REDUCING SOIL EROSION IN TOBACCO THROUGH NO-TILLAGE

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ABSTRACT

Production of flue-cured and burley tobacco occupies about 726,800 acres of land in the Southeastern U.S. It is an important source of income in several states; and in North Carolina, gross value of flue-cured tobacco alone was $1.2 billion for 1983. Howeverthe traditional clean-cultivation production methods, along with morphological characteristics of the plant make tobacco a very soil erosion prone crop. Average soil losses from tobacco cropland in North Carolina total 15-18 T/A), exceeding the average annual loss of 5 T/A from U.S. cropland. Even with large scale adoption of herbicides for chemical weed control, several cultivations are still recommended for additional weed control, to loosen the soil and to build row ridges.

In the Upper Tar River area in North Carolina, a Soil Conservation Service study showed soil erosion from tobacco cropland averaged 11.4 T/A and in the Piedmont Bright Leaf district, soil losses averaged as much as 18 T/A. Sheet and rill erosion in tobacco results in 47%. 26%, and 27% of the cropland losing soil at rates of < 5.0, 5.0-10.0, > 10.0 T/A/year, respectively. Based on the 1977 National Resource Inventory report, 51% of the nation's cultivated cropland is faced with soil erosion as a major conservation problem. These substantial losses of topsoil from tobacco and other cultivated cropland could threaten long term soil productivity.

Another problem in tobacco related to clean cultivation is the accumulation of sand and soil on the lower leaves caused by splashing raindrops. This problem is so severe in fact that, in one year, one tobacco company removed 8.6 million pounds of sand at a cost of $9 million before the leaf could be processed for tobacco products.

In view of these severe losses of topsoil in tobacco and the fact that the potential for no-till tobacco seems promising in research done in North Carolina, a preliminary soil erosion research project was initiated in 1982 with more detailed studies in 1983. The purpose of this study was to measure the differences in soil loss from conventionally-tilled tobacco and no-till tobacco. The idea of no-tillage or conservation tillage production of tobacco has been around since 1965 with sporadic research efforts in

Kentucky, North Carolina, and Virginia. Advantages of no-till tobacco could be realized in fuel and labor savings, increased soil moisture conservation, reduced soil erosion, and elimination of tillage for planting and weed control.

The primary objectives of this research project were (1) to measure soil loss differences between the two tillage methods and (2) to determine the potential for implementing no-till production in flue-cured tobacco as another means to control soil erosion.

Methods: Eight 30 gallon metal barrels were prepared for collecting runoff and sediment by cutting the tops in half and then hinging them in place. The hinged tops prevented rainfall from falling into the barrels and were propped open 4 inches to allow the runoff to flow into the barrel. Each barrel was **30** inches deep and 18 inches wide with a volume of 7861 inches^3 . Collected runoff water flowed from one half of two adjacent rows and was channeled into the barrel by galvanized metal skirts attached to the lip of the barrel and extending to the crest of the ridged row. Sand and cement was spread around the skirting and the immediate entrance to the barrel. V-shaped galvanized metal sheets were secured into the ground 47 feet from the barrels to function as sample plot borders and surface water barriers. Row ridges were approximately 12 inches tall and served as borders along the plot length.

Each collection plot measured 4 ft. x 47 ft. The four foot plot width is a standard tobacco row width. Total area for the four replications in conventional and no-till treatments was 1/58 of an acre (16' x 47'). Average slope for the test in 1982 was 1.3% and 3.1% in 1983. Soil types in the collection area were a Goldsboro loamy sand on the upper range and a Bibb series on the lower end of the field.

For no-till production, a rye cover crop was sown on rows bedded in the fall. The rye cover was treated with paraquat (.5 lb ai/A) two weeks prior to transplanting the tobacco. The barrels were placed in the ground the same day as transplanting. Diphenamid was broadcast at 6.0 lb/A for weed control immediately after transplanting.

Sample collections were made after each significant rainfall, >.5 in. Depth of water in each barrel was measured and recorded before drawing the samples. Two-liter samples were taken from each barrel after the contents were thoroughly stirred to suspend the sediment.

Samples were filtered through a Buchner funnel and a glass microfibre filter paper. Samples were dried 24 hours at lOO^{o}C, then cleaned of plant material and stones. if present, before determining dry weight.

Results: Data for 1982 and 1983 show a dramatic difference in soil loss between the two methods (Table 1) of tobacco production. An unusually heavy rain, 5.2 inches, fell within less than a 24-hour period in 1983, accounting for substantial differences in the first collection. When

a normal rainfall occurred after cultivations, there was an increase in sediment collected from the conventional plots. Runoff was generally greater in the no-till plots than in the conventional. Tobacco yield and quality differences have been recognized in herbicide evaluation tests and these differences were examined in 1983 between the no-till and conventional plots of this study. The yield reduction in no-till averages about 20% less than the conventional; whereas quality in no-till is higher on lower leaves and about the same for the upper leaves. This difference is important in determining the potential tor the no-till culture in flue-cured tobacco.

Summary: Loss of soil between the two treatments in 1982 and 1983 was 22 and 80 times greater in the conventionally tilled tobacco compared with the no-tillage tobacco, respectively. Soil loss in the no-till plots in 1983 averaged 0.05 T/A while soil loss in the conventional plots was 4.03 T/A. Yield of the no-till tobacco was 1707 lb/A compared to 1962 lb/A for the conventional. Thus the no-till tobacco produced 255 lb/A less (13%) than the conventional tobacco in these tests. No-till tobacco definitely reduces soil erosion and with further work to improve weed control and yield it should be to the point where it could be adopted hy growers in the near future.

Table 1. Soil Loss, No-Till vs. Conventional Tobacco, NC, 1982 and 1983.

Treatment	Soil loss* 1982	Soil loss* 1983	Yield* 1983
	(T/A)		(Ib/A)
No-ti11	**0.05**	**0.05**	**1707**
Conventional	**1.10**	**4.03**	**1962**
(Difference)	**(22X)**	**(81X)**	**(87%)**

*Ave. 2 replications. Sandy loam soil, 1.3% slope in 1982, 3.1% slope in 1983. Rainfall + irrigation May-September, 1982 -- 22.9 in., 1983 -- 15.3 in.