Final Project Report to the NYS IPM Program, Agricultural IPM 2002-2003

1. Title: Overcoming Barriers to Success in Reduced-Tillage Pumpkin Production: Implementing Effective Plant Establishment and Weed Management Strategies

2. Project Leaders: Charles Bornt and Ted Blomgren, Cornell Cooperative Extension Capital District Vegetable Program

4. Type of Grant: Systems Comparison Trial

5. Project locations: Cornell Research Farm, Columbia County, NY

6. Abstract: Adoption of reduced-tillage pumpkin planting systems has been limited in the Capital District Region of NY. Pumpkin growers in the Capital District have been quick to point out that the two most significant barriers to success with reduced-till systems are plant establishment and weed control. Traditional reduced-tillage systems in this area have focused on direct seeding pumpkins into an herbicide killed winter rye. This project will focus on using transplants for plant establishment. It will also help determine which cell size (72, 98 or 128) can optimize yields and greenhouse space. This project also will compare herbicide treatments in reduced-till pumpkins.

7. Background and justification: Research in reduced-tillage planting systems for pumpkins has been an area of interest for Capital District vegetable growers for many years. Much of the focus over the years has been with direct seeding into a herbicide killed rye mulch. However, implementation of reduced-till systems has been very limited for two key reasons. First, direct seeding of pumpkins in reduced-tillage systems has often resulted in poor plant stands because of problems resulting from cold soils and heavy crop residues. Transplants may be used to ensure greater control over plant populations in the field. Using transplants also offers greater flexibility over the timing of planting. When transplants are used, there is an increase in production costs. This trial will also help to determine when to plant and what cell sizes are most economical. In more recent years, investigations into using pumpkin transplants instead of direct seeding and different rye killing methods have been researched in the Capital District with encouraging results.

The second reasons reduce-tillage systems have been limited in the Capital District is poor weed control with the use of organic mulches. Mulch crops are rarely weed-suppressive for more than 4 to 6 weeks after pumpkin establishment. Therefore, mid to late season weed management strategies need to be addressed. In particular, post emergent broadleaf herbicides are needed for these systems. The introduction of a new herbicide called Sandea and its pending registration in NY could become an important weed control tool not only in conventional plantings, but in reduced-till systems as well. This new herbicide has proven to be very effective in controlling many of the weeds that have escaped currently registered products, and is one of the few post-emergent broadleaf herbicides labeled for pumpkins. The ability of this material to be used post emergent on

broadleaf weeds could be one of the missing links for reduced-till pumpkin systems to be used more widely in New York. Sandea may be used in conjunction with Poast, a post-emergent herbicide used to control annual grasses in the seedling stage. An IPM weed control strategy would entail the use of one or both of these post-emergent herbicides on as as-needed basis. The decision of what materials to use and when to apply them could be based on scouting information.

8. Objectives: The overall objective of this work is to encourage increased grower use of effective reduce-tillage pumpkin production strategies. The two specific objectives of this project are as follows:

1) To demonstrate effective as-needed weed management strategies, integrating the use of a weed-suppressive cover crop (winter rye), a pumpkin planting strategy that causes minimal soil disturbance (using a no-till Water Wheel planter), weed scouting, and the as-needed use of post emergence herbicides.

2) To demonstrate alternative strategies for pumpkin stand establishment, integrating the use of small, cost-effective cell sizes, transplanting at the cotyledon and first true leaf stages of development for minimal transplanting shock, and the optimal timing of transplanting.

9. Procedures: Reduced-Till Herbicide Trial:
In the Fall of 2001 at the Cornell Research Farm in Valatie, NY, a 2 acre field was plowed and 600 lbs of 15-15-15 fertilizer was broadcast and harrowed in. A cover crop of winter rye was drilled several days later at a 130 lbs/acre rate. No stand measurements were taken, but rye growth was observed to be in excellent condition.

In the spring of 2002, the treatments found in Table 1 were planned using two different rye kill methods (Round-Up or Flail mowing), two different plant establishment methods (direct seeding and 14 day old transplants) and weed control strategies. On May 23, plots were treated with Round-Up (2qts/acre) or flailed mowed. On May 31, using a water wheel planter, plots were direct seeded with Howden pumpkin seed using 5-foot between row spacing and 3-foot in row spacing. Plots consisted of 2 side by side rows, with 8 plants per row, and were replicated 3 times. Plots also consisted of two guard rows on the sides of the treated rows.

On May 27, Howden seeds were planted into 72 cell flats at the Blomgren Farm and put into the greenhouse. On June 10, these plants were planted into winter rye using the rye kill methods mentioned in Table 1.

Table 1: Rye Kill Method, Plant Establishment and Herbicide Trial Treatments.

Treatment #	Kill Method	Rye Kill	Planting date	Variety	Establishment	Herbicide
1	Round - up	23-May	31-May	Howden	Direct Seed	weedy check
2	Round - up	23-May	31-May	Howden	Direct Seed	Sandea Post
3	Round - up	23-May	31-May	Howden	Direct Seed	Command Post
4	Flail Mow	23-May	31-May	Howden	Direct Seed	weedy check
5	Flail Mow	23-May	31-May	Howden	Direct Seed	Sandea Post
6	Flail Mow	23-May	31-May	Howden	Direct Seed	Command Post
7	Round - up	28-May	10-June	Howden	Transplant	weedy check
8	Round - up	28-May	10-June	Howden	Transplant	Sandea Post
9	Round - up	28-May	10-June	Howden	Transplant	Command Pre
10	Flail Mow	28-May	10-June	Howden	Transplant	weedy check
11	Flail Mow	28-May	10-June	Howden	Transplant	Sandea Post
12	Flail Mow	28-May	10-June	Howden	Transplant	Command Pre

Reduced-Till Plant Stand Establishment Trial:
In the same 2-acre field mentioned above, a plant establishment trial was planned with the treatments found in Table 2. This trial also looked at the establishment differences between a pumpkin variety that had a 110 day maturity (Howden) and one that had a 80 day maturity (Racer) to determine what effect transplanting had if any. The winter rye in this trial was killed using Round-Up (2 qts/acre) on the dates found in Table 2. Seeds were sowed in 72, 98, or 128 cell flats and put in the greenhouse at the Blomgren Farm. Plots were then planted using a water wheel transplanter in 5-foot centers and 3-foot in-row spacing. Plots consisted of 2, side by side rows, each containing 8 plants and replicated 3 times. Plots that were to be direct seeded were planted on the same day the transplants were field planted using the water wheel transplanter. Plots also consisted of two guard rows on the sides of the treated rows.

Table 2. Cell Size and Variety Plant Establishment Treatments.

Treatment #	Rye Kill	Sowing date	Planting date	Variety	Establishment	Cell Size
1	23-May	x	31-May	Howden	Direct Seed	x
2	23-May	15-May	31-May	Howden	Transplant	72
3	23-May	15-May	31-May	Howden	Transplant	98
4	23-May	15-May	31-May	Howden	Transplant	128
5	23-May	15-May	31-May	Racer	Transplant	98
6	23-May	x	31-May	Racer	Direct Seed	x

10. Results and Discussion: Reduced-Till Herbicide Trial
The 2002 growing season proved to not only be hard on NYS vegetable growers, but also on CCE Specialist doing field research on vegetables. The cool wet spring hindered fieldwork and trial establishment. Upon inspection of direct seeded plots on June 2, it was apparent that over 90% of the direct seeded herbicide trial planted on May 31 was destroyed due to the predation of the seed by mice and other animals. With little to no plant stands, no herbicide applications were applied and trial was not replanted.

The transplant herbicide trial also experienced difficulties. We did not apply any pre-plant Command because of conversations with Cornell faculty and possible labeling restrictions. In addition, transplant health immediately after and several days following transplanting looked superb. However, as experienced with the John Altobelli no-till trial in 2001, we experienced the same problem in 2002 in which plants started to exhibit a marginal necrosis. At first we thought it was Round-Up injury, but were soon assured that this was not the case. Plants in the flailed mowed plots that received no Round-up applications also exhibited marginal necrosis, further assuring us that it was not Round-Up injury. As a result of this marginal necrosis, many plants died and those that do survive are weak and generally non-productive. In addition, Sandea herbicide was suppose to have a label for the 2002-growing season, however, it did not receive NYS registration and was unavailable for our use in this trial. For these reasons, this trial was also abandoned.

Reduced-Till Plant Stand Establishment Trial: The reduced till establishment trial also had some difficulties. As reported above, this trial also suffered some marginal necrosis, which resulted in plant stand reductions and overall stand health. However, enough of these plants survived and yield data was collected on October 10, 2002 and can be found in Table 3. Howden yields were always greater when a transplant was used compared to direct seeding. There is little difference in yield between 72 and 98 cell sizes, but it would appear that a 128 cell size may reduce overall yields. There was no difference in average fruit size between all Howden treatments. Howden direct seeded plots also suffered from mice and other animal predation. When comparing Racer transplants to direct seeding, there is no difference in yield or average fruit size. For reasons that we cannot explain, Racer direct seeded plots were not reduced compared to Howden direct seeded plots.

At this point, we would recommended that when growing Howden in a no-till or reduced-till system, a grower use a 98 cell size to maximize greenhouse space without sacrificing yield or fruit size. If Racer is to be grown, either direct seeding or transplants could be used. However, due to the predation of seed by mice etc., it may prove advantageous to use transplants instead of seed.

Table 3. Yield and Average Fruit Size of Pumpkins in Reduced-Till Establishment Trial.

Type of Establishment	Cell Size	Variety	Marketable Fruit Number	Marketable Fruit Weight (lbs)	Average Fruit Size
Transplanted	72	Howden	9.3	100.7	10.8
Transplanted	98	Howden	9.0	94.8	10.5
Transplanted	128	Howden	8.5	89.4	10.5
Seeded	~	Howden	3.0	32.3	10.8
Transplanted	98	Racer	13.3	99.5	7.5
Seeded	~	Racer	14.0	103.3	7.4