Harvesting

(Vern Hofman)

Maturity

Sunflower in the northern Great Plains production area usually is ready for harvest in late September or October, with a growing season of approximately 120 days. The growing season may vary in length, depending on summer temperatures, relative moisture distribution and fertility levels. The sunflower plant is physiologically mature when the back of the head has turned from green to yellow and the bracts are turning brown (Stage R-9), about 30 to 45 days after bloom, and seed moisture is about 35 percent.

Desiccants can be applied to the crop after physiological maturity to speed the dry-down process. The chemical compounds act much like a frost to kill the green tissue on the plant and accelerate its drying. After applications of a desiccant, dry down of the seed is not as rapid as the dry down of the plant. Growers often are tempted to apply desiccants too early when potential loss factors are present. Application of a desiccant before the plant reaches physiological maturity will reduce yield and lower oil percentage. Drying is facilitated in most years by a killing frost, but if frost occurs too early, yield and oil percentages are reduced.

Seed shattering loss during harvest and loss from birds may be reduced by harvesting sunflower at moisture contents as high as 25 percent. Sunflower seed from the combine then is dried in a grain dryer to 9.5 percent, which is considered a safe storage level.

Harvesting Attachments

Combines suitable for threshing small grains can be adapted to harvest sunflower. A variety of header attachments are available, with many operating on a head stripper principle.

The attachments are designed to gather only the sunflower heads and eliminate as much stalk as possible. Major components of this attachment are catch pans, a deflector and a small reel. Long catch pans extend ahead of the cutter bar to catch the seed as it shatters. The deflector mounted above the catch pans pushes the stalk forward until only the heads remain above the cutter bar. As the heads move below the deflector, the stems contact the cutter bar and are cut just below the head. A small reel, mounted directly behind the deflector, pushes the heads into the combine feeder.

Catch pans are available in various widths. These range from narrow 9-inch pans spaced on 12-inch centers (Figure 120) to 37-inch pans spaced on 40-inch centers (Figure 121). The narrow 9-inch pans can operate on any row spacing, while the wider and more efficient 30- to 40-inch spaced pans are limited to a fixed-row spacing.

The deflector consists of a curved piece of sheet metal the full width of the combine head. It is attached to the reel support arms above the catch pans. The reel for the unit is mounted directly behind the deflector and usually consists of three or four arms. The reel is usually 16 to 20 inches in diameter and mounted 4 to 5 inches above the catch pans, so when the heads come in contact with the reel, they are pushed back into the feeder. The shield and reel can handle tall plants while taking only a minimum length of stalk with the head, allowing harvest when the seed is dry but stalk moisture may remain above 50 percent. Cleaner threshing also is accomplished when only the head enters the machine.

Optional forward rotating stalk-walker shafts, introduced from Argentina and used mainly in the southern Plains, can be mounted under the cutter bar to reduce plugging of stalk slots between pans. The stalk-walker pulls sunflower stalks and weeds down so that only the sunflower head is fed into the combine. Stalk-walkers are reported to be especially useful in fields with tall weeds.

A rotating drum with metal projections that replaces the deflector bar and reel often is used (Figure 122). The projections are triangular-shaped pieces of strap iron welded to its surface. As the drum rotates, the projections pass through the slots between the catch pans to remove any stalks that may cause clogging. The smooth drum acts as a deflector bar to strip stalks until one of the projections catches a head and pushes it into the cutter bar and into the combine header.

Row-crop units mounted on combine headers have been used successfully to harvest sunflower seed (Figure 123). One unit uses gathering belts, one on each side of the row, to draw the stalk into the cutting unit and the header. A large quantity of stalk passes through the machine with this unit and may increase the foreign matter in the seed, but this unit works well picking up lodged sunflower and getting the heads into the machine.

Another type of header uses a short section of screw conveyor to pull the stalks into the cutter bar and the combine header. This unit also works well for picking up lodged sunflower.

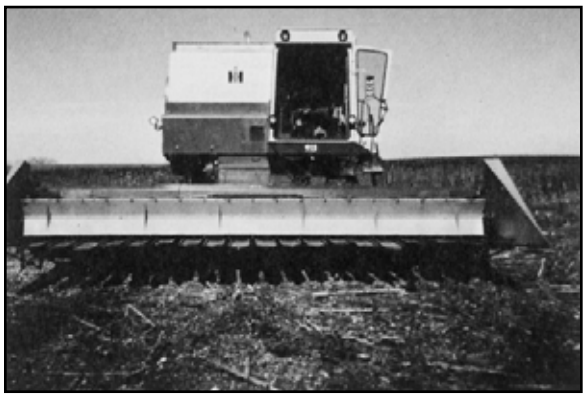

Figure 120. Catch pans in narrow 9 inch pans spaced on 12 inch centers. (V. Hofman)

Figure 122. Rotating drum with metal projections. (V. Hofman)

Figure 121. Catch pans in wide 37 inch pans spaced on 36 inch centers. (V. Hofman)

Figure 123. All crop header used to harvest sunflower. (V. Hofman)

Combine Adjustments

Forward Speed: A combine's forward speed usually should average between 3 and 5 miles per hour. Optimum forward speed usually will vary depending upon moisture content of the sunflower seed and yield of the crop. Forward speed should be decreased as moisture content of the seed decreases to reduce the shatter loss as the heads feed into the combine. Faster forward speeds are possible if the moisture of the seed is between 12 percent and 15 percent. The higher speeds should not overload the cylinder and the separating area of the combine except in an extremely heavy crop. Seed having 12 percent to 15 percent moisture will thresh from the head very easily as it passes through the cylinder.

Cylinder Speed: After the sunflower heads are separated from the plant, they should be threshed at a cylinder speed operating as slow as possible. The normal cylinder speed should be about 300 revolutions per minute (rpm), depending upon the condition of the crop and the combine being used. This cylinder speed is for a combine with a 22-inch-diameter cylinder to give a cylinder bar travel speed of 1,725 feet per minute. Combines with smaller cylinders will require a faster speed and combines with a larger cylinder diameter will require a slower speed. Rotary combines, as well as conventional machines, should have similar cylinder travel speeds. A rotary combine with a 30-inch cylinder will need to be operated at 220 rpm to have a cylinder bar speed of 1,725 feet per minute. A combine with a 17-inch cylinder will need to operate at 390 rpm to have a cylinder bar speed of 1,725 feet per minute.

If a combine cylinder operates at speeds of 400 to 500 rpm, giving a cylinder bar speed of more than 2,500 feet per minute, very little seed should be cracked or broken if the moisture content of the seed is above 11 percent. Cylinder bar speeds of more than 3,000 feet per minute should not be used because they will cause excessive broken seed and increased dockage. Excess dockage and broken seed may overload the sieves and the return elevator.

Concave Adjustment: Sunflower threshes relatively easily. When crop moisture is at 10 percent or less, conventional machines should be set wide open to give a cylinder-to-concave spacing of about 1 inch at the front of the cylinder and about 0.75 inch at the rear. A smaller concave clearance should be used only if some seed is left in the heads. If the moisture percentage of the crop is between 10 percent and 12 percent, rather than increase the cylinder speed, the cylinder-to-concave clearance should be decreased to improve threshing. If seed moisture exceeds 15 percent to 20 percent, a higher cylinder speed and a closer concave setting may be necessary, even though foreign material in the seed increases. Seed breakage and dehulling may be a problem with close concave settings. Make initial adjustments as recommended in the operator's manual. Final adjustments should be made based on crop conditions.

Rotary combines should be set to have a rotor-to-concave spacing of about 0.75 to 1 inch. Making initial settings as recommended in the operator's manual usually is best. Final adjustments should be made based on crop conditions.

Fan Adjustment: Oilseed and nonoilseed sunflower weigh about 28 to 32 pounds per bushel and 22 to 26 pounds per bushel, respectively. The seed is relatively light compared with other crops, so excessive wind may blow seed over the chaffer and sieve. Seed forced over the sieve and into the tailings auger will be returned to the cylinder and may be dehulled. Only enough wind to keep the trash floating across the sieve should be used. The chaffer and sieve should be adjusted to minimize the amount of material that passes through the tailings elevator.

When the combine is adjusted correctly to thresh sunflower seed, the threshed heads will come through only slightly broken and with only unfilled seed remaining in the head. Cylinder concaves and cleaning sieves usually can be set to obtain less than 5 percent dockage. Improper settings will crush the seed but leave the hull intact. Proper setting is critical, especially for nonoilseed sunflower that is used for the human food market. The upper sieve should be open enough to allow an average seed to pass through on end, or be set at a ½- to 5/8- inch opening. The lower sieve should be adjusted to provide a slightly smaller opening, or about 3/8 inch wide. The final adjustments will depend on the amount of material returning through the tailings elevator and an estimation of the amount of dockage in the grain tank. Some operators are able to adjust and operate their machine to allow only 2 percent to 3 percent dockage in the seed.

Field Loss

The harvested yield of sunflower can be increased by making necessary adjustments following a determination of field loss. Three main sources of loss are: (a) loss in the standing crop ahead of the combine, (b) header loss as the crop enters the machine and (c) threshing and separating loss. The loss found in any of these three areas will give the combine operator a good estimate of sources of seed loss and the adjustments necessary to minimize seed loss.

Loss occurring in any of these areas may be estimated by counting the seed on the soil surface in a square-foot area. Ten seeds per square foot equal approximately 1 hundredweight (cwt) per acre loss if seed loss is uniform throughout the entire field.

The loss in the standing crop is estimated by counting the seed in a 1-square-foot area ahead of the machine at several different places in the field. Header loss can be calculated by counting seed in a 1-square-foot area behind the head under the combine and subtracting the standing crop loss. The loss in combine separation can be found by counting the seed in a 1-square-foot area directly behind the rear of the combine and subtracting the shatter loss and the header loss found under the machine. The count made directly behind the combine will be concentrated, so an adjustment must be made to equalize the loss over the entire width of cut. The result should be divided by the ratio:

$$\frac{\textbf{Width of Header Cut (feet)}}{\textbf{Width of Rear of Combine (feet)}}$$

The answer is the adjusted separator loss for the width of cut. This result must be divided by 10 to obtain the combine separator loss in cwt per acre. The total loss in cwt per acre is determined by adding the seed loss in the standing crop, header loss and separator loss and dividing this answer by 10. The percentage loss can be found by dividing the total cwt per acre by the yield in cwt per acre.

Harvest without some seed loss is almost impossible. Usually a permissible loss is about 3 percent. Loss as high as 15 percent to 20 percent has occurred with a well-adjusted combine if the ground speed is too fast, resulting in machine overload.