field, which can be used for future decisions about fumigating. It may be possible for this grower to eliminate fumigation in the region of the field where Strips 5 through 8 are located while continuing to fumigate in the area occupying Strips 1 through 4.

Example 2. Should I apply a mid-season insecticide for southern corn rootworm control?

1. Identify the pest in question.

2. Design your on-farm test using the "knowing your field" technique. This grower marked and mapped eight strips across the field, as in Example 1. He prepared a data collection sheet.

3. Monitor plant and pest reaction, and accurately document differences. Record your information on your data collection sheet. In early September, the grower collected 100 pods and calculated the percent damaged (Figure 7) from three stops within each strip. He recorded this information on his data collection sheet.

As with Example 1, it is important to use strips to get a better understanding of the degree of damage across the entire field. Southern corn rootworm damage is often more prevalent in regions of the field that have a finer soil texture and are poorly drained. This information can be used to decide when insecticide would prevent damage from this pest. Projected percent yield loss from pod scarring is presented in Figure 8.

Figure 7. Pod damage from southern corn rootworm.

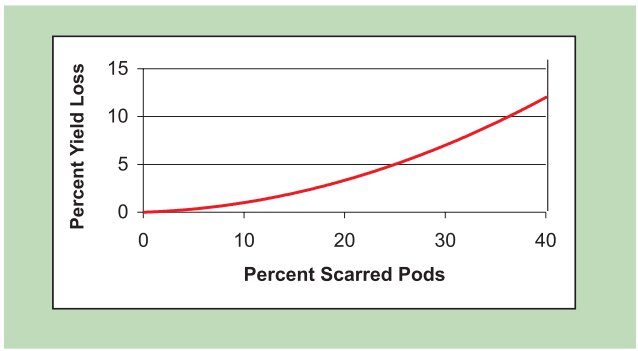

Figure 8. Correlation between pod damage from southern corn rootworm and yield loss.

Example 3. Should I apply in-furrow insecticides to control thrips?

1. *Identify the pest.* Using information from Extension, this grower determined that thrips were, in fact, the cause of damage to his peanut crop (Figures 9 and 10).

2. *Design your on-farm test using the "knowing your field" technique.* This grower marked and mapped eight strips in his field. In alternating strips, he applied a recommended insecticide for thrips control. The other strips were not treated with insecticide. He prepared a data collection sheet.

3. *Monitor plant and pest reaction, and accurately document differences. Record results on your data collection sheet.* The producer determined the percent of damaged leaflets (Figure 10) by counting damage

Figure 9. Severe thrips damage on right and no damage on left.

Figure 10. Peanut seedling damage from thrips feeding.

of 10 plants at three stops within each of the eight strips approximately 3 weeks after planting. He recorded the information on his data collection sheet.

Although thrips can cause severe damage early in the season, damage does not always translate into yield loss. Many factors, such as herbicide damage and heat or moisture stress during the season, can delay maturity of the crop. Thrips damage also can delay crop maturity and, in some years, this can have an impact on yield. However, in many years, damage by thrips will not impact yield or quality. The challenge and difficulty is to predict when those years will occur. Making several observations will help in determining the rate of thrips build up. The average can be calculated for each strip based on three stops and used to gain a better perspective of thrips damage across the field and potential yield loss (Figure 11).

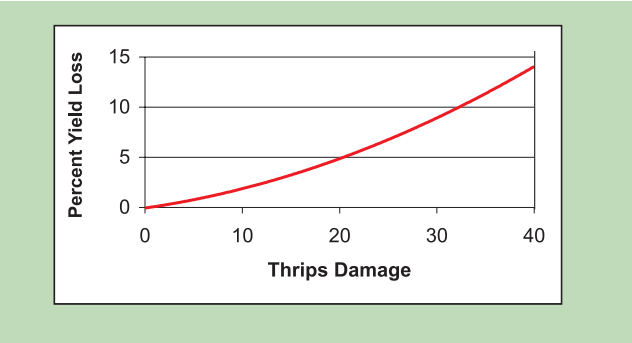

Figure 11. Correlation between percent thrips damage and percent yield loss.

Figure 12. Weeds in a peanut field at the normal timing of postmergence herbicide applications.

Example 4. Should I apply different herbicides for weed control?

1. Identify the pest. The grower used a good weed identification guide so that he knew which weeds were present. Your Extension agent can also help you identify weeds.

2. Design your on-farm test using the "knowing your field" technique. The producer marked and mapped three 100-square-foot sections of one row at three stops for eight strips across the field. He prepared a data collection sheet.

3. Monitor plant and pest reactions, and accurately document differences between strips (treatments). Record the results on your data collection sheet. Figure 12 shows weeds in a peanut field before a postemergence herbicide application.

Using the collected information with Herbicide Application Decision Support System (HADSS), the grower could select the most economical postemergence herbicide option. HADSS considers estimated peanut yield without weed interference, estimated yield loss from the weed complex, estimated gross value of peanut, herbicide and application costs, and the effectiveness of herbicides in controlling the specific weed complex in order to recommend the most economical herbicide treatments. See *Peanut Information 2001* for more information on HADSS. The grower could also be comparing a new soil-applied herbicide to the herbicide program he had used in the past.

Weeds generally are patchy in fields. Much like Example 1, it is important to compare weed control provided by the herbicides and not differences in weeds on one side of the field versus the other. The "knowing your field" approach allows the best comparison.

Example 5. Should I use strip till rather than conventional till?

1. *Identify the pest. Distinguishing among diseases is critical when deciding which management practices to use.* Southern stem rot (Figure 13) and Rhizoctonia limb rot (Figure 14) can be confused with Sclerotinia blight (Figure 15).

2. Design your on-farm test using the "knowing your field" technique. Prepare a data collection sheet.

3. *Monitor plant and pest reaction, and accurately document differences. Record your information on your data collection sheet.* To compare strip and conventional till (Figure 16), this grower evaluated peanut stand, weed infestation, insect and disease reaction, and peanut yield as they related to tillage. He monitored pests using the techniques outlined in the previous examples. Peanut yield was a critical component of this comparison. Figure 17 shows his completed data collection sheet.

If you look at the data collection sheet, you'll see how data collected on diseases can help this grower target fungicide sprays and select a peanut variety for the next rotation cycle. You'll also see how basing a decision on data collected by splitting the field, rather than the "knowing your field" technique, would have mislead him. Strip 2 (conventional tillage) has

Figure 13. Southern stem rot-infected limbs.

Figure 14. Rhizoctonia infected limbs.

Figure 15. Sclerotinia blight-infected limbs.

Figure 16. Reduced tillage in cotton stubble on left, and conventional tillage on right.

Data Collection Sheet for Field B6
Field identification number: *B6*
Date: *October 2, 2000*
Evaluator: *Williams*
Measurement and Procedure: *Number of plants in a 100-foot section (with three stops within each strip) with disease. Yield was determined by harvesting the entire strip and weighing peanuts from each strip individually and converting to pounds per acre.*

Strip	Till.	Stop 1	Stop 2	Stop 3	Avg. Dis.	Avg. Yield
1	ST	53	12	0	22	2,420
2	CT	3	25	16	15	2,500
3	ST	6	4	9	6	3,219
4	CT	5	2	6	4	3,160
5	ST	0	0	1	11	3,600
6	CT	1	0	0	1	3,720

Figure 17. Data Collection Sheet for Field B6.

considerable more of the disease in question than the opposite side of the field (Strip 6, conventional tillage), so dividing the field in half could lead to a incorrect conclusion about tillage systems. If the reduced tillage system was evaluated on the side of the field that happened to have more disease, the grower might have assumed that this plant disease is more prevalent in reduced tillage peanuts. But, the "knowing your field" technique, reveals only minor differences between conventional and strip till systems for both disease incidence and yield.

Interpreting Your Test Results

To interpret results from your in-field experiments, list differences among treatments for each strip and decide if there is a trend in the data. Try to answer the question: *Are pest damage, pest numbers, yield, or any other measurement for treatment A greater than for treatment B?* Compare strips that are side by side. Figure 18 will help you reach a conclusion.

If You Found:	You Can Conclude That:
All strip comparisons are "yes"	Treatment A is greater than Treatment B
One of five strip comparisons is "yes"	More than likely, Treatment A is not greater than Treatment B
Four of five strip comparisons are "yes"	Treatment A is more than likely greater than Treatment B
None of the strip comparisons are "yes"	Treatment A is not greater than Treatment B
All others	Inconclusive

Figure 18. Drawing Conclusions from Data Collected on Your Farm.

Using this procedure, we can answer the following question: *Is the level of Sclerotinia blight and the yield of peanuts higher in strip tillage compared with conventional tillage (Figure 19)?*

Strip Comparison	Sclerotinia Blight	Peanut Yield
1 versus 2	Yes	No
2 versus 3	No	Yes
3 versus 4	Yes	Yes
4 versus 5	Yes	Yes
5 versus 6	Yes	No
General conclusions	More than likely, more Sclerotinia blight will be present in strip tillage.	Results are inconclusive. Yields are the same in both tillage systems.

Figure 19. Data Collected In an On-Farm Test Comparing Strip and Conventional Tillage.

For example, if there were 6 strips, 3 of Treatment A and 3 of Treatment B, there are 5 comparisons (1 versus 2, 2 vs. 3, etc.)

The "knowing your field" technique allows you to go a step farther and estimate the variation in response to treatments in a given field and extrapolate beyond that on-farm test. Use of statistics can be very complex. You can get help with these calculations from your local Cooperative Extension agent or Peanut Extension Agronomist David Jordan at NC State University. Statistical analyses will allow you to extend your results beyond the given on-farm test.

Results from multiple on-farm tests may be combined to help you in predicting a response over a wide range of environments or soil conditions. However, you must carefully consider what happens at each location because specific results at a single location may not show up in the overall average. By using strips at each location, you learn about your own situation.

Discuss your results with other growers who have done the same test. When trying to determine the value of a specific input, the best approach is to conduct the experiment at several locations over several years with replication (strip) at each site.

Remember, statistics are an important tool in helping us predict how crops and pests will respond to various inputs and practices. Contact your county Extension agent if you need assistance in getting the most value out of the results of your on-farm test.

Examples in this publication are cited to demonstrate the power of information in formulating production and pest management strategies. The "knowing your field" approach is one way you can acquire more information for your farming operation.

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