Optimizing Strawberry Production with a Reduced Tillage System

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Strawberry weed control has long been a challenge for growers. Experiments that attempt to integrate sustainable practices with herbicides have helped growers maintain matted row strawberries, but the planting year remains a challenge. When growers focused on controlling weeds in strawberries during the establishment year by transplanting dormant berry plants into a killed cover crop, a barrier was observed. Most growers had difficulty planting through the cover crop, which resulted in slower establishment during the first month and a greater number of skips. Previous research has shown that control of weeds during the first weeks of the growing season makes the most difference to yield in a matted row system. There have also been studies that support the use of cover crops as a way to decrease incidence of plant disease. To address this set of circumstances, it was decided to modify the transplanting system and use a reduced till (also called zone-till) system.

Reduced Tillage System

The reduced-till system uses a sub-soiler to loosen soil deeply. Coulters follow the ripper, which are then followed by a rolling basket that all work together to prepare a 6-10” wide seedbed (Figure 1). This technique allows the longer rooted strawberry plant to be correctly planted while still having minimum soil disturbance between the rows. By only tilling this narrow area, the chance of new weed seeds being brought to the surface for germination is reduced. Because the strawberry plants will get off to a good start, they should out-compete weed competitors in the tilled zone. The shank ripped zone allows for improved water drainage hopefully reducing disease pressure from soil borne diseases like Phytophthora root rot (Figure 2). The use of reduced tillage tools usually requires a single trip across a field for it to be fitted for planting – an important advantage that translates into approximately 1/3 less labor when compared to standard primary tillage. Reduced fuel consumption and a decreased risk of soil compaction are other potential benefits of zone tillage.

Materials and Methods

To evaluate the value of the Reduced Tillage System, we conducted a field project, supported by a NESARE Partnership grant, which sought to improve weed control during the establishment year of a perennial matted row strawberry system while also reducing cultivation and herbicide inputs and improving soil health.

Comparison trials were established on 3 farms where the Reduced Tillage System of preparing a strawberry field was compared to a No Till system and to a conventional seedbed preparation system. After the preplant preparation treatments, strawberry plants were transplanted into the field and the weight of weed biomass and the number of annual or perennial weeds was recorded for each system on June 10 and Sept. 10 in the year of planting and on May 11 the second year. At harvest in the second year, yield was measured by harvesting all the trusses from randomly selected areas within each treatment. The berries were counted, put in primary, secondary and tertiary categories and then weighed.

Results and Discussion

The results from the study were variable. The dried weed weight from all sampling dates varied among the farms (Figure 3). All 3 farms saw significantly larger weed biomass during the first month after planting in the conventionally prepared treat-
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ment than for the reduced till or no-till treatments. However, this does not mean that there were more weeds in the conventional treatment, rather the weed number data in Figure 4 suggests that for Farm 1 and 3 that the weeds were more numerous but much smaller in the reduced till treatment than in the conventional treatment. This may be explained because it took longer for the weeds to emerge through the killed cover crop.

The number and type of weeds varied dramatically from farm to farm (Figure 4). Farm 1 showed a higher number of perennial weeds than both other farms, due to the fact that this trial was installed into a killed sod on Farm 1. That high ratio of perennial weeds to annual weeds continued through the next 2 sampling periods. This result does not bode well for the productive life of the planting, as perennial weeds are difficult to eradicate once established in a matted row strawberry system.

With Farm 2, there was greater weed biomass in the control treatment one month after planting than the no-till or reduced till treatments, but the reduced till treatment still had higher numbers of weeds. This same trend was seen with Farm 3 – larger weed biomass in the control treatment, but higher numbers of weeds in the reduced till treatment.

For all 3 farms, the differences in weed biomass in the three treatments diminished as time progressed and the farmer had more tools available to control weeds. The number of weeds however did not follow a clear pattern throughout the year of monitoring. This may be due to the individual farm weed pressure and the type of weeds existing on each farm.

For Farms 1 and 2 the control treatment yielded significantly more berries than did the reduced till or no-till treatments (Figure 5). Farm 3 however, which had the largest volume of berries of all 3 farms, yielded almost 1/3 more in the reduced till treatment than the control. This farmer was so enthusiastic about zone tillage that he has installed 1 acre of reduced till June bearing strawberries during the spring of 2012.

**Conclusions**

There appears to be promise in using reduced tillage in a matted row strawberry system despite these variable preliminary
results. The speed at which a zone tilled planting can be established will be a benefit to growers that find themselves exceptionally busy during May.

From a farm profitability perspective, labor savings with the reduced tillage system averaged 37% and fuel savings 40% compared to conventional tillage for field preparation. The range reported by growers for savings in fuel ranged from 27 to 60% and savings in labor costs ranged from 25 to 60% (Dr. Anu Rangarajan, Cornell University).

The reduced tillage approach would be more attractive if we could prove that yield of this high value crop would not suffer. The results from this study imply that farmers should experiment with reduced till in their matted row strawberries in order to maximize production and minimize costs.

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Figure 5. Effect of tillage system on strawberry yield on 3 farms in the second year.