



Soil Facts

Conservation Tillage Use in Peanut Production

Peanut growers in North Carolina can successfully use conservation tillage if they carefully plan the transition from a conventional system. Growers should consider the production details and suggestions in this guide to make a successful transition.

Conservation Tillage Benefits

Using conservation tillage management practices for any crop on your farm can (1) decrease soil loss from water and wind erosion, (2) increase soil moisture retention, (3) reduce time and labor costs for crop production, (4) reduce machinery needs, and (5) save fuel and energy. Because many factors influence the success of conservation tillage, it is important that you evaluate the various aspects of your farming operation, including equipment, soils, and labor, before you make the transition from conventional tillage. Such an evaluation will help you make the necessary changes in your farming practices, especially with respect to peanut production.

Conservation tillage can be described as any tillage and cropping sequence that leaves 30 percent of the soil surface covered with residue to protect the soil from erosion throughout the year. This can include practices such as no-till, strip-till, minimum-till, cover crops, and even light disking. Tillage practices alone do not ensure that conservation tillage goals will be met. Some crops, such as cotton, leave very little residue, so crop rotation is also important in meeting conservation tillage requirements.

Conservation tillage for peanut production has been around since the mid-1970s, although the mainstay of land preparation has been moldboard plowing—a practice that has declined dramatically in recent years (Table 1). Secondary tillage has also decreased somewhat, but most farmers bed or rip and bed peanut land. Recent advances in herbicides and

fungicides have reduced the need to bury residue using the moldboard plow. Nevertheless, recent studies in North Carolina have shown peanut yield to be somewhat lower with conservation tillage compared to conventional tillage. Many peanut farmers, however, have successfully embraced conservation tillage production systems.

Protection of soil from water erosion is important for peanut production in counties such as Halifax and Northampton, where sloping fields make soil susceptible to runoff. Conservation tillage systems can reduce wind erosion, which can lead to “sand blasting” on sandy coastal plain soils. In the short term, a conservation tillage system for peanuts also offers modest sav-

Table 1. Number of peanut farmers in North Carolina implementing a variety of tillage practices.

Data represent approximately 30% of the peanut acreage and were collected at annual county production meetings during 1998, 2004, and 2010.

Tillage	1998	2004	2010
Disk	90	78	71
Chisel	25	53	27
Moldboard plow	58	17	7
Field cultivate	75	55	42
Rip and bed	49	39	40
Bed	44	35	32
Reduced tillage	10	23	41



Strip-tillage occurring for peanuts in a plot with a small-grain cover.



Peanut plants (in June) growing in a strip-tilled plot with small-grain residue.

ings in production costs. (See *2010 Peanut Information*, Cooperative Extension production guide AG-331, for budget comparisons between conventional and conservation tillage systems.)

Soil Texture and Field Selection

Soil texture (percentage of sand, silt, clay) plays a key role in the success or failure of conservation tillage peanut production, especially when a grower makes the transition from conventional tillage. Generally, sandy soils are the most favorable for this transition because they are well-drained and allow for easy digging of peanuts. Soils with higher silt and clay content are often more difficult to dig without losing pods in the process. This problem can be increased when peanuts are not grown on beds, which is often the case when strip tillage is performed in stubble from the previous crop. Tractor drivers also have greater difficulty tracking rows when peanuts are not grown on beds, either in conservation or conventional tillage systems, which can further decrease digging efficiency.

A series of peanut tillage experiments conducted in North Carolina from 1997 – 2009 showed that average peanut yield was only 3 percent greater with conventional compared to conservation tillage. In these experiments, however, conventional tillage yields ranged anywhere from 17 percent lower to 28 percent higher than conservation tillage yields (Table 2). Based on those experiments, we developed a risk index for transitioning to conservation tillage (Table 3). This index, developed for the large-seeded Virginia market type, presents the risk of decreased peanut yield in conservation tillage systems based on the degree of tillage intensity and soil series. The transition to conservation tillage is much easier when growing small-seeded runner market types because smaller pods offer less resistance when they are dug, and thus fewer pods are shed.

Although less than 20 percent of North Carolina’s peanut acreage is irrigated, farmers who use irrigation have greater flexibility in tillage selection because they can irrigate fields prior to digging, which can soften soil and minimize pod loss irrespective of tillage or variety selection.

Table 2. Peanut response to tillage in North Carolina. Data are from 53 trials conducted from 1997 – 2010.

A positive value indicates that peanut yield was greater in conventional tillage compared to conservation tillage.

Years	No. of trials	Actual Difference (lb/acre)	Percent Difference	Range (%)
1997 – 2001	28	+164	+5.0	-11 to +29
2002 – 2005	12	-68	-2.3	-15 to +17
2006 – 2009	13	+252	+3.0	-5 to +28
1997 – 2009	53	+133	+3.1	-15 to +28

Crop Rotation

Crop rotation is critical in peanut production in both conventional and conservation tillage systems. Research in North Carolina has demonstrated that previous cropping history (corn, cotton, grain sorghum) does not influence peanut response to a particular tillage system. In other research, peanut yield in North Carolina did not differ when peanuts were planted after four years of fall-established tall fescue sod compared to a rotation with cotton or corn in a conservation tillage system. However, peanut yield was lower in a strip-till system on four distinctly different soil series. (See *2010 Peanut Information* for more information on those results.)

Table 3. Advisory index for determining the risk of peanut yield in reduced tillage systems being lower than yield in conventional tillage systems

Soil Series	Points	Soil series
Roanoke and Craven...	40	Your score:
Goldsboro and Lynchburg...	20	
Norfolk...	10	
Conetoe and Wanda...	0	
Pod loss on finer-textured soils, such as those on the Roanoke and Craven series, is often greater than on coarser-textured soils, such as Conetoe and Wanda series, regardless of tillage system. Difficulty in digging can increase when these soils become hard in the fall if rainfall is limited.		
Tillage Intensity	Points	Tillage Intensity
No tillage into flat ground...	40	Your score:
Strip tillage into flat ground...	10	
Strip tillage into stale seedbeds...	0	
Peanut response to reduced tillage systems is invariably correlated with the degree of soil disturbance. Efficient digging can be difficult when peanuts are planted in flat ground in no-tillage systems. While fields may appear to be flat and uniformly level, often field surfaces are more uneven than they appear. Calibrating the digger to match unforeseen contours in the field can be difficult. Strip tillage into flat ground is a better alternative than no-tillage into flat ground, although digging peanuts planted on flat ground can be more challenging regardless of the tillage system. Strip tillage into preformed beds often results in yields approaching those of conventional tillage.		
Risk of yield being lower in reduced tillage than in conventional tillage: 40 or Less—Low Risk		Total Index Value Your score:

Pest Management

Disease

Growers have seen less tomato spotted wilt virus and thrips in conservation tillage peanut production. The increased yield resulting from the suppression of tomato spotted wilt virus may offset some of the yield loss that may occur due to other agronomic or pest factors in conservation tillage systems. An advisory index for managing tomato spotted wilt virus can be found in *2010 Peanut Information*. However, managing tomato spotted wilt based on tillage selection is considered the least effective strategy due to possible risks of a reduced tillage system as discussed previously.

Most other major peanut diseases are not affected by reducing tillage in peanuts. There are concerns, however, that fumigation for *Cylindrocladium* black rot (CBR) will be less effective in conservation tillage because a single pass with a strip-tillage implement may not seal the fumigant sufficiently to ensure uniform distribution throughout the pod production zone. Additionally, soils can warm more slowly in the spring when conservation tillage is used, and CBR infects peanut roots more effectively when soils are cool.

Weeds

Early season weed management will be a critical component for successful conservation tillage peanut production. To control weeds under a reduced tillage system, the grower

must select appropriate preplant burndown herbicides and limit incorporating preplant herbicides. With these exceptions, weed management will vary little between conventional and conservation tillage systems.

Although not applied directly to emerged peanuts, glyphosate plays a pivotal role in preplant weed control. With the development of glyphosate-resistant horseweed, Italian ryegrass, pigweeds, common ragweed, and possibly lambsquarters, growers should consider carefully the transition to conservation tillage peanuts if these weeds are present in fields. Applying dicamba or 2,4-D to control horseweed will be important well ahead of planting, and use of residual herbicides such as Valor SX may be required to make sure fields are weed-free at planting. Paraquat can also be applied to manage winter vegetation and emerged summer weeds when applied in a timely manner.

Regardless of the tillage system and weed complex, it is critical to minimize weed interference in peanuts, especially during the first month of the season. This process can be more difficult with conservation tillage if glyphosate-resistant weeds are present. Thus, the use of preemergence herbicides, often rendered only partially effective by limited rainfall, will place greater reliance on postemergence herbicides in conservation tillage systems along with an increase in management. (See *2010 Peanut Information* for more detail on herbicide programs.)

Equipment and Land Preparation

Reduced tillage peanuts may require changes in field preparation and planting equipment. A good no-till planter is required if planting completely no-till. Most successful no-till peanut plantings have used a wavy coulters in front of the double-disc openers. A set of trash cleaners ahead of the coulters will provide an additional benefit. Strip-till planting will require, in addition to the strip-till assembly, a sub-soiling operation. A standalone subsoiler (ripper) is one option, but having ripping shanks on a strip-till unit is also a good choice. Keep in mind that subsoiling shanks require as much 40 tractor horsepower per shank, which may limit your use of subsoiling.

Nutrient Management

As in any cropping system, proper soil fertility should be maintained in a conservation tillage system. Because soil disturbance is minimized or completely eliminated with conservation tillage, pH and other fertility requirements should be managed before implementing conservation tillage. Nutrient stratification can occur when fertilizers are not incorporated. In time, nutrient accumulation in the upper portion of the root zone may result in deficient levels at

deeper soil depths. Of particular concern is excessive potassium in the pegging zone. Soil samples should be taken to a depth of 8 inches unless long-term conservation tillage has occurred. In that case, samples should periodically be taken at two depths (0 to 4 and 4 to 8 inches) to determine if nutrient stratification is occurring.

Summary

Conservation tillage practices can be beneficial to the soil and may be an alternative to your peanut farm management plan. Peanut growers in North Carolina can take advantage of these benefits in their farming operation if they carefully plan their transition to one of these systems. Paying attention to details, such as field selection and crop rotation, and using the advisory index and other suggestions in this guide will help you make the right decisions.

Resources

Jordan, D. (Ed.). 2010. *Peanut Information* (AG-331). Raleigh: N.C. Cooperative Extension, N.C. State University. http://ipm.ncsu.edu/Production_Guides/Peanuts/main.pdf

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