

## Economics of Commercial Weed Control Programs in No-Till Soybean, 2005

Christy Sprague

A field trial in no-till soybean was conducted at the MSU Research Farm in E. Lansing to compare weed control, soybean injury, soybean yield, and economic returns of dominant weed control programs being marketed to Michigan growers. Each major herbicide company was asked to submit up to four weed control programs for the study based on soil type and weed infestation history. Site characteristics and herbicide application timings are described in Table 1. Table 2 describes the herbicides programs selected by each company. Herbicide programs are sorted by application method and the need for Roundup Ready seed. Yield loss due to weeds was extremely high at this location. The maximum soybean yield from this trial was 61.7 bu/A and the weedy (untreated) yield was 28.6 bu/A. Thus, uncontrolled weeds at this site reduced soybean yield by 33.1 bu/A (54%).

**Table 1.** Site description.

<b>Crop</b>	Soybean
<b>Variety</b>	Asgrow 2107
<b>Soil Texture</b>	Clay Loam
<b>Soil pH</b>	7.3 <sup>a</sup>
<b>Soil Organic Matter (OM)</b>	2.5%
<b>Dominant Weeds</b>	TAROF, ERIST, ERICA, DAUCA, SETFA/DIGSA, CHEAL, AMBEL
<b>Planting Date</b>	May 5
<b>Application Timings:</b>	
<b>14 EPP</b>	April 19
<b>7 EPP</b>	April 28
<b>PRE</b>	May 5
<b>POST</b>	June 13
<b>Evaluation Time</b>	54 d (injury) and 67 d (weed control)

Abbreviations: TAROF = dandelion, ERIST = rough fleabane, ERICA = horseweed (marestail), DAUCA = wild carrot, SETFA = giant foxtail, DIGSA = large crabgrass, CHEAL = common lambsquarters, AMBEL = common ragweed.

<sup>a</sup> Due to the high soil pH at this site some of the programs listed in this trial would be restrictive to rotational crops the following season (i.e., programs containing chlorimuron).

**Table 2.** Commercial no-till soybean herbicide programs selected by companies.

<b>Conventional</b>	<b>Treatments (Rate/A)</b>	<b>Abbreviated Form</b>
<b>7 EPP</b>	Extreme (3 pt) + 2,4-D ester (1 pt) + Prowl H <sub>2</sub> O (2 pt) + NIS (0.25%) + AMS (2.5 lb)	Extreme + 2,4-D + Prowl
<b>PRE</b>	Define (14.4 fl oz) + Extreme (3 pt) + Sencor (6.4 oz) + NIS (0.25%) + AMS (17 lb/100 gal) Gangster (3.6 oz) + Pendimax (2 pt) + Roundup OriginalMax (1.5 pt) + AMS (17 lb/100 gal)	Define + Extreme + Sencor Gangster + Pend + RupOM
<b>7EPP/POST</b>	Boundary (1.75 pt) + 2,4-D ester (1 pt) + COC (1%) fb. Flexstar (16 fl oz) + COC (1%) Glyphosate (32 fl oz) + 2,4-D ester (1 pt) + AMS (17 lb/100 gal) fb. Classic (0.25 oz) + Harmony GT (0.08 oz) + Assure II (8 fl oz) + NIS (0.2 pt) + 28% N (2 qt) - WeedSOFT	Boundary + 2,4-D fb. Flexstar Glypho + 2,4-D fb. Class + Harm + Assure
<b>PRE/POST</b>	Sequence (2.5 pt) + AMS (17 lb/100 gal) fb. Flexstar (16 fl oz) + COC (1%)	Sequence fb. Flexstar
<b>Roundup Ready</b>		
<b>14EPP/POST</b>	Extreme (3 pt) + 2,4-D ester (1 pt) + NIS (0.25%) + AMS (2.5 lb) fb. Roundup OriginalMax (22 fl oz) + AMS (2.5 lb) Linex (1 pt) + 2,4-D ester (1 pt) + COC (1%) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) Synchrony XP (1 oz) + Roundup WeatherMax (16 fl oz) + AMS (17 lb/100 gal) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) Roundup WeatherMax (16 fl oz) + 2,4-D Ester (1 pt) + AMS (17 lb/100 gal) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal)	Extreme + 2,4-D fb. RupOM  Linex + 2,4-D fb. RupWM Synch + RupWM fb. RupWM  RupWM + 2,4-D fb. RupWM
<b>7EPP/POST</b>	Python (0.8 oz) + Durango (1.5 pt) + 2,4-D ester (1 pt) + AMS (1.5%) fb. Durango (1.5 pt) + AMS (1.5%) FirstRate (0.3 oz) + Durango (1.5 pt) + 2,4-D ester (1 pt) + AMS (1.5%) fb. Durango (1.5 pt) + AMS (1.5%) Boundary (1.75 pt) + 2,4-D ester (1 pt) + COC (1%) fb. Touchdown Total (24 fl oz) + AMS (17 lb/100 gal) Glyphosate (32 fl oz) + 2,4-D ester (1 pt) + AMS (17 lb/100 gal) fb. Glyphosate (32 fl oz) + AMS (17 lb/100 gal) – WeedSOFT	Python + Dura + 2,4-D fb. Dura FRate + Dura + 2,4-D fb. Dura Boundary + 2,4-D fb. Touchdown Glypho + 2,4-D fb. Glypho
<b>PRE/POST</b>	Sencor (6.4 oz) + COC (1%) fb. Roundup WeatherMax (22 fl oz) + AMS (17 lb/100 gal) Roundup OriginalMax (16 fl oz) + AMS (17 lb/100 gal) fb. Roundup OriginalMax (16 fl oz) + AMS (17 lb/100 gal) Sequence (2.5 pt) + AMS (17 lb/100 gal) fb. Touchdown Total (24 fl oz) + AMS (17 lb/100 gal)	Sencor fb. RoundupWM RoundupOM fb. RoundupOM Sequence fb. Touchdown

**Table 3.** Soybean injury, weed control, weed control program costs, soybean yield, and gross margins for no-till herbicide programs.

	<i>Soybean Injury (%)</i>	<i>TAROF (%)</i>	<i>ERIST (%)</i>	<i>ERICA (%)</i>	<i>DAUCA (%)</i>	<i>SETFA/ DIGSA (%)</i>	<i>CHEAL (%)</i>	<i>AMBEL (%)</i>	<i>All Weeds (≥90%)</i>	<i>Costs<sup>1</sup> (\$/A)</i>	<i>Yield (bu/A)</i>	<i>Gross Margins<sup>2</sup> (\$/A)</i>
<b>7 EPP (Conventional)</b>												
Extreme + 2,4-D + Prowl	0	97	99	92	99	80	97	58	NO	\$27.06	52.2	\$233.94*
<b>PRE (Conventional)</b>												
Define + Extreme + Sencor	0	76	66	91	55	94	93	91	NO	\$40.61	54.0	\$229.64*
Gangster + Pend + RupOM	5†	83	98	99	50	89	88	90	NO	\$36.44	55.6*	\$241.44*
<b>7 EPP fb. POST (Conventional)</b>												
Boundary + 2,4-D fb. Flexstar	11†	38	9	55	25	91	81	98	NO	\$40.67	43.1	\$174.83
Glypho + 2,4-D fb. Class + Harm + Assure	10†	96	99	99	99	91	70	59	NO	\$31.90	51.7	\$226.48*
<b>PRE fb. POST (Conventional)</b>												
Sequence fb. Flexstar	10†	74	68	89	64	81	48	99	NO	\$40.21	49.6	\$207.79
<b>14 EPP fb. POST (Roundup Ready)</b>												
Extreme + 2,4-D fb. RupOM	0	98	99	99	99	93	99	99	YES	\$51.38	61.7*	\$256.88*
Linex + 2,4-D fb. RupWM	0	89	99	99	96	89	99	98	NO	\$51.11	56.4*	\$230.77*
Synch + RupWM fb. RupWM	1	98	99	99	99	91	99	99	YES	\$55.06	56.9*	\$229.32*
RupWM + 2,4-D fb. RupWM	1	98	99	99	99	86	98	99	NO	\$51.03	57.5*	\$236.47*
<b>7 EPP fb. POST (Roundup Ready)</b>												
Python + Dura + 2,4-D fb. Dura	0	96	99	99	99	91	99	99	YES	\$51.41	61.5*	\$255.97*
FRate + Dura + 2,4-D fb. Dura	4†	99	99	99	99	89	99	99	NO	\$51.73	53.6	\$216.02
Boundary + 2,4-D fb. Touchdown	0	87	93	99	91	90	99	99	NO	\$54.05	56.3*	\$227.20*
Glypho + 2,4-D fb. Glypho	1	99	99	99	99	88	99	99	NO	\$44.02	57.7*	\$244.36*
<b>PRE fb. POST (Roundup Ready)</b>												
Sencor fb. RoundupWM	1	79	93	99	86	86	99	99	NO	\$51.16	52.2	\$209.72
RoundupOM fb. RoundupOM	0	84	99	99	99	90	98	98	NO	\$41.72	56.7*	\$241.91*
Sequence fb. Touchdown	0	93	99	99	99	90	99	98	YES	\$53.59	57.2*	\$232.41*
<b>Untreated</b>	0	0	0	0	0	0	0	0	NO	0	28.6	\$142.75

Abbreviations: TAROF = dandelion, ERIST = rough fleabane, ERICA = horseweed (marestalk), DAUCA = wild carrot, SETFA = giant foxtail, DIGSA = large crabgrass, CHEAL = common lambsquarters, AMBEL = common ragweed, fb. = followed by.

<sup>1</sup>Herbicide and additive costs = avg. of price lists (April 2005); Application cost = \$6.00/A; Roundup Ready seed premium = \$14.00/50 lb bag; seeding rate = 200,000 seeds/A. Weed control costs = Herbicide \$ + Additive \$ + Application \$ + seed premium \$ (where applicable).

<sup>2</sup>Crop selling price = \$5.00/bu (December 2005). Gross margin = (Yield x Price) – Weed Control Costs.

\* Values are not significantly different from the highest value within that column.

† Indicates significant soybean injury 54 days after soybean planting.

**Table 4.** Summary of instances of soybean injury, weed control, herbicide program costs, highest yielding, and highest gross margins for the 7 no-till weed control systems.

	<b>Soybean Injury</b>	<b>All Weeds Controlled (<math>\geq 90\%</math>)</b>	<b>5 Most Expensive</b>	<b>5 Least Expensive</b>	<b>Highest Yielding</b>	<b>Highest Gross Margins</b>
<b>Conventional</b>						
7 EPP	0/1	0/1	0/1	1/1	0/1	1/1
PRE	1/2	0/2	0/2	2/2	1/2	2/2
7 EPP/POST	2/2	0/2	0/2	1/2	0/2	1/2
PRE/POST	1/1	0/1	0/1	1/1	0/1	0/1
<b>Roundup Ready</b>						
14 EPP/POST	0/4	2/4	1/4	0/4	4/4	4/4
7 EPP/POST	1/4	1/4	3/4	0/4	3/4	3/4
PRE/POST	0/3	1/3	1/3	0/3	2/3	2/3

Information in Table 4 is based on results presented in Table 3.

**Results:**

Table 3 lists soybean injury, weed control effectiveness, weed control cost, soybean yield, and gross margin for each of the herbicide programs included in the study. Table 4 summarizes soybean injury, weed control, the five most and five least expensive programs, soybean yield, and gross margins for each of the seven weed control systems included in the trial.

**General Observations:**

Initial control of weeds that were present before or at planting (dandelion, rough fleabane, horseweed, and wild carrot) was important in preserving soybean yield. Most programs that effectively controlled these weeds included a glyphosate product in the burndown application (14 EPP, 7 EPP, of PRE). If a program did not initially control these weeds and a follow up application of a glyphosate product was made these weed were controlled at the end of the season. However, early season weed competition had already occurred and soybean yield was reduced. Out of the 17 herbicide programs evaluated only 4 herbicide programs effectively controlled all weed greater than or equal to 90%. Even though not all of the programs controlled weeds greater than 90%, 10 programs ranked among the highest yielding. Of these 10 programs all but one of the programs was Roundup Ready. All of the programs that ranked among the highest yielding were also among programs with the highest gross margins. Additionally, three other conventional soybean herbicide programs ranked among the highest gross margins, each of these programs were also among the five least expensive programs. Overall weed control that affected soybean yield and herbicide program cost all factored into the economic returns for the various programs.

This study is the results of one year and one year only. Please take this into consideration when forming your own conclusions.