Early Sweet Corn from Transplants: FNE03-491

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2) Sweet corn is a tremendously important crop for many farms in the northeast. A major challenge to growers in producing this heat loving crop is our often cool and wet spring weather. Resulting soil conditions inhibit even germination of bare ground direct seeded corn. Harvest is often delayed to slow emergence, or in worst case scenarios, lost entirely due to insufficient germination. A most commonly used tactic to ensure germination is using treated seed. However, this does in no way hasten germination or growing on. In addition, certified organic growers are no longer allowed to use any treated seed. Other tactics have been to employ the use of floating row covers and/or plastic mulches. Row covers are not selective as to what growth is improved, thus weeds benefit as much as the crop. This presents a hurdle to growers who abstain from use of herbicides. Likewise, plastic mulches require the use of herbicides in the wheel tracks, and in the bed with clear mulches. Recent experimenting with growing sweet corn from transplants has shown promise. This SARE grant has helped further explore the merits of producing early corn in this manner, looking at the practicality and the economics of providing the additional needed inputs. In addition, different transplant configurations were used and compared to see if greater results were obtainable.

3) Wood's Market Garden is a diversified small fruit and vegetable farm with 25 acres in cultivation. This is my fourth season at this farm, and I have been a grower since the late 1980's. Our production also includes several greenhouses for early season tomatoes and bedding plants. Our crops are entirely marketed through the retail stand, which was established over 75 years ago with the Wood family. Sweet corn represents a full quarter of our farm's produce income, though represents about ½ of what people think of when the stand is mentioned(the other ½ is strawberries, and the other ½ is tomatoes…..ie typical farmstand). Though not certified organic, this farm refrains from the use of herbicides, and relies on organic practices for all field production. Sweet corn is grown on roughly 10-12 acres of land. This year a total of just over 3 acres of corn was grown from transplants and covered with floating row cover.

4) My technical advisor, Vern Grubinger, was helpful in framing the grant into a focused experiment. He also has been a sounding board for my ideas and how these relate to other growers' experiences. Andrew Knafel and I worked often over the winter to develop a drop seeder that proved to be an enormous time saver at seeding time. We have also compared notes on the performances of different varieties, as well as timing of plantings.

5) There were two plantings of sweet corn from transplants. These were each covered with floating row cover. Timed with bare ground direct seeded crops, we were

able to harvest continually from July 12 thru end of September. Transplants were produced in our greenhouses. We seeded each variety into trays with 4 different configurations. 162-cell and 98-cell trays were used(98 cell has about 70% more soil volume per cell), and either one seed per cell or two seeds per cell were used. Our plant population in the field would be consistent, so the double seeded cells would be placed half as often at transplanting. Finding straight organic compost-based potting soil to be too dense for the smaller cells, we blended this 50/50 with a conventional potting mix(more on this later in report). Transplants were grown out, with 68-75 degree days and 64 degree nights, for 14 days. Then for two or three days we hardened them off outside, using less water so as to produce a sturdier transplant. At 16-18 days from seeding, when transplants were large enough to handle, we used a Mechanical Transplanter 1000 to place them in the field. Single-seed cells were placed at 8" spacing, and double-seeded cells at 16" spacing. At 36" row spacing, this gave a consistent 21,000 plants per acre. For each transplanting, we planted 5 blocks of 12-400' rows each, one variety per block. Three rows in each block were split up into 4-100' sections, and the four transplant configurations were represented in these sections. The remaining 9 rows of each block were filled with 162 cell, double seeded transplants at 16". Immediately after transplanting each block, the seedlings were covered with a row cover. Our first seeding was started in the greenhouse April 13-14th, and transplanted into the field 29-30th. Row cover was pulled aside on May 19th, the corn cultivated and sidedressed, and row cover reapplied. We uncovered this for good June 3rd, as the earliest variety had started to tassel. A quick cultivation and hand hoe was our last measure before harvest. The second seeding was started April 22-23rd and transplanted into the field May 9-10th. Cultivation/sidedressing took place May 23rd, and final uncovering took place on June 8th. Harvesting took place beginning on July 12th with Seneca Arrowhead. With heavy early pressure from corn borer, scouting called for application of a bt, which was done at tassel emergence and about one week later(twice for each planting.

6) First and foremost, transplanting sweet corn can and does work. We saw consistent yields throughout all of the transplanted corn. Quality and tip fill varied somewhat by variety, but the overwhelming majority of ears were marketable, ***giving 250-300 bushel per acre yields***. The timing was excellent, providing early corn to market, only two days behind Hudson Valley growers who had direct seeded corn under row covers(source of corn for some of our competitor's stands). During harvest, we weighed random samples within the four configurations to help compare performance, and there was a 5-10% heavier weight, depending on variety, with the single seeded cells. There was no difference between the 98- and 162-cell corn at harvest. The most notable differences were earlier in the process:

> The 98-cell trays obviously took up a significant amount more of space than the 162-cell trays, as did the single seed trays compared to the double seeded trays. To point this out, single seed 98-cell trays would require about 215 trays per acre of corn, whereas a double seeded 162-cell tray would need 68 trays.

The 98-cell trays produced a much larger seedling in the same amount of time. With such a larger volume of soil available, the 98 developed a much larger and healthier root system, thus resulting in more robust top growth. Taking apart seedlings after about one week, the primary root of a 98 would be from 6-8 inches long, and had much finer secondary hairs. The 162 primary root would only be 3-5 inches long and virtually no root hairs. What this translated to later was a much easier plant to handle in a shorter amount of time. Likewise, the plant grew quicker after transplanting, keeping slightly more ahead of the weeds. This allowed for a more aggressive cultivation at the first row cover removal.

A dramatic difference that also occurred was the earlier emergence of tassels with the 98 cell corn(by about two days).

Despite this, and despite the previous differences noted, when it came to harvest, timing was essentially identical.

One unexpected result came from our workshop. With the intention of showing participants the size difference between transplants, we seeded some sample trays about two weeks before the meeting in June. Curious about the effect of a compost-based soil versus a conventional peat based soil, I put half of the plants in each soil type in the four tray configurations represented in the experiment. There was no difference with the non-compost soil, presumably because of the seed germ providing enough oomph to grow for those first two weeks or so. This is worth noting, as the heavier organic soil was hard to plant into with the smaller 162-cell. I had always blended the two, but it was still rather dense and inconvenient…seems straight potting soil would work fine.

7) Our farm's soils are very light and sandy. This allows us the flexibility to put our transplants in when they are ready, an advantage especially with the smaller cells. We tried to see how our extra transplants "held up" after scheduled planting time. The 162 trays were hard, even with food, to keep looking good. There was simply no soil left. On the other hand, these light soils are in a cold pocket, and the row cover is essential, as it dropped to 26-28 degrees for two nights just after we planted. Have your row covers ready to go folks!

8) I feel the economics of this system work well here, largely because of the retail marketing. It is easy to recover the initially high input costs. The added costs of producing transplants, including planting, is roughly $750 an acre over the $1500 per acre for direct seeding corn and covering with row cover. With the high yields that have proven to be obtainable transplanting, gross returns at the retail level can be as high as $6000 per acre. This leaves plenty of net, making corn a high value crop.

Growers need to look at other factors regarding viability of growing corn transplants, and the configuration of trays that best suit their needs, space and labor. Space available is an issue related to economics, as corn returns do not come close to those from greenhouse bench space reserved for bedding plants, if that market is

available. If room does exist, the larger cells certainly offer a higher quality plant. The labor issue does not really come into play with different sized cells. Where it does is with the seeds per cell factor. Simply put, it's twice as much labor from greenhouse to ground with a single-seeded cell tray. Worth it? I don't think so. The marginally larger ear does not bring a corresponding return…we sell corn by piece, not weight. Consumers are used to a smaller ear early in the season, and any size decrease is offset by the fact that by transplanting a grower can choose main season varieties which have superior taste and larger size anyway. A small version of a Mystique is still larger and tastier than a beefed up Fleet. However, this may not be the view of another grower with a different market.

9) One valuable idea that came to fruition during this project was a prototype for a drop seeder for starting the transplants. This brought what had been a 20 labor-hour per acre job down to a 4 labor-hour per acre job. I would like to find a deeper cell tray in the 162 range, which would give some more soil volume. It's enough space for the 2 plants, but a little tight on roots. Some varieties are not vigorous, even in the greenhouse environment. For timing purposes, it would be nice to develop a list of varieties and how they perform under such conditions. For example, Mystique really needs a couple of extra days before transplanting, but catches right up in the field and produces a top quality ear in the scheduled 75 day time.

10) High yields in early-mid July of top quality ears for retail….yes, I plan on implementing this again. In fact, I intend to replace my first direct seeded bare ground planting with a third transplant. Weed pressure is the main reason for this, as I find the labor spent weeding early, slow emerging corn exceeds the labor spent transplanting a comparable crop. I would still direct seed corn after about the 12th of May.

11) We had one on-farm tour that had low attendance, possibly due to the limited advertising that NOFA-VT gave to the event, and perhaps because we had a similar tour well attended last year with VVBGA. We did bi-weekly updates through the Vermont Vegetable & Berry Page. I've included a list of varieties we used, as well as collaborator Andrew Knafel, and provided some comments on their performance. Though yet unscheduled, this winter will probably have a presentation or round table on the topic, and I will be putting together a tip sheet for the process.

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Sweet Corn Varieties for Transplanting: 2003

Bi-colors:

Seneca Arrowhead *Excellent first-early yields with fair size and great flavor. Needs to picked early to ensure good taste. Vigorous plant early to size for transplanting.*

Tomahawk *Superb taste, blocky ear. Some problems with tip fill, but taste makes up for it. Holds well. Slow to size for transplanting and a little sluggish in field, but catches up.*

Trinity *Fussy grower and slow to develop, prefer for direct seeding. However, the first corn with that 'taste' of summer. Tip fill variable. Slender ear, tender.*

Temptation *Awesome, vigorous performer for transplanting. Quick to size plant, durable, big leaf. Most consistent yielder, picking every single ear over long period. Full size. Available untreated.*

Bon Appetit *Like Temptation, big and vigorous, so handles handling well. Huge blocky ear, could run for governor in California. Taste is fantastic young, though not as tender at later dates. Available untreated.*

Mystique *A winner, unmistakable yummy and full size ears just as the second week of picking opens up. One problem was it is very slow out of the gate and could stand an extra three or four days before handling if doing mechanically. Not as fussy if transplanting by hand or water wheel. Available untreated.*

Sensor *Insurance corn. It will be there, no matter what happens. Flavor and tenderness top rate. Pain in the #@$%^# to pick(Jamaicans call it chainsaw), but its worth it.*

Delectable *Steady variety. Big and blocky and well known for the right reasons. A little slow to develop for transplanting. Available untreated.*

Seneca Dancer *Long season, not worth it(a later transplanting of an earlier variety would beat it to harvest), unless you want a main season harvest from early transplant. Advantage is fantastic ear, taste and quality, and holding ability. Works great if transplanting later season. Available untreated.*

Yellow Kernels:

Bodacious *Excellent early yellow with great taste and tenderness.*

Tuxedo *Fabulous ear if you have a market for yellow. Much like Mystique, but quicker to size up for handling.*

Custer *Excellent direct seeded, but very slow to size for transplanting.*

COMPARISON OF COSTS FOR TRANSPLANTING VS. DIRECT SEEDED EARLY SWEET CORN:

Assumptions…..

Costs for raising early sweet corn are same in both systems for seed, land prep, row cover, fertilizer and harvesting tasks, whether crop is transplanted or direct seeded.

Added costs are limited to the production of seedlings until transplanted into ground.

Desired plant population is 21,000 plants per acre, with 36" row spacing and 8" between plants(16" if 2 seeds per cell transplanting).

At this rate, using 98 cell trays would require 110 trays per acre, and using 162's would require 65 trays per acre(same # of cells per acre, achieving same density).

Labor doubles for single seeded cell trays, as well as associated greenhouse costs Below figures are per acre figures for double seeded trays, adjusted figure for single seeded cells listed later:

Task	For 162 tray	For 98 tray
Filling trays, seeding, setting out	10	18
Growing on 14-18 days	10	12
Transplanting	20	22
Total hours……..……..	**40**	**52**
Labor Costs@ $10/hour	***$400***	***$520***
Soil, Vermiculite	$25	$45
Greenhouse Costs*...$5 per tray* Estimate on value of 2 square feet of covered, heated space, and use of trays. Could be used for higher value crops, such as bedding plants	$325	$550
TOTAL ADDED COST TRANSPLANTING SYSTEM, PER ACRE		
If using two seed per cell……...	**$750**	**$1115**
If using one seed per cell……..……..	**$1500**	**$2230**

One could easily figure in **added costs of direct seeding** that are not incurred in transplanting. These would always be the ***labor costs*** *of seeding in field*, and in most cases, an *early cultivation* that is unnecessary with transplanting because the crop is so much ahead of weeds. If an herbicide is used, that cost would be constant for both systems, and hence, not an added cost for direct seeding. If mechanically cultivating, it is hard to avoid a hand weeding/hoeing in cold soils. The transplanting system generally will avoid this because the crop is far ahead of weeds and can be quickly and mechanically cultivated. One can assume 2 labor hours for seeding per acre, and 20 hours per acre for hand cultivation. At $10/ hour the **added costs of direct seeding would total $220.**

Thus the difference in costs per acre between the two systems would be $530 more for double seeded 162's, and $895 more for double seed 98's. Single seeded 162's would have $1280 extra costs, and the single seeded 98's would be the most expensive at $2010 added cost per acre.