# Replanting Corn and Soybeans after Hail Damage

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Hail damage to crops occurs frequently in Minnesota. When hail falls on corn or soybeans early in the growing season, replanting is possible; but deciding whether to replant is usually difficult. Plant population, leaf loss, weed control, and calendar date are factors to consider in making this decision.

## PLANT POPULATION

The first consideration after a hail storm is the number and distribution of plants remaining alive. Both corn and soybeans have a capacity to regrow after plant injury from hail.

**Corn.** The growing point is located at the top of the stalk (Figure 1). It remains below ground for 2 to 3 weeks after plant emergence. The plant will have six to seven leaves when the stalk begins to elongate and the growing point is pushed above ground. When above ground, the growing point is somewhat protected from mechanical injury by being located in the center of the plant. If the growing point is not damaged, corn will usually recover and perform better than replanted corn.

To determine growing point location and condition, split the stalk down the center with a knife. The growing point, if normal, will be white in color and firm in texture. Bacteria may cause the growing point to decay. If this has happened, the tissue will be discolored and soft and the plant will die. Field inspection soon after hail damage will not determine the proportion of plants which may die due to bacterial growth on the growing point. Within 3 to 4 days, this damage should be more apparent.

Hail damage sometimes results in plants which have their leaves bound in the whorl. Such plants are referred to as ties or buggy whips. The leaves remain so tightly bound that the tassel may not emerge from the whorl. These plants may recover to form an ear and contribute to yield, but this cannot be determined before a decision to replant must be made. For this reason, these plants should be considered as not living when the stand count is made.

Yield data from corn population studies show that little yield difference occurs between 24,000 and 30,000 plants per acre for full-season hybrids on soils with ade-

**Figure 1. Schematic drawing of seedling corn plant.**

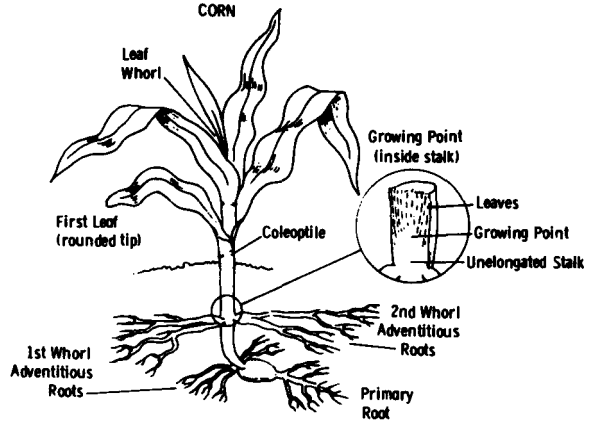


Figure 2. Yield potential of short- and full-season hybrids over a range of plant populations (Morris, Waseca, Lamberton, Minnesota, 1967-70).

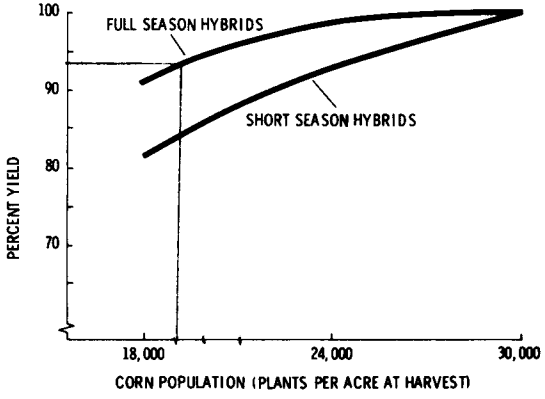



Figure 3. Schematic drawing of seedling soybean plant.

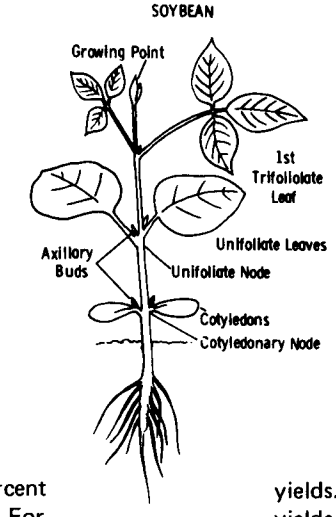
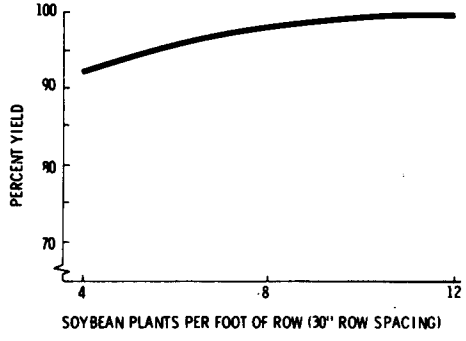



Figure 4. Yield potential of soybeans over a range of plant populations (Waseca, Minnesota, 1973-74).




quate fertility and good water holding capacity (Figure 2). But yields were 9 percent less from populations of 18,000 than yields from 24,000 or greater populations. For short-season hybrids, yield reductions of 7 and 11 percent occurred as populations were reduced from 30,000 to 24,000 and to 18,000, respectively. For both maturity groups, the yield reduction increases as population drops below 18,000 plants per acre.

The optimum population for maximum corn yield is lower when some production factor such as low rainfall or fertility is limiting.

The plant population after hail may be too low to produce a maximum grain yield, but compare the estimated yield reduction due to reduced population to the expected yield loss due to late planting of short-season corn. In addition, add replanting costs and the uncertainty of obtaining the desired stand with the later planting.

**Soybeans.** The growing point (terminal vegetative bud) of the soybean is located in the top of the plant where new leaves are emerging (Figure 3). In addition, vegetative buds in leaf axils serve as growing points, since they may develop into branches. The soybean growing point is easily damaged after plant emergence. Regrowth will not occur if hail cuts off the stem below the cotyledonary node. If the top of the plant is damaged or cut off above the cotyledonary node, regrowth can occur from one or more of the axillary buds. However, regrowth may be slower than growth of replanted soybeans if a large amount of leaf area is removed.

Soybean stems may be bruised or broken by hail. The damage may not be severe enough to kill the plant. However, the plant may lodge later, especially after pod development and filling. Lodging and plant breaking as a result of hail damage will depend upon the severity of bruise, position of damage on the stem, soybean variety, and environment.

Because of branching, soybean plant populations can vary greatly with little, if any, difference in yield. Stands of 11 to 12, 8 to 9, and 5 to 6 plants per linear foot of row in 40, 30, and 20 inch row spacing, respectively, should give maximum soybean yields. Fewer plants (if spaced fairly evenly in the row) will produce comparable yields. In some cases, heavily podded branches may break from the plant and may not be harvested, but yield loss due to this would probably be small. Recent results from combine harvested trials where soybean density was a variable are given in Figure 4.

## LEAF LOSS

After it has been determined that there is a sufficient stand of live plants (plants which will recover), damage to leaf tissue should be assessed. Degree of defoliation and stage of plant development at the time of damage affect the expected grain yield reduction. Yield leaf loss charts for young corn and soybeans currently used by crop hail adjustors are given in Tables 1 and 2. These charts were developed after simulated hail research at several universities. This work was sponsored in part by the National Crop Insurance Association and the Crop Insurance Research Bureau.

**Table 1. Effect of leaf loss of young corn plants on yield (data from Corn Loss Instructions and National Crop Insurance Association).**

| Leaf Stage* | Percent Leaf Area Destroyed | | | | |
|---|---|---|---|---|---|
| | 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 number corresponds to number of leaves which have unrolled.

Complete loss of leaves when soybeans have fewer than two trifoliolates and corn fewer than six leaves usually does not greatly affect grain yield. The yield reduction from complete leaf loss is not great enough to offset replanting costs and the lower yields associated with later planting.

**Table 2. Effect of plant damage on young soybean plants on yield (data from Soybean Loss Instructions and National Crop Insurance Association).**

| Number of Trifoliolate Leaves | Percent Plant Damage | | | |
|---|---|---|---|---|
| | 25 | 50 | 75 | 100 |
| | Percent Yield Loss | | | |
| 2 | 1 | 5 | 6 | 21 |
| 4 | 1 | 6 | 7 | 23 |
| 6 | 2 | 6 | 8 | 26 |
| 8 | 2 | 7 | 9 | 28 |

## WEED CONTROL

Assuming that enough live plants (with good distribution in the row) remain after the hail storm to warrant leaving the stand, the weed status of the field is an important consideration in determining whether to replant. Both corn and soybeans will grow slowly during the next few days, depending on the amount of leaf loss and temperature.

If a field is relatively free of weeds, both corn and soybeans that are not too severely injured will probably recover and grow fast enough so that combinations of rotary hoeing, cultivation, and applying postemergence herbicides will be effective. Even if some weeds are present, most annual weeds in corn can be controlled by a chemical applied postemergence. Many kinds of broad-leaved weeds can be controlled in soybeans with postemergence herbicides. But, postemergence herbicides should not be applied until the soybeans have recovered from the hail damage and have new leaves. By this time some of the broadleafs may be too big to control with herbicides. Grasses are resistant to currently cleared postemergence herbicides for soybeans. Therefore, if soybeans are weedy (particularly with grasses, or broadleafs that are more than 3 to 4 inches tall, or species that are resistant to chemicals) and there is considerable leaf loss, replanting is advisable even though the soybean plants would probably recover.

If a field to be replanted is especially weedy, a herbicide application may be needed on the second planting. To reduce the chances of crop injury, select a compound that is suited to the soil and weed situation but that is not in the same chemical group as the first herbicide (see Table 3). For example, if the first crop was soybeans treated with trifluralin (Treflan), replanted soybeans should not be treated with dinitramine (Cobex) or profluralin (Tolban) which are chemically similar to trifluralin. Instead, choose a suitable chemical from one of the other groups.

In fields that have good weed control on the original stand but require replanting because of severe hail damage, application of a herbicide is probably not necessary. Most preemergence or preplanting herbicides used on the first planting would remain

**Table 3. Herbicides by chemical groups.**

| Chemical Group | Herbicides |
|---|---|
| Dinotroanalines | Dinitramine (Cobex) |
| | Profluralin (Tolban) |
| | Trifluralin (Treflan) |
| Substituted Ureas and Triazines | Atrazine (AAtrex, etc.) |
| | Chlorbromuron (Bromex, Maloran) |
| | Cyanazine (Bladex) |
| | Cyprazine (Fox-4, Outfox) |
| | Linuron (Lorox) |
| | Metribuzin (Lexone, Sencor) |
| | Simazine (Princep) |
| Carbamates | Butylate (Sutan+) |
| | EPTC (Eradicane) |
| | Vernolate (Vernam) |
| Acetanalides | Alachlor (Lasso) DUAL (METHACHLOR) |
| | Propachlor (Ramrod) HARNESS (Acetochlor) |
| Benzoic Acid Derivatives | Chloramben (Amiben) |
| | Dicamba (Banvel) |

in sufficient quantity to give some weed control in the replanted crop, and most of the weeds near the soil surface would have already germinated in the first crop. If the field is free of weeds, the soil should be planted without any tillage or should be tilled no more than 1½ to 2 inches deep to avoid bringing weed seeds and untreated soil to the surface. Soil and air temperatures will probably be favorable for fast germination, emergence, and growth of the crop, giving the crop a good competitive advantage over weeds. Germinating weeds should be controllable with rotary hoeing and/or cultivation.

In some situations it may be too late to replant the same crop, necessitating a change to a shorter season crop. The herbicide used on the first crop may limit the choice of crops that can be replanted. Most preemergence or preplanting herbicides will persist in the soil at least 4 to 12 weeks and therefore may injure the second crop. In addition, label clearance restrictions may also limit the crops that can be planted. Of course, any crop for which the chemical is labeled may be planted. Label information regarding replanting should be followed carefully.

Suggestions for crops which can be planted when various herbicides were used on the first crop are given in Table 4.

## CALENDAR DATE

Maximum yields of both corn and soybeans are obtained with early May planting (Figure 5). Corn yields are reduced by .45 percent or ½ bushel per acre per day delay in planting through May, whereas soybean yields decline .34 percent or about 1/10 bushel per acre per day planting delay. Yield reductions for both corn and soybeans are greater than these percentages for each day planting is delayed into June.

The lower yield potential of short-season varieties planted late plus replanting costs should be compared with the "potential yield" remaining after a hail storm reduces stands and damages leaf area and stalks or stems of remaining plants.

For late planted corn and soybeans, short-season hybrids and varieties should be used. Maturities recommended for late planting dates are given in Table 5. Maturity zones are identified in Figure 6.

Hail damage might occur so late in the growing season that replanting corn or soybeans for grain should not be done. If the herbicide residue is not a problem, alternative crops can be planted and utilized for pasture or forage (see Agronomy Fact Sheet No. 7, Emergency Crops).

**Table 4. Alternative crops for second planting when the first planting was treated with various herbicides.**

| First Chemical Used | Crops that can be Planted* |
|---|---|
| Alachlor (Lasso) | Corn, soybeans, dry beans |
| Atrazine (AAtrex, etc.) | Corn, soybeans, sorghum, sorghum-sudan |
| Bifenox (Modown) | Soybeans |
| Butylate (Sutan+) | Corn; soybeans if 21 days or more have elapsed since application |
| Chloramben (Amiben) | Soybeans, dry beans, sunflowers |
| Chlorbromuron (Maloran, Bromex) | Corn, soybeans, potatoes |
| Cyanazine (Bladex) | Corn |
| Cyprazine (Fox-4, Outfox) | Corn |
| Dicamba (Banvel) | Corn |
| Dinitramine (Cobex) | Soybeans, dry beans |
| EPTC (Eradicane) | Corn, dry beans, flax, sunflower, alfalfa, clover, peas, potatoes, sugarbeets; soybeans if 30 days or more have elapsed since application |
| Fluorodifen (Preforan, Soyex) | Soybeans, field peas, dry beans |
| Linuron (Lorox) | Corn, soybeans. After 4 months any crop can be planted. |
| Metribuzin (Lexone, Sencor) | Soybeans. Do not replant to any other crop within 4 months after treatment. |
| Profluralin (Tolban) | Soybeans |
| Propachlor (Ramrod) | Corn, grain sorghum, green peas, soybeans for seed |
| Simazine (Princep) | Corn |
| Trifluralin (Treflan) | Soybeans, dry beans, mustard, peas, sunflowers |
| Vernolate (Vernam) | Soybeans |

*This list includes only those crops for which the respective herbicide is cleared.

Figure 5. Yield potential of corn and soybeans with May planting date (Waseca and Lamberton, 1966-74).

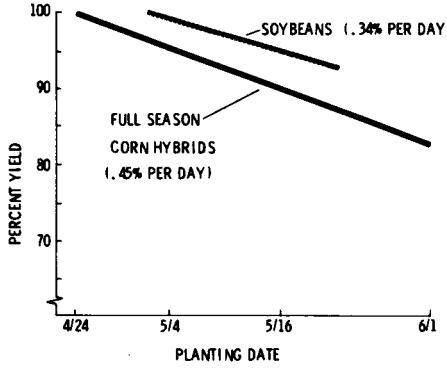



Figure 6. Minnesota crop maturity zones.

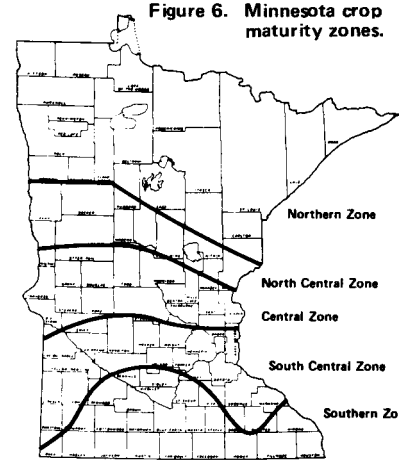



Table 5. Maturity of "full-season" varieties of corn and soybeans for various planting dates in all maturity zones.

| | Corn for grain if planting occurs by: | | | |
|---|---|---|---|---|
| Maturity Zone* | May 15 | June 1 | June 15 | July 1 |
| Northern | 80 RM** | – | – | – |
| North Central | 90 | 85 | – | – |
| Central | 95-100 | 85-90 | 70 | – |
| South Central | 105 | 90-95 | 85 | 75 (Silage) |
| Southern | 110-115 | 100-105 | 90 | 85 (Silage) |

| | Soybeans for grain if planting occurs by: | | | |
|---|---|---|---|---|
| Maturity Zone* | May 15 | June 1 | June 15 | July 1 |
| Northern | Clay*** | Clay | – | – |
| North Central | Evans | Evans | Altona | – |
| Central | Hodgson | Evans | Clay | – |
| South Central | Hodgson | Hodgson | Hodgson | Clay |
| Southern | Corsoy | Corsoy | Hodgson | Evans |

* Maturity zones are defined in Figure 6.

** The RM (Relative Maturity) given in the Table is "full-season" for the zone and planting date. Hybrids of earlier maturity could also be used.

*** Soybean varieties similar or earlier in maturity can be used for each zone and planting date combination.