

Harvesting Soybean

John Nowatzki

Extension Agricultural Machine Systems Specialist

Field studies in soybean harvesting have shown that a 10 percent or higher harvest loss is not uncommon, but studies also have shown that harvest loss can be reduced to 3 percent or less. To keep losses low, you need to know where harvest losses occur, how to measure loss, what is a reasonable level of loss, and the equipment adjustments and operating practices that will help reduce losses.

Soybean Loss

Soybean should be harvested when bean moisture content reaches 13 percent on the first dry down (Figure 7). However, if beans are ready for harvest

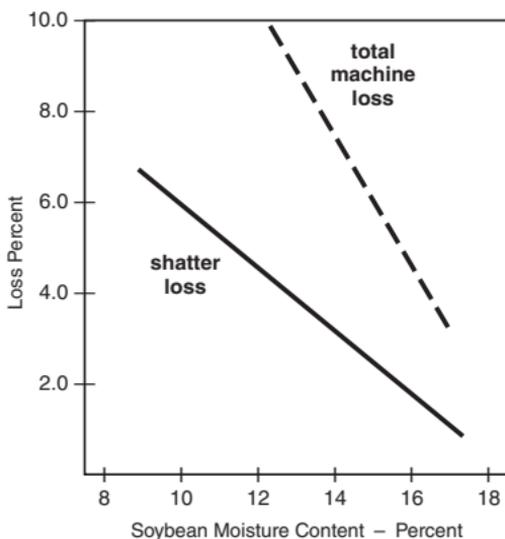


Figure 7.
Shatter and
machine loss
related to
moisture content
at harvest.

and then are subjected to alternating periods of wet and dry weather, preharvest or shatter loss can be high. Preharvest losses are influenced by the time of harvest and can be reduced by harvesting early. Preharvest losses are beans that have dropped on the ground prior to harvest.

Gathering or header losses can account for more than 80 percent of the total loss in soybean harvesting. These include all losses occurring at the header caused by actions of the cutter bar, reel and feeder auger, and losses from soybeans left on uncut stubble.

Gathering losses are divided as follows:

- **Shatter loss** – shelled beans and detached bean pods that are shattered from stalks by the header and fall to the ground
- **Stubble loss** – beans remaining on stubble
- **Stalk loss** – beans in pods attached to stalks that were cut, fell on the ground and did not run through the combine
- **Lodged stalks** – beans remaining in pods attached to stalks that are laying on the soil or, if cut, were cut at lengths larger than stubble height

Soybean is an easy crop to thresh, separate and clean. The beans are easy to remove from the pod, and their size and shape make them easy to clean. But small errors in adjustment can cause serious bean loss. Follow the settings recommended in the operators manual for cylinder speed and concave spacing, along with air flow and shoe settings. Then,

operate the combine in the field and check for loss. Usually, only small adjustments need to be made in the field. Remember to run the cylinder at the slowest speed possible but fast enough to thresh the beans from the pods. Excessive cylinder or rotor speed is usually the main reason for cracked bean seeds.

Gathering Equipment

Several machinery developments have occurred to improve the soybean gathering efficiency compared with a conventional rigid cutter-bar platform. These include the integral flexible-floating cutter bar, row-crop head, pickup finger reels, pickup guards, narrow-pitch knives (1½ vs. 3 inches) and combination pickup finger/air reels.

These attachments provide significant reductions in soybean loss. The flexible-floating cutter bar is able to follow soil slopes better and cut shorter stubble, reducing the number of pods left on the stalks. Pickup reels help lift lodged stalks so the cutter bar can slide under and retrieve them.

Narrow-pitch knives help reduce side movement of plants and the resulting shatter loss. Pickup guards ride on the soil surface, sliding under lodged bean stalks so they are cut and directed into the combine header. Combination finger/air reels help push cut stalks and pods back into the feeder housing to reduce bean pods and seed from building up on the cutter bar with the resulting shelling and bean loss.

All these attachments have been shown to reduce bean loss, but growers have a cost factor to consider before the equipment can be justified economically. For example, a grower needs to complete a cost-reduction estimate to determine how much money he or she can afford to spend on the attachments. A grower must estimate how many acres of beans will be harvested, crop yield and a loss level improvement regarding soybean harvesting.

For example, a producer may grow 500 acres of soybean and be able to reduce loss by 3 to 5 percent. With a 35 bushel per acre (bu/a) yield and a 3 to 5 percent reduction in loss, a grower could see a return of 1 to 1.75 bu/a more beans in the bin. Multiplied times 500 acres, an extra 500 to 875 bushels of soybeans could be saved. Spread the investment over five or more years, and a significant amount of money can be justified to reduce harvest loss of beans. Interest costs on the money should be included, along with repairs, insurance and resale value.

Combine Adjustments

Reel speed and position are extremely important to reduce bean loss. Reels with pickup fingers will cause the least disturbance to the standing plants and, when positioned correctly, will place cut plants to convey smoothly along the header auger and into the feeder.

The proper reel speed is 25 to 50 percent faster than the forward travel speed. Faster reel speeds will rip

bean pods off stalks and result in increased bean loss. The axis of the reel should be positioned 8 to 12 inches ahead of the cutter bar.

Harvesting High-quality Seed

Cylinder or rotor speed has more effect on seed damage than cylinder-concave clearance (Figure 8). Operating the cylinder only fast enough to remove the beans from the pods and no faster is important. Slowing the cylinder speed during the day as beans dry also is important. This is more important for conventional combines than rotary because Illinois tests

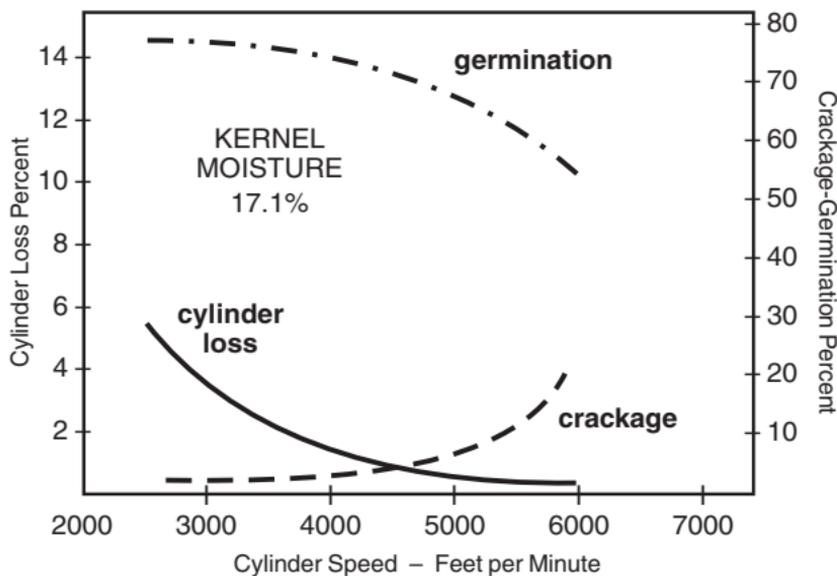


Figure 8. Relationship of cylinder speed to cylinder loss, germination and soybean crackage.

found that rotary combines produced significantly fewer splits than conventional cylinder concave-type machines. But both types of machines could produce high-quality soybeans easily. If cylinder or rotor speeds are too fast, damaged soybeans will result.

Measuring Harvest Loss

Identifying where harvest losses are occurring is important so growers can take measures to eliminate or minimize the loss. Soybean seed loss from the various areas is determined by making several seed counts inside a measured area. The measured area is best completed by forming a 1-foot by 1-foot square. The best way to do this is to form a heavy piece of wire (No. 9 is good) into a square. Then this square is used in the field to make seed counts.

Refer to Figure 9 (page 141) and record your seed counts in the “Loss” table (see below).

The procedure to use in the field is:

- 1) Operate the combine in the field and stop.
Back up the combine about 20 feet.
- 2) Using the 1-foot-square frame, count all beans in the frame as the frame is moved across the width of the cutter bar. Refer to Figure 9.
 - a. Count beans in the uncut area to determine “preharvest shatter loss.”

This is location 1 in Figure 9.

- b. Count beans behind the combine to find the “total crop loss.”

This is location 2 in Figure 9.

- 3) Enter the bean counts for “preharvest losses” and “total crop loss” into the “Loss” table.
- 4) Divide that number by the number of frame counts that were completed across the cutting width of the combine. This number is the average number of beans per frame.
- 5) Divide No. 4 by 4 because approximately four beans per square foot equals 1 bushel per acre. If the beans you are raising are large, then three beans per square foot would equal 1 bushel per acre.
- 6) Subtract the preharvest loss from the total harvest loss. This is the machine loss due to combine operation. Then estimate your crop yield and divide the bu/a loss by the yield. For example:

$$\begin{array}{l} 35 \text{ bu/a yield and} \\ 1.2 \text{ bu/a loss} \end{array} \quad \text{percent loss} = \frac{1.2 \text{ bu/a}}{35 \text{ bu/a}} \times 100 = 3.4 \text{ percent}$$

If the machine loss is more than 3 percent of crop yield, growers may need to do further investigation into the source of loss.

- 7) Gathering loss is determined and measured between the combine header and the unharvested crop (location 3). Again, measurements should be made across the entire width of the header.
- a. Shatter loss is determined by counting all loose beans and beans in loose pods on the ground.

Enter this number under shatter losses in the "Loss" table.

- b. Loose stalk loss is determined by counting all beans on loose stalks that were cut and are lying on the ground. Add this to the table.
- c. Lodged stalk loss is determined by counting all beans in pods on stalks still attached to the ground and lying flat. Add to the table. Pickup guards on the cutter bar may reduce this loss considerably.
- d. Stubble loss is determined by counting all beans in pods still attached to the stubble. Add this to the table.

Add the four gathering unit losses and subtract the preharvest loss from the gathering unit loss.

This figure will give the gathering unit loss.

Subtract the gathering unit loss from the machine loss to give the cylinder and separation loss. Follow the step-by-step procedure in the "Loss" table.

Loss Table	No. of Beans	No. of Frames (counts)	Avg. No. of Beans Per Frame	Bu/acre
A. Total crop loss			÷ 4	
B. Preharvest losses			÷ 4	
D. Gathering unit losses a+b+c+d - B				
a. shatter loss			÷ 4	
b. loose stalk loss			÷ 4	
c. lodged stalk loss			÷ 4	
d. stubble loss			÷ 4	
E. Cylinder and separation losses (C-D)				

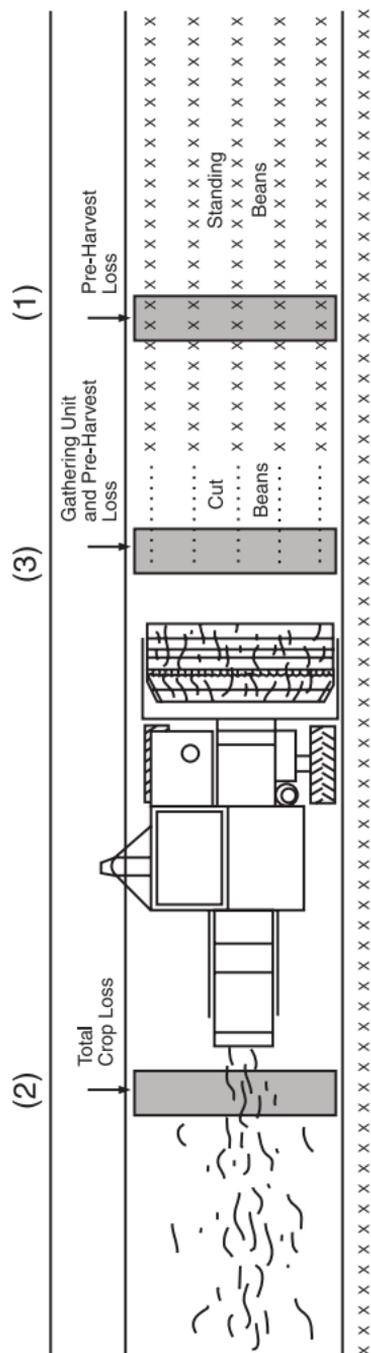


Figure 9. Location of areas to make seed loss counts.