GROULX, BRIAN J.[1] *, JAMES F. STEWART. [1], LEE A. HUBBELL[1], AND GREGORY M. Clark[2]. [1]Michigan Sugar Company, Agricultural Research Center, 1459 S. Valley Center Dr., Bay City, MI 48706, [2]Michigan Sugar Company, 2600 South Euclid Avenue, Bay City, MI 48706. **Bringing Research Harvest into the 21st Century**

ABSTRACT

The Research Department at Michigan Sugar Company has been very fortunate over the past few years in receiving new equipment to provide better, faster, and more precise information to our growers. Among those additions, the Research Department has acquired; two new planters, RTK auto steer, and now a new six-row research plot harvester. These additions have allowed the Research Department to reduce the amount of time it takes to turn plot data into useable information, while also reducing the amount of labor required to plant, maintain, and harvest research plots.

The latest of the new equipment is a custom built 6-row plot harvester. Harvest consists of roughly 100 acres of test plots at 20+ trial locations, harvested previously with two, two-row Farmhand harvesters that were cutting edge technology circa 1955. These machines have gone through numerous updates including grab-roll cleaning beds, hydraulically driven components, and digital scales with hydraulic weigh hoppers over their approximate 15 years of use. They have been maintained and work very well, but their slow pace creates the need to begin harvest during early September to be done by the first week of November, averaging around 40-42 days of harvest. The main issue with the current harvesters is the continuous change in weight due to the carrying of beets in the hopper and plot samples to be unloaded at the ends of the trial. The harvester stops between each plot in a rotary tilled alley providing the break between plots. When waiting in this alley to take the sample and plot weight, the harvester would sink into the loose soil, which caused issues when it would begin harvesting again. Also, with the increases in yields, the plot lengths were becoming an issue because there is simply not enough room in the hopper to go from one end of the trial to the other. Unloading the hopper while harvesting would require redesigning the plots resulting in a lot of wasted space. The time that it takes to unload the hopper was also a concern. Each time the hopper was unloaded, valuable harvest time was being consumed. It became apparent that more trials could be planted and maintained than could be harvested, so it was decided it was time for a new harvesting process.

The trials are planted with a six-row and 12-row planter, thus a six-row harvesting machine made the most sense. Existing and current harvesting machines were looked at to modify, similar to what was done when the two-row machines were built. It was quickly realized that to meet our needs, no current harvester was going to work. One of the largest obstacles dealt with when harvesting the plots is keeping each row separate throughout the harvesting and weighing process. Keeping the rows separate allows accounting for rows that are deemed unusable for data due to thin stands, disease, or other issues. The weights for those rows will not be used, and keeping them separate allows us to do this by simply leaving the hopper open while digging that row. Current harvesters using ferris wheels or scrubber chains would not allow this as they collect all harvested rows and funnel them to either a tank or conveyor to be loaded. It was decided that our variety trials would remain two-row plots and our agronomy trials would remain six-row plots. Each hopper collects two rows to be weighed, but each individual row can be opened and closed as needed. The weighing app that was created

records weights for each two row division as well as totaling all six rows together. Another obstacle in the process is having to empty the bulk hopper at each end of the pass. We are unable to drive trucks in the field because of the way the trials are planted and the way we harvest, so this new harvester drops beets in a windrow to be picked up by a WIC beet harvester that our employees modified in our own shop. Windrowing the beets for later pick-up also allows the harvester to operate with minimal downtime, harvesting continuously without having to wait to unload into a truck. Typically, samples can be emptied once or twice while harvesting a trial, but unloading the bulk hopper would have to happen as many as 15 times throughout a trial.

Our research team met with fabricators in the area to work through some of the details of the new machine. The construction of this harvester resulted in a collaboration between Richmond Brothers Fabrication in Bayport, Ike's Welding and Manufacturing in Munger, and Cech Corporation in Saginaw. Richmond's supplied the common harvester parts (e.g. lifter wheels, struts, etc.) and grabroll assembly; Ike's designed and fabricated the frame, hydraulic circuit, and weigh hoppers; and Cech Corporation created the weighing program and supplied the electrical components to record weights. The harvester lifts beets much like any existing harvester, but that is where the similarities end. Once clear of the lifting wheels, the beets travel up an incline scrubber chain where they fall onto grabrolls for additional cleaning. These grabrolls then dump into the six separate baskets, each with a hydraulic trap door on the bottom. These baskets are suspended on load cells which communicate through a wireless Bluetooth connection with an Android tablet which will record and document the weights into a custom created app as the plots are harvested. Once the weight and tare sample are collected, the trapdoors in the baskets are opened and the beets fall onto a cross conveyor chain to be windrowed. The tare samples will be stored on a platform behind the work area that has a hydraulic scissor lift to facilitate unloading of the nearly 9,000 samples we will bag in one year.

There are many things that set this harvester apart from the current two row machines as well as many other harvesters. This six-row harvester is supported by a set of Camoplast Tracks. These were chosen for their load bearing capability as well as their weight distribution. The current two-row harvesters are on pneumatic tires with walking beam axle assemblies, and when conditions are wet, they tend to sink in creating uneven harvesting depths and delays in harvest. The hydraulic system of the new six-row harvester is completely adjustable for speed with the simple touch of a button. With this the speed of the grabrolls, paddleshaft, and two scrubber chains can be changed independently to compensate for harvest speeds and soil conditions. Also, the weighing program will allow templates to be uploaded from Microsoft Excel for each individual plot reducing the amount of paperwork on the front end, while reducing the time to compile the data on the back end.

This new harvester is a welcome addition to the Research Department. It will allow for plots to be harvested in a more timely manner and when conditions are more favorable. It will also allow results to be compiled quicker after harvest, thus reducing the amount of time and labor it takes to enter hand collected data.