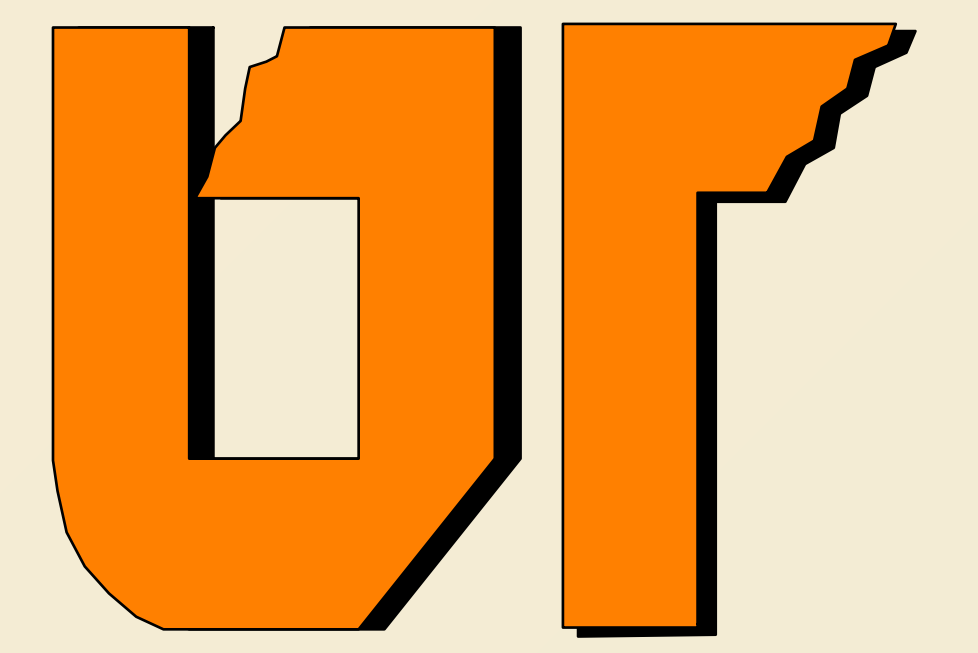




Nitrogen Rate, Cover Crop, and Tillage Effects on Long-Term Tilled and No-Tilled Cotton



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Abstract

The highly erodible loess soils of West Tennessee were intensively cropped using conventional tillage systems including deep tillage since the early 1800's. This has resulted in severe soil losses due to water erosion. The use of soil conserving practices such as cover crops and no-tillage were very much needed, especially in low residue cotton production. In 1979, a long-term experiment was established on a Lexington silt loam (Ultic Hapludalf). Changes were made in treatments in 1986. The objectives were to investigate the effects of nitrogen rate, cover crops, and tillage on soil quality and cotton yield. The experimental design was a randomized complete block with a sub-subplot design with four replications. The main treatment was nitrogen rate with cover crop as the sub plot and tillage as the sub-subplot. Nitrogen rates were 0, 34, 67, and 101 kg/ha, sub plots were hairy vetch (*Vicia villosa*), crimson clover (*Trifolium incarnatum*), winter wheat (*Triticum aestivum*), and no cover, and the sub-subplots were tillage and no-tillage. Results indicated a fertilizer nitrogen equivalency of 67-90 kg/ha to the cotton crop when planted into the incorporated or non-incorporated nitrogen fixing legumes of crimson clover or hairy vetch. Cotton yields were not significantly different between no-till and tilled systems. The use of cover crops and no-tillage were shown to be practical and no-tillage cotton is now widely adopted in Tennessee.

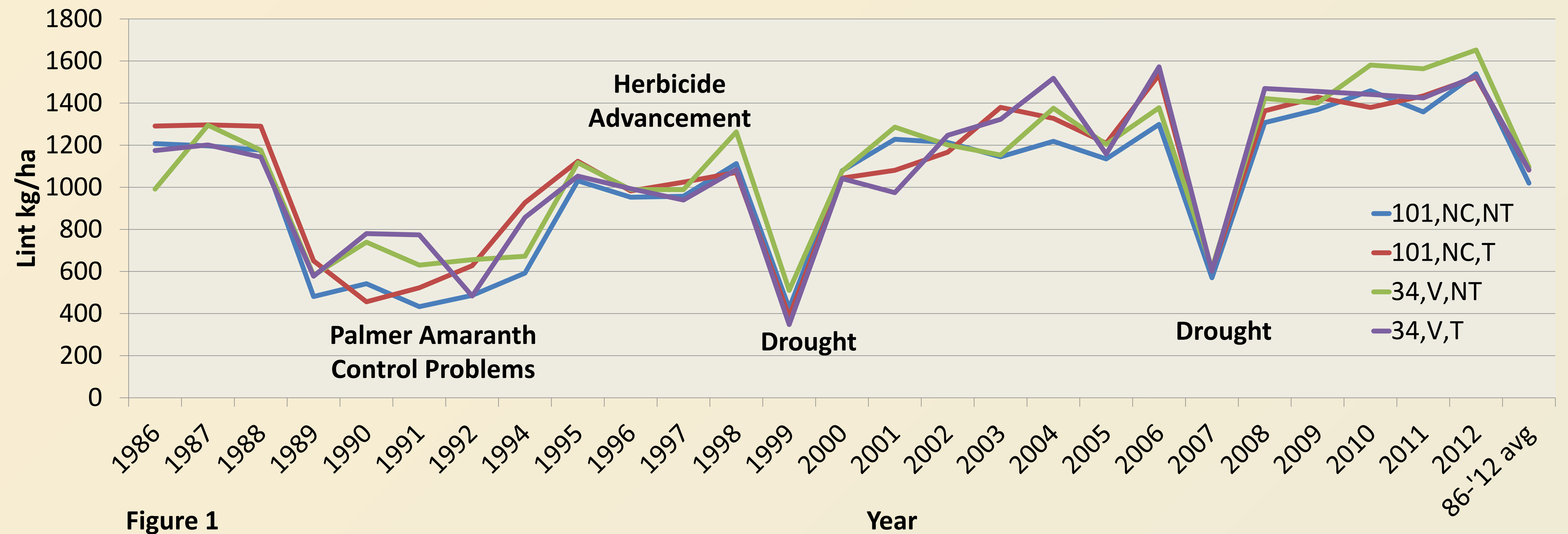


Figure 1

kg N/ha	No-Tillage	
	No Cover	Vetch
	kg lint/ha	
0	773	1141
34	1006	1289
67	1233	1224
101	1207	1244

Figure 2

kg N/ha	Tillage	
	No Cover	Vetch
	kg lint/ha	
0	827	1088
34	1044	1321
67	1226	1286
101	1283	1280

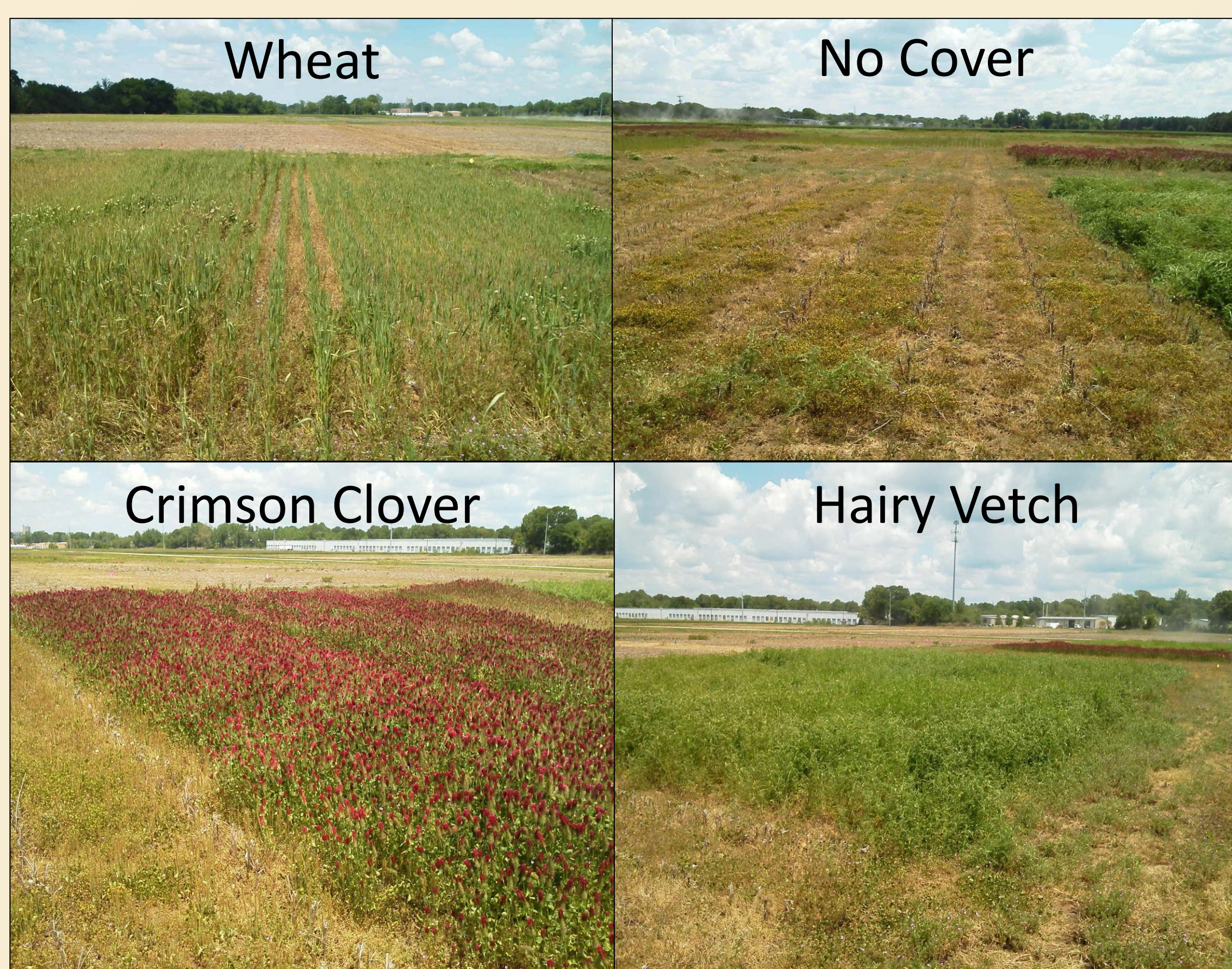
Figure 3

kg N/ha	No-Tillage	
	Wheat	Crimson Clover
	kg lint/ha	
0	770	1121
34	1061	1210
67	1253	1223
101	1238	1224

Figure 4

kg N/ha	Tillage	
	Wheat	Crimson Clover
	kg lint/ha	
0	768	1054
34	1057	1185
67	1266	1163
101	1223	1313

Figure 5



Materials and Methods

Plots were created in 1979 at the University of Tennessee's West Tennessee Research and Education Center, located in Jackson, TN.

At the time of cotton planting, the winter cover crops are terminated and the plots receiving tillage are disked to incorporate the cover crop. Phosphorous and Potassium are applied at UT soil test recommendations. Nitrogen is also applied at planting at the required rates. All cotton plots are managed the same within the growing season including, herbicides, insecticides, plant growth regulator, defoliant, and boll opener. After harvest, stalks are mowed and winter cover crops are planted in the fall using a no-till grain drill. Seeding rates for the winter cover crop are: crimson clover; 22.4 kg/ha, hairy vetch; 16.8 kg/ha, and winter wheat; 100.8 kg/ha.

Results and Discussion

- Long-Term cotton yield means for 34 kg N/ ha Hairy Vetch, no-till and tilled, and 101 kg N/ ha no cover, no-tilled and tilled are shown in Figure 1. Cotton yields were low from '89-'94 due to weed control problems. Yields were also low in '99 and '07 due to drought. Overall, 34 kg N / ha with hairy vetch cover yielded similarly to 101 kg N / ha and no cover crop.
- The last 10 years cotton yield means compared across all treatments are shown in figures 2-5. Both legume cover crops are supplying fertilizer N equivalency of between 67 and 101 kg/ha. Maximum fertilizer N response was at 67 kg/ha.

Conclusions

- Long term cotton yields (1986-2012) were generally not significantly different, with 34 kg N / ha fertilizer and a hairy vetch cover crop yielding similarly to no cover crop with 101 kg N / ha in both tillage systems.
- Properly managed, winter legume cover crops (Hairy Vetch or Crimson Clover) can provide 67-90 kg/ha N available for the following cotton crop.
- Yields between no-till and tilled were usually not significantly different.