

No-till

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answers, Bandel said

In Maryland, research on no-tillage corn fertilization has thus far been concentrated on nitrogen management.

One of the earliest problems to be addressed concerned the observation that corn grown on uncultivated soil required higher nitrogen rates than corn grown under the conventional tillage systems. To make comparisons between the two tillage systems and determine whether no-tillage did actually require additional nitrogen, tests were initiated at several locations in Maryland in 1973 and continued through 1980.

No-tillage and conventional tillage corn were compared at five nitrogen rates: 0, 40, 80, 120 and 160 lbs N/A. In recent years, the 40 lb rate was replaced with a 240 lb N rate.

According to Bandel, the typical response has been that at low nitrogen rates, no-tillage corn did not yield as well as conventional tillage corn. But at more optimal N rates, no-tillage generally out-yielded conventional tillage corn.

Apparently, conventional tillage corn benefits from soil N mineralized from organic matter by cultivation. When the soil is plowed, organic matter is

oxidized and some of its N is released for plant use. Less organic N is mineralized under no-tillage since the soil is not tilled and exposed to atmospheric oxygen.

In spite of the frequency of the above described "typical" relationship between tillage and N rate, it does not always occur.

For instance, at the Forage Research Farm in 1978, no-tillage consistently out-yielded conventional tillage corn at all N rates. And conversely at Wye Institute the same year, conventional tillage consistently out-yielded no-tillage corn.

Why? Was it because of some unique soil characteristic such as temperature, moisture or soil drainage? Or could it have been due to time of N application, management, local weather or what?

In an effort to examine time of N application, a test at Poplar Hill was established in 1978 so that two N application dates could be compared. The plots were split, with N applied to one half of the plot on April 28. All for the N for the other half of the plot was applied on June 6.

On those plots which received N on April 28, conventional tillage consistently out-yielded no-tillage corn. This was unexpected, since at the Poplar Hill location, the "cross-over" type relationship described previously between tillage and N rate had prevailed in the past. However, for those plots which had received N on June 6, the expected "cross-over" relationship did occur between no-tillage and conventional tillage grain yields.

It was obvious in this case that the early N application did not benefit no-tillage as much as conventional tillage corn. Under conventional tillage, there was no yield

difference due to the date of N application. However, under no-tillage a rather large grain yield benefit occurred in favor of the late N application.

It was apparent that under no-tillage some mechanism reduced availability of the early applied N. Either the N was leached from the root zone before the plants could recover it, or the N was immobilized by soil microorganisms. Timing had no apparent effect upon N availability (as reflected by corn yields) under the conventional tillage corn.

Yield data collected in 1979 and 1980, in an effort to repeat these results, were not conclusive. Abnormal weather conditions may have been partially responsible. In the 1980 growing season was abnormally wet, and 1980 was extremely droughty.

Of five test locations in 1979, at only one was there any benefit observed for delayed N application. This occurred on a Beltsville silt loam soil at the Plant Research Farm near College Park. At Poplar Hill the only response was due to N rate.

In 1980, grain yields were not influenced by any significant interaction between tillage, N rate, or time of N application. The greatest response observed was due to tillage.

At Poplar Hill when optimal N rates had been applied, no-tillage corn yielded approximated 40 bushels per acre more than similarly fertilizer conventional tillage corn.

Similar trends were also observed at the other three locations. Drought stress obviously was less severe in the no-tillage plots than in the conventional tillage plots.

Labeled N fertilizer tests conducted by Drs. Legg, Stanford and Meisinger at USDA, Beltsville, Maryland

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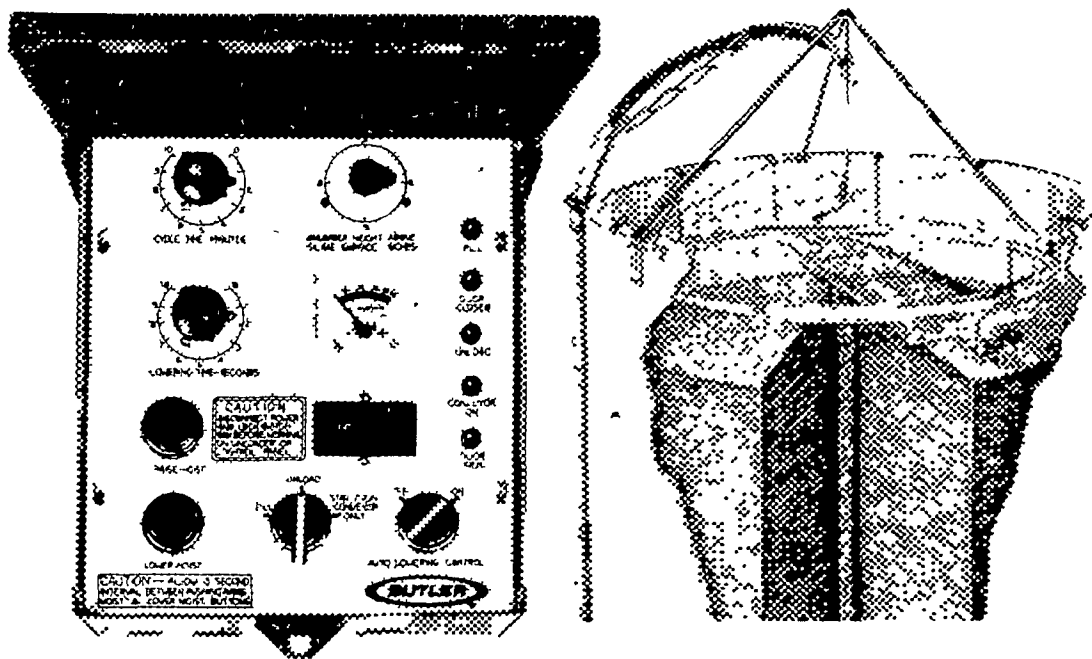


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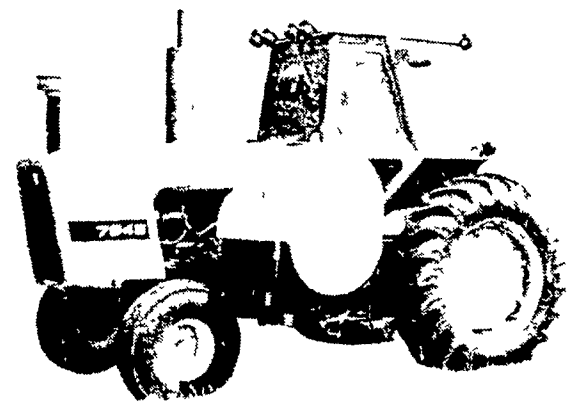
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