A Progress Report of Planter Tests in Michigan[1]

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The work reported on in this paper is a continuation of mechanical planter tests reported in 1951. (1)[3] A number of different furrow openers, press wheels, seedbed preparation devices and forces on the press wheels have been tested. Three of the more promising press wheels and experimental furrow opener are shown in Figures 1 and 2.

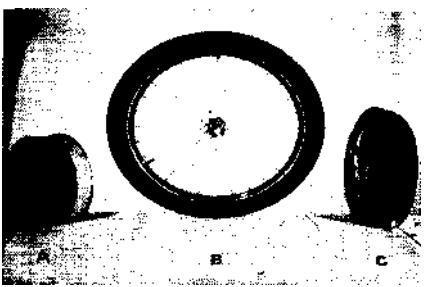

Figure 1. A. Beveled commercial press wheel. **B. 2.125 x** 20 pneumatic-tired bicycle wheel. C. Four section press wheel.

The two outside sections of the press wheel C in Figure 1 are rigidly fastened to a hub which in turn fits on a closely fitted spindle or axle. The two outside sections are 12 inches in diameter. The two inside sections are 12 1/2 inches and 12 3/4 inches in diameter and have center holes which fit loosely over the hub to which the outside sections are firmly fixed. The center holes of the inside sections are of such a diameter that when all sections are resting on a plane surface the hub is in contact with the lowest point on the circumference of the holes in the two center sections.

Spacers, 7/16-inch thick, are used between sections. The two center sections are free to turn independently of each other and the two outside sections. Slightly different diameters result in different angular velocities between any two adjacent sections.

The action of the wheel was such that there was no difficulty from soil filling in between the four sections and producing the effect of a solid wheel.

Carleton (2) tested a pneumatic press wheel and the rolling wheel furrow opener (Figure 2, B) in 1947 and 1948 with some encouraging results. The writer (1) continued testing these components in 1949 and introduced the four-section press wheel (Figure 1, C) that year. In 1949 and 1950 various combinations of press wheels, furrow openers, and downward forces on the press wheels were tested. The results of the 1949 and 1950 tests which are summarized below were reported in detail in 1951 (1).

[1] The study reported in this paper is being conducted as a cooperative project of the Michigan Agricultural Experiment Station (Agricultural Engineering Department cooperating) and the Bureau of Plant Industry, Soils, and Agricultural Engineering (Farm Machinery Division), U. S. Department of Agriculture.

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[3] Numbers in parentheses refer to literature cited.

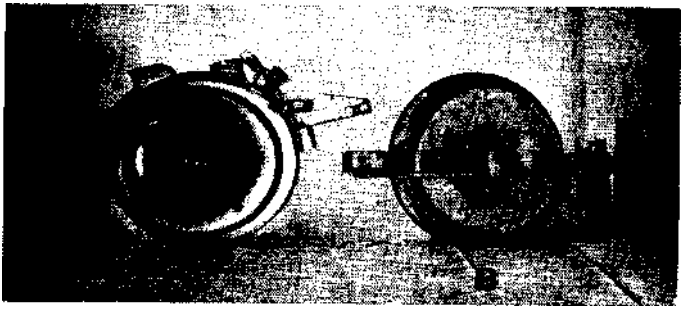

Figure 2. A. Commercial double disc furrow opener with depth bands to provide for 1-inch planting depth. B. Experimental rolling wheel furrow former equipped with depth bands to provide for 1-inch planting depth. The close fitting shoe back of the wheel served to keep the furrow open until the seed dropped to the bottom of the furrow. The thickness of the wheel at the periphery is 3/8-inch, at the depth band, 3/4-inch.

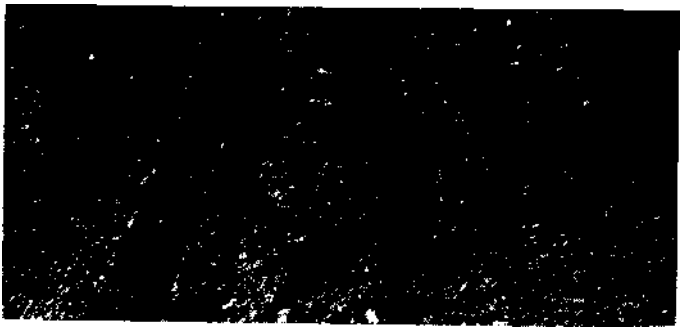

Figure 3. Appearance of seedbed following row strip seedbed preparation and planting. The two rows in the center were subjected to this experimental method of seedbed preparation. The outside rows were planted on a conventional seedbed- The coarser clods can be seen in the centers between the rows.

Figure 4. Unit for grading aggregates left in row strip and compaction of row strip.

Summary of Results

1949-1950

1. In 1949 the rolling wheel furrow opener showed promise of producing better emergence than the commercial double disc furrow opener used with the commercial beveled press wheel. In 1950 no significant results could be attributed to furrow openers alone.

2. In 1950 significant interactions between furrow openers and press wheels were indicated. Of the six furrow opener — press wheel combinations used, two appeared to be better than the others. The double disc commercial furrow opener (Figure 2, A) with the experimental four-section press wheel (Figure 1, C) was consistently associated with comparatively high emergence rates. This was also true of the rolling wheel furrow former (Figure 2, B) and commercial beveled press wheel (Figure 1, A) combination.

3. In 1949 and 1950 the double disc furrow opener—beveled press wheel combination was associated with comparatively low rates of emergence.

4. No consistent effects from downward forces on the press wheels ranging from 55 pounds to 155 pounds were recorded.

Results of 1951 Tests

In 1951 the press wheels (Figure 1) and the furrow openers (Figure 2) used in 1950 were again tested. Since no consistent effects from downward forces on the press wheels were observed in previous years, that variable was discarded and seedbed preparation substituted as a third variable.

A conventional seedbed was prepared by plowing, tandem disking, and dragging with a spring tooth harrow. An experimental seedbed was prepared in rows by grading the soil aggregates and moving the coarser clods to the centers between the rows (Figure 3). The refinement of the seedbed in the row strip was accomplished as follows:

1. After plowing and tandem disking, disc hillers mounted on the tool bars of the tractor were used to throw up ridges of soil approximately six

inches high and a foot wide at the base. The spacing between the ridges was equal to the spacing between the beet rows to be subsequently planted.

2. The purpose of the ridges was to provide an excess of soil over the row strip so that removal of clods would not leave a depression. The equipment for separating out the coarse clods is shown in Figure 4. When used with a trailed planter this operation and planting was accomplished in a single pass through the field.

The unit A in Figure 4 is power-take-off driven in reverse to direction of travel. It is centered over the strip where the row is subsequently planted.

Table 1.—Percentage of Potential Emergence and Least Significant Differences Attained in **Experimental** Planting Made On May 16, 1951.

Stand Counts June 4. Potential Emergence = 100%					
Main Effects					
Seed Bed	**Percent**	**Furrow Opener**	**Percent**	**Press Wheel**	**Percent**
C	43.3	DD	42.1	BW	40.4
E	47.7	RW	48.9	PN	45.0
				4S	51.1
Least Significant Differences					
	3.32*		4.42**		5.45**
First Order Interactions					
Seedbed x Fur. Opener	**Percent**	**Seedbed x Press Wheel**	**Percent**	**Furrow Opener x Press Wheel**	**Percent**
E x RW	54.2	E x 4S	55.0	RW x 4S	51.6
E x DD	41.1	E x PN	49.6	RW x PN	45.8
C x RW	43.8	E x BW	38.1	RW x BW	51.4
C x DD	42.9	C x 4S	47.0	DD x 4S	50.5
		C x PN	40.2	DD x PN	46.2
		C v BW	42.5	DD x BW	29.3
Least Significant Differences					
	6.25**		7.87**		5.79*

C—Conventional seedbed
E—Experimental seedbed
DD—Double disc furrow opener
RW—Rolling wheel furrow former
BW—Beveled press wheel
PN—Pneumatic press wheel
4S—4-Section press wheel
*—95% level of significance
**—99% level of significance

On May 16, 1951, a planting was made using six combination of the three press wheels and two furrow openers (Figures 1 and 2) which were used in 1950. These furrow opener-press wheel combinations were used both on the conventional seedbed and the experimental row strip seedbed and replicated eight times. A factorial experimental design was used so interactions between press wheel, seedbed, and furrow opener could be evaluated. An analysis of variance on results of stand counts made on June 4 indicated significance in respect to both main effects and interactions. The results are shown in Table 1.

Discussion of the Results

The experimental seed bed preparation in rows produced significantly better results than the conventional seed bed.

Soil moisture at time of planting and precipitation afterward are factors which may overshadow the effects of the furrow opener and presswheel. The more striking contrasts were obtained in 1949 on a planting made on a dry, cloddy seedbed. The rolling wheel furrow former (Figure 2B) produced markedly superior emergence. In 1950 precipitation of 2.3 inches occurred a few hours after making a planting. All treatments produced low emergence rates with no significant differences. In 1951 the emergence with all treatments was much higher than the same ones in 1950.

Summary of Results

1. The four-section presswheel—commercial double disc furrow opener and the beveled presswheel—rolling wheel furrow former combinations have produced emergence superior to that attained with the commercial presswheel—furrow opener combination. Consistently improved emergence cannot be attributed to the furrow opener alone.

2. Superior emergence was associated with a high degree of seedbed refinement in 1951.

Literature Cited

(1) FRENCH, GEORGE W.
1950. "Progress Report on Sugar Beet Planter Studies in 1949 and 1950." Proceedings of the Sixth Regional Meeting American Society of Sugar Beet Technologists, Eastern United States and Canada.

(2) CARLETON, WALTER M.
1948. Ph.D. Thesis, Michigan State College, "Principles Affecting the Performance of Mechanical Sugar Beet Planters," 1948. Carleton was working on a Farmers and Manufacturers Beet Sugar Association fellowship.

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