MICHIGAN SUGARBEET REACh

Research & Education Advisory Council

Management Guidelines for Improving Sugarbeet Harvest

EARLY HARVEST

Criteria for selection of sugarbeet fields for early harvest should include potential for yield gain, disease issues, and field drainage.

Early sugarbeet harvest in Michigan is usually scheduled to begin the first week of September. Sugarbeets taken in at this time will be processed immediately and not permanently piled. Permanent piling of sugarbeets usually occurs when temperatures are favorable (cold) after October 15th and into November. This allows some fields to continue to grow for another 30-60 days. Recent research conducted by the REACh research program found that a healthy field averaged an increase in yield of one ton per acre per week during the fall. Research also indicates that diseased sugarbeet fields do not store well in permanent piles.

Sugarbeet fields that have a good stand and are healthy have the most to gain from later harvest. Sugarbeets that are diseased from Rhizoctonia rot root, Cercospora leaf spot, and cyst nematode will not gain yield as much as a healthy field. In some cases, fields with heavy Rhizoctonia will actually reduce in yields and quality. It is also well known that **Rhizoctonia infested sugarbeets do not store well in permanent piles.** These beets can jeopardize long term storage in beet piles.

Heavy amounts of Cercospora leaf spot will also affect long term gain on yield and quality. Leaf spot infested sugarbeets will expend significant energy to re-grow new foliage at the expense of increasing tonnage and storing sugar. Also, dead/damage leafs can remain attached and become more difficult to remove during defoliation. Poorly defoliated and Cercospora infested beets also do not store well in permanent piles.

Sugarbeet cyst nematodes have been detected on about 25% of the sugarbeet fields in Michigan. Cyst can be easily detected on hair roots at this time of year. Fields that have cyst nematodes and were planted to a nematode susceptible variety are also good candidates for early harvest. Nematodes will interfere with water and nutrient uptake, which will reduce yield gain.

Certainly other reasons exist for harvesting fields early including tile drainage, field location and managing harvest labor.

SUGARBEET DEFOLIATION

Good defoliation will improve sugarbeet quality, storability and grower profitability

The MSU Sugarbeet Advancement program has worked closely with dozens of producers in numerous research trials in the last several years. It has become apparent that many producers do not put the same emphasis on properly maintained, adjusted and operated defoliators as they do with harvesters. Green petioles on the beets will increase impurities and storage losses. Poor clear juice impurity (CJP) will reduce the amount of extractable white sugar. If the Michigan Sugar Cooperative could increase recoverable white sugar at 30 cents per pound by only one pound per ton, four million pounds more sugar could be marketed **valued at over 1.2 million dollars**.

A well maintained topper is a key component to excellent topping. Flails that are worn or broken should be replaced. They should also be tight on the row unit. Flails that are loose will separate/split when going over the crown and leave additional green matter. Often we have seen topping being better earlier in the season and as flails wear, topping becomes poorer later. This is especially concerning since we will then be putting those tops in permanent piles which will effect long term storage. Flails should be replaced as needed throughout the harvest season.

Toppers should be adjusted every time a field is entered and/or whenever varieties change. Crown

height is different between varieties and also with plant population levels. Thin beets will stick out of the ground further than thick stands. Rhizoctonia infection will make topping difficult when trying to minimize knock outs. Some conditions such as high populations, dehydrated or frosted beets will also make topping more difficult. In these situations toppers may need to be set a bit lower, PTO speeds increased and/or a decrease in ground speed may be needed. Topping speed is dependent on field and defoliator conditions, but generally should not be more than 3.5 to 4 mph.

The sugarbeet harvester operator should always be in close communication with the person operating the topper. If adjustments are needed, they should be communicated appropriately.

Michigan Sugar Company research has shown an additional 11 pounds of sugar from good topping compared to poor. Sugarbeet Advancement research has shown between 4 to 9 pounds additional recovery per ton. Ten pounds of RWST is approximately $46 in 25 ton/acre beets at $50 per ton ($4600 per 100 acres). Even four pounds RWST would be $18.50 per acre or $1850 on 100 acres. **Taking a little extra time to do a good job in topping sugarbeets can pay good dividends!**

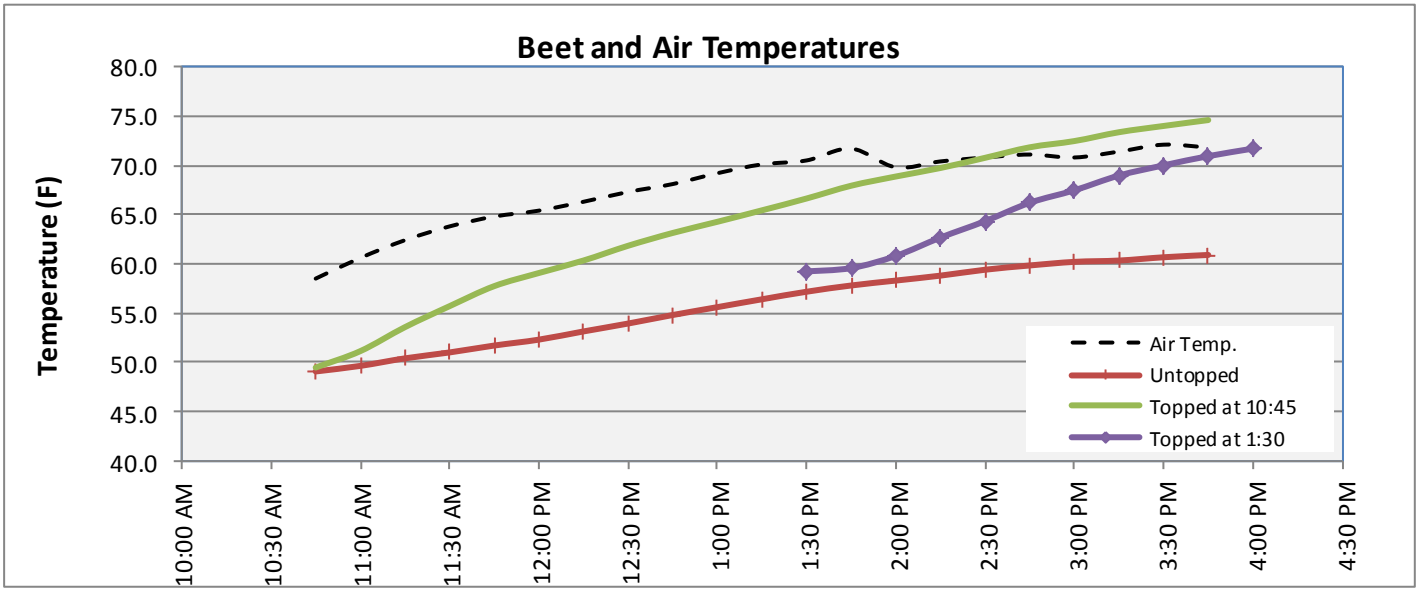
BEAT THE HEAT WHEN TOPPING

Topping sugarbeets to far ahead of the harvester will lead to warm beets in the pile that will reduce quality and storability. Proper sugarbeet storage temperature is below 50˚F.

It has long been known that heat is the enemy when it comes to harvesting and storing sugarbeets. Piled under warm conditions, length of storability is greatly reduced due to increased respiration, microbial activity and regrowth. These factors combined will reduce beet quality and factory efficiency. Typical storage loss in piles averages nearly 0.5 pound of sugar per ton of roots per day. Under warm conditions, sugarbeet respiration will increase and burn up sugar stored in the root. For every 15 degrees increase in beet temperature, respiration will double. Keeping the sugarbeet canopy intact until just prior to lifting goes a long way in beating the heat to keep the roots cool.

In 2011, a study was conducted by Sugarbeet Advancement at the Saginaw Valley Research and Extension farm. The trial was conducted to compare how fast temperatures increase in beets that have a canopy compared to defoliated. This trial was conducted during early season delivery on October 4, 2011. The day was bright and sunny. Sugarbeets were defoliated at 10:45 AM with air temperature at 57 degrees and 1:30 PM with air temperature at 72 degrees. Defoliated beets were compared to sugarbeets that had full canopies in the adjacent rows. Digital thermometers were inserted two inches into the beet crowns and temperature was taken every fifteen minutes.

Sugarbeets that were not defoliated (full canopy) gained temperature slower than those that were defoliated. Defoliated beets actually increased temperature more quickly than air temperature. (See Table Below) This indicates that the radiant energy (sun) was also warming the crown. By mid to late afternoon, sugarbeet crowns were actually warmer than the ambient air temperature for both defoliation timings. By



mid-afternoon the 10:45 AM defoliated beets were 13.5 degrees warmer than the non-defoliated beets. Defoliated beets gained about five degrees per hour in temperature. The rate of warming for non-defoliated beets was 2.4 degrees per hour, or half that of defoliated.

In order to beat the heat, growers are encouraged to not get too far ahead of the harvester. This is particularly critical during permanent pile when the temperature for piling is marginal and the sun is brightly shining. Sugarbeets should not be defoliated more than 30 minutes ahead of harvest. Often, those topping beets will need to stop and wait for the harvester to catch up. Another strategy is to slow down your topper to better match harvester progress. This approach may include the benefit of improved beet quality by better defoliation. This could easily pay good dividends to cover the wage of the topper operator and improve beet storability and profitability of the Cooperative.

HARVESTOR MAINTENANCE

Harvesters need to be properly maintained and adjusted to minimize downtime, reduce tare, and increase harvest efficiency.

Lifter wheels need to be examined closely. As lifter wheels wear, the pinch point becomes larger. This can affect the harvester's ability to lift beets, particularly smaller beets. Optimum pinch point measurement should be between 1 3/4 to 2 inches. Harvester speed and lifter wheel depth should be adjusted to minimize tare and root breakage. When lifter wheels become thinner, metal breakage can increase causing more downtime. Also pay special attention to rollers and transitions. As wraps become worn, the ability to transport beets is lessened. This can also increase tare and slow down harvest operations. Rollers should be straightened to within 1/16 of an inch of true. Remember, rollers will need to be adjusted for optimum performance. Be sure to examine the center bearing of the hex shaft while the harvester is in the shop. If the bearing fails in the field, significant downtime will occur.

Ferris wheels also need be examined yearly for repair and replacement needs. A new ferris wheel may be needed if it is out of round; breaking of rods occur, breaking or cracking of the 2 X 2 tubes, and/or the guide rail is worn out. If the ferris wheel is determined to be in need of replacement, new styles have been developed with improvements over the standard and are available commercially.

HARVEST LOSSES

Total field loss can average 0.9 ton/acre and range from 0.2 to 4.0 tons/acre. Losses greater than 1 ton/acre is considered excessive.

Leaving beets in the field that were missed by the harvester can be costly. A ton of sugarbeets is likely worth between forty to fifty dollars. Often minor adjustments to equipment and speed can be made to decrease harvest loss and increase profitability. It is important to first determine where losses are coming from and what types of losses. Large beets left in the middle of the row often are an indication that the topper has knocked them out. This is particularly common with uneven emergence and poor stands. In years with long spells of dry weather, digging conditions are typically not ideal. It is common to see small beets and broken tips left in the row or on the ground. This is part of the lifting operation and usually indicate lifter wheels are too shallow or excessive speed.

Harvest losses over one ton per acre are considered excessive. Determining harvest loss in each field is not a complicated procedure. The only tools that are required are a five gallon bucket, tape measure and a small scale. In the field, randomly select at least three locations to determine harvest loss. The locations should represent normal harvesting conditions in the field. The area to be measured should be equal to the number of rows that are harvested (4, 6 or 8) by 10 foot long. Mark the perimeter and this will be the sample area.

Inside the perimeter pick up all intact beets, broken tails and larger beet fragments. Be sure to drag your foot in the digger trench and pull out any broken off beets still in it. All beet material should be put into the bucket for weighing. Be sure to subtract the bucket weight from the gross. In Table 1, find the correct harvest row number and row width then multiply the weight by the conversion factor listed. This will give you harvest loss in tons/acres. For example, if you picked up ten pounds of beets and fragments from a six row harvester in 30 inch rows, you would have 1.45 tons/acres harvest loss (10 x .145). Average together all sampled locations for gross harvest loss for the field.

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Table 1: Conversion factors for determining harvest yield loss in the field.

Harvested Rows	Row Width	Conversion Factor
8	20	0.163
4	22	0.297
6	22	0.198
8	22	0.149
4	28	0.233
6	28	0.156
4	30	0.218
6	30	0.145

1. Weigh beets/fragments in an area 10ft. Long by number of rows harvested.
2. Select conversion factor from appropriate harvested rows/row width.
3. Multiply weight in pounds by conversion factor to determine harvest loss in tons.

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