The

Corn Growers

Field Guide

For

Evaluating

Crop Damage

And

Replant Options

The Corn Growers Field Guide
For Evaluating Crop Damage And Replant Options

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Hello from the Corn Production Stewardship Team.

We all suffer crop losses at one time or another and, despite the wonderful capability of the corn plant to compensate for stand loss, sometimes we have to make a replant decision.

This excellent *Field Guide* offers powerful testimony to the fact that we can recover from a devasting crop loss if we are able to make thoughtful decisions based on research-based information. That's why some of the content in this *Field Guide* was made possible by Minnesota corn-funded research.

Each of us will be glad this *Field Guide* is available when we need it.

Karlen Nelson
Minnesota Corn Research and Promotion Council

From the Editor

Editing this *Field Guide* has been a rare opportunity for me to participate in issues of agricultural production not readily evident in the grocery store. Farming seems to most of us who know it only, or primarily, as consumers to be a pleasant and laid-back lifestyle.

Well, it probably is pleasant, but it's definitely **not** laid-back. Farming is hard work -- there are long hours, dusty and dirty conditions, machinery and manpower problems and, of course, the weather. The wonderful, unpredictable, life-giving and life-taking weather.

This *Field Guide*, your *Field Guide*, has been developed to help corn and soybean growers deal efficiently and effectively with losses caused by the weather -- especially hail damage.

The written text and the tables in the *Guide* have been carefully and thoughtfully prepared by well-informed, experienced agronomy experts. The photo section is intended to display graphically both specific and general issues, aspects, and situations relevant to understanding and dealing with unexpected catastrophic losses in your fields; especially the surprisingly complicated replant decision.

We, the authors, the editors, and those who approved and funded this worthwhile and important project, trust that you will find our work to be an asset to you in your work; the physical and the mental work that soybean and corn growers do so unselfishly, and so well.

J. Michael Bennett Ed.D.

THE CORN GROWERS FIELD GUIDE FOR EVALUATING CROP DAMAGE AND REPLANT OPTIONS

INTRODUCTION

Corn crop injury occurs somewhere in the state every year. The major cause of crop injury is hail. Hail annually causes corn crop losses valued at $100 million in Minnesota. There currently is about $10 million spent annually on crop insurance premiums to hedge against losses due to hail. Losses vary by year, but annually average about $6 million paid to growers to compensate them for their losses. Crop injury and reduced stands may also be due to insect feeding, flooding, low air temperature, nutrient deficiencies, crusted soils, soil borne fungi and bacteria, cold seedbeds, or chemical injury (fertilizers, insecticides, or herbicides). Early season injury may require you to decide whether you need to replant the crop. This publication describes growth and development of the corn plant and presents the factors to evaluate when determining whether to replant. Hail injury is used as the model in this publication, but the principles of evaluating crop injury and regrowth potential are similar for other crop injury situations.

Extreme injury to agricultural crops, which is far too common, can be an emotional event for the farmer, and replant decisions should be made based on facts from research rather than the grower's "gut feelings" of anger and despair at the loss. This *Field Guide* is designed to help you become more familiar with the stages of growth of the corn plant, the function of leaves, and the plants' ability to regrow and recover following defoliation and losses that are associated with delayed planting and reduced plant population. This guide will help you make good decisions regarding replanting based on the results of extensive university research with plant populations, planting dates, and plant damage.

PLANT GROWTH

Growth stages are defined as vegetative (V) or reproductive (R). The vegetative stage begins when the seedling emerges, and continues until tasseling, when the reproductive stage begins. During the vegetative stage, leaves develop and grow, the stalk forms, and reproductive structures (ear and tassel) begin to form. The vegetative stage occurs between early May and early to mid-July. There are about 1300 heat units (growing degree-days) that accumulate during this calendar time period. The reproductive stage begins with pollination, and ends when grain has fully formed. The reproductive stage begins about early to mid-July and ends about mid-September. There are about 1100 heat units that accumulate during this time period.

A growing degree-day is a measure of heat accumulation calculated by subtracting 50 from the daily average temperature. The base of 50 is used because very little if any growth occurs for corn when the temperature is below 50^0 F. Temperature is one environmental parameter that drives plant growth and heat units can be used to predict important corn developmental events such as tasseling and maturity.

A young corn plant and its parts is shown in photograph C-1. The growing point is a group of cells that are rapidly dividing and produce each new leaf from its base. A new leaf is formed approximately every four days until this group of cells begins to produce reproductive structures (ear and tassel). There are usually 18 leaves that form on each corn plant. The growing point (C-2) remains below the soil surface for 2 to 3 weeks after the plant emerges. This protects the plant early in its development from frost and other damage. Early vegetative growth consists of root development and leaf development and expansion. Stages of growth during the vegetative period are described as leaf stages, and define the number of leaves developed or extended from the whorl, the top of the plant from which leaves are growing. For example, a V4 stage plant has developed four leaves.

Each corn leaf has three parts – the blade, collar, and sheath (C-3). The sheath is the basal portion of the leaf that is wrapped around the stalk, and the blade is the portion of the leaf that extends upward and outward from the stalk. The leaf collar is the transition structure between the sheath and the blade. The leaf blade is the most important part of the leaf for intercepting sunlight. The blade points upward and gracefully arches over with the tip of the blade pointing downward when the blade is fully exposed.

Leaves intercept the physical energy of the sun and convert it into chemical energy that can be used by animals or in industrial processing. The function of leaves on the young corn plant is to provide energy to the growing plant to develop new leaves, roots, and reproductive structures. After pollination, the leaves continue to provide nutrition to roots, assist in maintaining the integrity of the entire plant, and provide the plant materials to fill the grain. The uppermost leaves, especially those above the ear, contribute the largest portion of plant materials to fill the grain. When some portion of the uppermost leaves is damaged or removed, leaves below the ear can, and do, fill the grain. Grain yield per plant may be reduced because of the damage to some of the leaves above the ear, but lower leaves can provide some sustenance to the filling grain and, therefore, yield per plant will not be greatly affected if leaf loss is minimal.

There are two methods currently used to describe the point when a leaf is developed. The "collar visible" method of staging counts leaves, from the bottom up, that have the collar visible. As leaves grow and extend from the whorl, the collar is visible when the leaf is fully extended from the whorl. A V3 plant has three leaves with the collars showing and two or more leaves partially exposed above the third leaf (C-4).

The lowermost leaf of a corn plant has a rounded tip; all other leaves have pointed tips (C-5). When staging, look at the tip of the lowermost leaf. If it has a rounded tip, begin counting that leaf as number one, and count all leaves above with a collar visible. A V3 plant has 3 leaves with the collars showing.

The other staging method counts all leaves with tips of the leaves pointing downward. There will be 50 percent or more of the leaf area of that leaf exposed from the whorl when the tip points downward (arched over). Starting with the lowermost leaf with the rounded tip, count upward to the uppermost leaf that has its tip pointing downward. A

V5 plant with this staging method has five leaves with the tip pointing downward, but the collars of the two uppermost leaves are not yet visible. Crop hail insurance adjusters use this method to describe corn vegetative growth stage. Both methods adequately describe vegetative growth stages. Some post-emergence herbicide labels describe growth stages for application timing, so growers should know which staging method was used in order to properly apply the herbicide. Because this, we use their hail method hereafter in this field guide to describe corn growth stages.

About 3 weeks after emergence, the growing point moves above the soil surface as the stalk grows, but the growing point remains protected by the new leaves which are in a tight whorl surrounding it. The plant will now have approximately eight to ten leaves. Unlike the soybean plant, which can regrow from any of many axillary buds, the corn plant has only one primary growing point from which leaves can emerge. If this tissue is damaged by hail, frost, or other means, the chances of the plant remaining alive are poor; and, if the plant lives, it will not contribute significantly to grain yield.

As the plant continues to develop leaves and the stalk grows upward, the stalk grows horizontally, also. As this occurs, the lower leaf sheaths are pushed away from the stalk. Later, brace roots grow from these lower nodes just above the soil, which also pushes the leaf sheaths away from the lower stalk (C-6). These leaves ultimately die as they break away from the stalk. Five to six leaves normally slough from the stalk as the stalk enlarges in diameter. This sloughing of leaves occurs between the eight-leaf stage and the tasseling stage. At tasseling, and throughout the grain filling period, there are 12 to 13 leaves on the plant with about half the leaves above the ear, and half below.

After leaf number one with the rounded tip has sloughed from the plant, the lowest leaf on the plant will have a pointed tip and one must split the stalk to determine the morphological leaf number of that lowest leaf. Dig the plant, and split the stalk longitudinally to view the nodes and internodes (C-7). The darker bands across the stalk are nodes and the lighter stalk tissue between each band is the internode. All leaf sheaths are attached to nodes. Since the three lowermost internodes do not elongate, and are therefore not visible, the lower stalk area looks like one big node. The fourth internode is the lowermost internode that elongates, and leaf number 5 is attached to the node immediately above. Leaf 6 is attached to the next node upwards, 7 to the next, and so on. One can now trace the lowermost leaf on the plant to the node where it is attached and, thereby, determine the leaf number of that particular leaf. One continues to count upward to the highest leaf that is arched over. That will be the number of leaves that the plant has developed, and is the leaf stage number to identify the growth stage.

Reproductive (R) growth stages begin with fertilization of the floret (pollination) and end when the grain has reached its maximum dry weight. This later stage is called physiological maturity (PM). Grain moisture content is about 32% at PM. Reproductive stages are described based on degrees of kernel development. The R1 stage begins when silks are visible outside the husks; pollination will occur soon after when the falling pollen grains land on the silks. The R2 stage is the blister stage and begins 10 to 14 days after silking (C-8). R3, the milk stage, begins about 21 days after pollination and is the prime roasting ear stage (C-9). In R4, kernels are in the dough stage, which begins 24 to 28 days after silking (C-10). In R5, 35-42 days after silking, kernels are denting (all kernels have an indentation on the top of the kernel – C-11). R6 is the mature stage and occurs 55-65 days after silking (C-12). The time range for the reproductive stages varies because of temperature, soil water availability, available soil nutrients, and hybrid maturity differences. For example, higher than normal temperatures hasten growth and reduce the time interval to pass through growth stages. Conversely, a soil nutrient deficiency or lower than normal temperatures will slow growth, and they increase the time interval for each of the growth stages.

WHETHER TO REPLANT

One of the most stressful and important decisions a farmer has to make is whether to replant when plant stands are reduced because of some kind of injury to the crop. The seven factors for evaluating whether to replant are 1) the existing plant stand, 2) distribution of the plant stand, 3) calendar date, 4) weed situation, 5) seed availability of earlier maturing hybrids, 6) cost to replant, and 7) yield potential of the existing crop.

REDUCED PLANT POPULATIONS

Establishing and maintaining an optimum plant stand is important for profitable crop yields. Poor stands may occur due to several situations -- poor germination, crusted surface (or other poor conditions for emergence), a cold seedbed, excess moisture, insects, chemical injury (fertilizers, insecticides, or herbicides), or hail. When considering replanting the crop, the first two factors to evaluate are the plant stand and the distribution of the plants remaining. Determine the number of live and healthy plants that exist. If hail caused the stand reduction, wait for three to five days following the storm to allow the plants to begin to regrow. This gives time for some regrowth and, consequently, a better evaluation of whether the plants will survive. During this waiting time, growers can make all the necessary plans for replanting such as financial considerations, preparing the equipment, determining the availability of seed of early maturing, good yielding hybrids, and others. However, if insects caused the stand reduction, the replant decision can be made as soon as the damage has been found and evaluated.

When hail damages young corn plants, they usually regrow if the growing point is still healthy. Locate the growing point by splitting a stalk down the center; a healthy growing point will be white to light green in color and firm in texture (C-2). If the growing point has been damaged, bacteria will often invade the plant and the growing point will be brown and soft (C-13). These plants will not recover, so count them dead.

Some plants that are severely damaged by hail may have difficulty regrowing. Plants with leaves loosely bound in the whorl usually grow or blow out, and continue with normal development (C-14). But, plants with leaves very tightly bound in the whorl usually don’t grow out (C-15). These plants are often referred to as buggy whips or ties. The leaves remain so tightly wrapped that some of the uppermost leaves and the tassel are unable to emerge from the whorl. It is impossible to determine if these plants will recover or the degree to which they will recover. Although some of these tied plants might shoot an ear and produce some grain (tassel emergence is not necessary on each plant to allow pollination), they should not be counted as living plants when the population count is made. They are not likely to contribute significantly to grain yield.

Determine the remaining plant population in your field. The length of row equivalent to one thousandth of an acre for various row spacings is given in Table 1. Measure the distance for 1/1000th of an acre for your row spacing and count the number of live plants in that row section. Then multiply by 1000 to determine the number of healthy plants per acre. Several checks should be made throughout the field. (Scouting the entire field may identify areas of the field that do not need replanting.)

Table 1. Length of row to equal 1/1000th of an acre for various row widths

Row spacing (inches)	Row Length
40	13 feet 1 inch
36	13 feet 6 inches
30	17 feet 5 inches
22	23 feet 9 inches
15	34 feet 10 inches

The optimum harvest population for achieving maximum grain yield is 29,000 to 31,000 plants per acre for most corn hybrids and locations in the northern Corn Belt. Most hybrids will increase the size of the ear (both kernel number and kernel size), and sometimes the number of ears per plant, when the plant population drops below the optimum. Small changes in plant population below the optimum result in larger kernels, and more kernels on the top ear. Large reductions in plant population result in more and larger kernels on the top ear and significant grain production on the second ear. Therefore, the reduction in grain yield is not in direct proportion to the reduction in stand (Table 2.).

The uniformity of the stand remaining is also important. Uniformly spaced plants produce more per plant, and more per acre, than do unevenly spaced plants. Clumped stands can vary in many ways that lead to non-uniformly spaced plants. There can be parts of the field with fairly uniformly spaced plants and near optimum yields, to areas in the field with large gaps between plants within the row. Large gaps reduce yield more than do small gaps. Large gaps in the stand can reduce grain yields by about 5% at plant populations between 14,000 and 28,000 plants per acre. Therefore, add 5% to the yield reduction for lower than optimum populations with large gaps (two feet or more) in the stand.

Table 2. Relationship between corn plant population and grain yield for corn planted prior to May 1

Plant Population (Plants/Acre)	Grain Yield Potential (%)
30,000	100
28,000	98
26,000	94
24,000	92
22,000	88
20,000	84
18,000	79
16,000	74
14,000	67

When plant populations are lower than optimum, and will no longer produce a maximum yield, be sure to compare the lower yield due to late planting of a short-season hybrid with the yield potential of the reduced stand. Other factors to consider would be replanting costs, uncertainty of obtaining a good stand with a late planting and the possibility of a reduction in yield due to moisture stress at silking time. It's also important to remember that late-planted corn will be higher in kernel moisture content at harvest, which will increases your cost to dry the grain to a storable moisture level.

WEED STATUS

The weed status of the field is another important consideration in determining whether to replant, even when enough healthy plants with good distribution remain after a hailstorm. The rate at which corn recovers will influence its competitive ability with weeds and its sensitivity to various weed control practices. In relatively weed-free fields, corn that is not too severely injured will probably recover and grow fast enough so that combinations of cultivation and an application of post-emergence herbicides will be effective. Weeds 1 to 3 inches in height can be controlled with cultivation if the crop is tall enough to prevent it from being buried by soil. Cultivating 1 to 2 inches deep will control most weeds, and a shallow cultivation will usually control annual weeds, with little crop stress or soil moisture loss.

If the field to be replanted is especially weedy, a soil-applied herbicide may be needed on the second planting. To reduce the potential for crop injury to the replanted crop, select a herbicide that is suited to the soil and weed situation, but which is not in the same chemical family as the herbicide that was used at the original planting. For example, if the first crop of corn was treated with pendimethalin (Prowl), replanted corn should not be treated with Prowl. Use the Cultural and Chemical Weed Control in Field Crops publication (University of Minnesota Publication # 3157) to choose a herbicide from another chemical family that will control the weed species present in the field. Choose a herbicide that, when applied late in the growing season, will not present a carryover problem to the next year's crop.

For example, if the first crop was corn treated with Prowl, replanted soybeans should not be treated with Prowl, or chemicals similar to Prowl, such as ethalfluralin (Sonalan) or trifluralin (Treflan). See the individual herbicide labels for crop rotation restrictions. If you for some reason must re-treat the crop with the herbicide that was previously used, check the label for the maximum registered amount of herbicide that can be legally applied.

In the late spring, when corn might be replanted, the major weeds likely to exist are the foxtails, crabgrass, quackgrass, black nightshade, and waterhemp. These weeds are shown in pictures S-14 through S-28. Assess the weed situation – what weeds are there in the field? What is the size of the weeds? Can they be controlled, and at what extra cost?

LEAF LOSS AND GRAIN YIELD

Once you have decided that you still have a sufficient number of live plants, determine the amount of leaf loss. The amount of defoliation and the stage of development at the time of a hailstorm will determine the effect on grain yield. Complete defoliation of young corn plants up to the 7-leaf stage will usually result in little or no reduction in yield. As the plant gets older, the loss of leaf area will more greatly affect yield. This has been determined by extensive research on a number of hybrids and locations in the U.S. The results were used to establish the loss from leaf removal for hail insurance adjustment (Table 3.).

Leaves are sometimes torn or shredded due to high velocity winds or hail. Leaf tissue remaining on the plant, and green in color, continues to function and contribute to grain filling. Only leaf tissue completely removed, or brown in color, should be considered when determining the percentage of leaf area destroyed or removed.

Table 3. Effect of leaf area destroyed on corn grain yield

	Percent Leaf Area Destroyed				
Leaf stage *	**20**	**40**	**60**	**80**	**100**
	Percent Yield Loss				
7	0	1	4	6	9
8	0	1	5	7	11
9	0	2	6	9	13
10	0	4	8	11	16

*Leaf stage corresponds to number of leaves, which are arched over, and pointing downward.

LEAF LOSS AND CORN MATURITY

Leaf loss early in the growing season, particularly major amounts of leaf loss, is thought to set back the corn plant or delay the maturity. But, extensive research shows no appreciable delay in tassel emergence, silking date, or kernel moisture content at harvest resulting from partial or complete leaf removal for plants between leaf stages five and thirteen. Significantly shorter plants occur due to complete defoliation at these growth stages when the stalk is elongating. Plants can be as much as 8-10 inches shorter due to complete defoliation during this time. Corn will grow more slowly following leaf removal, depending upon the amount of leaf area lost and the weather that follows, but the shorter plants that grow after defoliation are not "set back" in maturity. Grain yield, of course, is reduced according to the amount of leaf area destroyed and the growth stage when the damage occurs.

YIELD POTENTIAL OF LATE PLANTED CORN

Late April planted corn yields the highest and produces the most profit per acre. Yield potential is lower when corn is planted after April 25. The yield reduction associated with planting in May and early June is given in Table 4.

Table 4. Grain yield loss and expected yield potential for various corn planting dates

Planting Date	Grain yield loss (%)	Grain Yield Potential (%)
April 25	0	100
April 30	1	99
May 5	3	97
May 10	6	94
May 15	9	91
May 20	12	88
May 25	14	86
May 30	17	83
June 4	23	77
June 9	29	71
June 14	35	65
June 19	41	59

For grain production, corn should not be planted after June 15 in southern Minnesota and not after June 5 for central to northern Minnesota. Corn could be planted for silage as late as June 25 in southern Minnesota. Recommended corn hybrid maturities for various planting dates and growing zones are given in Table 5.

Table 5. Recommended Corn Hybrid Maturities for late planting

Planting date	Relative Maturity Units Earlier Than Full Season [1]
May 25 – May 31	5 –7 Relative Maturity Units
June 1 – 10	8 – 15 Relative Maturity Units
June 11 - 15	15 or more Relative Maturity Units

[1] For areas where 105 RM hybrids are full-season, one should plant hybrids with maturity ratings of 100 or less for grain production.

MAKING THE REPLANT DECISION

By using the information on plant population, leaf loss, and late planting, you can compare the estimated losses from the hailstorm with the yield potential and costs associated with replanting the crop. For the existing crop, consider the weed situation. What is the population of weeds? The species? Can they be controlled if the crop is left? If not, what effect will they have on regrowth and yield potential of the existing crop? And at what extra cost?

Replant costs including seed, labor, and fuel, currently represent approximately 13% of the original crop potential. Replant costs are extra, so reduce the yield potential by 13% to pay the replant costs. Although the cost to replant may vary greatly from farm to farm and year to year, be sure to include other real costs in the costs of replanting. These include interest on loans taken to replant, and opportunity costs due to time spent replanting that could have been used for other profitable (or profit-saving) activities. Replant costs may be partially or completely compensated for if you have crop hail insurance that carries a replant clause. If you have insurance, notify your agent of your loss and ask about replant cost-sharing.

The following worksheet will help you to decide whether it will pay to replant. The alternative which has the higher yield potential should be the more profitable option. You will also need to consider the availability of seed, and replant costs for seed, labor, and fuel. Fill in the following worksheet and compare the yield potential of the existing crop with that of a replanted crop.

If you decide to replant, choose seed with a relative maturity from Table 5. for your location and planting date.

CORN COMPARISON WORKSHEET

FIELD NOT REPLANTED:
Estimated loss due to:

Reduced stand	__________%
Leaves removed	__________%
Weed Condition	Good, Fair, or Poor
SUM OF LOSSES	__________%

REMAINING CROP POTENTIAL OF EXISTING STAND ___________%

FIELD REPLANTED:
Estimated loss due to:

Late Planting	__________%
Replanting	_________13%
SUM OF LOSSES	__________%

CROP POTENTIAL OF A REPLANTED CROP ___________%

ALTERNATE CROPS

If your herbicide program permits, you may decide to replant to soybean, or some other crop, especially if it's after June 15. Soybean is probably the best crop alternative, even though this probably means that soybeans will be grown following a crop of soybeans. This is not usually recommended because of diseases, nematodes, and yield considerations of continuous versus rotational cropping. However, the only other crops that might give some production are forages such as sudan grass. There are other factors to consider. Do you need forage? Do you have the equipment to harvest, handle, and perhaps store forage? What market opportunities are there?

If the crop is so badly damaged that it will not be economically feasible to pay the harvest costs, destroying the crop and planting a cover crop may be the best alternative. It is not good to leave the land fallow because of the effect of fallowing on the next crop. For instance, if the next crop is corn, phosphorus deficiency often occurs during the early vegetative growth periods of corn grown on fallow soil.

SALVAGING A CROP FOR SILAGE

If hail strikes shortly before or after silking, grain yield can be reduced drastically. If live ear shoots remain on the plant, the reduction in yield will depend upon the amount of leaf loss. Hail that occurs during grain filling can cause kernel damage (C-16). These kernels may just shrivel up, or may begin to rot, causing the entire ear to rot. Molds often occur on kernels in damaged ears. Some molds can produce mycotoxins, which can affect animal performance -- rate of gain, milk production, and reproductive status. One should inspect ears carefully before feeding, and consult an animal nutritionist or a veterinarian before feeding grain or silage that has visible mold growth.

Smut galls may form on any corn plant tissue, but primarily occur on tassel or ear tissue (C-17). The organism may gain entrance into the plant when the plant is injured because of hailstones or insect feeding. Grain development is significantly reduced on individual plants where smut develops and can cause breathing difficulty and discomfort to the combine operator during harvest. Smut may affect animal performance. If smut infected corn is ensiled, consult an animal nutritionist or a veterinarian before feeding. Even though ensiling reduces the toxic potential of the smut, infected plants may not be a good feed choice for some livestock.

Silage that is made from corn plants with no ears or partially filled ears has 90 – 100% of the value on a dry matter basis of silage made from well-eared plants. But, because silage made from barren plants or stalks with little grain is higher in moisture, total dry matter intake is reduced and animal performance will also decrease.

Plants with little to no grain may have high levels of nitrates. The higher nitrate concentration occurs in the lower stalk, so cutting the plants at a higher level will decrease the nitrates of the harvested plantlage. Fermentation after ensiling usually reduces the nitrate nitrogen level to acceptable feeding levels. Silo gases may be hazardous for the first 30 days following ensiling, so the silo room should be well ventilated before you enter it during this time period.

STALK BREAKAGE

Stalk breakage may occur because of high velocity winds. Stalk breakage can occur any time after corn plants have reached knee high, but most frequently occur in the one-to two-week window prior to tasseling. Plants at that stage are growing rapidly such that stalks are brittle and very vulnerable to breaking when high velocity winds occur. Breakage early in the growing season when plants are knee-high causes a reduction in stand, and the calendar date may be such that replanting is not economically feasible. Plants that are not broken will compensate somewhat for reduced competition from adjacent plants, but grain yield will be lowered because of the lower plant population. Breakage is also common just before tasseling. The effect of this injury on grain yield will depend on a number of factors: 1) the percent of plants broken, 2) the distribution of broken plants, 3) the location of the break on the stalk, and 4) the growth stage of the crop.

Yields are least affected when the stalk breaks above the uppermost ear. Plants adjacent to broken plants will partially compensate and produce more grain weight per plant because of less competition, especially for sunlight. Even though the unbroken plants will produce more because of the lack of competition, a yield reduction for the whole field occurs, which averages 0.28% per percent of plants broken above the uppermost ear. Yields are reduced more when the stalk is broken below the uppermost (top) ear compared with when the stalk is broken above the top ear. At the tassel stage, the potential size of the second ear has been determined with the plant “expecting to fill kernels on the top ear” and, under most situations, there usually is little or no grain produced on the second ear. At this stage, the plant cannot adjust the number of kernels that can be produced on the second ear. Research shows a yield reduction of 0.56% per percent of plants broken above the uppermost ear.

SUMMARY

Corn has largely been responsible for the great wealth and social/cultural achievements of the United States. The annual U.S. crop totals 9 billion bushels coming from 80 million acres that yield on average 130 bushels per acre. Of the 80 million acres of corn, about 8 million acres are grown for silage. When all agricultural and industrial products are considered, corn is the single most valuable one in the country. America is the number one corn exporter in the world, though only 5% of the crop is used for that purpose.

In Minnesota, corn is grown on approximately 7 million acres; about 1 million acres are harvested for silage and the other 6 million are harvested for grain. Average grain yields for the state have been about 125 bushels per acre. The maximum state average yield was 153 bushels per acre in 1998. Corn is grown on more acres in Minnesota than any other crop and is the number one cash crop for Minnesota farmers. The value of the crop is about $2 billion annually.

Our hope and our mission in this publication is to help corn growers to keep producing as large and as profitable a crop as possible, even under adverse conditions caused by hail or other catastrophic damage. It’s important to the farmer, the state, the nation, and the world to do that.

CORN COMPARISON WORKSHEET

FIELD NOT REPLANTED:
Estimated loss due to:

Reduced stand __________%
Leaves removed __________%
Weed Condition Good, Fair, or Poor

SUM OF LOSSES __________%

REMAINING CROP POTENTIAL OF EXISTING STAND __________%

FIELD REPLANTED:
Estimated loss due to:

Late Planting __________%
Replanting ________13%

SUM OF LOSSES __________%

CROP POTENTIAL OF A REPLANTED CROP __________%

CORN COMPARISON WORKSHEET

FIELD NOT REPLANTED:
Estimated loss due to:

Reduced stand __________%
Leaves removed __________%
Weed Condition Good, Fair, or Poor

SUM OF LOSSES __________%

REMAINING CROP POTENTIAL OF EXISTING STAND __________%

FIELD REPLANTED:
Estimated loss due to:

Late Planting __________%
Replanting ________13%

SUM OF LOSSES __________%

CROP POTENTIAL OF A REPLANTED CROP __________%