Use Automatic Steering to Avoid Mowing the Same Ground Twice

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Producers hate to leave strips of uncut crop, commonly called "skips," in hay fields. There is not much yield wasted, but pride of a clean cut field is often lost to local café gossip. Typically, to avoid skips, an operator would overlap the cutterbar into the previous pass by a small amount. How much does this well-manicured landscape cost in lost productivity? Precise steering to achieve full cut width on every pass would be more productive. On the other hand, driving at maximum cutting width can be a tiresome chore. Could automatic steering give operators the break they need while maximizing the cutting width of the mower? These are some of the questions which inspired this research two seasons ago.

The problem was approached in two ways. First, an experiment was conducted at the UW-Madison Arlington Ag Research Station to better understand what factors influenced the degree to which producers tend to overlap. Second, observations were made on farms and of custom operators to see how folks were driving.

How driver experience and cutting speed influenced the amount of overlap was tested in the controlled experiment. The cutting speeds tested were 4, 6, and 8 miles per hour (mph). The experienced driver had been cutting at the research farm for over five years and the second driver was new to the job. The experiement was conducted in first and second cuttings with the farm's donated self-propelled windrower with a disk cutterbar (thanks to John Deere Ottumwa Works). Surprisingly, neither speed nor experience played much of a role in overlap. However, when the two factors interacted, particularly high speeds and low experience levels, the overlap loss increased.

Pass-to-pass overlap on 15 farms was measured as part of the second experiement. The machines included pull-type, mounted, and self-propelled mowers with operating widths varying from 10-32'. The operating speeds varied from 5.5-12.5 mph. The overlap varied from 0.5-16% with the average around 5%. That is 5% of the cutting width wasted with each pass. On a 14' mower that is about 8" per pass. Overlap averaged slightly higher for the pull-type at 6.6% than for the mounted and self-propelled machines at 5.2 and 5.0%, respectively. The other interesting fact gleaned from the study was that machines utilizing automatic steering with SF2 or OmniSTAR HP signal correction were able to cut overlap in half from 5 to 2.5% in the machines observed.

But could cutting overlap from 5 to 2.5% pay for the hardware needed for automatic steering? Well, the usual response of "it depends" applies. If enough acres are covered, the answer is yes. Other applications may be necessary to spread the cost if the system cannot be paid for by mowing alone. Tillage, spraying, and seeding would all be good candidates. The figure shows the payback (using USDA NASS's 2007 custom rate survey) on using the system on mowing alone.

Figure. Savings using automatic steering in mowing for 100, 500, and 1,000 acres of crop harvested four times annually. Based on this research, overlap with guidance is reduced to 2.5% of cutting width. Therefore, overlap is reduced from 5, 10, and 15% to 2.5, 7.5, and 12.5% for the orange, blue, and green bars, respectively.