Harvesting Corn Biomass: Wet vs. Dry?
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Deciding whether to bale or "bunker" your corn residue is a choice that depends on each individual's production procedures. While there appears to be some preference toward wet harvesting, there are also benefits of harvesting residue once it has dried. The following text will present the pros and cons of harvesting biomass at different moisture contents.

If your operation utilizes dry grain corn, then a dry residue harvesting system would be the best fit. This procedure includes field drying of the remaining residue, possibly windrowing, and baling. Many producers already have access to all the required equipment and with a few adjustments one can complete this residue recovery technique. The benefits are that you are using the whole plant, not just the grain, and there is some revenue to be reaped.

However, there are drawbacks to the dry harvesting methods. When you consider the logistics of dry residue harvesting, there is a narrow window between when corn is harvested and when residue can be removed without making a mess of a field. Some researchers have said that there is a 40-day window after corn harvest to allow for residue collection (Nielsen, 1995). Fall in Ontario is typically wet and some producers already struggle with corn harvest without the added burden of residue recovery (Figure 1). Also, residue should be left in the fields until it is between 20-30% moisture to avoid damage or losses during storage. Wet field conditions can cause costly delays or the inability to recover any residue at all. Field operations for residue harvesting can become difficult and detrimental to the soil when a field is wet. The extra traffic associated with cutting or windrowing, baling, and removal can lead to compaction which is made worse when the soil is wet. Another consideration when baling corn stalks is the wear and tear on the equipment. Stalk recovery and baling have been noted to greatly strain equipment compared to typical hay harvesting (Nielsen, 1995).

The quality and quantity of the final residue removed from the field is different for dry harvest than it is for wet harvesting. A large quantity of foreign matter (sticks, stones, dirt) can be collected by the baler during dry residue harvest. This can influence the processing and price you receive for your residue. In terms of quantity, Shinners and Binversie (2004) discuss how the excessive field trafficking can lead to a smaller amount of residue collected. Harvesting efficiency, i.e. the ratio of stover mass actually harvested to mass in the field averaged 37% for dry baling. This number was 13% less than that for wet harvesting. This could be due to stalks being knocked over and flattened during harvesting procedures and the high amount of traffic required for a multi-pass harvesting system. Also, bale breakage during collection and storage can result in lower returns.

Figure 1: Wet field conditions prevent stover recovery

The one-pass system of wet harvest has many benefits over the dry residue harvest if it fits into your system. The wet harvesting procedure can be done at any point once the grain has been removed (if grain removal is part of the process). There is no waiting period for residue to dry. In many cases one enters the field when the corn is at 60% or more moisture and chops it into a wagon and removes it from the field right away. There is only one pass of equipment and it is early enough in the fall that there is little worry of wet field conditions. This is particularly important in no-till fields which typically stay wetter longer. Another benefit of the one-pass system is that the residue does not touch the ground, avoiding any contamination by dirt, sticks, etc. (Shinners and Binversie, 2004). The harvest efficiency of a one-pass system is greater than 50% (Shinners et al, 2009; Shinners and Binversie, 2004).

There are some drawbacks of the one-pass system. Tweaking of existing equipment or the purchase of new equipment all together may be required. This may include having something to separate the grain from the rest of the plant if the grain is wanted for feedstock. This could mean re-outfitting your old harvester, or purchasing a specially equipped harvester. Also researchers have mentioned that shredding the plants into one foot sections rather than 0.38" sections typical of a silage cutter, would save horsepower and reduce production costs (Atchison and Hettenhaus, 2003). Again adjustments will need to be made to existing equipment. Moving wet residue off the field can be costly because the higher moisture content makes it heavier resulting in more frequent trips to move biomass from the field and/or to the processor.

Even with the information provided above, the decision will depend on your system and your imagination. Figures 2 and 3 are excellent examples of how tools can be tweaked. Equipment can be altered and new methods of collection can surface. Ultimately, each individual farmer will develop a system that works for his or her particular operation.

Figure 2: Baling Stover right out of the combine.

Figure 3: Separating grain corn and stover

Notes:

Atchison, J.E. and Hettenhaus, J.R. 2003. Innovative Methods for Corn Stover Collecting, Handling, Storing and Transporting. Available at: www.nrel.gov/docs/fy04osti/33893.pdf

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Shinners, K.J. Boettcher, G.C., Hoffman, D.S., Munk, J.T., Muck, R.E., Weimer, P.J. 2009. Single-pass Harvest of Corn Grain and Stover: Performance of Three Harvester Configurations. American Society of Agricultural and Biological Engineers. 52(1): 51-60.