

ADVISORY INDEX FOR TRANSITIONING TO REDUCED TILLAGE PEANUT

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ABSTRACT

An advisory index was developed in North Carolina to help growers determine risks associated with planting peanut in reduced tillage systems. This index is modeled after risk advisories developed for management of southern corn rootworm and tomato spotted wilt virus. Points are used to define risks associated with cultivar selection, ability to irrigate, soil series, tillage intensity within the reduced tillage system, presence of a small grain cover crop, and history of tomato spotted wilt virus. Compiling values associated with each of these practices gives an indication of potential for peanut yields in reduced tillage systems to be lower than yields in conventional tillage systems. This index does not consider savings often associated with labor and time in with reduced tillage production, and it does not consider the long-term benefits of reduced tillage production on soil properties. This advisory index is designed to help growers assess risk during the transition from conventional to reduced tillage production.

INTRODUCTION

Peanut (*Arachis hypogaea* L.) in North Carolina is typically grown in conventionally tilled systems. However, interest in growing peanut in reduced tillage systems has increased in part due to concerns of tomato spotted wilt virus and reduction in profit at the farm level. Because peanut response to reduced tillage has been inconsistent (Jordan et al., 2001), growers need assistance in determining when reduced tillage peanut production will be successful. Risk indices for southern corn rootworm and tomato spotted wilt virus management have been developed for peanut (Herbert, 2003; Hurt et al., 2003). An advisory index was developed for tillage using a similar concept.

The advisory does not incorporate the economical impact of each component. Savings in costs associated with less tillage are often offset by increased herbicide costs to manage winter weeds and emerged summer annual and perennial weeds. Investment in reduced tillage equipment is important to consider. Two of the more difficult management factors to place an economic value on is savings in labor and the ability to enter fields in a more timely manner in reduced tillage systems. These factors are not considered in the advisory.

Management Considerations in Reduced Tillage Systems

Growers adopting reduced tillage systems may need to devote more time to overall management of peanuts, particularly early in the season. This especially applies to weed management. Establishing adequate fertility levels, especially pH, is critical as peanut is transitioned into reduced tillage systems. Movement of lime into the root zone may be slow in reduced tillage systems. Potassium applied to the soil surface at planting that does not leach through the pegging zone can interfere with calcium absorption by developing pegs. Stand establishment may be more difficult depending upon crop residue and existing winter vegetation. Early-season weed management will be critical, with selection and proper application timing of burndown herbicides being essential to providing a weed-free seedbed when peanut is emerging and growing early in the season. Benefits of soil-incorporated herbicides will be minimized in reduced tillage systems. Although some tillage can be performed in the strip tillage operation, the degree of incorporation of herbicides is limited and often not uniform. Weed management with preemergence and postemergence herbicides will become more critical. Thrips and some other insects may be less of a problem in reduced tillage systems. With the exception of tomato spotted wilt (TSWV), which is less prevalent in reduced tillage systems compared with conventional tillage systems, incidence of other diseases is not generally affected by tillage. Digging may be less efficient in reduced tillage systems. Soils can be harder and digging losses greater under some conditions, especially when soils are dry. Long-term benefits in soil tilth have been observed for many crops that are produced in reduced tillage systems, and this may also hold true for peanut.

Component of the Advisory Index Peanut Variety¹

Virginia market type	5
Runner market type	0

¹Pods and kernels for runner market type varieties are considerably smaller than pods and kernels for Virginia market type varieties, especially when comparing the runner market type Georgia Green with the Virginia market type Gregory. During the digging and inverting process, there is greater resistance from soil as Virginia market types are removed from the ground than there is for runner market types. Greater resistance can cause a higher percentage of pods to strip away from vines and can increase digging loss.

Irrigation²

No irrigation	10
Irrigation	0

²Irrigation or timely rainfall can create soil conditions that minimize pod loss during the digging and inversion process. Access to irrigation serves as insurance if soil conditions are less than favorable for digging.

Soil series²

Roanoke and Craven	40
Goldsboro and Lynchburg	20
Norfolk	10
Conetoe and Wanda	0

³Pod loss on finer-textured soils such as those in 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 intensity⁴

No tillage into flat ground	40
Strip tillage into flat ground	20
Strip tillage into stale seedbeds	0

⁴Peanut response to reduced tillage systems is invariably correlated with the degree of tillage. Efficient digging can be difficult when peanuts are planted in flat ground in reduced tillage systems. While fields may appear to be flat and uniformly level, often times fields are more rugged than they appear, and setting up 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 peanut 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.

Small grain cover crop⁵

Not present	5
Present	0

⁵Cover crops serve several purposes, including conservation of soil moisture and reduction in wind and water erosion. Cover crops also contribute to soil tilth, and they can minimize winter weed populations. The decision of which burndown herbicide to apply is often made easier by having a cover crop.

History of tomato spotted wilt virus⁶

No tomato spotted wilt in the past	10
Tomato spotted wilt present in the past	0

⁶Less tomato spotted wilt virus and fewer thrips have been seen in reduced tillage peanut production. Lower risk (value of 0) associated with having had tomato spotted wilt in the past is because pod yield might increase in reduced tillage when tomato spotted wilt is present due to suppression of tomato spotted wilt by reduced tillage systems. Increased yield as a result of tomato spotted wilt suppression may offset a at least a portion of yield loss associated with reduced tillage systems as a result of other agronomic or pest management factors. Consistent trends for other diseases have not been observed in North Carolina, and overall effects of disease on response to tillage appear to be negligible.

Risk of Yield Being Lower in Reduced Tillage than in Conventional Tillage

30 or Less.....	Low Risk
35-65.....	Moderate Risk
70 or More.....	High Risk

CONCLUSIONS

This advisory index was developed based on research conducted in North Carolina over the past decade (Jordan et al., 2001). Additional research is needed to validate the advisory and to define other factors or improve conclusions about the factors listed here to help growers in the decision-making process.

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REFERENCES

- Herbert, D..A. 2003. The peanut southern corn rootworm advisory. Virginia Cooperative Extension Service Series 444-351.
- Hurt, C., R. Brandenburg, D. Jordan, B. Shew, T. Isleib, M. Linker, A. Herbert, P. Phipps, C. Swann, and W. Mozingo. 2003. Managing tomato spotted wilt virus in peanuts in North Carolina and Virginia. North Carolina Cooperative Extension Service. AG-638.
- Jordan, D.L., P.D. Johnson, A.S. Culpepper, J.S. Barnes, C.R. Bogle, G.C. Naderman, G.T. Roberson, J.E. Bailey, and R.L. Brandenburg. 2002. Research in North Carolina with Reduced tillage systems for peanut (1997-2001). Pages 336-340 *in* E. van Santen (ed.) 2002. Making Conservation Tillage Conventional: Building a Future on 25 Years of Research. Proc. of 25th Annual Southern Conservation Tillage Conference for Sustainable Agriculture. Auburn, AL 24-26 June 2002. Special Report No. 1. Alabama Agric. Expt. Stn. and Auburn University, AL 36849. USA.