

COTTON STALK MANAGEMENT

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The cotton stalk management study of one-pass stalk embedding as a key component to a reduced tillage system and controlled traffic systems for cotton is in its fourth year of evaluation. The study was extended one extra year to verify yield results obtained in the 1998 crop year. The original hypothesis included reduced energy, improved soil condition, no disease differences, no nutrient differences and no yield differences. Of these hypothesis all are true except for yield differences. In years 1 and 2, no yield difference could be measured between stalk embedding and normal stalk disposal systems. However, in year 3, we measured a substantial yield increase for stalk embedding. Because the yield increase was substantial we have not published these yields for two reasons: 1) there is always the possibility in any test that one years results are not representative, and 2) we have no explanation for the yield increase. If the 1999 season yields substantiate the observations of 1998 then the significance of stalk embedding is greater than the cost savings related to tillage and equipment and the advantages of controlled traffic systems. Also this result, if repeatable, will be an indication that changes in soil environment require several years for a change in production.

The study began as a Cooperative Research and Development Agreement (CRADA) between USDA, ARS and the Pegasus Company of Tucson, Arizona. Pegasus is developing a patent issued to Wayne Coates and Gary Thacker of the University of Arizona for the first workable idea for one-pass whole-stalk embedding. ARS at Shafter spent several years in the 1960's attempting to design such a machine. All were failures for one or more reasons and all shared the same two problems; 1) operation was erratic and 2) the stalks were left standing in the first and last 20 feet of each pass. The patent described unique methods of folding the plant into a trench that we did not imagine in the 60's. Within the CRADA study we have determined that the system will work in certain soil conditions. The potential for cost reduction with a system based upon embedding has been estimated at between \$30 and \$50 per acre depending upon the system that is compared. Perhaps the most interesting data to date has been the soil strength profiles, showing an increased volume of soil available for root exploration with combination of stalk embedding and precision tillage. The precision tillage was accomplished with bent-leg shanks positioned to reach from the side and not disturb the stalk embedded "ribbon". The most important data, organic matter content and distribution and nitrogen distribution will not be obtained until after harvest.

Because the CRADA study was limited to fields on the Shafter Research and Extension Center, we needed information for other soil types and conditions. Through a 1999 research grant from Cotton Incorporated we were able to work on several fields throughout the cotton area of the San Joaquin Valley. The studies were applied before the initiation of the grant in September through December of 1998. The operation results are mixed. The appearance of some of the fields after embedding was not as uniform as in the Station study. A few ideas for improving performance were identified by project personnel, cooperating machinery companies, and cooperating farmers. Many of these ideas will be incorporated in future tests. However, in all fields that were continued, the cotton growth appeared normal. Yield data is not available. Although no longer supported by Cotton Incorporated after January 1, ARS will continue the study for at least one more year.

On the next page is a chart to help explain the long process, beginning in the 19th century, to develop a zone production system particularly for cotton. The last key is the development of the stalk embedding system that will allow development of practical, low-cost management systems no longer requiring broadcast tillage such as disking and plowing and will allow controlled traffic systems for long term improvement in soil "tilth".

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