

## **Chapter VI.**

### **Conclusions**

Although conservation tillage was introduced in the late 1960's, adoption for tobacco production has been slow. Consistent yield reduction, limited weed control options, and delayed tobacco development limited producer acceptance and substantiated the need for continued investigation. Explanations for these production pitfalls mainly encompassed inadequate transplanter equipment, limited herbicide effectiveness, and fertilizer application method. Although these limitations were addressed with introduction of the Subsurface Tiller Transplanter<sup>TM</sup>, the herbicide sulfentrazone (Spartan<sup>TM</sup>) and subsurface banding of fertilizer, an average yield reduction of approximately 28 percent resulted in the present study. This excessive yield reduction indicated the need for modification of the previously described production system.

Since row cultivation increases conventional tillage tobacco yield (Wilson 1955; Hawks and Collins 1970), different cultivation timings were investigated for conservation tillage production. A minimum of two cultivations increased both flue-cured and Virginia dark-fired tobacco yields to the level of conventional tillage check treatments. Although row cultivation disturbed the soil and incorporated surface residues, soil erosion was not significantly increased. Row cultivation enhanced soil surface roughness and consequently reduced the overland flow of water and the corresponding movement of suspended soil particles.

The previous reports of delayed upper plant development (Moschler *et al.* 1971) and thinner tobacco (Chappell and Link 1977; Link 1984) were not confirmed by these

investigations. The lack of significant grade index differences, similar to those of Shilling *et al.* (1986) and Wiepke *et al.* (1988), likely resulted from the banding of fertilizer rather than broadcast surface application. Although no significant increase in conservation tillage tobacco yield was reported for the banding of fertilizer (Moschler *et al.* 1971), a higher plant nitrogen uptake and utilization was observed. The banding of fertilizer concentrates nutrients in the zone of plant uptake and therefore allows for a quicker and more efficient plant utilization.

The banding of fertilizer offers producers the opportunity to reduce fertilizer nitrogen use. Zartman *et al.* (1976) broadcast fertilizer nitrogen at rates of 90 and 180 kg/ha and concluded conventional tillage tobacco nitrogen uptake was only similar to conservation tillage tobacco at the high application rate. This report led to the recommendation of 25 percent additional nitrogen for conservation tillage tobacco (Worsham and Peedin 1995). Although additional nitrogen is recommended, Wiepke *et al.* (1988) and Shilling *et al.* (1986) banded fertilizer at soil test recommendations and achieved similar conservation tillage tobacco quality, but reduced tobacco yield.

The lack of a tobacco yield enhancement resulting from the banding of fertilizer likely relates to plant utilization of soil moisture. Although soil surface residues are known to conserve soil moisture, irrigation was necessary in both studies to alleviate moisture deficits and is recommended for conservation tillage tobacco production (Worsham and Peedin 1995). The reduced root weights resulting from conservation tillage culture confirmed the necessity of irrigation. Reduced root systems limit plant uptake of water and can place undue stress on plants during dry periods.

### **Future Research Direction**

Although minimal disease pressures were observed during these research investigations, control measures need to be evaluated for the tobacco cyst nematode, black shank and Granville Wilt before widespread producer acceptance of the production practice. Conservation tillage limits soil incorporation opportunities for the chemicals necessary to control these pathogens.

An exciting practice to improve conservation tillage tobacco production is strip-tillage. Strip-tillage offers the opportunity for producers to intensively till a narrow zone for tobacco transplanting without disturbing the area between crop rows. This practice would offer chemical incorporation opportunities and would also loosen the soil for enhanced tobacco root system development.

### Literature cited

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