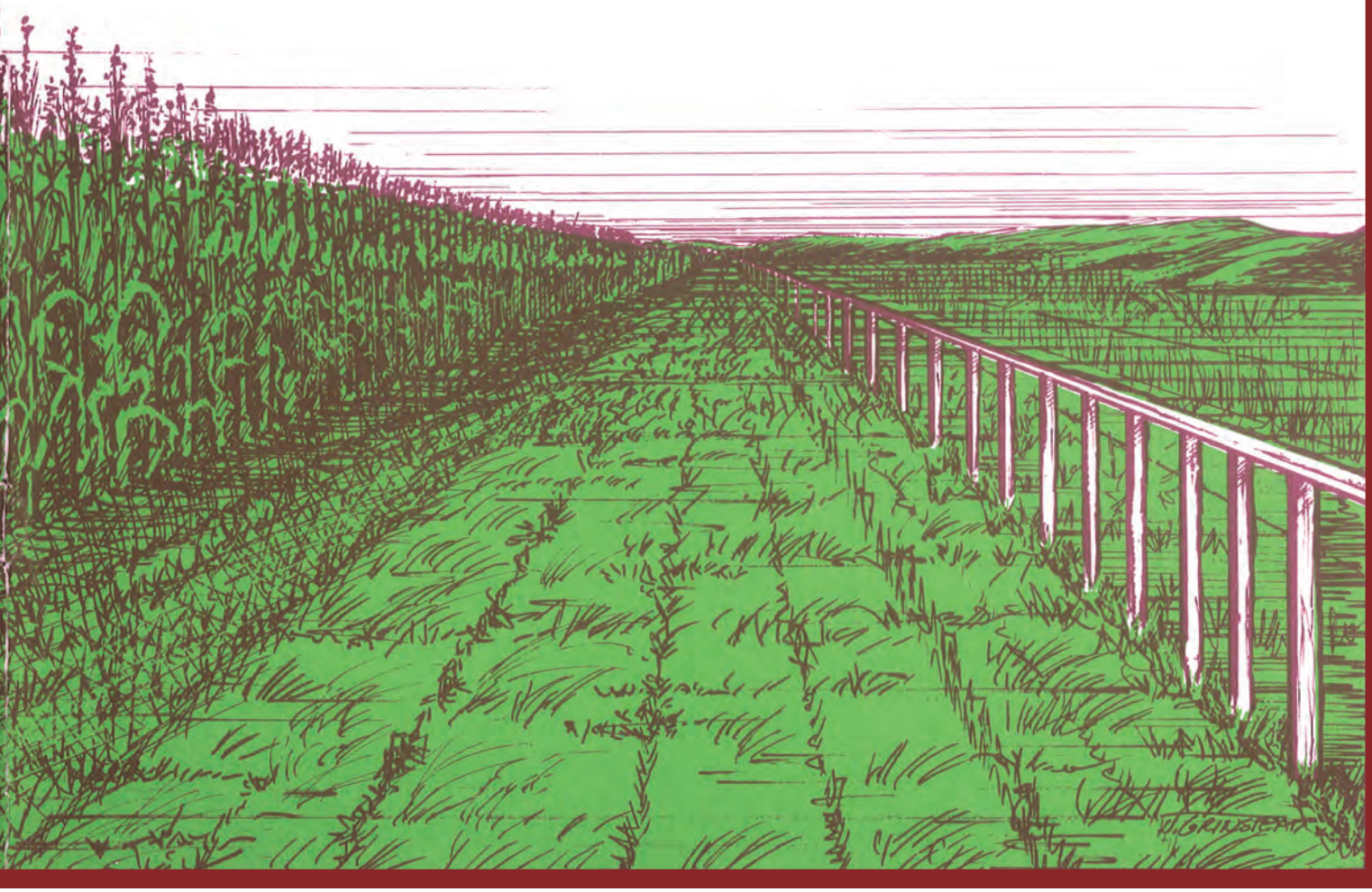
4-H-673-W

The Indiana 4-H Corn Project

HYBRID CORN

Selecting, Growing, Harvesting, Using

Intermediate Level



Purdue University Cooperative Extension Service, West Lafayette, Indiana 47907

Note to Parents

The Indiana 4-H Corn Project is intended to teach and challenge your children while providing you an opportunity to help them learn important life skills, such as planning, budgeting, and communicating.

To be meaningful, the project requires your involvement. For instance, your youngsters need help in selecting project activities, gathering materials, keeping records, and making financial arrangements. They also need encouragement to give talks and demonstrations on their project activities.

But your greatest contributions will be your words of praise and support and the time you spend listening to their ideas for each activity.

Read this manual with your children so you all understand the Corn Project and its requirements. Then encourage them to select activities that are appropriate to their knowledge and experience. Finally, all of you discuss the activities chosen with the 4-H leader, your Extension agent, or an agriculture teacher. Also, think about how other family members can get involved.

Remember, your 4-H'ers are the ones who must do the work required to complete each project activity. That's how they will gain knowledge, develop useful skills, and perhaps make a start toward rewarding careers. In the process, you're going to learn something about your youngsters' interests and potentials as well as become more aware of the needs of young people at different ages.

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The Indiana 4-H Corn Project—Intermediate Level

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Section I. What You'll Learn and Do in the Intermediate-Level Corn Project

The Indiana 4-H Corn Project has three levels, each with its own project manual. These levels and the suggested ages for each one are:

Beginner—first and second years enrolled (ages 10-11).

Intermediate—third, fourth, and fifth years (ages 12-14).

Advanced—sixth year and beyond (ages 15 and above).

This is the intermediate-level manual. In it, you're going to learn a lot about Indiana's leading agricultural crop—hybrid dent corn. First, you'll learn by reading about (a) how hybrids are developed, (b) how to select the right ones, (c) how to grow, protect, and harvest corn safely and profitably, and (d) how corn is used in food and household products. Then you'll learn by doing the activities at the end of each section.

As you plan your project and work on activities, ask for help from parents, 4-H leader, crops or corn club leader (if your county has one), vo-ag teacher, and county Extension agent.

Project Requirements

Here are the things that you are to do *each year* in the intermediate level of the 4-H Corn Project.

- Plan your project year with the help of your parents, club leader, or Corn Project leader, and review your progress with them every so often.
- If your county has a 4-H crops or corn club, help the leader decide how many and what kind of meetings your group should have during the year, and be sure to attend those meetings.
- Grow a large plot of corn (at least an acre, if possible). If you don't have your own land, either team up with a Corn Project member who does and work together, *or* arrange to use part of a neighbor's corn field and help him produce the crop that's on it.
- Complete at least five of the activities presented in this manual your first year, six activities your second year, and seven the third year. You *must* do Activity #12 (field scouting) all three years and Activity #13 (reading pesticide labels) one of the years. You *may* repeat certain others; but not more than two of the total number in any one year can be repeats. (See the individual activities for which ones may or may not be repeated.)
- Make an exhibit from one of the project activities you selected, and show it at the county 4-H fair. Below are the suggested exhibits for the intermediate-level Corn Project.
- Give talks or demonstrations to your 4-H club on how you carried out one or more of your project activities and the results you obtained.
- At the end of the project year, fill out 4-H 626, "Crops Project Record Sheet," (available at your county Extension office), as completely as you can, and have your 4-H leader sign it. Add it to your green record book, which you turn in as the leader advises. This is your report of what you did, what you learned, and what you plan to do next year.

Suggested Fair Exhibits

Here are five intermediate-level Corn Project activities to choose from for making your county 4-H fair exhibit and what each one should include. Use your imagination in making an attractive display within a maximum space of 3 feet x 5 feet. You cannot exhibit the same activity twice.

Your county's 4-H Corn Project exhibit requirements may be different than the ones suggested below, so check first with your club leader or 4-H fair book. Also, if your county uses 4-H 702, "Corn Project Exhibit Scorecard," review it carefully to see what the judges will be looking for.

"My Own Corn Germination Test" (see Activity #8). Starting 2 weeks before the fair, do for the first time or repeat Activity #8, in which you run a corn germination test for one of the hybrids you planted. Display your germinated seed, together with a card showing: (1) the germination percentage that was listed on the seed corn tag, and (2) the germination percentage resulting from your test and how you figured it (see Step D of Activity #8).

"Effects of Weed Competition on Corn Growth" (see Activity #11). Starting 4 weeks before the fair, do for the first time or repeat Activity #11, where you grow corn in containers under three levels of weed control—continuously weeded, once weeded, and never weeded. Display the three containers, together with a card on which you recorded average plant height, number of leaves, leaf color, and any other observations of the corn in each container at the end of week 4 only. (Don't pull up the plants to measure root length until after exhibiting.)

"Know How to Read Pesticide Labels" (see Activity #13). Select a weed, insect, or disease control chemical that is approved for use on corn, read the 12 parts of the pesticide label as discussed on page 22, and write down the information from each part as outlined in Step B of Activity #13. Then make a display that includes: (1) the pesticide container (empty and thoroughly cleaned) with label attached, highlighting with a red marker everything on that label that has to do with safety; (2) the information you recorded for the 12 label parts, and (3) pictures, drawings, or actual specimens of at least two of the weeds, insects or diseases that the chemical helps control.

"Making the Farmstead Safer" (see Activities #16 and #17). From the 40-item farm safety checklist in Activity #16, find four problems that need correcting on the farm you inspected as outlined in Activity #17. Take a picture or series of pictures of each problem before it was corrected and again after it was corrected. Display your photographs with brief explanations of the specific hazards under the "before" pictures, and how and when they were corrected under the "after" pictures.

"The Role of Corn in Other Foods" (see Activity #22). In your kitchen or at the grocery store, find four food items, each of which contains a different type of corn or corn product as an ingredient. Display those four food items, with a card accompanying each one naming the corn product contained and briefly explaining the role it plays as an ingredient.

Figure 1. What the offspring from one inbred (self-pollinated) corn ear are apt to look like.

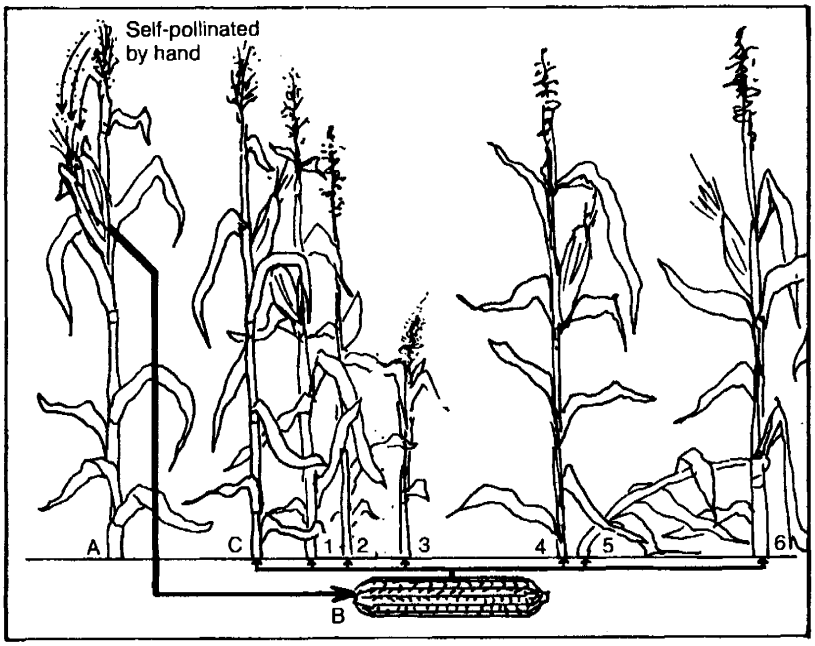
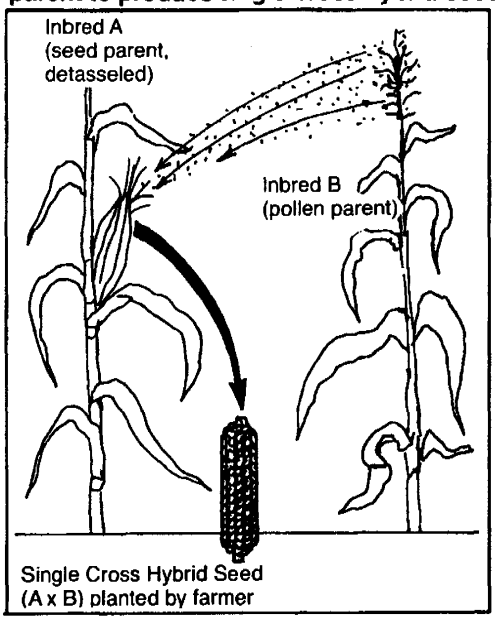


Figure 2. Pollination of a detasseled inbred line seed parent by a different inbred line pollen parent to produce single-cross hybrid seed.



Section II. Hybrid Corn—History and Development

Corn or maize (scientific name, *Zea mays*) is a contribution of the Americas to the world's list of food crops. Its place of origin is thought to be either Peru or Bolivia in South America or the Mexico-Guatemala area in Central America. The greatest number of corn varieties and teosinte are found in these regions.

Corn was a main food of the Indians throughout North, Central, and South America. They ground the kernels into meal or ate them roasted, popped or parched. Large-seeded corn often was cooked then popped out of its skins and eaten like grapes.

Early white settlers in the United States commonly used corn seed for barter and trade. This led to some improvement in corn because the best ears were constantly being selected for seed.

Such improvements were hard to maintain, however, because at that time most corn was open-pollinated. This means it was pollinated randomly by wind-borne pollen, which resulted in great variations in kernel color and ear size. Indian corn is an example of open pollination.

Plant geneticists discovered the principles of hybrid corn production in the late 1890's. But it wasn't until about 1930 that commercial corn hybrids became accepted. Just what is hybrid corn and how are hybrids developed today?

How Hybrid Corn Is Made

Every corn plant has a set of features that gives it its own personality. Some of these features we want the plant to have (for example, high grain yield, strong stalks, disease resistance); others we do not. It's the job of corn breeders to produce plants that have as many good features as possible. They do this by developing what are called *hybrids.*

Hybrid corn is the offspring from two unrelated parents known as *inbreds.* Making a new commercial hybrid is usually a long and tedious process that involves (1) developing pure inbred lines through controlled self-pollination, (2) deciding which of those inbred lines to cross to produce the best hybrids, (3) testing the resulting hybrids to find the most outstanding one, then (4) multiplying that new hybrid's seed for sale to corn growers. Here's how the process works.

First, corn plants are selected that have the features we want the inbred parents to have. The seeds of these plants are sown and allowed to grow. When each new plant's tassel and silks begin to appear, they are covered with paper or plastic bags to prevent pollination by the neighboring plants. Several days later, the bags are removed, and pollen is collected from the tassel and immediately shaken onto the silks of the same plant. This is called *self-pollination*, and the ear that develops is said to be "inbred." The kernels from that ear are planted the following year, and the self-pollination or *inbreeding* process is repeated.

Inbreeding has a dramatic effect on a corn plant's appearance. Offspring from an inbred ear not only differ from each other in many ways, but also usually look poorer than the parent plant (see Figure 1).

Year after year, only those plants having the features wanted are chosen to continue the inbreeding process. At the end of about 6 years, the resulting plants will all look alike, making up what is called an *inbred line.* In the meantime, other inbred lines have been developed the same way.

Using two inbred lines that possess our desired features, plant breeders are now ready to produce the hybrid. This is done by removing the tassels from the inbred line chosen as the *seed parents* to prevent self-pollination, and allowing the other line chosen as the *pollen parents* to pollinate the silks of the seed parents (see Figure 2). The seed produced on the seed parents' ears from this "cross pollination" is called *single-cross hybrid seed*, which is multiplied and eventually sold to farmers for planting.

Plants grown from single-cross seed will show what is called *hybrid vigor.* That is, they will be taller, higher-yielding, and generally healthier than either of their inbred parents.

About 80% of the hybrid corn grown in the United States today is from single-cross seed made like we have just described. The other 20% is from either double, three-way, or modified cross seed. These hybrids are generally used in marginal corn-growing regions because of lower seed cost and lower yield potential in these areas.

In Section V, you'll learn how to select the corn hybrids that are best for your particular soil conditions and climate. But first, you need to know more about soils, the weather, how they affect corn production, and how to manage them. That's what the next two sections deal with.

Section III. Managing Soils for Top Corn Production

Indiana has a higher percentage of prime farmland than any other state. Prime means it's the best for growing crops. To be kept as productive as possible, Indiana soils deserve careful management. In this section, you'll learn two things very important for making right soil management decisions: (1) how to identify your soils and (2) how to keep them in good condition.

The first step in soil management is to find out what kinds of soils you have. Once you know this, you can then determine how they should be handled. In Activity #1, you'll use a county soil survey map to locate your corn field, identify the soils it contains, and learn something about them.

How productive a soil can be largely depends on its physical condition or "tilth." In the Midwest, a major problem affecting tilth is *soil compaction*. Compaction is when soil particles and organic matter become pressed together. This reduces air space and the soil's ability to get rid of extra water. The common causes of compaction are: big equipment, working the soil when it's wet, not rotating crops, and too much tillage.

One way to avoid or at least reduce compaction is by adding organic matter to the soil, such as crop residue. Activity #2 is an experiment that lets you compare the condition of a soil with and without crop residue mixed in.

Activities to Learn More About Soil Management

Activity #1, Identify Soils from a Soil Survey Report

(This activity may be repeated once *if* you select a different field.)

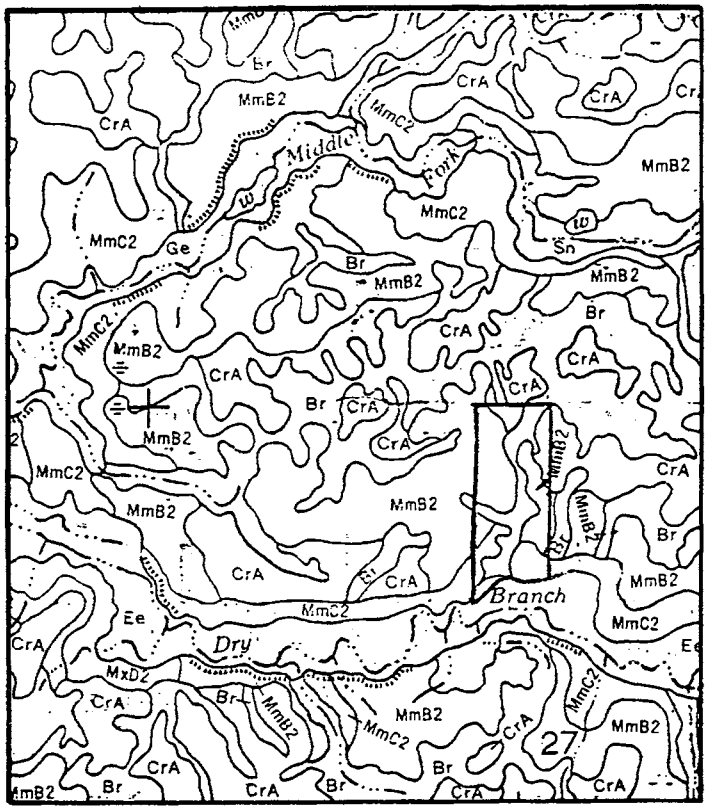
A. Visit the local Soil Conservation Service (SCS) office, and ask to see your county's soil survey report. If the latest survey is not yet published, SCS may have the previous report or, better still, a copy of the updated county soil map with soil legend. The map and legend are all you really need to complete this activity.

B. Locate your corn field on the soil map. (The SCS people can help you.) Then in the space to the right, draw an outline of your field and the areas of different soil that fall within its boundaries. Label each soil area using the symbols shown on the soil map. (See example in Figure 3.)

C. In the following table, list in the left column the map symbols that you recorded on your field drawing. Then referring to the soil legend that accompanies the map, write down in the other three columns the soil series name, percent slope, and degree of erosion for each map symbol. If slope is not listed for a particular soil, that means the slope is 0 to 2 percent; if erosion is not listed, then erosion is none to slight. (Again see the Figure 3 example.)

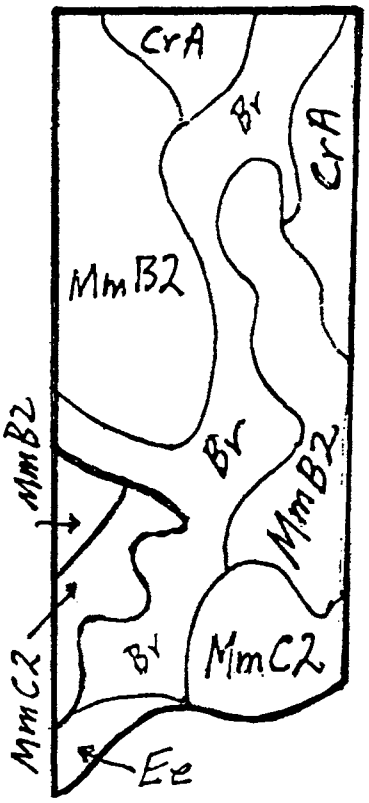
Map Symbol	Soil series name	Percent slope	Degree of erosion

Figure 3. (Top) Part of the Marion County (IN) soil survey map and soil legend. (Bottom) Example of a field drawing with map symbols included and the symbols defined.



SOIL LEGEND

SYMBOL	NAME
Br	Brookston silty clay loam
CrA	Crosby silt loam, 0 to 2 percent slopes
CsB2	Crosby-Miami silt loams, 2 to 4 percent slopes, eroded
Ee	Eel silt loam
FoA	Fox loam, 0 to 2 percent slopes
FoB2	Fox loam, 2 to 6 percent slopes, eroded
FxC2	Fox complex, 6 to 15 percent slopes, eroded
Ge	Genesee silt loam
HeF	Hennepin loam, 25 to 50 percent slopes
MgA	Martinsville silt loam, 0 to 2 percent slopes
MgB2	Martinsville silt loam, 2 to 6 percent slopes, eroded
MmA	Miami silt loam, 0 to 2 percent slopes, gravelly substratum
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded
MxD2	Miami complex, 12 to 18 percent slopes, eroded
MxE2	Miami complex, 18 to 24 percent slopes, eroded
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB2	Ockley silt loam, 2 to 6 percent slopes, eroded
Re	Rensselaer clay loam
Sh	Shoals silt loam
Sk	Sleeth loam
Sn	Sloan silt loam
Ub	Urban land-Brookston complex
Uc	Urban land-Crosby complex
UfA	Urban land-Fox complex, 0 to 3 percent slopes
UfC	Urban land-Fox complex, 6 to 12 percent slopes
Ug	Urban land-Genesee complex
UmB	Urban land-Miami complex, 0 to 6 percent slopes
UmC	Urban land-Miami complex, 6 to 12 percent slopes
Uw	Urban land-Westland complex
We	Westland clay loam
Wh	Whitaker silt loam



Map symbol	Soil series	Percent slope	Degree of erosion
Br	Brookston Silty Clay Loam	0-2%	None
CrA	Crosby Silt Loam	0-2%	None
Ee	Eel Silt Loam	0-2%	None
MmB2	Miami Silt Loam	2-6%	eroded
MmC2	Miami Silt Loam	6-12%	eroded

D. Answer the following questions:

(1) What is the average percent slope of your field? _____

(2) What is the average degree of erosion for your field? _____

(3) In your opinion, is this an excellent, good, marginal, or poor field on which to grow a row crop like corn, and why?

E. Show to your 4-H leader for his/her review and approval.

Activity #2, Show the Effects of Crop Residues on Tilth

(This activity may not be repeated.)

A. Get a bucketful of a soil that is not sandy, and another bucketful of some kind of crop residue, such as corn stalks, wheat or oat straw, soybean or forage stubble. Chop the residue into pieces no more than an inch long.

B. Measure out two cups of the soil you collected and put it in a bucket or bowl. Add enough water to make a "mud pie," knead it (work it with your hands) for about 5 minutes, then place it on a pie tin or paper plate.

C. Make a second mud pie the same way, except this time add one cup of the chopped up residue to the two cups of soil before adding the water.

D. Put both mud pies in the sun for a few days to dry. Then break them apart, carefully examine each one, and answer these questions:

(1) Which one was easier to break, and what do you think was the reason?

(2) What differences, if any, did you notice between the mud pies, such as degree of dryness, particle size, crumble characteristics, etc.?

E. Show to your 4-H leader for his/her review and approval.

To the 4-H Leader:

Circle the "Learn More About Soil Management" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #1 #2

Date: _____ Signature: _____

Second year: Activity #1 #2

Date: _____ Signature: _____

Third year: Activity #1 #2

Date: _____ Signature: _____

Section IV. Major Weather Factors that Affect Corn Production

The weather factors most important to corn production are precipitation (rainfall) and temperature of the air and soil. In this section, we'll look at how these factors affect growth and yield, and learn how to take rainfall and soil temperature measurements.

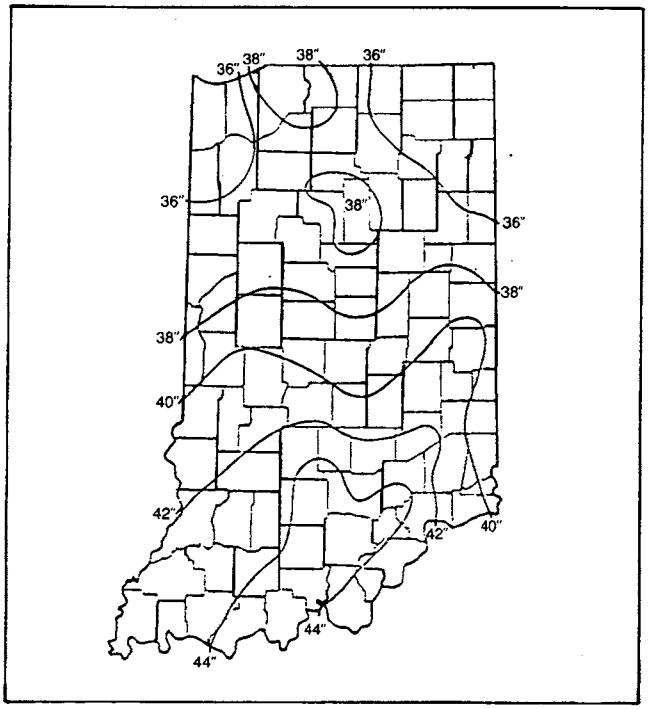
Precipitation

It requires as little as 20 inches of rainfall to produce 100 bushels of corn per acre. Figure 4 shows that much of Indiana receives about twice that amount in a year's time. Even so, drought stress is an annual problem on some corn land. How come?

One reason is timing of the rains. For good corn growth, it's important that rainfall be well distributed over the growing season. The other reason is soil water-holding capacity. Soils differ greatly in their ability to store moisture. Medium- or fine-textured soils that have a high percent of silt and clay particles can store much more water than can coarse-textured sandy or gravelly soils.

Water is lost from plants by evapotranspiration and from soil by evaporation and leaching (that is, passing down through and out of the root zone). Moisture loss is especially high during hot weather on coarse-textured soils, which don't hold the moisture tightly. To get profitable corn yields on these drought-prone soils usually requires additional water from irrigation.

Figure 4. Average annual precipitation that occurs throughout Indiana.



Measuring Precipitation

Precipitation can vary greatly from one place to another. The amount of rain falling on your corn field could be much different from that recorded at the nearest official weather station. Therefore, it's a good idea to take your own rainfall measurements using a rain gauge. Activity #3 gives you an opportunity to do this, then to judge whether the amount received was enough for good corn growth.

Rain gauges come in various shapes and sizes. Probably the most accurate is a cylinder-shaped gauge 1 inch or more in diameter. Smaller-diameter gauges tend to record larger amounts of rainfall than actually occur; wedge- and cone-shaped gauges are less accurate than cylinder types.

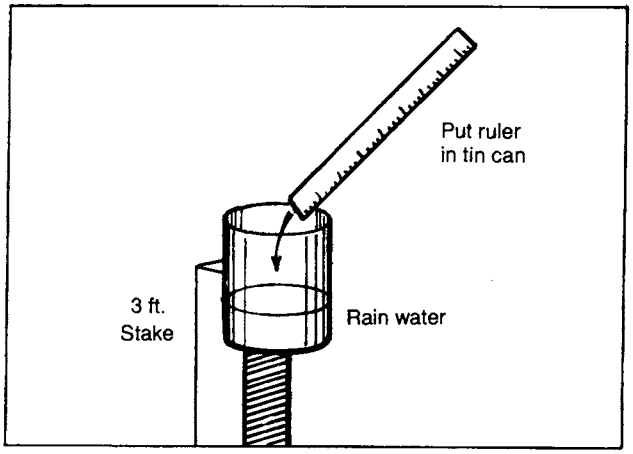
Locate the gauge in an open area away from buildings, trees, fences, and even overhanging wires. Mount it on a post so that the top of the gauge is about 3 feet off the ground and higher than the top of the post (see Figure 5). This prevents splash-in from the ground and top of the post.

To determine the amount of precipitation from a snowfall, the general rule is 10 inches of snow equals 1 inch of rain. If the snowfall is heavy and wet, figure 8 inches to an inch of rain; if very light and fluffy, figure 12 inches to 1 inch.

Air and Soil Temperature

Temperature is a measure of the heat in an environment, such as air and soil. Air temperature is an important factor when corn is up and growing, while soil temperature is especially important when corn is planted. A corn seed needs a soil temperature of at least 50°F to germinate.

Figure 5. How to make, mount, and read a simple home-made rain guage.



Measuring Air Temperature

Three types of thermometers are commonly used to measure current air temperature—alcohol-filled glass column (most common), mercury-filled glass column, and dial-type that has a two-metal coil for sensing temperature. The mercury thermometers are the most accurate, followed by the alcohol-filled then the dial-type. There is also a U-shaped mercury thermometer for recording daily highs and lows rather than current temperature; it must be handled carefully to prevent separation in the mercury column.

Thermometers that measure outside air temperature must be shielded from direct sunlight. Usually the best location is the north side of a building and at least 5 feet high to eliminate the influence of heat radiating from the ground.

Measuring Soil Temperature

Taking the soil temperature requires that a thermometer be pushed into the ground. Thus, the less breakable metal dial-types are generally used, even though they are less accurate. However, this type is not suitable to leave in place for repeated readings because the metal will conduct heat in and out of the soil. If you want the thermometer to remain in the soil, use a glass one fastened to a wooden stake, and insert it carefully.

Temperatures should be taken 2 to 4 inches below the soil surface at three or four locations where soil texture and color look average for the field. Avoid rocky and shady areas. Leave the thermometer in the soil at least 2 minutes before reading it.

Plan to make your soil temperature measurements between 7 and 9 a.m. and again between 4 and 6 p.m. The average of the 7-9 a.m. readings will give a good estimate of the 24-hour low at the 2-inch planting depth; the 4-6 p.m. average reading should give the 24-hour high. As a rule, soil temperature lags the air temperature by about 1 hour for each inch of depth.

In Activity #4, you get to chart the soil temperature lows and highs in your corn field, and determine when soil temperature is right for planting. In Activity #5, you see what the effects are of planting before the soil is warm enough for corn to germinate.

Activities to Learn More About Weather Effects on Corn

Activity #3, Collect and Analyze Rainfall Records

(This activity may be repeated once.)

A. Sometime before planting, buy or make a rain guage, and install it in or near your corn field as described above and shown in Figure 5.

B. Starting the day you finished planting the field and continuing over the next 6 weeks, measure and record in a notebook the rainfall amount received within every 24-hour period. Decide at the beginning what time of day is most convenient to check the guage, then take a reading at that same time each day. Show your weekly and 6-week totals here.

1st week: _____	3rd week: _____	5th week: _____	Total for the
2nd week: _____	4th week: _____	6th week: _____	6 weeks: _____

C. Answer the following questions:

(1) What was the amount of difference in rainfall between the wettest week and driest week in your 6-week recording period?

(2) What percent of the 6-week total rainfall fell in the wettest week?

(3) What effects do you feel the timing and amounts of rainfall over this 6-week period will have on final crop yield?

(4) If you completed this activity last year or the year before, how do the 6-week rainfall totals compare? In your opinion, which year's rainfall timing and amounts were better for corn production, and why?

D. Show to your 4-H leader for his/her review and approval.

Activity #4, Collect and Analyze Soil Temperature Records

(This activity may be repeated once.)

A. Beginning April 1, each day before school and again between 4 and 6 p.m., take soil temperature readings at the same three or four locations in your corn field; and write down the average morning and average evening temperatures in a notebook.

B. Continue to take morning and evening readings up until the average morning soil temperature is 50°F or more for 3 days in a row.

C. After you no longer need to take the soil temperature readings, answer the following questions:

(1) What was the date of your final reading? _____

(2) What was the narrowest spread between one day's morning and evening temperatures? And on what date did that occur?

(3) What was the widest spread between one day's morning and evening temperatures? And on what date did that occur?

(4) What was the earliest date you feel you *could* have planted?

(5) If you completed this activity last year or the year before, how does that year's earliest planting date compare with this year's?

D. Show to your 4-H leader for his/her review and approval.

Activity #5, Use Soil Temperature as a Planting Guide

(This activity may be repeated once.)

There's a planting rule that says: The right time to plant corn is when soil temperature 2 inches below the surface reaches 50°F anytime between 7 and 9 a.m. This activity lets you test that rule.

A. Sometime around mid March, measure off two 15-foot rows side by side at one edge of your corn field, prepare them for planting (with garden tools, if necessary), and mark them Row A and Row B. Also, make up two identical packets of seed corn containing 30 seeds each, and label them Packet A and Packet B.

B. Before school each day from then on, take the soil temperature at your two-row test plot as described above.

C. The first day that the morning soil temperature reaches 40°F, plant the 30 seeds from Packet A in Row A, and write down the date planted in the table below. Then on the first day that the morning soil temperature reaches 50°F, plant Packet B in Row B, and record that date below.

D. Check the two rows once a day for the next 21 days. Note on what date the first seedling emerged in *each* row, and how many seedlings were up and alive 21 days after planting. Write down that information in this table.

Row	Date planted	Soil temperature at planting	Date first seedling emerged	Seedlings alive 21 days after planting
A				
B				

E. Examine both rows about 6 weeks after Row B was planted, and answer the following questions:

(1) Which row has the most live plants? _____ tallest plants? _____ healthiest-looking plants? _____

(2) In your experiment, did the "planting rule" presented at the beginning of this activity make a difference?

(3) What might be the explanation as to why the rule did or did not make a difference?

F. Show to your 4-H leader for his/her review and approval.

To the 4-H leader:

Circle the "Learn More about Weather Effects on Corn" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #3 #4 #5

Date: _____ Signature: _____

Second year: Activity #3 #4 #5

Date: _____ Signature: _____

Third year: Activity #3 #4 #5

Date: _____ Signature: _____

Section V. Selecting Corn Hybrids

Choosing which hybrids to plant is a very important decision for most corn growers. Often, the difference between an average- and an excellent-performing hybrid spells the difference between merely breaking even or making a profit. But right choices just don't happen; they are the result of a careful selection process.

All seed corn looks pretty much alike. So you can't judge the performance of one hybrid over another by merely comparing the seed. You need information on how they will do under growing conditions and on soils like yours. And chances are, you'll find that no one single hybrid is best for every field on a farm.

Getting and Using Hybrid Performance Information

Where do you get corn hybrid performance information, and what are the most important things to look for? In Indiana, the main sources of such information are:

- **Purdue University corn performance trials.** These compare the hybrids from many different seed corn companies at various test locations throughout the state and over a number of years. The results are published in a bulletin called "Performance of Commercial Dent Corn Hybrids in Indiana," which is available from your county Extension office by January of each year. Activity #6 shows you how to use this publication to help select some hybrids that should do well in your area.
- **Local corn demonstration plots.** Usually sponsored by Extension, FFA chapters, or seed companies, these provide valuable information if they are well-managed, each hybrid has three replications, and the tests are run at more than one location. Results should be available from the plot sponsor.
- **On-farm testing by individual farmers.** This has greatest value for a grower who wants to make final comparisons among a handful of top-performing hybrids under his own conditions and set of production practices.
- **Commercial seed company tests and literature.** A seed corn company's testing program allows you to compare among the hybrids available from that company. Additional information on individual lines can be found in the company's promotional literature and, of course, on the seed bag and tag. In Activity #7, you compare the bag and tag information of several different hybrids and pick the one you think is superior. In Activity #8, you conduct your own seed germination test to see how the germination percentage you get compares to that listed on the seed tag.

The three main things evaluated in corn hybrid performance tests are yield, standability, and maturity time. Let's look briefly at each one.

Yield

This is usually the major consideration in selecting hybrids, but it's a hard one to predict. Different hybrids will perform differently under different conditons. And because no two growing seasons or corn fields are exactly alike, the hybrid you choose may not live up to its performance test yields—or it may do better! The thing to remember is that yield is just one performance measure, although an important one. So, look for the best yielding hybrids that also have the standability, maturity, and disease-resistance features you're interested in.

Standability

The ability of a corn plant to remain standing until harvested is also very important. When plants lodge (fall over) before harvest, total yield is reduced because the combine can't pick up corn from the lodged stalks. The major causes of lodging are: close plant spacing, diseases, and insect damage.

Corn planted closer together means more plants per acre thus higher yield. So if you plan on higher planting rates, you need a hybrid with good stalk strength. Stalk or root diseases can weaken a plant enough to make it lodge; so look for a hybrid that has good disease resistance. Lodging can also be caused by insects, especially the corn rootworm, which damages the root system, and the European corn borer, which feeds inside the stalk. At this point, there's no such thing as an insect-resistant hybrid; but scientists are working on it.

Maturity Time

Maturity time is the number of days between planting and when the kernels contain the greatest amount of dry matter. That would be the best time to harvest corn for silage. At maturity, kernel moisture content ranges from 28 to 35 percent; also yield won't be affected if frost occurs.

Corn hybrids are developed to have different maturity times and are identified as full-, medium- or short-season. So you need to select those with the right maturity for your situation. Full-season hybrids generally produce better yields because they make fuller use of the growing season, plant nutrients, and moisture supply. Short-season ones are useful if early harvest is necessary or planting must be delayed.

Many growers plant hybrids with different maturities over a period of several weeks. This spreads out the pollination stage, which reduces the risk of bad weather causing pollination problems for the entire crop. It can also spread out the harvest period.

Growing-Degree-Day Maturity Rating for Hybrids

The maturity time for corn is often expressed in terms of accumulated thermal (heat) units called growing-degree-days or GDDs. GDDs measure the total amount of heat that corn is exposed to over a period of time. Corn hybrids differ in the number of GDDs needed to reach maturity. In Indiana, most require between 2400 and 2800. The approximate maturity time in GDDs for each hybrid should be printed on the seed bag or tag.

Just how many days it actually takes for a particular hybrid to mature in Indiana depends on its maturity time, where it is grown, and average temperature during the growing season. Figure 6 shows the growing-degree-days required for short-, medium- and full-season hybrids to reach maturity in different parts of the state. Note that a full-season hybrid in northern Indiana is only a short-season one in the southwestern part. In Activity #9, you learn to identify different-season hybrids.

How to Figure Growing-Degree-Days

If you know the GDD maturity rating of a particular hybrid, you can then know the day that it reaches maturity simply by keeping track of accumulated GDDs during the growing season. Here's how:

1. Starting the day after you finished planting your corn field, find out the daily high and low temperature readings for your area from radio, TV, or newspaper weather summaries or from your own high-low thermometer (mentioned earlier).

2. Calculate the GDDs for each day, using the following formula:

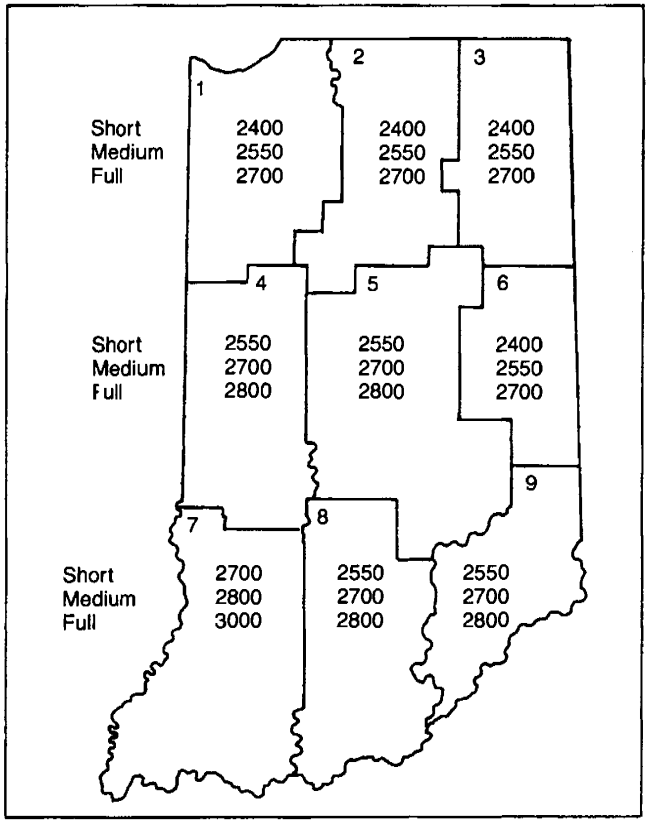
$$\text{GDDs} = \frac{\text{High temperature (86 maximum)} + \text{Low temperature (50 minimum)}}{2} - 50$$

If the high temperature is above 86°F, use 86 in the formula; if the low is below 50°F, use 50. For example, if the high on a certain day is 92°F and the low is 66°F, the GDDs for that day would be:

$$\frac{86 + 66}{2} - 50 = \frac{152}{2} - 50 = 76 - 50 = 26 \text{ GDDs}$$

3. Add each day's GDDs to the previous accumulated total. When that total equals the hybrid's listed GDD maturity rating, the crop is mature. In Activity #10, you calculate the daily and accumulated GDDs for your own corn field.

Figure 6. Indiana official crop reporting districts, each showing the approximate growing-degree-day (GDD) requirements for short-, medium-, and full-season corn hybrids.



Activities to Learn More About Selecting Corn Hybrids

Activity #6, Evaluate Corn Performance Trial Results

(This activity may be repeated once.)

A. Pick up at your county Extension office the latest version of "Performance of Commercial Dent Corn Hybrids in Indiana." Read the first few pages of introduction; then look at the heading and map for each set of hybrid performance tables, and find the one that best fits your location, soil conditions, and intended plant population.

B. Study Sub-table "A", which gives 3-year averages for the hybrids tested. Then list by brand name and number, the ten hybrids having the highest yield, the ten having the lowest moisture content, the ten with the least broken or lodged plants, and the ten with the highest stand.

Higher bushel-per-acre yield	Lowest percent water at harvest	Lowest percent broken/lodged plants	Highest percent stand

C. Circle any hybrids that show up in more than one column.

D. Of all the hybrids listed above, which one(s) would you choose to grow and why?

E. Show to your 4-H leader for his/her review and approval.

Activity #7, Compare Seed Corn Bag and Tag Information

(This activity may be repeated once *if* you select another three hybrids.)

A. Visit a seed store or co-op, and compare the seed bags and tags of three different hybrids. Write down what information each bag or tag says about the following items:

	Hybrid #1	Hybrid #2	Hybrid #3
Brand name and number			
Percent of pure seed			
Percent of other crop seeds			
Percent of inert matter			
Percent of weed seeds			
Germination percentage			
Number of kernels per pound			
Grade size of kernels			
Maturity rating (in GDDs)			
Seed treatment applied			

B. Write down here the retail price for equal quantities of each hybrid. _____ _____ _____

C. From the above comparisons, which one of the three hybrids would you buy, and why?

D. Show to your 4-H leader for his/her review and approval.

Activity #8, Conduct a Seed Corn Germination Test

(This activity may be repeated once.)

A. From the seed you plan to plant in your corn field, count out 100 kernels. Lay them out on two thicknesses of thoroughly wetted paper towels, being careful that the kernels do not touch each other. Then cover them with two more thicknesses of wetted paper towels. *(Reminder: If planning to rerun this germination test later for your county fair exhibit, don't forget to save back an extra 100 seeds.)*

B. Carefully roll up the towels with kernels between them, and secure each end with a rubber band. Store the roll for 5 days where the temperature is at least 72°F, and wet it every day with enough water to keep it damp.

C. At the end of 5 days, carefully unroll the towels, remove and count those seeds that have ½ inch of root growth, and write down that number in the space below. Then carefully reroll the towels with the remaining kernels, rubber-band the ends, and store the roll for 7 more days, moistening daily as you did before. *(Reminder: Save those sprouted seeds if exhibiting this activity at the fair.)*

D. At the end of that time (12 days total), open the roll, count the seeds that have root growth, and record that number below. The number of kernels germinated after 5 days plus the number germinated after 7 more days out of 100 kernels total gives you the percent germination.

Germinated after 5 days		**Germinated after 7 more days**		**Total Seeds**		**Percent germination**
_____	+	_____	÷	100	=	_____

E. Answer the following questions.

(1) How did your germination test results compare with the germination percentage figure printed on the seed bag or tag?

(2) If there was a difference, what do you think may have been the reason(s)?

(3) If you ran this test a second time (for your fair exhibit or because you were not satisfied with the first test), how did these results compare with the first time? Explain what may have caused any differences.

F. Show to your 4-H leader for his/her review and approval.

Activity #9, Identify Hybrids of Different Maturity Groups

(This activity may not be repeated.)

A. Look at Figure 6 to determine what crop reporting district you live in. Then write down here the growing-degree-day requirements for short-, medium-, and full-season hybrids in your district.

District number	Short-season GDDs	Medium-season GDDs	Full-season GDDs
_____	_____	_____	_____

B. Visit a seed store, co-op, or seed dealer. Checking their seed corn catalogs, literature, or seed bags on hand, identify three short-season, three medium-season, and three full-season hybrids for your area, according to their GDD maturity ratings. List them here.

	Hybrid name and number	GDD maturity rating
Short-season	_____	_____
	_____	_____
	_____	_____
Medium-season	_____	_____
	_____	_____
	_____	_____
Full-season	_____	_____
	_____	_____
	_____	_____

C. Answer the following questions:

(1) Of all the hybrids you looked at, did more fall into one maturity group than another? If so, which group?

(2) Which season hybrid do you feel is best for your situation, and why?

D. Show to your 4-H leader for his/her approval.

Activity #10, Determine Date of Hybrid Maturity from Accumulated GDDs

(This activity may be repeated once.)

A. Sometime before you plant your corn, prepare a logsheet as shown in Figure 7. List at the top the name of the hybrid planted, its GDD maturity rating, and date planted. Then make five columns and label them as follows: day's date, high temperature, low temperature, day's GDDs, and accumulated GDDs.

B. Every day beginning the day after you plant, record the date and your area's high and low temperatures. Then calculate the growing-degree-days for that date as explained on page 14; and finally, add that day's GDDs to the previous accumulated GDDs (again see Figure 7).

C. Stop keeping records on the day your accumulated GDD figure is the same as the hybrid's stated maturity rating. Then write in below what you had recorded on your logsheet on the 30th, 60th, 90th, and final day.

Hybrid name and number: _____ Maturity rating: _____ Date planted: _____

	Day's date	High temperature	Low temperature	Day's GDDs	Accumulated GDDS
30th day					
60th day					
90th day					
Final day					

D. On that final day, pick a few ears of corn and immediately have them examined by someone who would know if the corn was mature. Then answer these questions.

(1) Who examined your corn; and in their opinion, has it reached maturity?

(2) If so, did it reach maturity just now or some time ago? If not yet mature, how many days until it is?

(3) What do you think caused your hybrid to mature early? Or what may have delayed its maturity?

E. Show to your 4-H leader for his/her review and approval.

To the 4-H Leader:

Circle the "Learn More About Selecting Corn Hybrids" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #6 #7 #8 #9 #10

Date: _____ Signature: _____

Second year: Activity #6 #7 #8 #9 #10

Date: _____ Signature: _____

Third year: Activity #6 #7 #8 #9 #10

Date: _____ Signature: _____

Figure 7. Example of the top part of a logsheet for recording daily temperatures and calculating growing-degree-days (GDDs).

Hybrid name and number: BIGEAR 1542 Maturity rating: 112 RM 2750 GDD Date planted: 4/15

Day's date	High temperature	Low temperature	Day's GDDs	Accumulated GDDs
4/15	65°	52°	8	8
4/16	67°	52°	9	17
4/17	66°	53°	9	26
4/18	69°	54°	11	37

---ETC---

Section VI. Protecting the Growing Corn Plant

The corn plant has three natural enemies—weeds, diseases, and insects. Weeds are an enemy because they interfere with plant growth by competing for space, soil nutrients, and moisture. Diseases and insects are enemies because they attack and damage plant parts (seed, roots, stalk, leaves, or ears) during the growing season.

To produce top yields, corn must be protected from these natural enemies. Many modern production practices are designed to do just that. This section looks at some of those practices. The three activities at the end show you what one enemy—weeds—can do to corn, give you more experience in scouting a corn field for pest problems, and teach you how to read and understand pesticide labels.

Plant Protection Practices

Controlling Weeds

A weed is any plant that's growing where you don't want it to grow. Weeds in your corn field compete for the water, sunlight, and nutrients that the crop needs. This competition can seriously hinder corn plant growth and development, thus reduce yields. Also, weed seeds that are harvested with the corn grain may lower its market value. In Activity #11, you run an experiment to measure the effect of weed competition on the growth of corn plants.

Chances are you can't completely eliminate weeds from your fields. But you can greatly reduce their number by (1) planting weed-free (clean) corn seed, (2) cultivating at the right time, and (3) properly applying weed control chemicals, called herbicides.

Clean seed. A farmer is inviting the enemy into his field by planting seed corn that contains weed seeds. Weed-free seed may be a bit more expensive, but it's a good way to reduce weed problems.

Cultivation. The best time for controlling weeds in corn is 3-5 weeks after planting. By then, the crop has emerged and is pretty well established; but most of the weeds are still small, delicate, and easy to knock down with a row cultivator or a rotary hoe. Weeds allowed to reach a height 6-8 inches have already competed enough with corn to reduce yield.

Herbicides. Herbicides control weeds by preventing them from germinating or by killing them after they're up, and without harming the corn (if properly used). There are three basic types of corn herbicides, depending on when they are used: (1) *preplant-incorporated,* which is applied on, then worked into, the soil before the crop is planted; (2) *preemergence,* which is applied on the soil surface after planting but before the corn and weeds are up; and (3) *postemergence,* which is sprayed over the young corn and weed seedlings that have emerged. Most corn weed control programs involve both tillage and herbicide use.

Controlling Diseases

A number of diseases can damage the corn plant and prevent it from producing top yields. A few of the more common ones in Indiana are:

Leaf blights. These are mostly produced by fungi, although a few are caused by viruses and bacteria. A leaf blight is a large injured area on the leaf. It first appears as small lesions or spots that continue to grow until much of the leaf turns brown.

Corn smut. This is the most visible disease that occurs on corn, but it rarely affects the plants enough to reduce yields. It is caused by a fungus that can grow on any above-ground plant part (stalk, leaves, tassel, and ears). Smut is first seen as a gray-colored lump that later becomes quite large. As it matures, the lump turns black, then bursts open and releases spores. Plants already damaged in some way are more susceptible to the smut fungus.

Stalk rots. These are usually fungal diseases. The stalk becomes weak and unable to support the rest of the plant, so it often lodges (falls over). Rot may occur at the nodes (where the leaves are attached) or between nodes, depending on the type of fungus.

Ear rot. Several fungi can produce ear rots, including those that cause stalk rots. The kernels become moldy, and the ears shrunken and light in weight. Sometimes, there are no outward signs; but stripping back the husk will reveal white, pink, black, or green mold between the kernels. Certain ear rot fungi may be toxic to livestock, such as the Gibberella fungus, which produces a substance poisonous to hogs.

Corn diseases are controlled primarily by: (1) selection of disease-resistant hybrids, (2) use of disease-free or chemically treated seed, (3) crop rotation, and (4) moldboard plowing to bury previous-crop residue. In hybrid corn production, fungicides (fungus-killing chemicals) are commonly used as a seed treatment to prevent seedling blight, but are rarely applied to the growing plants. That's because the chemicals do not provide long-term protection, and repeated applications are too expensive. However, fungicides are sometimes used in seed corn production because inbreds are much more susceptible to disease then hybrids.

Controlling Insects

There are at least 30 different insects that may feed on the corn plant as it grows. They fall into three groups, according to where on the plant they feed.

Below-ground insects include: corn rootworms, wireworms, white grubs, and seedcorn maggots, all of which attack the plant's root system; and black cutworms, which cut off seedlings at the soil surface. **Above-ground insects** include: armyworms and grasshoppers, which feed on the corn leaves; European corn borers and common stalk borers, which tunnel in the stalk; and corn leaf aphids and spider mites, which suck plant juices from leaves and stalks. **Ear-feeding insects** include: corn earworms, European corn borers, and fall armyworms, which feed on the developing kernels or in the ear shank.

Corn rootworm, black cutworm, and European corn borer are the major corn insect pests in Indiana. Most growers protect against rootworms either by crop rotation or by applying a soil insecticide (insect-killing chemical) at planting time. Cutworm and corn borer outbreaks do not occur as regularly as rootworm outbreaks, because they are often kept under control by weather conditions, natural enemies, and field cultivation.

As is the case with weeds and diseases, the best way to control insects is to prevent them from building up in the first place. Good preventive measures include: rotating crops, planting at the right time, and keeping down weeds.

Determining the Need for Pest Control Measures

A program of crop rotation, planting only clean, treated seed, and timely cultivation will usually keep corn pests in check. But it's no guarantee that serious problems still can't develop anytime during the growing season. That's why field scouting is important.

As you may have learned in the beginner-level Corn Project manual, field scouting is a systematic way of checking on a growing crop to detect any problem, determine how serious it is, and find out the cause. Revisits allow you to monitor the problem so you can make right decisions about the need for control, particularly chemical control. Activity #12 gives you more experience in field scouting.

Extension agents, vo-ag teachers, chemical dealers, parents, or neighboring farmers can help you determine if a problem is serious enough to apply control measures. Weed, disease, and insect identification and control publications are available at your county Extension office. You might want to take these with you while scouting, especially a corn scouting calendar, which lists those pests most likely to be present at certain times of the growing season.

How to Field Scout (Intermediate Level)

The basics of field scouting were presented in the beginner-level manual. We're reviewing those basics again here but are increasing the number of scouting sites and visits that you as an intermediate-level Corn Project member must make.

To field-scout, you should have the following items:

- Clipboard
- Pencil
- Knife
- Collection containers (sandwich bags, small jars, etc.)
- Identification tags
- Hand-held magnifying glass
- Measuring stick or tape measure
- Trowel or small shovel
- Bucket or bag to carry scouting items
- Four 6-foot flagged marker poles
- Copies of 4-H 672a, "Corn Project Scouting Form," available at your county Extension office (see sample in Appendix).

Scout your field at least five times during the growing season. Start when the corn is at the two-leaf stage of growth (about 6 inches high), and then revisit every 10-12 days thereafter (sooner if you found problems on your previous visit). The corn should be scouted up to at least the pre-tassel stage. You will need a new 4-H 672a form each time you scout.

The first time out, divide the field into four about-equal areas and set a flagged marking pole in one of the corn rows somewhere near the middle of each area. The four spots chosen should *not* be at the field edges or next to any waterways or drainageways, because pest numbers and activity are likely to be greater there than the rest of the field.

Now, in the row where a marker has been set, examine at least 20 plants (10 on each side of the marker). Look for pest damage symptoms on the plants as well as for the pests themselves. Then on the scouting form, write down what you found. If you need to, collect samples of both the pests and damage symptoms for identification later.

Also, *your first time out only,* dig up a corn plant next to the row you just examined in each of the four field areas, and look for worms and insects in the soil around the roots. Then take those four plants home, and gently wash off and examine the roots for damage. Healthy roots will be white to yellow-white with no scarred or broken tissue.

Every time you scout, examine the same 20 plants at each of the four marked sites, and repeat what you did the first time. However, only dig up a plant to look for root damage if it seems to be sick. What you find out on your repeat visits will help you determine if control measures are going to be needed.

When you scout, don't forget to record plant height and soil and weather conditions, which can provide important clues as to what might have caused problems in your field. Under certain conditions, corn plants become more vulnerable to (easily attacked by) diseases or insects. Also, don't forget to remove the four markers after your final field visit, or else they might get "harvested" with the crop.

Reading and Understanding Pesticide Labels

The pesticide label is printed directly on or glued securely to the pesticide container. It provides the information you need in order to use the product inside correctly, legally, and safely. Most labels are easy to understand, but some can be pretty complicated.

There are 12 different parts to a pesticide label, each important to proper and safe use. Don't apply any pesticide product—in fact, don't even open the container—until you have read each part of the label and understand *all* instructions and cautions.

Following is a brief look at the 12 label parts and what each tells you. In Activity #13, you learn to locate those parts first on a sample pesticide label then on one that you choose and record the information asked for.

1. Brand name. That's the name used in advertising the product. It shows up plainly on the front panel of the label.

2. Type of formulation. Pesticide materials come in different forms requiring different methods of handling. So it's important to know the type of formulation you have, such as liquid (L), wettable power (WP), emulsifiable concentrate (EC), dust (D), or granular (G). This is usually found along with a number, such as 4L, near the product name. The number in front of the letter(s) means either pounds of active ingredient (A.I.) per gallon if it's a liquid formulation *or* percent of A.I. by weight if a dry formulation.

3. Common name. Because a pesticide is likely to have a complex chemical name, often it is given another name to make it easier to identify. This common chemical name is found next to the active ingredient statement.

4. Ingredient statement. Each label must list everything the product contains. The list is written so you quickly see each active ingredient and its percent of the total product. Inert ingredients, which serve as filler, don't have to be identified, but their percent of the total must be shown.

5. Net content. This tells how much product by weight or volume (depending on formulation) is in the container. It usually appears at the bottom of the front panel, but may be stamped or printed elsewhere.

6. Manufacter's name and address. Law requires that this be on the label so you know who made or sold the product.

7. Registration and establishment numbers. The registration number, which shows that the product is registered with the federal government, appears as "EPA Registration No. XXXXX" and is usually found on the front panel. The establishment number, which is a code number for the manufacturing plant where the chemical was made, can be located anywhere on the container.

8. Signal words and symbol. Many times, for a pesticide to control a target pest, it may be toxic (poisonous) or otherwise harmful to people. Three signal words are used to tell how harmful. They are: "Danger" (very harmful)—a taste to a teaspoonful can kill you; "Warning" (moderately harmful)—a teaspoonful to a tablespoonful can kill; and "Caution" (slightly harmful)—an ounce to more than a pint can kill.

The skull and crossbones symbol is often printed on a label to draw attention to a product's toxicity or harmfulness. In fact, it must appear, along with the words "Danger" and "Poison", on all highly toxic materials.

9. Precautionary statement. This section explains the ways in which the product may be poisonous to man and animals. It mentions any environmental precautions, such as toxicity to bees from residues remaining on crops or possibility of contaminating water. It also notes any special fire, explosion, or chemical hazards.

10. Practical treatment statement. This part tells what emergency first-aid measures to follow if a harmful product is swallowed, breathed, or gets into your eyes or on your skin.

11. Use-classification statement. The label must show whether the product is for general use or restricted use. A restricted-use pesticide is one that could cause human injury or environmental damage, even when used exactly as directed; a general-use material is not as hazardous. The restricted-use statement must appear at the top of the label's front panel.

12. Directions for use. These are the instructions on how to correctly prepare, handle, and apply the product. This part of the label might also include: (a) storage and disposal directions; (b) a mis-use statement, which explains improper practices or uses of the chemical; and (c) a re-entry statement, which tells when it's safe for humans or livestock to occupy the treated area.

Activities to Learn More About Protecting the Corn Plant (and Yourself)

Activity #11, See the Importance of Weed Control

(This activity may not be repeated.)

A. Get a bucketful of soil that you know contains weed seeds. For instance, take the top 2 inches of soil from a weedy fence row, pasture, or field that hasn't been treated with herbicides recently.

B. Mix the soil thoroughly and put it into three containers of the same size, such as large clay flower pots or 3-pound coffee cans. Make sure there are holes and a layer of gravel in the bottom of each container for proper drainage.

C. Plant four corn seeds about 1 inch deep in each container, and label the containers #1, #2, and #3. Put them someplace where they'll get plenty of sunshine, and water them every couple of days (but don't overwater).

D. Over the next 4 weeks, control weeds as follows: in container #1, remove any weed seedlings as soon as they emerge; in #2, pull any weeds at the end of the second week only; in #3, let the weeds grow with the corn all 4 weeks.

E. At the end of weeks 1, 2, 3, and 4, write down the observations asked for in the table.

	Average plant height (inches)	Average number of leaves per plant	Leaf* color	Average root** length (inches)	Other observations
Container #1 (weeded continually)					
End of week 1	_____	_____	_____	XXXX	_____
End of week 2	_____	_____	_____	XXXX	_____
End of week 3	_____	_____	_____	XXXX	_____
End of week 4	_____	_____	_____	_____	_____
Container #2 (weeded once)					
End of week 1	_____	_____	_____	XXXX	_____
End of week 2	_____	_____	_____	XXXX	_____
End of week 3	_____	_____	_____	XXXX	_____
End of week 4	_____	_____	_____	_____	_____
Container #3 (not weeded)					
End of week 1	_____	_____	_____	XXXX	_____
End of week 2	_____	_____	_____	XXXX	_____
End of week 3	_____	_____	_____	XXXX	_____
End of week 4	_____	_____	_____	_____	_____

* Record as dark, light, yellow, or dead.

** At the end of week 4, remove the corn plants from each container, wash the soil from the roots, measure for length, and record the average.

F. Answer the following questions:

(1) At the end of week 4, what differences were there between the three containers as to corn plant height, leaf color, or general health?

(2) What influence do you think the weeds had on any of the differences you noted?

(3) If container #3 was a field of corn, what problems (yield, plant health, harvesting, marketing, etc.) might the farmer be faced with because of weeds?

G. Show to your 4-H leader for his/her review and approval.

Activity #12, Field Scout Corn for Weed, Disease, and Insect Problems

(This activity *must* be done each year.)

Scout a corn field (yours, a friend's or a neighbor's) five different times as described on page 19. Consider teaming up with another Corn Project member for this activity. Chances are it'll be more fun and you'll probably find a greater variety of pest problems.

Each of the five times out, do the following:

A. In Parts 1 and 2 of 4-H 672a, "Corn Project Scouting Form" (see sample in Appendix), write down the name (or collect to identify later) and how many of each different kind of weed and insect pest you found in the four scouting areas. Calculate weeds per foot of row and percent of plants harboring insects as explained in the scouting form instructions. Then record your judgment as to the seriousness of each weed and insect problem.

B. In Part 3 of the scouting form, describe any plant damage you saw, and record the number of plants in each scouting area showing that same kind of damage. Calculate the percent of plants affected as explained in the scouting form instructions. Then try to determine what caused the damage, and check out your guess with an expert (parent, 4-H leader, extension agent, vo-ag teacher, etc.)

C. Collect and preserve one different kind of weed pest, insect pest and damaged corn plant part on each of your five field visits. Identify, mount, and label these 15 corn pests and plant parts; then display and tell about them at a meeting of your 4-H club or county corn club. You just gave a demonstration! *(See 4-H 247 on how to press weeds and plant parts, and Ext. Cir. 509 on how to preserve insects; both are available at your Extension office.)*

D. Show your five completed scouting forms and corn plant pest display to your 4-H leader for his/her review and approval.

Activity #13, Learn to Read Pesticide Labels

(This activity *must* be done once, and may be repeated *if* you use a different label.)

A. On pages 26-27 is a reproduction of an actual pesticide label, used with the manufacturer's permission. Below are the number and name of each of the 12 label parts discussed on page 22. Read the label, then identify each label part by writing the part number on or next to it. (Brand name, #1, is already done as an example.) You may have to write a number more than once if the information appears at different locations on the label.

1. Brand name
2. Type of formulation
3. Common name
4. Ingredient statement
5. Net contents
6. Manufacturer's name and address
7. Registration and establishment numbers
8. Signal words and symbols
9. Precautionary statements
10. Practical treatment statement
11. Use classification statement
12. Directions for use

B. On your own farm, a friend's or neighbor's farm, or at a co-op or farm supply center, read the label of a weed, insect, or disease control chemical that's recommended for use on corn (but is different than the pesticide on page 26). In the blanks below, write down the information requested.

1. Brand name: _____

2. Type of formulation: _____

3. Common name: _____

4. Ingredient statement—Active and percent: _____

   Inert and percent: _____

5. Net contents: _____

6. Manufacture's name and address: _____

   _____

7. Registration number: _____

   Establishment number: _____

8. Signal word: _____

9. Precautionary statements (summarize): _____

   _____

10. Practical treatment statement (summarize): _____

    _____

11. Use classification statement (summarize): _____

    _____

12. Directions for use on corn (summarize): _____

    _____

    _____

C. From this label information and what you read in this section about understanding a pesticide label, answer the following questions:

(1) How much active ingredient is there in one pound (if a dry formulation) or in one gallon (if a liquid formulation) of this product?

(2) What does the signal word tell you about the product?

(3) What protective gear is to be worn when mixing the chemical and when applying it?

(4) Do you have the protective gear or safety equipment that is mentioned on the label? If not, where would you buy it?

D. Show to your 4-H leader for his/her review and approval.

Code 3669

#1

RESTRICTED USE PESTICIDE

Due To Avian Toxicity

For retail sale to and use only by certified applicators or persons under their direct supervision, and only for those uses covered by the certified applicator's certification.

Net Weight 50 LBS

Furadan® 15G

Insecticide-Nematicide

For Agricultural or Commercial Use Only

EPA REG. NO. 279-3023 **EPA Est., 279-**

ACTIVE INGREDIENT:

*Carbofuran	15.0%
INERT INGREDIENTS:	85.0%
	100.0%

*2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate
U.S. Patent No. 3,474,171

KEEP OUT OF REACH OF CHILDREN

WARNING

PRECAUTIONARY STATEMENTS

Hazards to Humans (& Domestic Animals)

Warning

Poisonous if swallowed. May be fatal or harmful as a result of skin or eye contact or by breathing dust. Causes cholinesterase inhibition. Warning symptoms of poisoning include weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision, pinpoint eye pupils, abnormal flow of saliva, abdominal cramps, and unconsciousness. Atropine sulfate is antidotal.

Wear long-sleeved clothing and protective gloves when handling. Wash hands and face before eating or smoking. Bathe at the end of the work day. Change clothing daily and wash before reuse.

STATEMENT OF PRACTICAL TREATMENT

If swallowed, drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention.

If in eyes, flush with plenty of water for at least 15 minutes. Get medical attention.

If on skin, wash immediately with soap and water. Remove contaminated clothing and wash before reuse.

Antidote

Note to Physician: Carbofuran is a reversible cholinesterase inhibitor. Do not use oximes such as 2-PAM. Start by giving 2 mg. atropine intramuscularly. According to clinical response, continue until signs of atropinization occur (dry mouth or dilated pupils). If in eye, instill one drop of homatropine.

For Emergency Assistance Call 716-735-3765.

See other panels for additional precautionary information.

FMC

FMC Corporation
Agricultural Chemical Group
2000 Market Street
Philadelphia Pennsylvania 19103

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish, birds and other wildlife. Birds feeding on treated areas may be killed. Birds killed by carbofuran pose a hazard to hawks and other birds-of-prey; bury or otherwise dispose of dead birds to prevent poisoning of other wildlife. Cover or incorporate granules in spill areas. Runoff from treated areas may be hazardous to fish in neighboring areas. Do not apply directly to water. Do not contaminate wells, wetlands or any body of water by cleaning of equipment or disposal of waste.

Notice: It is a Federal offense to use any pesticide in a manner that results in the death of a member of an endangered species.

The use of Furadan 15 G may pose a hazard to the following Federally designated endangered/threatened species known to be found in certain areas within the named locations.

Attwater's Greater Prairie Chicken—Texas counties including: Aransas, Austin, Brazoria, Colorado, Galveston, Goliad, Harris, Refugio and Victoria.

Aleutian Canada Goose—California counties including Colusa, Merced, Stanislaus and Sutter

Kern Primrose Sphinx Moth—Walker Basin of Kern County, California.

This product may not be used in areas where adverse impact on the Federally designated endangered/threatened species, noted above, is likely. Prior to making applications, the user of this product must determine that no such species are located in or immediately adjacent to the area to be treated. If the user is in doubt whether or not the above named endangered species may be affected, he should contact either the regional U.S. Fish and Wildlife Service office (Endangered Species Specialist) or personnel of the State Fish and Game office.

Carbofuran is a chemical which can travel (seep or leach) through soil and can contaminate ground water which may be used as drinking water. Carbofuran has been found in ground water as a result of agricultural use. Users are advised not to apply carbofuran where the water table (ground water) is close to the surface and where the soils are very permeable, i.e., well-drained soils such as loamy sands. Your local agricultural agencies can provide further information on the type of soil in your area and the location of ground water.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not use this product on Long Island, N.Y.

STORAGE AND DISPOSAL

Pesticide Storage

Do not store in or around the home.

Keep out of reach of children and animals. Store in original containers only. Store in a cool, dry place and avoid excess heat. Carefully open containers. After partial use, fold and roll back bags, clamp and close tightly. Do not put concentrate or dilute material into food or drink containers. Do not contaminate other pesticides, fertilizers, water, food or feed by storage or disposal.

In case of spill, avoid contact, isolate area and keep out animals and unprotected persons. Confine spills. Call FMC collect: (716) 735-3765.

To confine spill: If liquid, dike surrounding area or absorb with sand, cat litter or commercial clay. If dry material, cover to prevent dispersal. Place damaged package in a holding container. Identify contents.

Pesticide Disposal

Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal Law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Disposal

Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

If prolonged intimate contact with corn and/or sorghum foliage will result, do not re-enter treated fields within 14 days of application without wearing proper protective clothing. For all other situations, do not re-enter fields less than 24 hours following application.

Cover or incorporate granules in spill areas.

Do not plant with any crop for which carbofuran treatment is not registered for at least 10 months.

Do not rotate with any crop on soil treated at greater than 3.0 pounds active ingredient per acre for at least 10 months.

Field Corn, Popcorn, Sweet Corn—Conventional, Minimum & No Tillage
Corn Rootworms (Northern, Southern, and Western), Flea Beetles, Wireworms, aid in the control of White Grubs and first generation European Corn Borer, reduce losses due to Stalk Rot by reducing the incidence of insect wounds which permit entry by the Stalk Rot Fungi; Armyworm control for approximately 4 to 6 weeks after planting and suppression of Cutworms—Use 8 ounces of Furadan 15 G per 1,000 linear feet of row (6.7 lbs. per acre with 40 inch row spacing). Early season suppression of Common Stalk Borer—Use 16 to 24 ounces per 1,000 linear feet of row (13.3 to 20 lbs. per acre with 40 inch row spacing). Apply in a 7 inch band ahead of the planter press wheel and incorporate into the top 1 inch of soil by use of special covering devices or by dragging a short length of chain.—OR—Direct the granules into the planter shoe with the seed.—OR—Place the applicator tube directly behind the planter shoe so that the granules drop into the furrow and mix with the covering soil.

Lesion Nematodes (Northeast and Midwest Corn States including Colorado and Wyoming)—Use 8 to 16 ounces per 1,000 linear feet of row (6.7 to 13.3 lbs. per acre with 40 inch row spacing). Apply "at planting" as above (in a covered band or in the seed furrow).

European Corn Borer (first generation)—Use 16 to 24 ounces per 1,000 linear feet of row (13.3 to 20 lbs. per acre with 40 inch row spacing) "at planting" as above (in a covered band or in the seed furrow).

Seed Corn Maggot—Use 8 ounces per 1,000 linear feet of row (6.7 lbs. per acre with 40 inch row spacing). Southwestern Corn Borer (second to third generation)—Use 12 to 24 ounces per 1,000 linear feet of row (10 to 20 lbs. per acre with 40 inch row spacing). Southern Corn Billbug (Southeastern states), and to aid in the control of Leafhoppers and thereby reduce losses due to Maize Chlorotic Dwarf Virus and Corn Stunt disease—Use 16 to 24 ounces per 1,000 linear feet of row (13.3 to 20 lbs. per acre with 40 inch row spacing). Apply into the seed furrow as noted above.

Nematodes (Sting, Stunt, Stubby Root, Root-Knot, Dagger, Lesion, Lance, and Spiral)—Use 12 to 16 ounces per 1,000 linear feet of row (10 to 13.3 lbs. per acre with 40 inch row spacing). Apply at planting time in a 7 to 15 inch band and incorporate into the top 3 inches of soil.

Field Corn, Popcorn—Post Plant
Northern and Western Corn Rootworm—Use 8 ounces of Furadan 15 G per 1,000 linear feet of row (6.7 lbs. per acre with 40 inch row spacing) by banding over the row or by side dressing both sides of the row and cultivating into the soil.

Field Corn—Foliar Application
Southwestern Corn Borers and European Corn Borers—Use 6.7 lbs. per acre. Apply with aircraft by broadcasting over the corn plants or with ground equipment by directing the granules into the corn whorls. Apply when eggs begin to hatch. Do not make a foliar application if Furadan 15 G was applied at more than 8 ounces per 1,000 linear feet of row (6.7 lbs. per acre with 40 inch row spacing) at planting. Do not make more than two foliar applications per season.

Corn Insecticide Applicator Setting
This product is a dense, free flowing insecticide requiring accurate equipment calibration to apply the recommended amount per acre. Always calibrate your planter at the speed which you plan to travel during the planting operation. The following are approximate settings for guidance in calibration:

Applicator Gauge Setting

Application Rate	6.7 lbs./A			10 lbs./A			13.3 lbs./A		
Planter Speed (MPH)	4	6	8	4	6	8	4	6	8
Equipment									
Allis Chalmers	3	3	3	5	5	5	7	7	7
Gandy	14	18	21	18	22	25	22	25	29
IHC Cyclo Planter									
Gate	1	1	2	1	2	2	2	2	3
Dial	7	9	2	9	3	8	2	8	5
John Deere									
Range	1	2	2	1	2	2	2	2	2
Notch	18	1	2	20	2	4	1	4	8
Max. Emerge (even number notches—0-10-20-30-40)	10	14	19	14	21	25	19	25	30
Max. Emerge (odd number notches—5-15-25-35)	9	12	14	12	15	18	14	18	21
Noble									
Round Opening	8	12	16	12	17	22	16	22	28
Rectangular Opening	5	7	9	7	10	13	9	13	17

Corn Application Rates
When the granular application equipment is set to deliver Furadan 15 G at a rate of 8 ounces per 1,000 linear feet, the total amount applied per acre will vary depending on row spacing. Use the table below to determine your Furadan needs for each acre.

Row Spacing (Inches)	40"	38"	36"	30"	28"
Furadan 15 G (lbs. per acre)	6.7	7.0	7.3	8.7	9.3

Dealers Should Sell in Original Packages Only.

Terms of Sale or Use: On purchase of this product buyer and user agree to the following conditions:

Warranty: FMC makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Except as so warranted, the product is sold as is. Buyer and user assume all risk of use and/or handling and/or storage of this material when such use and/or handling and/or storage is contrary to label instructions.

Directions and Recommendations: Follow directions carefully. Timing and method of application, weather and crop conditions, mixture with other chemicals not specifically recommended and other influencing factors in the use of this product are beyond the control of the seller and are assumed by buyer at his own risk.

Use of Product: FMC's recommendations for the use of this product are based upon tests believed to be reliable. The use of this product being beyond the control of the manufacturer, no guarantee, expressed or implied, is made as to the effects of such or the results to be obtained if not used in accordance with directions or established safe practice.

Damages: Buyer's or user's exclusive remedy for damages for breach of warranty or negligence shall be limited to direct damages not exceeding the purchase price paid and shall not include incidental or consequential damages.

Furadan and FMC—FMC Trademarks (3669-5/86)

To the 4-H Leader:

Circle the "Learn More about Protecting the Corn Plant (and Yourself)" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #11 #12 #13

Date: _____ Signature: _____

Second year: Activity #11 #12 #13

Date: _____ Signature: _____

Third year: Activity #11 #12 #13

Date: _____ Signature: _____

Section VII. Harvesting the Corn Crop

As we discussed in Section V on selecting hybrids, when corn reaches maturity, moisture content of the grain is between 28 and 35%. That's when to harvest the whole plant for silage. The best time to harvest the grain, however, depends on a lot of different things including weather conditions, condition of the crop, how it's harvested (as shelled or ear corn), where and how it's stored, availability of drying equipment, cost considerations, etc.

Most of the corn in Indiana is harvested by combine as shelled grain. Ideally, combining should be done when kernel moisture content is between 18 and 22%. But some farmers harvest at higher moistures, while others wait until it's lower. Each has advantages and drawbacks.

The advantage of harvesting early, with grain moisture around 24-26%, is to keep field and machine losses down. Field losses increase when drying stalks lodge or the ears fall off; machine losses also go up as the corn becomes drier. The main disadvantage of early harvesting is the cost of drying the grain down to safe storage levels (about 15.5% moisture). Corn stored at a higher moisture content is more susceptible to molds and other diseases. Also, corn that is harvested too wet can be damaged by the action of the combine.

The advantage of delaying corn harvest, of course, is less time and expense for artificial drying. On the other hand, overdry corn may crack when combined and handled; and overripe ears are more likely to break off the plant and not be harvested at all. Also, late harvesting increases the chances of bad weather causing further delays.

Once you've decided on the grain moisture content at which you want to harvest, you need to know when the crop reaches that moisture level. This is determined by moisture-testing some grain samples, which you get to do in Activity #14. Then once you harvest and weigh the crop, Activity #15 shows how to figure the bushel-per-acre yield.

Activities to Learn More About Corn Harvesting

Activity #14, Measure Grain Moisture Content

(This activity may be repeated once.)

A. If you don't have a grain moisture tester, buy one or find someone who will either let you use theirs or test your corn for you. Most farmers who store their own grain have moisture testers, as do local grain elevators and high school vo-ag departments.

B. Just before harvest, draw a map of your corn field, divide it into ten areas, and number them. Collect six ears of corn from each area, shell those six ears by hand into a sack, and label the sack with the number corresponding to the area of the field from which the ears were taken. Repeat this procedure for each of the 10 six-ear samples.

C. Just before running the moisture tests, complete the following statements:

I want to harvest when my corn's moisture content is _____

I think it will reach that moisture level on (date) _____

I guess my corn's present average moisture content to be _____

My samples are being moisture tested on (date) _____

D. Now run the tests (or have them run) on all 10 corn samples, write down the test results on the chart, and calculate the average.

	Sampling area										
	1	2	3	4	5	6	7	8	9	10	Avg.
Moisture test results	____	____	____	____	____	____	____	____	____	____	____

E. Answer the following questions:

(1) How close was the actual average moisture content to what you predicted it would be in Step C?

(2) The largest difference in moisture readings was between what two sampling areas? What was the amount of that difference?

(3) What are some possible reasons for the differences in moisture content readings between any of the sampling areas?

(4) Based on the test results, on what date do you think you can start harvesting? How close was this date to your original prediction in Step C?

F. Show to your 4-H leader for his/her review and approval.

Activity #15, Calculate Your Corn Crop Yield

(This activity may be repeated once.)

Once the corn is harvested, to find out what your yield was in bushels per acre, you simply divide the total number of bushels harvested by the total number of acres harvested. To determine bushels and acres harvested, however, you first need to know five things: (1) the grain's moisture content when weighed, (2) total weight of the harvested grain, (3) average length of the field rows, (4) spacing between the rows, and (5) number of rows harvested.

This activity shows you how to collect and use those figures to calculate your yield. But before you do, write down your best guess as to the yield, then let's see how close your prediction was.

I guess my corn yield to be: _____ bushels per acre.

A. Find out the five things you need to know in figuring yield, and write them down here.

(1) Moisture content of harvested grain (from on-farm or local elevator moisture tests): _____ percent

(2) Weight of harvested grain (by weighing it on-farm or at the local grain elevator): _____ pounds

(3) Average row length (by selecting then measuring an average-length row): _____ feet

(4) Between-row spacing (set when the crop was planted): _____ inches

(5) Number of rows harvested (by counting them): _____ rows

B. Determine from Table 1 the weight of each bushel of corn. To do this, find your corn's moisture content (Step A.1) in the table's left column, then read to the right to find the pound-per-bushel weight for ear or shelled corn (whichever you have), and record that where indicated in Step C. (For example, a bushel of 20% moisture shelled corn weights 59.15 pounds.)

C. Calculate here the total bushels harvested by dividing total pounds of corn harvested (Step A.2) by the number of pounds per bushel (Step B), and record here.

_____ pounds harvested ÷ _____ pounds per bushel = _____ bushels harvested.

D. Determine from Table 2 the portion of an acre that each corn field row takes up. In that table's far left column, find the row length nearest your field's average row length (Step A.3), then read to the right until you get to the column for your row spacing (Step A.4), and record that figure where indicated in Step E. (For example, a 990-foot row at 36-inch row spacing takes up 0.068 acre.)

E. Calculate here the total acres harvested by multiplying the portion of an acre in each row (Step D) by the number of rows harvested (Step A.5).

_____ acre per row x _____ rows harvested = _____ acres harvested

F. Finally, calculate here the bushel-per-acre yield by dividing number of bushels harvested (Step C) by number of acres harvested (Step E).

_____ bushels harvest ÷ _____ acres harvested = _____ bushels per acre

G. Knowing your field's bushel-per-acre yield, answer the following questions:

(1) How close was the answer in Step F to your original guess?

(2) Were your yield results higher or lower than the long-term yield average for this field? By how much?

(3) What do you think were the reasons for any differences?

H. Show to your 4-H leader for his/her review and approval.

Table 1. Weight Per Bushel of Corn at Different Moisture Contents.

Percentage moisture in sample	Weight in pounds per bushel	
	Ear corn	Shelled corn
11	63.3	53.17
12	64.2	53.77
13	65.2	54.39
14	66.2	55.02
15	67.3	55.67
15.5	67.85	56.00
16	68.4	56.33
17	69.6	57.01
18	70.8	57.71
19	72.1	58.42
20	73.4	59.15
21	74.8	59.90
22	76.2	60.67
23	77.7	61.45
24	79.2	62.26
25	80.7	63.09
26	82.2	63.95
27	83.7	64.82
28	85.2	65.72
29	86.7	66.65
30	88.2	67.60
32	91.7	69.59
34	95.6	71.76
36	99.9	73.94

Table 2. Number of Acres Per Row for Various Row Spacings.

Length of row in feet	Row spacing in inches				
	20	30	36	38	40
660	0.025	0.038	0.045	0.048	0.050
825	0.031	0.047	0.057	0.060	0.063
990	0.038	0.057	0.068	0.072	0.076
1,155	0.044	0.066	0.079	0.084	0.088
1,320	0.051	0.077	0.091	0.096	0.101
1,485	0.057	0.083	0.102	0.108	0.114
1,650	0.063	0.095	0.113	0.120	0.126
1,815	0.069	0.104	0.124	0.132	0.139
1,980	0.076	0.114	0.138	0.145	0.151
2,145	0.082	0.123	0.147	0.156	0.164
2,310	0.088	0.132	0.159	0.169	0.177
2,475	0.095	0.141	0.170	0.180	0.189
2,640	0.101	0.151	0.182	0.192	0.202

To the 4-H Leader:

Circle the "Learn More about Corn Harvesting" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #14 #15

Date: _____ Signature: _____

Second year: Activity #14 #15

Date: _____ Signature: _____

Third year: Activity #14 #15

Date: _____ Signature: _____

Section VIII. Safety Around the Farmstead

Each year, farm accidents cost Hoosier farmers millions of dollars in damaged property, lost time, and lost productivity. But most importantly, accidents can cost in terms of personal injury or loss of life. Too many accidents result from hazards around the farmstead that were either neglected or overlooked.

In the beginner-level Corn Project manual, you went on a hazard hunt by looking at a drawing of a farm yard and circling all the hazards you could find. In Activity #16 below, you again get a chance to go on a hazard hunt, but this time on an actual farmstead. Then in Activity #17, you will correct some of the potential hazards you find.

Activities to Learn More About Farm Safety

Activity #16, Conduct a Farmstead Hazard Hunt

(This activity may be repeated twice.)

A. Make an inspection of a farmstead, using the 40-item Farm Safety Checklist below. If you don't live on a farm, arrange to safety-inspect a neighbor's, a relative's or a 4-H friend's farmstead.

B. Answer each of the checklist items with a "yes" or "no" as you make your inspection. Afterwards, write down the type of accidents avoided by following each suggested safety measure.

C. When done, go over the checklist with the farm owner or tenant (parents, neighbor, friend's parents) and have them sign in the space provided.

D. Show to your 4-H leader for his/her review and approval.

Farm Safety Checklist

Farm visited: _____ Date visited: _____

Owner's/tenant's signature: _____

Suggested safety measure	Yes or no	Accident(s) avoided by observing this safety measure
Farm Buildings		
1. All buildings are free of trash, litter, junk, and other debris.	_____	
2. All buildings are well-lighted outside and inside (if need be).	_____	
3. Above-ground fuel storage tanks are at least 40 feet from any building.	_____	
4. The area around fuel storage tanks is free of weeds and other combustible materials.	_____	
5. No-smoking signs are posted at fuel storage and refueling areas.	_____	
6. Each major building is equipped with a fully charged ABC-type fire extinguisher.	_____	
7. Each major building contains a well maintained first-aid kit.	_____	
8. Each major building has a communication system (phone, intercom, buzzer) to use in case of an emergency.	_____	
9. Emergency telephone numbers (fire, doctor, poison control center, ambulance) are posted by all phones.	_____	
10. All electrical outlets are grounded to accommodate grounded (3-wire) appliances and equipment.	_____	
11. All electrical wiring is firmly supported or enclosed in conduit.	_____	
12. All electrical wiring insulation is in good condition.	_____	

Suggested safety measure	Yes or no	Accident(s) avoided by observing this safety measure
Crop Storage Areas		
13. Entrances to grain bins and silos can be closed to keep children out.	_____	
14. Each grain bin or other grain storage area has a sign at the entrance warning about the dangers of flowing grain.	_____	
15. The lights in crop storage areas are protected from dust and water.	_____	
16. All grain bins have both outside and inside permanent ladders.	_____	
17. All silo and grain bin ladders are securely fastened and in good condition.	_____	
18. All crops are being stored at safe moisture levels to prevent spontaneous heating.	_____	
19. Limited-oxygen silos are kept sealed at all times except when loading or unloading.	_____	
20. Each silo has a sign at the entrance warning about silo gas.	_____	
21. There is a fully charged ABC-type fire extinguisher in each crop storage area.	_____	
22. A respirator or dust mask is available for use when working around stored grain.	_____	
23. All grain-drying equipment and electric motors are clean and free of trash.	_____	
24. Equipment and motors used in crop storage areas are serviced regularly.	_____	
25. All electric motors are located where there is ample ventilation.	_____	
26. Overhead power lines are located away from grain bins and silos where tall equipment like augers are used.	_____	
Chemical Storage Areas		
27. Crop chemicals are kept stored in locked rooms or buildings.	_____	
28. Each chemical storage area has a sign at the entrance listing what is inside and warning of the hazards.	_____	
29. All chemicals are stored in their original containers or at least in containers that are clearly marked.	_____	
30. All empty containers are disposed of properly.	_____	
31. No-smoking signs are posted in and around buildings where chemicals are stored.	_____	
32. Smoking is prohibited when chemicals are being handled.	_____	
33. The right personal protective gear is used whenever chemicals are being handled.	_____	
Fields and Driveways		
34. Cropped fields are free of stumps, large rocks and other obstacles.	_____	
35. Obstacles in fields that can't be removed have been well marked for easy visibility.	_____	
36. Ample room has been left along road or drainage ditches to turn planting and harvesting equipment.	_____	
37. Trees along field edges and driveways are trimmed so machinery can pass under.	_____	
38. There is an unobstructed view in all directions where the driveway enters the public road.	_____	
39. The driveway entrance is wide enough so trucks and farm equipment don't have to swing into the opposite lane when entering or leaving.	_____	
40. The corners of all intersections on the farms are free of tall crops that would block the driver's vision when entering the intersection.	_____	

Activity #17, Eliminate Hazards Around the Farmstead

(This activity may be repeated twice.)

A. From the farm safety checklist, choose at least four suggested safety measures that have not been followed on a farm you inspect, and see to it that the hazards get corrected. Correct them yourself, together with others or, if necessary, use professional help.

B. List below the safety hazards eliminated and the date each was corrected. Then have the farm owner or tenant (parents, neighbor, friend's parents) sign in the space provided.

Hazard corrected	Date corrected	Owner's/tenant's signature
(1)		
(2)		
(3)		
(4)		
(5) extra		
(6) extra		

C. Show to your 4-H leader for his/her review and approval.

To the 4-H Leader:

Circle the "Learn More About Safety Around the Farmstead" activities attempted and completed by the 4-H member, date and sign your name.

First year: Activity #16 #17

Date: _____ Signature: _____

Second year: Activity #16 #17

Date: _____ Signature: _____

Third year: Activity #16 #17

Date: _____ Signature: _____

Section IX. Managing Your Resources for Profitable Corn Production

Management is the term that describes the process of deciding how to use your resources. Some people do a better job of management than others. They get more profit or other satisfactions from the use of their resources. We say that they are better managers.

How productive and profitable your corn crop will be depends, in part, on the cooperation of some natural resources over which you have no control, such as enough rainfall at the right times, plenty of sunlight, warm temperatures, etc. However, it also depends on how you use certain other resources over which you do have control. These include your money and material items (capital), your muscle (labor), and your mind (management skill).

All of us have these resources and are constantly choosing when and how to use them. Sometimes we choose to *sell* them to others—our money for interest, our land or machinery for rent, our muscle for wages, or our mind for a salary. Other times, we choose to *buy* them, such as when we take out a loan, rent land, hire custom work to be done, or use a consulting service.

Usually, to make the most profit in producing corn, farmers use as many of their own resources as possible. But sometimes they choose to borrow, rent, or hire certain goods or services. When doing this, they can still make a profit *if* the extra returns are greater than the extra costs.

The rest of this section and the activities are designed to teach you some basic resource management principles and skills, including working out a production and financing plan, setting up a bank account, and borrowing money for your Corn Project.

How to Make a Corn Project Production and Financing Plan

Any business venture should be guided by a financial plan, which helps determine if it can earn a profit and provides information for making right decisions. Your corn-growing project is a business venture, so you too need such a plan. By making one at the beginning of each project year, you can know (1) how much money you'll need for production inputs (seed, fertilizer, pesticides, machinery, etc.), (2) how much you'll have to borrow to meet expenses, and (3) how much profit you're likely to earn after paying all the bills.

Figure 8 shows a simple Corn Project production and financing plan. The plan's ten steps and summary are explained below, using an example situation. In Activity #18, you'll develop the same kind of plan for your own project. Often, a good manager will make several versions of a financial plan then choose the best one. In fact, that's what you get a chance to do in the advanced-level manual.

Step 1. At the beginning of his first year as an intermediate-level 4-H Corn Project member, Jack Sample decides he's going to use the $25 in his savings account at First Bank to help pay the costs of growing corn.

Step 2. Jack arranges to rent 2 acres of dad's land at a rental rate of 75¢ of its bushel-per-acre yield capability. This land averaged 140 bushels per acre the last three times it was planted to corn, so Jack gets to rent it for 140 x $0.75 or $115 per acre.

Step 3. Jack and dad also agree that Jack's 2 acres would be tilled, planted, harvested, and dried at the same time as the rest of the field, and that he'd pay dad for these services at average custom rate costs. Here are the field activities that have to be performed and the per-acre custom rate Jack is to pay for each. (See EC-130, "Indiana Custom Rates for Power-Operated Farm Machinery," for the current average rates being charged in your part of the state. Copies are available at county Extension offices.)

Type of service and average custom rate*	Jack's per-acre cost
Broadcasting fertilizer ($2.96/acre)	$ 2.96
Chiseling ($8.36/acre)	8.36
Discing ($5.80/acre) x 2 times	11.60
Applying anhydrous ammonia ($5.46/acre)	5.46
Planting ($9.45/acre)	9.45
Cultivating ($4.95/acre)	4.95
Spraying, tractor-mounted ($3.47/acre)	3.47
Combining at 140 bu. ($22.48/acre)	22.48
Hauling ($0.05/bu.) x 140 bu.	7.00
Drying, 5 points removed ($0.13/bu.) x 140 bu.	18.20
Total	$93.73

*Average rates charged in 1986.

Step 4. Jack will use the same fertilizer, seed, and chemicals that dad is using. Dad follows Purdue soil test recommendations for fertilizer type and rates, seed company recommendations for hybrid selection and planting rate, and Purdue weed control recommendations from ID-1, "Weeding with Chemicals" (available at Extension offices), for herbicide materials and rates. Therefore, Jack's per-acre costs will be:

Production input and its per-unit cost	Jack's per-acre cost
Fertilizer:	
154 lb. NH_3 at $0.12/lb.	= $18.48
26 lb. P_2O_5 at $0.17/lb.	= 4.42
50 lb. K_2O at $0.08/lb.	= 4.00
50 lb. 10-34-0 at $0.10/lb.	= 5.00
500 lb. lime at $10/ton	= 2.50
Fertilizer cost/acre	$34.40

Production input and its per-unit cost	Jack's per-acre cost
Seed Corn:	
19 lb. seed at $60/bu.	= $20.40
Seed cost/acre	$20.40
Chemicals:	
2 lb. herbicide A at $2.50/lb.	= $ 5.00
2 qt. herbicide B at $4.75/qt.	= 9.50
Chemical cost/acre	$14.50

Step 5. Jack can now determine how much money he'll need to borrow by first adding up his production costs in Steps 2, 3, and 4, which usually have to be paid before the corn crop is sold, and then subtracting from that his beginning bank balance in Step 1.A ($560 − 25 = $535). If Jack can borrow that much, his bank account will "cash flow"—that is, have enough in it to pay his corn growing costs as they occur. If he doesn't have the needed cash flow himself or can't borrow it, then he must not grow corn using this plan.

Step 6. Dad agrees to let Jack borrow the $535 at ½ percent interest for each month between when he borrows it and when he sells his crop.

Step 7. Jack opens a checking account at First Bank just for his corn project and deposits dad's loan *plus* the $25 from his savings account.

Step 8. Jack expects his crop to yield 140 bushels per acre—the same that dad has been getting off this field. He hopes to harvest it at about 20-21% moisture, dry it down to 15.5%, then sell it without storing for $2.10 a bushel. Although both yield and price are unknown at this time, he feels comfortable about making decisions based on these estimates.

Step 9. Jack's loan is $535. The loan period will be about 6 months (mid-April to mid-October). At ½% per month or 3% for the 6 months, the interest on the loan comes to $16.05. This means he must pay dad $551.05 to clear his debt.

Step 10. Subtracting what he will pay out to dad (Step 9) from what he expects to deposit from the sale of his corn (Step 8), Jack's ending bank balance should be about $41.

Summary. Jack's project profit or loss is merely the ending bank balance (Step 10) minus the beginning balance (Step 1); whereas per-acre profit or loss is the estimated sales per acre (Step 8) minus the estimated costs per acre (Step 5.A). This summary is what a lender needs to see to determine if he should risk loaning Jack the money.

The process for deciding how to best use your resources to grow corn most profitably is quite simple—(a) prepare a production and financing plan for each possible way you might grow corn; (b) discard the plans that you can't cash-flow; then (c) from the remaining plans, pick the one that's most profitable.

Now comes the more difficult part—successfully carrying out the plan you selected. This requires doing a good job of soil management and production management. Good soil management involves finding and using right information about "what makes corn grow" on your particular soil. Good production management means mastering the planting, pest control, harvesting, and other skills needed to grow corn. Hopefully, you'll improve these important management skills as you progress through the 4-H Corn Project.

In summary, management involves deciding what to do and then doing it. It's choosing how to use your resources so as to earn the most profit and other satisfactions. It's also getting the job done right so that you actually realize those satisfactions. People who do a better job of deciding and doing than others we call better managers.

Let's Look at Some Banking Services

One reason banks are in business is to provide people with useful financial services. Here are the main ones.

First, you can get your own savings account and deposit your money in it. The bank will pay you interest for the time you leave your money in that savings account.

Second, you can open your own checking account and deposit your money in it. You can then write checks to pay people for the things you want. The bank charges a fee for this service, which gives you the convenience and safety of having to carry only a checkbook, and not cash, around with you.

Third, if you qualify, you can borrow money from the bank, which, in turn, charges you for the use of that money. Because they specialize in this business, banks often provide better lending services than can an individual lender. In addition to commercial banks, farmers can borrow money from a farmer-owned cooperative called the Farm Credit System.

Let's talk a little more about these last two services (checking and lending), because you may have to use either or both in your Corn Project.

Checking Accounts

In Activity #19, you learn about opening a checking account. You'll find that project financial record-keeping is really easy if you put all that you borrow and all that you earn into this account. As you write a check for each Corn Project expense, you have an accurate, up-to-date record. When you have sold the corn and repaid the loan, what's left over in the account is your profit.

Lending Services

Banks and other lending institutions usually get money from *savers* or *investors* and lend money to *borrowers*. The savers/investors expect to receive *interest* as

Figure 8. Example of a 4-H Corn Project production and financing plan.

4-H Corn Project Production and Financing Plan

			Project bank account cash flow		
			Checks (amounts paid)	Deposits (amount received)	Bank balance [1]
Step 1. a.	Beginning bank balance				$ 25.00
b.	Financing—loan amount needed (see Step 5)			$ 535.00	$ 560.00
		$/acre Acres			
Step 2.	Field rent[2]	$ 115.00 × 2	$ 230.00		
Step 3.	Power and machinery rent[2]	$ 93.73 × 2	$ 187.46		
Step 4.	Purchased inputs: Fertilizer	$ 34.40 × 2	$ 68.80		
	Seed	$ 20.40 × 2	$ 40.80		
	Chemicals	$ 14.50 × 2	$ 29.00		
Step 5.	Size of loan needed				
a.	Total production costs (add Steps 2, 3, 4)		$ 556.06		
b.	Subtract beginning bank balance (Step 1.a)		$ 25.00		$ 3.94
c.	Size of loan needed (insert in Step 1.b)		$ 531.06		
Step 6.	Name of lender: DAD @ 1/2% / MONTH for 6 MO.				
Step 7.	Name of bank: FIRST BANK				
Step 8.	Estimated sales (expected yield *times* price)				
	140 bu./ac. × 2 acres × $ 2.10 /bu.			$ 588.00	$ 591.94
Step 9.	Loan principal *plus* interest[3]		$ 551.05		
Step 10.	Ending bank balance (Step 8 − Step 9)				$ 40.89

Summary

A. Total project profit or loss: ending bank balance *minus* beginning bank balance.

Step 10		Step 1.a		Project profit
$ 40.89	−	$ 25.00	=	$ 15.89

B. Per-acre profit or loss: expected sales *minus* expected costs (including loan interest) *divided by* number of acres

Step 8		(Step 5.a + loan int.)		Acres		Profit/acre
$ 588.00	−	(556.06 + 16.05)	÷	2	=	$ 7.96

[1] Checks written are subtracted from your previous bank balance; deposits made are to be added.
[2] It is expected that you will be using your parent's land and machinery and not renting from commercial sources.
[3] Amount of interest can usually be provided by the lender or estimated as follows: loan principal × interest rate × time period of loan.
Example: $535.00 × 0.5%/month × 6 months = $16.05.

payment for use of their money. The borrowers, on the other hand, are expected to repay the money plus interest for the privilege of using it.

Banks charge a higher interest to the borrowers than they pay to the savers. They use the difference to cover their operating costs and any losses resulting from bad (unpaid) loans. These losses must be kept near zero if the interest charged to borrowers is to remain low.

To help keep down the risk of making bad loans, lenders often require borrowers to put up some type of security, such as property, stocks, or a signed promise by someone else to pay the loan (a co-signer). Then if the borrower does not fully repay, the lender can sell the security as repayment or get what is unpaid from the co-signer. Activity #20 will help you learn how to obtain a loan for meeting your Corn Project expenses.

Activities to Learn More About Using Financial Resources

Activity #18, Make a Corn Project Production and Financing Plan

(This activity may be repeated twice.)

A. Make some extra copies of the blank "Corn Project Production and Financing Plan" in the Appendix. If you do this activity more than one year, you don't want to mark up that page in the manual.

B. Sit down with your parents, Corn Project partner's parents, or whoever is working with or helping you grow your crop, and carefully go over the planning guide with them. You will especially need their counsel for Steps 2, 3, 4, 6, 7, and 8.

C. Complete the planning guide, then answer the following questions:

(1) Does the summary show that you can afford to grow corn in the way that you planned to?

(2) How much more profit would you realize if your expected yield were 10 bushels per acre higher? If the expected selling price were 25¢ per bushel more?

Additional profit if yield is 10 bu./ac. more: _____

Additional profit if selling price is 25¢/bu. more: _____

(3) Are there any changes you could make in the production inputs you used to figure costs in Steps 2 and 3 of your plan that might reduce those costs without reducing yield? Explain.

(4) Are there any changes you could make in those Step 2 and 3 production inputs that might increase yield without increasing costs? Explain.

(5) Are there any changes you could make in those same production inputs that might increase sales (yield times price) more than the increased costs or that might decrease costs more than the decrease in sales? Explain.

D. Show to your 4-H leader for his/her review and approval.

Activity #19, Shop for a Corn Project Bank Account

(This activity may not be repeated.)

A. Visit *two* different financial institutions in your community, such as a state or national bank, savings bank, savings and loan association, or credit union. Ask for their advice as to the type of bank account you should have for your Corn Project, and get as much information as you can about the one that each institution recommends.

B. List here what you feel are the good points and the limitations of the two different accounts. Consider such things as: interest paid and at what rate, activity charge, minimum balance, co-signing requirement, overdraft penalty, etc.

Advantages and disadvantages of—

Name of bank: _____	Name of bank: _____
Type of acct.: _____	Type of acct.: _____

C. After comparing the two bank accounts, answer the following questions:

(1) Which one do you think is better for your Corn Project, and why?

(2) Will you open an account like the one you felt was better? _____. If not, what are your reasons?

D. Show to your 4-H leader for his/her review and approval.

Activity #20, Shop for a Corn Project Loan

(This activity may be repeated once.)

This activity can be completed even if you do not plan to borrow money for your Corn Project from a commercial lender.

A. With a parent, select and visit *two* different types of financial institutions that loan money, such as a state or national bank, savings bank, savings and loan association, credit union, loan company, or farm credit system agency. Show the loan officer at each institution the production and financing plan that you completed for your Corn Project (Activity #18), and find out if it would qualify for a loan. Report their answers below.

	Name of institution	**Qualify (yes or no)**
No. 1:	_____	_____
No. 2:	_____	_____

B. If your project *would not* qualify at either or both institutions, explain here why not. If it *would* qualify, record here the loan terms, such as interest rate, repayment schedule, early payment clause, late payment penalty, insurance, security required, etc. (Remember, the loan officer only reports what his institution *can do* for you regarding a loan. Weigh all the alternatives and lending offers before deciding what you *will do* about borrowing the money.)

Institution No. 1 (loan terms or reasons a loan was denied):	**Institution No. 2** (loan terms or reasons a loan was denied):

C. After comparing the responses to your loan request, answer the following questions:

(1) If both institutions would loan you money, which of the two borrowing options is better in your opinion, and why?

(2) Will you borrow from the source you selected as being better? _____. If not, what are your reasons?

D. Show to your 4-H leader for his/her review and approval.

To the 4-H Leader:

Circle the "Learn More about Financial Resources" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #18 #19 #20

Date: _____ Signature: _____

Second year: Activity #18 #19 #20

Date: _____ Signature: _____

Third year: Activity #18 #19 #20

Date: _____ Signature: _____

Section X. Discovering the Many Other Uses of Corn

Much of the dent corn we grow in Indiana ends up on dinner plates throughout the world in the form of meat. But more and more of our corn is now being further-processed into what are called corn wet-milled products that have many uses, particularly in making other foods. The following story gives you an idea of just how often corn ends up in the foods we eat and items we use everyday around the home. Then Activities #21 and #22 help you learn more about corn wet-milled products and what they do specifically.

Corn in the Supermarket

How many items lining the shelves of your local supermarket do you think contain corn or a corn product as an ingredient? 100? 500? 1,000? A study by the Corn Refiners Association, Inc. found that, of the 12,000 items carried in the modern grocery store, about 1,160 have corn as an ingredient, whether in the form of syrup, syrup solids, starch, oil, meal, dextrose, dextrins or maltodextrins.

For instance, do you sometimes crave for genuine New England clam chowder? It's got corn in it. And so do those soup crackers that you sprinkle on top. How about the cranberry jelly that goes so well with turkey or pork roast? It contains corn. And the oatmeal cookies to be devoured with milk after school? Corn in oatmeal cookies? Yes indeed, and in wheat bread too.

If you're into convenience foods, chances are you're going to be into lots of corn products as well. That frozen chicken pot pie, for example, has corn in the crust and the thickening; and of course, corn was the basic feed that produced the meat.

Nowadays, it's hard to fix a meal that doesn't include something that uses corn wet-milled products. Corn has become America's major foodstuff. We're not talking about the sweet corn that you eat off the cob, but the dent or field corn that we grow so abundantly here in Indiana.

It's safe to say that, without corn, the modern supermarket would be hard to recognize. To give you some idea of how widespread corn is throughout the store, let's walk down the aisles and, first, buy what we need for tomorrow's meals, then shop at random to re-stock our food supplies at home.

Corn for Breakfast, Lunch, and Supper

Breakfast tomorrow begins with corn flakes or other corn-based dry or hot cereal that includes sweetening agents made with corn syrup and dextrose. Your eggs are fried in corn oil. The bacon or smoked links have corn syrup or dextrose; or if you like scrapple, it also contains dextrose made from corn. And there's dextrose, corn syrup, and syrup solids in those quick-energy breakfast bars.

Your English muffin has been rolled in corn meal; the sweet rolls contain corn starch in addition to several corn sweeteners; and a wide variety of frozen toaster breakfast foods (pastries, waffles, and even French toast) are made possible by corn-based ingredients. They all can be spread with pure corn oil margarine or butter from a corn-fed cow, then topped with corn-sweetened jelly.

Flavored instant coffee, cocoa and cocoa mixes all contain corn sweeteners. And those high-protein, high-vitamin instant breakfasts are made with either corn syrup or syrup solids.

Lunch is a hamburger (from a corn-fed steer) on a bun that contains corn syrup. Or if you're having a salami or bologna sandwich, there's corn syrup, syrup solids, or dextrose in luncheon meats. And your peanut butter contains dextrose to make it spread easier.

Having soup? The condensed kinds are usually made with corn syrup. The dry ones too have corn-based ingredients—mainly corn starch for thickening and corn syrup for flavor.

Supper tomorrow includes ham (from a corn-fed hog), sweet potatoes candied with corn syrup, corn bread made from corn meal, canned sweet corn, and a tossed salad with dressing that flows easily because of corn oil. Dessert is imitation tapioca made with corn starch and sweetened with corn syrup. The appetizer is tomato juice and crackers with cheese spread, which probably contains corn starch and dextrose.

Other Foods Containing Corn

As for the different sections of the supermarket, a little label snooping shows corn wet-milled products in some of the most unlikely foods. Take the canned goods section, for instance. Baked beans hold their consistency because of corn syrup, and canned zucchini and kidney beans are packed in corn starch. Canned cherries and strawberries are kept firm in the container by corn syrup; while other canned fruits, including fruit cocktail, peaches, pears, and apricots, count on corn sugar for flavoring and sweetening.

Such different foods as croutons and spaghetti contain corn starch, corn syrup, and dextrose. Whipped desserts and french fries both have dextrose added, and pizza and bouillon cubes include corn oil. Onion rings, Worchestershire sauce, Gatorade, gourmet cookies, and marmalades all contain corn syrup.

Over in the dairy case are high-protein foods and drinks from the cow, again supplemented with corn derivatives, especially sweeteners. Two such products

are ice cream and yogurt. There are more than 50 ice cream and nearly 40 yogurt items that use corn sweeteners to prevent crystallization, control freezing temperature, and maintain proper texture. Commercial production of 100% corn-sweetened ice cream is now underway. Corn sweetener is also found quite often in diet foods, including low-calorie frozen yogurt, in salad dressing, and in gravy, cake, and pudding mixes.

In the bakery section, it's hard to find a loaf of bread that doesn't include some ingredient of corn. The right corn syrups keep the loaf moist and fresh and give it that golden brown crust. Corn nutritives will also be found in coffee cakes and dinner rolls.

The use of corn continues to grow in the manufacture of cake mixes, chips and other snack foods, chow mein, fortune cookies, and a wide variety of sauces from soy to catsup. And speaking of cats, they are also probably fans of corn; many pet foods now contain corn starch, corn syrup, syrup solids, dextrose, and corn gluten meal.

Corn in the Non-Food Aisles

But what about in the non-food sections of the store? Is corn there too? You bet! The paper cups and plates you buy for that picnic have corn starch in them. And corn starches and dextrines are essential ingredients in the adhesives and coatings of many items. Note tablets and pastes in the school supply section contain corn products.

Even flashlight batteries have a corn connection; starch acts as a carrier for the electrolytic agents in batteries. And not to be left in the dark, safety matches use corn ingredients to hold the materials in the match head together.

Summary

So in the supermarket, corn and its products are everywhere. Some are easily recognized, like bags of popcorn, boxes of corn flakes, and cans of creamed corn or hominy. But in most cases, corn is used in supporting roles with other foods, enhancing their flavor, texture, and nutritional value, controlling moisture, and keeping costs down.

Next time you put the groceries away, look at the label of each item. Chances are at least one in ten that you'll find the word: CORN.

Activities to Learn More About Corn Products

Activity #21, Supermarket Hunt for Foods that Contain Corn Products

(This activity may be repeated once *if* you do not list the same food items.)

A. Go to your favorite supermarket, and locate the ten food sections listed below.

B. In each section, find two food items that contain corn or corn products. Write down here the name of each item (20 total) *and* its corn ingredient. (Example: Potato chips—refined corn oil.)

Baked goods

_____

_____

Baking Products

_____

_____

Beverages

_____

_____

Processed/canned fruits

_____

_____

Cereals

_____

_____

Processed/canned meats

_____

_____

Dairy products

_____

_____

Convenience/snack foods

_____

_____

Condiments (jellies, sauces, dressings, spreads, relishes, etc.)

_____

_____

Processed/canned vegetables

_____

_____

C. At home, rearrange the above list of food items into the following mealtime categories:

Breakfast items _____

_____

Luncheon items _____

_____

Supper/dinner items _____

_____

Snack items _____

_____

D. Answer the following questions:

(1) In which one of the ten supermarket food sections was it easiest to find items that contained corn products? In which section was it most difficult?

Easiest section: _____ Hardest section: _____

(2) In which one of the following types of foods was it easiest to find corn products—breakfast foods, lunchtime foods, supper/dinner foods, or snack foods? Explain why. (You may need to talk with your mom, home economics teacher, or county Extension home economist about this.)

E. Show to your 4-H leader for his/her review and approval.

Activity #22, Learn About the Role of Corn Products in Other Foods

(This activity may not be repeated.)

A. At your school or community library, from an encyclopedia, textbook, or any other source, find information on at least six of the corn products listed here that serve as ingredients in other foods.

Corn starch	Corn dextrose	Corn sorbitol
Corn dextrin	Corn syrup solids	Corn gluten
Corn glucose syrup	Corn oil	Corn maltodextrins
High fructose corn syrup	Corn lactic acid	

B. For each of the products chosen, write down here what it is, what it does, and at least one food in which it is found.

Corn product	What it is	What it does	Food(s) found in
1. _____	_____	_____	_____
	_____	_____	_____
2. _____	_____	_____	_____
	_____	_____	_____
3. _____	_____	_____	_____
	_____	_____	_____
4. _____	_____	_____	_____
	_____	_____	_____

5. _____	_____	_____	_____
	_____	_____	_____
6. _____	_____	_____	_____
	_____	_____	_____
7. (extra) _____	_____	_____	_____
	_____	_____	_____
8. (extra) _____	_____	_____	_____
	_____	_____	_____

C. Show to your 4-H leader for his/her review and approval.

To the 4-H Leader:

Circle the "Learn More about Corn By-Products" activities attempted and completed by the 4-H member, date, and sign your name.

First year: Activity #21 #22

Date: _____ Signature: _____

Second year: Activity #21 #22

Date: _____ Signature: _____

Third year: Activity #21 #22

Date: _____ Signature: _____

Appendix

4-H Corn Project Production and Financing Plan

			Project bank account cash flow		
			Checks (amounts paid)	**Deposits (amount received**	**Bank balance** [1]
Step 1. a.	Beginning bank balance				$ _____
b.	Financing—loan amount needed (see Step 5)			$ _____	$ _____
		$/acre Acres			
Step 2.	Field rent[2]	_____ × _____	$ _____		
Step 3.	Power and machinery rent[2]	_____ × _____	$ _____		
Step 4.	Purchased inputs: Fertilizer	_____ × _____	$ _____		
	Seed	_____ × _____	$ _____		
	Chemicals	_____ × _____	$ _____		
Step 5.	Size of loan needed				
a.	Total production costs (add Steps 2, 3, 4)		$ _____		
b.	Subtract beginning bank balance (Step 1.a)		$ _____		$ _____
c.	Size of loan needed (insert in Step 1.b)		$ _____		
Step 6.	Name of lender: _____				
Step 7.	Name of bank: _____				
Step 8.	Estimated sales (expected yield *times* price)				
	_____bu./ac. × _____ acres × $_____/bu.			$ _____	$ _____
Step 9.	Loan principal *plus* interest[3]		$ _____		
Step 10.	Ending bank balance (Step 8 − Step 9)				$ _____

Summary

A. Total project profit or loss: ending bank balance *minus* beginning bank balance.

Step 10 Step 1.a Project profit

$ _____ − $ _____ = $ _____

B. Per-acre profit or loss: expected sales *minus* expected costs (including loan interest) *divided by* number of acres

Step 8 (Step 5.a + loan int.) Acres Profit/acre

$ _____ − _____ ÷ _____ = _____

[1] Checks written are subtracted from your previous bank balance; deposits made are to be added.
[2] It is expected that you will be using your parent's land and machinery and not renting from commercial sources.
[3] Amount of interest can usually be provided by the lender or estimated as follows: loan principal × interest rate × time period of loan.
Example: $535.00 × 0.5%/month × 6 months = $16.05.

4-H 672a

4-H Corn Project Scouting Form

(instructions on back)

Name Jack Sample

Check One: ✓ Beginner / Intermediate / Advanced

Years in activity 2

Scouting Visit #1 #2 (#3) #4 #5 #6 (circle one)

Date June 15

Average plant height 20"

Soil Conditions

(wet) moist dry

loose (light crust) hard crust

Weather Conditions

cool (warm) hot

calm (breezy) windy

(sunny) cloudy rainy

Part 1. Different weeds found (identify at site or later)

	Scouting area 1	2	3	4	5	Total	Number of weeds per foot of row	Serious problems? (Yes/No)
	No. found in 2 square feet							
Foxtail	6	5	4			15	2.5*	Not yet
Lambsquarter	2	3	1			6	1	No
Pigweed	8	9	3			20	3.3	Yes
Canada thistle	0	1	4			5	.8	No

Part 2. Different insects found (identify at site or later)

	No. found in area scouted and no. of plants affected					Total	Percent of corn affected	Serious damage? (Yes/No)
Lady bird beetle	2	1	3			6	10%	No
Grasshopper	5	1	2			8	13%*	No

Part 3. Damage symptoms and affected plant parts (identify or describe)

	No. of plants affected in area scouted					Total	Percent of corn affected	Likely cause?
Black on some leaves (blight?)	10	5	7			22	37%	Wetness
Knots on stem/leaves (gall?)	2	0	1			3	5%	Fungus
Rows of holes in leaves	7	0	2			9	15%	Bugs?

* See how figured on back side.

Other Scouting Observations and Comments:

- looks like moles in Area #3, but don't think they did any damage.
- Rainstorm last Sunday broke off 2 of 20 plants examined in Area #1.

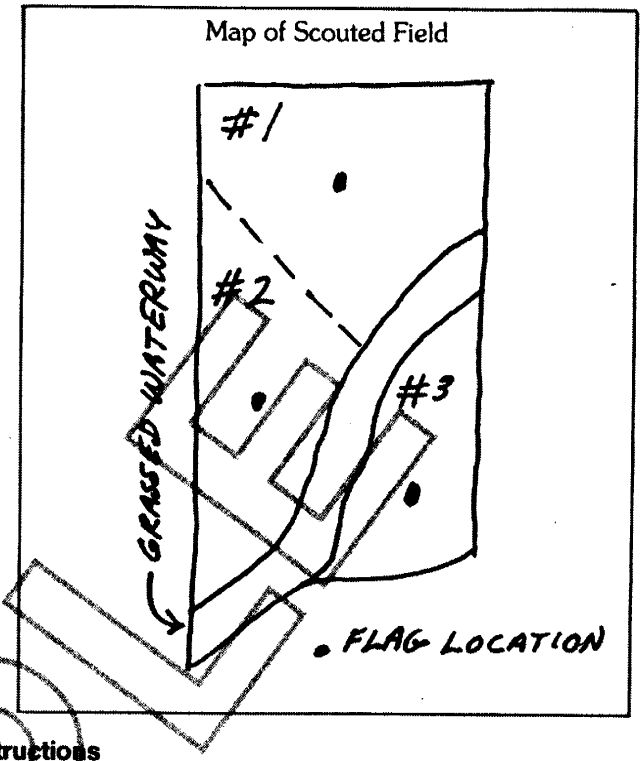
How to figure weeds/foot of row in Part 1.

$$\frac{\text{Total foxtail found at all 3 areas}}{\text{Total feet of row examined in all 3 areas}} = \frac{6+5+4}{2+2+2} = \frac{15}{6} = 2.5$$

How to figure percent of corn affected in Parts 2 and 3.

$$\frac{\text{Total grasshoppers at all 3 areas}}{\text{Total plants examined at all 3 areas}} = \frac{5+1+2}{20+20+20} = \frac{8}{60} = .133 \quad (13\%)$$

Map of Scouted Field



Scouting Instructions

(Beginner, Intermediate and Advanced project levels)

1. Write your name, indicate which project level, and show the number of years you have done this field scouting activity.
2. Circle which field scouting visit this is, and write down the date. (Beginner level members make at least four scouting trips; intermediate level, five trips; and advanced, six trips.) Use a new form for each visit.
3. Circle the soil conditions and weather conditions at the time of scouting.
4. Select scouting areas as described in your project manual; and draw a map in the space above showing field shape, natural drainage pattern, and the marked scouting sites. (Beginner level examines 20 plants in each of three scouting sites; intermediate level, 20 plants in each of four sites; and advanced, 20 plants in each of five sites.)
5. Measure three plants at each scouting site, and record the average height in inches. (Beginner level measures a total of 9 plants; intermediate level, 12 plants; and advanced, 15 plants.)
6. For Part 1 (Weeds), around the marking pole in each scouting site, measure off an area 2 feet long and 1 foot wide. Then count and record on a separate line how many of each *different* kind of weed found in that 2-square-foot area. (Suggestion: Pull the weeds and put them in piles of the same kind; then count.) To calculate number of weeds per foot of row, divide the total of each different weed found at all scouting sites by the total feet of row examined for weeds. In the far right column, indicate whether you think any weed might become a serious problem.
7. For Part 2 (Insects), count and record on a separate line how many of each *different* kind of insect found on or around the 20 plants you examine at each scouting site. If plants have been cut off, look for cutworms in the soil around the plant; record both number of plants cut and cutworms found. If plants are wilted or stunted, carefully dig one up and examine for insect feeding on the roots; record both number of plants affected and different insects found. If plants have "shot holes" in the whorl (center) leaf, cut into the whorl area to find the insects causing damage; record both plants affected and insects found. To calculate percent of corn affected, divide the total of each different insect found at all scouting sites by the total number of plants examined, and multiply by 100. Indicate in the last column if the damage by any insect could become serious enough to consider control measures.
8. For Part 3 (Damage Symptoms), examine the 20 plants in each scouting site, looking for things that aren't normal, such as holes in leaves or stalks, other-than-green coloration, a spongy stem, something growing on the plant that's not a plant part, wilting, stunted growth, etc. Dig up any unhealthy looking plant and, after checking for insect feeding, wash off the roots and inspect for other types of damage. Describe on a separate line each *different* kind of symptom, record the number of plants affected, calculate the percent of plants affected (as described in step #7), and write what you think caused the damage.
9. Under "Other Scouting Observations and Comments" above, write down anything relating to this visit that has not already been recorded and that you feel is or could be important to you.