

## Reduced Tillage in Vegetables (Northeastern United States)

### DONN BRANTON, LE ROY, NEW YORK

**Location:** Le Roy, Genesee County, New York

**Annual Precipitation:** 33 ins

**Reduced Tillage Method:** Strip Till, Zone Till and No Till

**Crops:** Dry Bean, Oat, Peas, Soybean, Wheat, Sweet Corn, Barley, Field Corn, Alfalfa hay.



Genesee County



**Description:** 1500 acres in vegetables and field crops. Established reduced tillage farm.

## BACKGROUND AND PREVIOUS TILLAGE METHODS

### GROWERS BACKGROUND

Donn was raised on a dairy farm. After his father passed away in 1967, Donn took over the running of the dairy farm for several years. After Donn decided to go to school, the cows were sold, however, Donn still kept working part of the farm while schooling. In high school, Donn took welding and agricultural mechanization. He continued with agricultural mechanization in his

college years. After completing college, Donn went into fertilizer and spraying business. He was in this business from 1971 until 1979. In 1979, Donn was able to get back into farming. He has been at his current farm for the past 20 years. Majority of land that Donn farms presently are leased.

### **FARM SIZE & CLIMATE**

Donn and Yvonne Branton farms approximately 1500 acres. The region where their farm is located experiences many cloudy days and extreme dry spell or wet spell depending on the year. During dry years, irrigation becomes necessary for most of the convention tillage growers in the area. For example, in 2003, Donn had 39ins of rain during growing season, which was 6ins over the area average. Donn has noticed a general fluctuation in seasonal weather patterns over the years and without proper management, these fluctuations can have significant impact on farm profits.

### **SOIL TYPE (CHALLENGES)**

The major soil series found on Donn's farm are Lima, Honeoye, Ontario, and Schoharie.

Donn has a variety of soil textures represented on his farm ranging from sand to clay and even natural bedrock. The challenges posed by the different soils vary with texture. The heavy textured soils (clays) are usually more difficult to work than the sandy soils, while the sandy soils are more drought prone than the clay soils.

### **PREVIOUS CROP/SOIL MANAGEMENT BEFORE REDUCED TILLAGE**

Before changing over to reduced tillage, Donn practiced conventional tillage based on moldboard and chisel plow. Donn started experimenting with reduced tillage in the middle of 80s until 1996. During this period of experimentation, he saw many promising results on the performance of field corn in reduced tillage systems. He then transitioned his whole farm to reduced tillage in 1996.

### **CROPS GROWN AND MARKETS**

All Donn's crops are grown with reduced tillage. Crops grown are dry beans (100ac) Oat 100ac, peas (250ac) soy-bean (350ac) wheat (250ac) sweet corn (225ac) barley (75ac) field corn (275ac) alfalfa hay (50ac). All these crops are either under strip-, zone- or no-tillage.

## **REASON FOR ADOPTING REDUCED TILLAGE & INITIAL EXPERIENCES**

While experimenting in the 80s, Donn found that reduced tillage methods offer a better flexibility and savings in farm operations compared to conventional tillage. There were timesavings simply because the whole field did not need to be cultivated as in conventional tillage. Savings on equipment, time, fuel and labor from reducing tillage was particularly attractive to Donn. Later on, Donn started to appreciate the environmental conservation and soil quality improvement under reduced tillage systems.

## **GENERAL APPROACH TO REDUCED TILLAGE**

Donn uses a strip tiller (Unverferth ripper stripper-Figure 1) as primary tillage tool for most of his crops which include dry beans, sweet corn, field corn and soybeans. The strip tiller consists of a narrow deep-rip shank and wavy coulters. The deep shank does the vertical tillage while the wavy coulters do the horizontal tillage. Donn runs the deep-rip shank only to a depth of 8-10 inches. Crops are planted into the zones created by the strip tiller. However, for small grains and processing peas, Donn plants them straight into the previous year's crop residue without any tillage. Donn used to go up to 16 inches with a zone builder to break the subsurface compaction in his soil. He reduced the depth of tillage about two years ago. He is of the opinion that once the deep ripping has been done, you do not need to do it often again if you are strip tilling.

### **Equipment Needed for the System to Work**

Sprayers, depending on crop type are important, strip tiller, a zone builder if needed, no-till drill for small grains and peas, corn planter and a stone picker. There are still problems with stones on Donn's farm. The stone problem became more prominent when Donn started strip tilling. The stone picker helps to remove some of them. Since Donn has different soil types on his farm, tillage depth often need to be adjusted depending on soil type. The depth is set deeper in clay soils than loamy or sandy soils. Also depending on crop type, the closing coulters may need to be adjusted. Donn has a 12-row Unverferth ripper stripper pulled by 235hp tractor.

## SPECIFIC CULTURAL PRACTICES USED

### ADVANTAGE/DISADVANTAGES

One of the main advantages of reduced tillage for Donn is the significant savings in fuel costs. Other advantages are less hours on the equipment thereby reducing the rate of depreciation, less labor and agricultural inputs such as herbicides.

The major disadvantage is the change in weed succession. Annual weeds give way to perennial weeds with transition to reduced tillage.

### EQUIPMENT & OPERATION

The equipment that Donn was using at the beginning of his transition to reduced tillage were not appropriate for the rocky soils on his farm. This led to a frequent equipment maintenance thus adding to the farm cost. He eventually purchased equipment that are more durable and require less maintenance. Important equipment that Donn has is the row marker. The row marker is a guidance system, which aligns field operations along the tilled strips. Precise guidance system using laser technology was still too expensive for Donn to buy. In case you hire an equipment operator, Donn suggested that you need an operator who understands how reduced tillage system works. For instance, the between row section for a particular year become the planting row for the next year.



**Figure 1. Unverferth ripper stripper.**



**Figure 2. The cart behind strip tiller**

### **CROPS, COVER CROPS & ROTATION**

Typically, Donn has 5 year rotation of any of the following crop sequence

1. Field corn – soybeans – sweet corn – fall cover crop (rye or barley) – peas – dry beans – (dry beans) – winter wheat
2. Field corn – soybeans – small grains – Corn or peas – dry beans – (dry beans) – winter wheat
3. Field corn – soybeans – peas – dry beans – (dry beans) – winter wheat

### **RESIDUE MANAGEMENT**

Donn initially had problems with residue management. He solved this residue problem by using a combine with straw chopper. This equipment effectively cuts the wheat straw into smaller pieces and makes the residue more manageable. After wheat harvest, the residues are spread uniformly on the soil surface. No residue is moved away from the farm. This method of residue management has led to an improvement in soil quality. Donn noticed that with better residue management, the earthworm's population and water infiltration into the soil has greatly improved

on his farm.

### **WEED MANAGEMENT**

Donn admits that an effective weed control program is a very challenging task under the reduced tillage system. Part of the challenge is the change in the weed spectrum from annual to perennial. Dandelions particularly have become the most prominent weed on Donn's farm. It is important to be very aware of what is going on in the field with respect to weed type and population. Donn engages in regular weed scouting to monitor weed distribution on his different fields. For Dandelions, application of 2-4-D in the fall can serve as an effective control. You can use less chemical in the fall and get more results for the control of perennial weeds compared with the same application rates in the spring. Donn also uses cover crops for weed management.

### **DISEASE AND INSECT MANAGEMENT**

Donn has had problems with slugs; however, the problem is not much different from those in conventional tillage systems. Particularly affected are the wide row crops. He is currently working on how best to control the slug problems on his field. He regularly scouts for slugs and applies bait treatments when necessary to combat this problem. He intends to modify one of the insecticideoppers to apply baits on the field for slug control.

### **CROP SEEDING AND FERTILIZATION STRATEGY**

Donn is very particular on having a good seed/soil contact during his planting operations. He adjusts his equipment to make sure that this happens. Donn has moved away from broadcasting fertilizers to banding. According to Donn, this has reduced fertilization costs due to reduced quantities of fertilizer applied. Donn has noticed over the years that he is able to plant his soils earlier than his neighbors practicing conventional tillage, especially during wet springs. He believes that the water infiltration into his soils has significantly improved over the years compared to neighboring soils under conventional tillage system. This has enabled Donn to keep to his planting schedules without delays.

### **REDUCED TILLAGE TRIAL**

## **BENEFITS FROM REDUCED TILLAGE**

### **POSSIBILITY OF INCREASING PROFIT**

Donn believes that there has been increase in profits. However, this increase is not yet noticeable because many changes took place in terms of equipment purchase and upgrading. Donn has noticed a reduction in his fuel costs. Under no-till small grains and peas, Donn uses 1 gallon per acre of fuel for planting. However, when strip tiller and stone picker are used for cultivation, the fuel consumption is usually 2 gallons per acre or slightly less. Donn is also applying less of nitrogen and phosphorus. Due to his good residue, cover crop and organic matter management, he was able to produce at a rate of 1 bushel of corn per 0.5 pound applied nitrogen compared with a recommended rate of 1.2 pounds per bushel of corn. From the information that Donn has on other reduced tillage growers, the rate of applied nitrogen per bushel of corn is between 0.6 and 0.75 pound.

### **SOIL QUALITY IMPROVEMENT**

Donn has noticed great changes in soil quality improvement. The earthworm populations has increased, the soil works better with equipment and water infiltration has drastically improved

### **ENVIRONMENTAL CONSERVATION**

Donn does not have any soil erosion on his field by either wind or water. However, there are incidences of erosion on neighboring fields practicing conventional tillage.

### **REDUCED COMPACTION**

Although Donn has not measured the penetration resistance of his soil, however, evidences point to reduced soil compaction arising from reduced tillage. He believes his ground is firmer and works better than before, pointing to improved soil structure and reduced soil compaction.

## **LESSONS LEARNT**

### **CROP ESTABLISHMENT AND SECURITY**

Under reduced tillage, Donn has never had a crop failure. He however experienced crop failures during the years of practicing conventional tillage in some drought years.

### **FALL VS. SPRING ZONE BUILDING**

Donn believes that it is better to do the zone building in the fall. This allows the zones to settle properly before planting in the spring.

### **FALL VS. SPRING WEED CONTROL?**

As already pointed out by Donn, a fall weed control of the perennials can be very crucial to the success of the reduced tillage.

### **TOO WET WEATHER?**

Donn's farm can cope with excessive wetness due high infiltration rates of his soil. He can work his soil even when it is still too wet for conventional growers around him to get onto their fields.

### **ADVICE FOR NEW FARMERS WILLING TO ADOPT REDUCED TILLAGE**

Donn would advise new growers not to be afraid of trying something new and different. He urges growers to think deeply on how they can adapt reduced tillage to their farms. He believes that talking to those with experiences on reduced tillage can also be useful. When things go wrong, find out why they do and how to prevent the problems.

### **PLANS FOR THE FUTURE AND CONSTRAINTS**

Donn plans to acquire a pneumatic delivery system for his fertilizer application, which he wants to install behind the strip tiller. This will enhance a better and deeper placement of nutrients for more efficient utilization by the crops. He is also thinking of acquiring a better guidance system in the future.

The major constraint is the cost associated with implementing these changes.