A FIELD COMPARISON OF SUGARBEET HARVESTERS

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Introduction

Extensive evaluations of sugarbeet harvesters have been done in Europe and England for many years. However, very limited evaluation of harvesters has been done in the United States. This study was initiated because eastern North Dakota and Minnesota sugarbeet growers desired information on more efficient harvesting methods. Objectives of the research were to evaluate the effect of harvester brand and speed of operation on sugarbeet yield and quality.

Materials/Methods

The study was conducted north of Grand Forks, ND, in 1991 and 1992. Harvesters used were 6 row WIC, Artsway, and Parma machines. The harvesters were operated at 4 and 6 mph in 1991 and 3 and 5 mph in 1992. Each treatment was replicated six times in 1991 and five times in 1992. The harvesters completed a pass the length of the half-mile-long field at each speed so company representatives could adjust operation of the harvesters to do the best possible job of lifting. Soil type in the field in 1991 was a Bearden silt loam; in 1992 it was a Fargo silty clay. Lifting conditions were ideal in 1991 and difficult in 1992 with wet to sticky surface soil. Defoliation was done with an Alloway 6-row defoliator with scalpers set to make a 1-inch cut on the beet crown. Plant population at harvest was 164 and 162 beets/100 feet of 22-inch-wide rows in 1991 and 1992, respectively. Field yield loss was determined by gleaning all beets to the depth of pinch wheel operation from three 144 sq. ft. areas after each pass with the harvester.

Results/Discussion

The yield and quality results from 1991 evaluations are presented in Table 1. Since machines were similar for all measured parameters, only means averaged across brands of harvesters will be discussed. Root yield significantly decreased 1.4 T/A as harvest speed increased from 4 to 6 mph. Recoverable sucrose per acre decreased about 457 lbs/A as speed increased. These yield reductions resulted in a decline in gross income per acre of $68, based on the American Crystal Sugar Company payment scale. Speed of harvester operation had almost no effect on sucrose percent, sugarbeet yield loss in the field, sugar loss to molasses, or impurity index. Dirt returned to the field and percent tare was greater at 6 than 4 mph.

Table 1. Effect of harvester speed of operation on sugarbeet yield and quality in 1991.

Harv. Speed	Sucrose	Sugarbeet Loss in Field	Dirt Tare	Dirt Returned to Field	Loss to Mol	Root Yield	Impur. Index	Extr. Sucr.	Gross Income
(mph)	(%)	(T/A)	(%)	(lbs)	(%)	(T/A)		(lb/A)	($/A)
4	18.1	1.2	4.5	1290	1.1	16.3	419	5530	986
6	18.1	1.2	5.0	1533	1.1	14.9	413	5073	879
LSD	NS	NS	NS	NS	NS	1.3	NS	286	---

Harvest results at 3 and 5 mph in 1992 were similar to those at 4 and 6 mph in 1991 (Table 2). The data in 1992 indicate no significant differences among harvesters for any yield parameter measured. However, yield decreased 0.6 T/A as harvest speed increased. Recoverable sugar decreased by 227 lb/A as harvest speed increased from 3 to 5 mph. Dirt tare increased 1.1% as harvest speed increased. Dirt returned to the field declined slightly as harvest speed increased. Sugarbeet quality parameters--sucrose percent, loss to molasses, and impurity index--were not affected by speed of harvester operation. Sugarbeet loss in the field was also not affected by speed of harvester operation. Gross income per acre was about $36.00 per acre less at 5 than at 3 mph.

Table 2. Effect of harvester speed of operation on sugarbeet yield and quality in 1992.

Speed	Sucrose	Sugarbeet Loss in Field	Dirt Tare	Dirt Returned to Field	Loss to Mol	Root Yield	Impurity Index	Extr. Sucr.	Gross Income
(mph)	(%)	(ton/A)	(%)	(lbs)	(%)	(ton/A)		(lb/A)	
3	18.2	1.9	4.9	2268	1.3	18.1	511	6104	1088
5	18.3	2.1	6.0	1928	1.4	17.5	541	5877	1047
LSD	NS	NS	NS	NS	NS	0.6	NS	NS	---

Dirt tare percent was 0.5% to 1% greater in 1992 than in 1991, even though harvesting speed was 1 mph slower. Dirt returned to the field was 500 to 700 pounds per load greater in 1992 and yield loss in the field was about 0.8 T/A greater in 1992 than 1991. The soil in 1992 was wetter and had higher clay content in 1992. The 1992 soil was a Fargo silty clay and the 1991 soil was a Bearden silt loam.

The difference in yield at 3 or 4 mph versus 5 or 6 mph was determined to be due to increased tail breakage and more difficulty staying on the row at higher speed. Experienced lifter operators and tractor drivers are essential to doing an excellent job of harvesting sugarbeets.

Conclusions

1. Sugarbeet yield and quality parameters were similar with all three harvesters.

2. Percent dirt tare increased as harvester ground speed increased.

3. Sugarbeet sucrose percent, loss to molasses, and impurity index were not affected by speed of harvester operation.

4. Dirt tare, dirt returned to the field, and yield loss in the field were greater under wet lifting conditions on a fine textured soil in 1992 as compared to ideal harvest conditions on a medium textured soil in 1991.

5. Yield in tons and recoverable sucrose per acre, and gross income per acre decreased as harvest speed increased each year.

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