

1982

1982 PURDUE TILLAGE STUDIES

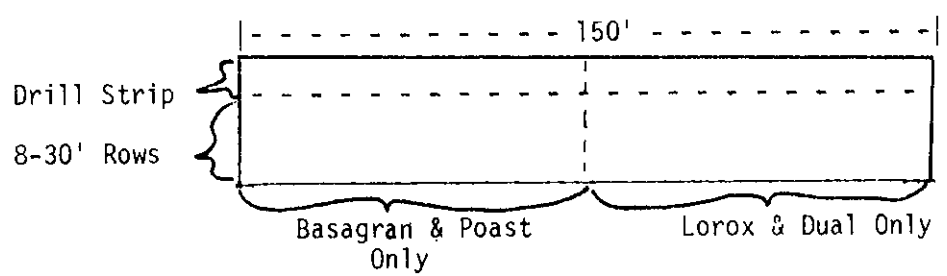
AGRONOMY FARM -- LONG-TIME STUDY

Although spring operations could not begin until April 24, nearly ideal weather during the next 2 weeks allowed timely planting. Mid season rainfall was also optimal, similar to that of 1979, allowing excellent yield potential.

Planting dates were April 30 for corn and May 11 for soybeans. In the till-plant continuous corn plots, we were not able to keep the planter centered on ridge tops. As a result, these plots were disked once and replanted 3 days after the original planting. Data was taken from these plots, but it should not be included with other "till-plant" data. Extra stabilizing disks were added to the planter before planting till-plant corn after beans and both till-plant bean treatments, resulting in satisfactory stabilization on ridge tops.

As in 1981, all soybean treatments, except till-planting, were split into 4 sub-plots as shown in the example below.

Example:



The drilled strip was seeded with a 7' Tye drill set on 10" spacing. In addition to the Basagran-Poast vs Lorox-Dual as shown, all no-till plots received Paraquat ahead of planting. Due to an early flush of smartweed in no-till continuous soybeans, these plots had 2 applications of Basagran in 1982. Soybean data from 30" rows with pre-emergence herbicides are included in this report. Marv Swearingin will report on soybean sub-plot treatments.

Unplanned pest control measures needed included Basagran application on all corn plots and zinc-phosphide use on all no-till and till-plant corn plots. Basagran was needed due to an increase in buttonweed since the Atrazine-Bledex combination has been used, replacing straight Atrazine pre-emergence. Zinc-phosphide was used to prevent field mouse damage, especially at plot ends next to grass alleyways. Weed, insect and disease problems did not appear to be yield limiting although morninglory and hedge bindweed continue to increase in all treatments.

Cultural practices used included:

	<u>Corn</u>	<u>Soybeans</u>
Hybrid/variety	Becks 65X	Century
Seed rate	26,000/acre	49 lbs/acre
Seedbed prep.	Disk once & field cult. once just pre-plant on plow & chisel plots	Same
Fertilizer	250#/A N as NH ₃ preplant 100#/A 28-28-0 starter 0-115-210 (N-P ₂ O ₅ - K ₂ O) b'cast fall 1982	No N No starter Same
Insecticide	Counter in row 9#/A	None
Weed control	Pre-plant: Paraquat 1.5 pt/A, No-till & till Pre-emergence: Bladex 4L, 1.5 qt/A Atrazine 4L, 1.5 qt/A Dual 8E, 3 pts/A Post-emergence: Basagran 1 qt/A	Same Pre-emerg. S 1/2 plots: Lorox L, 2.4 pts/A Dual 8E, 3 pts/A Post-emerg. N 1/2 plots: Basagran, 1 qt/A (2 x .75 qt no till B/B) Poast, 1 pt/A (0.3#AI)
Cultivation	Plow, chisel, ridge = once	Same
Harvest area	4 rows x 150'	2-30" rows x 60' and 4-10" rows x 60'

Stand, growth and yield:

Corn - When corn followed corn, plant growth and yield were best with plowing. Chiseling with our 2" straight point chisel, seems to be consistently intermediate between plow and no-till in growth and yield. Should we switch to the 4" twisted chisel on this flat, poorly drained soil? It is currently far more popular on these soils and is likely to provide more competitive yields. Remember that ridges were disked down for till-plant C/C, so data represent a non-ridged surface. In an adjacent experiment on the same soil type, till-plant C/C yielded 203.1 bu/A (4 rep. avg.).

When corn followed soybeans, no-till stands were reduced about 2200/A, apparently due to cutworm damage. No-till plant growth was reduced only 5" at 8 weeks vs 12" for C/C. Corn growth for till-plant at 8 weeks was measured to the top of the ridge; thus about 4" should be added to compare with other treatments. There was little difference in yield among tillage systems when corn followed beans, but yields for all systems were better in rotation than in C/C.

<u>Prev. Crop</u>	<u>Tillage</u>	<u>Stand, 4 wks</u>	<u>Height, 4 wks</u>	<u>Height, 8 wks</u>	<u>Harvest Moist.</u>	<u>Yield/ac @ 15 1/2% M</u>
		ppa	in.	in.	%	Bu.
Corn	Plow	24267	18.8	75.6	20.1	209.2
	Chisel	24933	16.4	67.6	20.4	190.4
	Till ^{a/}	23367 ^{a/}	19.2 ^{a/}	60.3 ^{a/}	21.2 ^{a/}	203.2 ^{a/}
	No-Till	23067	12.6	63.8	21.4	188.8
Soybeans	Plow	24367	18.8	77.9	20.0	212.4
	Chisel	24233	18.9	77.1	19.7	209.1
	Till	24367	18.3	71.8	19.6	216.6
	No-Till	22100	15.1	72.5	20.3	208.9

^{a/} Ridges were disked down and replanted 3 days later.

Soybeans - Stands for all systems were within the range considered adequate for top yield in 30" rows. Following corn, growth and yield were slightly reduced with chisel and no-till (as with C/C). For continuous beans, growth was not reduced but yield was lower for no-till. Yield for all tillage systems was lower in continuous cropping.

Table 2. Soybean response to tillage and previous crop, Chalmers si. c. 1., 1982.

<u>Prev. Crop</u>	<u>Tillage</u>	<u>Stand, 4 wks</u>	<u>Height, 4 wks</u>	<u>Height, 8 wks</u>	<u>Harvest Moist.</u>	<u>Yield/ac @ 15 1/2% M</u>
		ppa	in.	in.	%	Bu.
Corn	Plow	6.51	6.2	19.7	11.0	62.5
	Chisel	6.33	5.6	17.1	11.7	56.8
	Till	5.62	6.5	19.3	11.5	61.4
	No-Till	5.84	5.5	16.5	11.5	58.1
Soybean	Plow	6.00	6.5	18.9	11.7	55.4
	Chisel	5.70	6.2	18.3	11.9	53.1
	Till	6.22	7.5	20.6	11.5	53.1
	No-Till	5.44	6.0	18.5	11.9	47.7

ANOV, 1982 data - There was significant corn yield response to tillage, previous crop and their interaction. This was also true of plant growth and maturity. Soybean yield responses were not so clear, however, with only tillage differences being significant at the 5% level.

Table 3. ANOV summary, Agronomy Farm tillage data, 1982

Variable	Stand, 4 wks	Height, 4 wks	Height, 8 wks	Harvest Moist.	Bu/ac
----- Significance level -----					
<u>Corn</u>					
Tillage	.01	.01	.01	.05	.01
Previous crop	NS	NS	.01	.10	.01
Tillage x prev. crop	.05	.01	.05	.10	.05
<u>Soybeans</u>					
Tillage	NS	.01	.01	NS	.05
Previous crop	NS	.01	.05	NS	NS
Tillage x prev. crop	NS	NS	.05	NS	NS

Long-time yield trends:

There is an interesting comparison in corn yields between 1979 and 1982, the 2 years with 200 + bu/A yield potential. In 1979, no-till yield vs plowed was reduced about 30 bu/A for C/C and about 20 bu/A for C/B. In 1982 these same yield reductions were 20 bu/A and 3 bu/A, respectively, indicating that no-till corn after beans can be competitive at very high yield levels.

Soybean yields show rather consistent yield relationships - plow and chisel about equal, no-till reduced slightly in rotation and more in continuous cropping, and rotational yields better than continuous cropping for all tillage systems.

Table 4. Corn yield summary, Agronomy Farm tillage, 1975-82.

Previous Crop	Tillage	BU/AC								8 yr avg.
		1975	1976	1977	1978	1979	1980	1981	1982	
Corn	Plow	176.1	140.4	137.8	146.8	205.1	149.3	169.0	209.2	166.7
	Chisel	165.0	147.4	135.5	144.7	190.8	136.0	170.9	190.4 _{b/}	160.1
	Ridge	141.4	154.7	137.2	135.5 _{a/}	191.3	142.6	166.6	203.2 _{b/}	---
	(Till- 80-81) No-Till	165.4	153.7	136.3	146.1	176.6	134.4	164.6	188.8	158.2
Soybeans	Plow	167.4	145.1	146.1	145.4	209.5	166.0	176.4	212.4	171.0
	Chisel	177.1	140.8	149.5	140.2	206.7	159.4	170.3	209.1	169.1
	Ridge	149.5	154.7	147.8	142.1 _{a/}	194.8	164.2	173.6	216.6	---
	(Till- 80-82) No-Till	175.2	143.4	144.4	142.8	187.6	155.8	174.6	208.9	166.6

_{a/} Planted one week later in 1978.

_{b/} Ridges disked down and corn replanted 3 days later in 1982.

Table 5. Soybean yield summary, Agronomy Farm tillage, 1975-82.

Previous Crop	Tillage	BU/AC								8 yr. Avg.
		1975	1976	1977	1978	1979	1980	1981	1982	
Corn	Plow	56.4	54.4	55.4	39.3	48.6	54.4	49.2	62.5	52.5
	Chisel	57.6	50.7	54.1	45.0	49.5	54.6	46.2	56.8	51.8
	Ridge	49.9	50.9	50.4	39.4	48.3 ^{a/}	55.0	47.6	61.4	--
	(Till 80-82) No-Till	56.0	48.3	52.1	36.2	43.5	51.8	48.4	58.1	49.3
Soybeans	Plow	52.7	48.0	50.3	38.2	47.9	54.3	49.7	55.4	49.6
	Chisel	52.2	45.5	48.8	37.8	49.2	50.7	42.8	53.1	47.5
	Ridge	49.1	46.0	47.5	35.2	45.9 ^{a/}	48.1	45.6	53.1	--
	(Till 80-82) No-Till	47.8	41.4	44.6	34.1	45.0	49.5	46.8	47.7	44.6

^{a/} Ridges were disked down and soybeans replanted in 1979.

Other data collected:

Soil temperature and percent surface cover data were taken by Eileen Kladviko and will be included in other reports.

AGRONOMY FARM -- TILL-PLANT EQUIPMENT STUDY

This study, directed by Sam Parsons, Agr. Eng., was repeated for the second year. Attachments for J. D. Max-emerge planter units used in the trial included double-disk furrowers, V-wing bed toppers, Buffalo till-planter sweeps, fluted coulters, and no attachment. The Buffalo planter was used in the 1981 trial as a "check", but this planter was not available for 1982.

Plots were 8 rows wide and were so located that 4 reps were primarily on Raub soil and 4 reps were primarily on Chalmers soil. All 8 rows were machine harvested to check yields. Ridges were made at cultivating time in corn the previous year. Hybrid was Beck's 65X and row width was 30 inches, 250 lbs/ac N was applied as NH₃ preplant.

Table 6. Corn response to till-planting equipment, Agronomy Farm, 1982.

<u>Soil</u>	<u>Equipment</u>	<u>Stand, 4 wks.</u>	<u>Height, 4 wks.</u>	<u>Yield/ac @ 15 1/2% M</u>
		ppa	in.	Bu.
Chalmers si. c. 1.	Sweep	23,750	18.8	201.5
	V-wing	24,562	20.0	203.2
	Disk furrowers	23,625	18.9	202.5
	No-till coulter	24,312	20.9	198.0
	No attachment	<u>25,125</u>	<u>20.1</u>	<u>200.7</u>
	Soil Average	(24,275)	(19.7)	(201.2)
Raub si. 1.	Sweep	23,375	18.1	192.4
	V-wing	24,500	18.9	198.3
	Disk furrowers	23,562	18.4	192.9
	No-till coulter	24,625	18.4	191.7
	No attachment	<u>25,312</u>	<u>17.9</u>	<u>192.6</u>
	Soil Average	(24,275)	(18.3)	(193.6)

^{a/} Includes both compacted and non-compacted rows.

As in 1981, stand, height and yield differences among planter attachments were small, and yield differences were not significant. The 7.6 bu/A yield difference due to soil type was significant (.10).

Since combine wheels ran over 2 of every 4 ridges during harvest in the fall of '81, compacted vs non-compacted rows were hand sampled prior to machine harvest. Ear-bearing plants and yields from these checks are reported in Table 7. Both stand and yield were significantly (.05) influenced by ridge compaction from the combine wheels, with uncompacted rows yielding 10 bu/A more than compacted rows.

Table 7. Corn response to till-planting equipment and harvest row compaction, Agronomy Farm, 1982^{a/}.

Soil	Equipment	Ear Bearing Plants		Yield/ac	
		Compacted	Not Compacted	Compacted	Not Compacted
		----- ppa -----		----- bu -----	
Chalmers si. c. 1.	Sweep	21,750	23,750	185.5	197.0
	V-wing	23,250	24,750	183.0	197.0
	Disk furrowers	23,750	23,750	190.3	190.6
	No-till coulters	21,500	24,000	181.9	204.4
	No attachment	23,250	23,000	193.6	193.3
Raub si. 1.	Sweep	22,750	22,500	186.6	182.5
	V-wing	22,750	25,000	188.6	188.5
	Disk furrowers	23,000	25,000	161.1	193.6
	No-till coulters	22,000	23,750	166.5	181.8
	No attachment	21,750	22,750	172.8	181.5
Mean, comp. vs not comp.		22,575	23,825	181.0	191.0

^{a/} Average of 2 hand harvested 1/1000 ac. sub-plots each from compacted and uncompact rows (combine harvester compaction).

SEPAC Tillage Trials

Operations were much more timely in 1982 than in the previous two years of this experiment, when planting was delayed until June. Corn was planted on April 28 and soybeans on May 20 this year.

Two row beds were made in the fall of 1981, then triangular "bed toppers" were used on the planter to level and widen bed tops at planting. This worked fairly well in allowing the planter to remain centered on bed tops. However, it was noted at planting that the wide beds were not appreciably dryer than flat no-till plots.

No-till corn, only, was sprayed on May 20 for a developing cutworm problem. Other pest problems did not appear serious enough to affect yield. Nitrogen (NH₃) was side-dressed in 1982 vs pre-plant in the previous two years.

As in the Agronomy farm experiment, all soybean plots except beds were split with drill vs row and pre-emergence vs post-emergence herbicides. These yields will be reported by Marv Swearingin. Data from 30-inch row beans with pre-emergence herbicides was included in this analysis.

Cultural practices used:

	<u>Corn</u>	<u>Soybeans</u>
Hybrid/variety	P-3184	Williams 79
Date planted	April 28	May 20
Seed rate	26,000/A	48 lbs/A
Nitrogen	200 lbs/A as NH ₃	None
Starter fertilizer	18-46-0 120 lbs/A	None
Insecticide (planting)	Counter 15G, 9 lbs/A	None
(post)	Lorsban 4E, 1 qt/A	None
Herbicides	Paraquat, 1 pt/A	Same
	(no-till, bed)	
	Bladex 4L, .75 qt/A	Pre-emerg. (1/2 plot)
	Atrazine 4L, .75 qt/A	Lorox L, 1.25 pt/A
	Dual, 3 pts/A	Dual, 3 pts/A
		Post-emerg. (1/2 plot)
		Basagran, 1 qt/A
		Poast, 1 pt/A
Seedbed prep.	Disk 1 on plowed, Disk 2 on chisel & disk	Disk 2 on plow, chisel and disk.
Cultivation	Once on plow, chisel & disk	Same
Harvest	4 rows, full length	2 rows x 75', Reps I,II 2 rows x 100', Reps III,IV

Stand, growth and yield:

Corn - Surprisingly, response to tillage and previous crop for late April planting was similar to that with late planting ('80-'81), but at a much higher yield level. No-till growth and yield were significantly reduced in C/C, but were equal to or better than other treatments when corn followed beans. Chiseled C/C shows best growth and yield, but primarily due to one plot in Rep. II. Reasons for unusual response in this plot are not clear. Except for the chisel treatment, all corn yields were better in rotation than C/C.

Soybeans - As in 1981, there were no significant differences among soybean yields due to tillage.

Table 8. Response to tillage and previous crop, Clermont si. 1., SEPAC, 1982.

		Corn				
<u>Prev. Crop</u>	<u>Tillage</u>	<u>Stand, 4 wks</u>	<u>Height, 4 wks</u>	<u>Height, 8 wks</u>	<u>Harvest Moist.</u>	<u>Yield/ac @ 15 1/2% M</u>
		ppa	in.	in.	%	Bu.
Corn	Plow	24,950	17.0	51.8	28.1	186.8
	Chisel	24,250	19.4	56.6	27.5	194.4
	Disk	24,450	17.7	47.2	28.7	181.4
	Bed	22,600	16.1	49.8	29.8	181.6
	No-Till	22,750	14.1	42.6	33.1	159.9
Soybeans	Plow	24,825	16.8	56.4	28.8	196.6
	Chisel	25,400	16.9	53.8	28.9	187.3
	Disk	24,325	18.3	55.8	28.9	195.8
	Bed	23,975	16.2	55.0	29.2	191.6
	No-Till	23,150	18.1	60.8	28.7	197.2
		Soybeans				
		ppb	in.	in.	%	Bu.
Corn	Plow	7.5	5.6	17.6	13.4	52.0
	Chisel	7.7	5.9	17.8	13.5	51.1
	Disk	7.5	6.2	18.4	13.2	51.9
	Bed	7.1	5.1	16.1	13.2	48.9
	No-Till	6.5	5.6	17.3	13.5	49.4

Table 9. ANOV summary, SEPAC tillage data, 1982.

<u>Variable</u>	<u>Stand, 4 wks</u>	<u>Height, 4 wks</u>	<u>Height, 8 wks</u>	<u>Harvest Moist.</u>	<u>Bu/ac</u>
----- Significance level -----					
<u>Corn</u>					
Tillage	.01	.05	NS	NS	.10
Previous crop	.05	NS	.01	NS	.01
Tillage x prev. crop	NS	.01	.01	.01	.01
<u>Soybeans</u>					
Tillage	.01	.05	NS	NS	NS

Table 10. 1980-82 yield summary, SEPAC tillage.

Prev. Crop	Tillage	Corn				Soybeans			
		1980	1981	1982	3 yr. Avg.	1980	1981	1982	3 yr. Avg.
Corn	Plow	113.5	123.3	186.8	141.2	38.9	43.1	52.0	44.7
	Chisel	121.8	131.4	194.4	149.2	39.6	41.4	51.1	44.0
	Disk	117.0	125.2	181.4	141.2	40.0	38.6	51.9	43.5
	Bed	97.6	118.2	181.6	132.5	35.6	--	48.9	--
	No-Till	104.9	104.6	159.9	123.1	18.7 ^{a/}	42.2	49.4	36.8
Soybeans	Plow	116.2	122.0	196.6	144.9				
	Chisel	112.0	118.9	187.3	139.4				
	Disk	119.5	120.0	195.8	145.1				
	Bed	91.2	109.8	191.6	130.9				
	No-Till	119.6	115.5	197.2	144.1				

^{a/} Phytophthora root rot reduced yield.

DEMOS AT PAC'S - 1982

SEPAC -- Four acres on Clermont si. 1. were till-planted in ridges, continuous corn. Ridges were made at cultivation in 1981. These single-row ridges appeared to dry sooner than the 2-row beds at SEPAC, which may allow earlier planting. Corn yield was excellent and the demonstration will be repeated in 1983.

Don Biehle no-till planted several of the most erosive areas of SEPAC with variable success. One 20 acre field of well drained soil (including Park) had no-till planted corn into perennial sod. Field average yield was 210 bu/A, perhaps the highest documented no-till yield in Indiana.

Feldun -- All row-crops (120 acres) were no-till planted in 1982. Rotations included corn after corn, corn after beans, corn after meadow and beans after hay. Corn yields ranged from 100 bu/A (C/C) to 120 bu/A (C/B). Soybean yield was 35 bu/A. Weed control problems included bindweed and fall panicum for C/C, panicum + orchard and barnyard grass for C/meadow, and grass control where Poast was not used for beans/hay. All corn will be no-till planted again in 1983.

Miller -- A 30 acre field of Blount-Pewamo soil was no-till planted into residues from corn silage and corn for grain. The local S&WCD's planter was used. Late germinating grass was a problem. Both till-plant and no-till demos are planned for 1983.

Renkenberg Farm (PRF, not PAC) -- This farm is mostly Morley-Blount soil in Whitley Co. Two 10-acre fields were no-till planted with a planter rented from a fertilizer dealer. Corn into killed perennial grass sod was generally

successful. Corn after corn in a very poorly drained area suffered from delayed planting, slow growth and nitrogen deficiency.

PLANS FOR 1983

Research reported here will be repeated for 1983 with the following changes:

1. Till-plant single-row ridges will be substituted for the 2-row beds at SEPAC. Ridges were made in these plots after harvest in 1982.
2. A real effort will be made to use "controlled traffic" in ridges and no-till plots. This means confining wheel tracks to row middles and having 2 of every 4 row middles without traffic. This may mean spaced duals on combines at both Agronomy Farm and SEPAC.

FIELD OPERATIONS - 1982

- April 24 - Applied NH_3 for corn, Agron. Farm, tillage-rotation exp. and till-plant eq. exp.
Plowed and disked at SEPAC for both corn and beans - main tillage exp.
- April 26 - Disked once in plow and chisel treatments - Agron. Farm.
27 - Planted till-plant demo -- SEPAC.
28 - Planted all corn in main tillage exp. -- SEPAC.
29 - Field cultivated plow and chisel plots -- Agron. Farm.
30 - Planted all corn in main exp. -- Agron. Farm.
- May 1 - Planted all corn, till plant eq. exp. -- Agron. Farm.
4 - Applied zinc phosphide for mouse control on no-till and ridged corn -- Agron. Farm.
- May 10 - Planted Mengel's fertility-tillage corn -- Agron. Farm.
11 - Planted all beans, main tillage exp. and Mengel's fertility-tillage -- Agron. Farm.
Planted Steinhardt's corn in compaction plots -- Agron. Farm.
- May 12 - Applied pre-emerg. herb. to south end of all drilled bean plots -- Agron. Farm.
Applied Paraquat to north end of all no-till beans -- Agron. Farm.
Placed soil thermometers in tillage plots -- Agron. Farm.
- May 18 - Notes on SEPAC plots.
19 - Planted no-till vs plowed, drilled beans at Throck. PAC.
20 - Planted all row and drilled beans in tillage plots -- SEPAC.
Sprayed no-till corn with Lorsban for cutworms -- SEPAC.
- May 21 - Applied NH_3 to all tillage exp. corn except west 3 plots, Rep. III -- SEPAC.
- May 24 - Applied preemerg. herb. on drilled tillage beans -- Throck. PAC.
25 - Applied Basagran to all corn plots and north 1/2 of no-till B/B, main tillage exp. -- Agron. Farm.
- May 28 - Corn stand and height data -- SEPAC and Agron. Farm.
Applied NH_3 on last 3 plots, plus 4 acres of ridges -- SEPAC.
- June 7 - Applied Basagran and Poast, north 1/2 of bean plots -- Agron. Farm.
Cultivated all plow and chisel, and replanted ridges corn -- Agron. Farm.
- June 8 - Applied NH_3 on steinhardt plots -- Agron. Farm.
Cultivated all Mengel plots -- Agron. Farm.
- June 9 - Made ridges for till-plant demo -- Davis PAC.
10 - Cultivated plow, chisel and ridge beans -- Agron. Farm.
Ridged C/B at Agron. Farm.
- June 11 - Ridged till-plant eq. exp. corn -- Agron. Farm.
14 - Ridged 4 ac till-plant demo -- SEPAC.
- June 15 - Sprayed plot borders -- SEPAC.
16 - Sprayed plot borders -- Agron. Farm.
18 - Ridged till-plant C/C -- Agron. Farm.
30 - Took notes -- SEPAC.
- Sept. 26 - Harvest all corn tillage plots -- SEPAC.
30 - Harvest bean tillage -- Agron. Farm.
- Oct. 1 - Harvest bean tillage -- Agron. Farm.
6 - Harvest bean tillage -- SEPAC.

- Oct. 11 - Hand Harvest compact vs non-compacted rows, till plant eq. study --
Agron. Farm.
- Oct. 12 - Harvested corn, main tillage exp. -- Agron. Farm.
- 13 - Harvested till plant eq. study -- Agron. Farm.
- 14 - Harvested Steinhardt compaction corn -- Agron. Farm.
- 22 - Harvested drilled no-till vs plow beans -- Throck. PAC.
- 25 - Applied P&K to entire plot area -- Agron. Farm.
- 26 - Chiseled for corn and beans, main exp. and Mengels exp. -- Agron.
Farm.
- Oct. 27 - Plowed and ridged, main exp. -- Agron. Farm.
Plowed for Mengel exp. -- Agron. Farm.
Applied P&K, Steinhardt compaction study -- Agron. Farm.
- Nov. 1 - Ridged in main exp. -- SEPAC.
- 2 - Ridged for till-plant demo -- Davis PAC.
- 10 - Soil samples from all plots -- SEPAC.