Setting Combines for Harvesting Best Quality Seed and Field Corn

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DEFINITION OF QUALITY

First, the USDA corn grading standards are used by elevator operators for grading regular corn. A grain sample is shaken into a 12/64-inch sieve to identify and measure broken corn and foreign matter (BCFM). At the same time, the elevator operator examines the sample on top of the sieve superficially, looking for any kernel breakages and trash that did not pass through the sieve.

Second, the visible damage check, used by seed producers, and we use at Iowa State for combine performance evaluation. This involves carefully subdividing the bin sample with a Boerner divider to procure a 100 to 200 gram sub-sample. That sub-sample is screened through the 12/64-inch round hole sieve for BCFM, then the material on top is examined kernel by kernel for visible damage discernible to the trained eye. Usually we have two people evaluate separate samples on any given batch from the combine runs, and average the two readings.

Finally, there is a green dye test. We do not regularly conduct green dye tests in Agricultural Engineering on our corn samples because of the time each sample involves. Dye tests reveal more visible damage. There is an escalation in scale of damage levels measured.

Note that the combine shoe is fine-tuned to perform best when the engine is operated at a rated speed. If you cause the engine to slow significantly, processor, and particularly shoe performance, is adversely affected, so that losses and tailings flow will escalate.

As Jim Minnihan, Case Combines Product Support Specialist and a valuable source for many tips in this guide, says: “It pays to strive for grain quality.”

Thanks to Jim Minnihan, Mark Hanna, Nathan Isaac, Bill Couser, Wes Buchele and Marvin Gorden who were most helpful in the preparation of this harvesting guide.

Text and artwork by Graeme R. Quick, Ph.D., Leader, Power & Machinery Engineering Section, Agricultural and Biosystems Engineering Department, Iowa State University.

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SETTING COMBINES

for HARVESTING BEST QUALITY SEED AND FIELD CORN

Definition of QUALITY:

Seed Quality and Grain Damage mean different things to different customers, particularly for corn.

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Finally, there is a green dye test. We do not regularly conduct green dye tests in Agricultural Engineering on our corn samples because of the time each sample involves. Dye tests reveal more visible damage. There is an escalation in scale of damage levels measured.
from a given sample of corn. For example the ratio of damage at
the “normal” combine thresher speed is approximately 1 : 10 : 20
for the BCFM : visible damage : green dye measurements respec-
tively. Visible damage is the main criterion used for corn kernel
damage and quality assessment in this guide.

Combine settings and grain damage—SAMPLE
PURITY:
Damage comes from impact, crushing, and shearing of grain.
That takes place not only in the thresher but in grain-handling
equipment as well. Augers are not the best way to move grain if
damage is to be minimized. Where augers are deployed, they need
to be kept full to reduce damage!

The dominant machine setting affecting grain damage is
cylinder or rotor speed, but other settings are relevant, as men-
tioned below. Grain damage tends to increase with thresher speed,
so try to operate at the lowest cylinder or rotor-speed that will shell
the most grain with acceptable loss levels.

Damage to grain can start right at the head itself. Corn is more
susceptible to damage at higher moisture contents; therefore,
harvesting at 15 to 22% kernel moisture level is advantageous.
Assuming that the machine is run-in, with more than fifty hours
on the separator, here is a systematic procedure to minimize
damage:

Start with the settings in the operator’s manual first, making only
one adjustment at a time. Bear in mind that an underloaded machine
will cause more grain damage. Maintain engine speed for best
processor performance.

1. CORN HEAD
- Slow down stalk roll speeds; match to travel speed
- Move snapping plate openings to say 1-inch front, 1 1/4-inch
  rear for regular corn
- Raise cross auger and grind the sharp edges of the cross auger
  flighting
- Typical cross auger to pan clearance for corn should be 1-
  inch
- Adjust corn head to take in slightly more trash

- Keeping the machine loaded with corn by adjusting the
  forward speed will reduce kernel damage.

2. FEEDER HOUSE
- Grind/smooth any sharp leading edges off the feeder chain
  slats
- Raise lower stop to lift the feed elevator drum for corn and
  raise upper stop to maximum.

3. THRESHER
- Smooth all sharp edges
- Start with the low end speed recommendation in the
  operator’s manual.
- Thresher tip speed should typically be 2,700 ft/minute (range
  2,050-4,500 ft/min peripheral speed, depending on crop
  moisture conditions). On a 30-inch rotor machine, 2,700 ft/
  min would mean running the rotor at 345 rpm.
- Install smooth rasp bars if that option is available (They are
  available for Case Axial Flow combines.)
- Do not use surface chrome-plated wear parts such as thresher
  bars for vulnerable crops. On chrome-plated wear parts, the
  brittle plating tends to chip and the underlying material
  wears away, exposing the hard, thin, sharp chrome edge
  which will damage grain.
- Components made entirely of chrome alloy get better with
  wear, while chrome-plated parts only get worse. Chrome
  alloy wear parts are desirable for food and seed grade crops,
  especially if first conditioned in less delicate harvesting
  conditions. For example alloy rasps maintain their rasping
  ribs.
- Use filler plates on an open drum threshing cylinder
- Removing certain concave wires may be desirable for earlier
  escape of seeds through the concave
- Round bar concave elements are gentler than rectangular
  concave bars, if available.
- Increase concave clearance in small increments to reduce
damage. Typical settings are about 1 and 1/4-inch open for
  field corn.