WEED MANAGEMENT IN CONTINUOUS COTTON: SUMMARY OF THE BENCHMARK STUDY IN NORTH CAROLINA AND MISSISSIPPI (2006-2009)

D. Jordan **R.** Seagroves J. Hinton A. York S. Clewis W. Everman P. Eure North Carolina State University Raleigh, NC **D.** Shaw **B.** Edwards W. Givens J. Weirich J. Prince Mississippi State University Starkville, MS M. Owen **Iowa State University** Ames, IA **R.** Wilson University of Nebraska Scottsbluff, NE **B.** Young Southern Illinois University Carbondale, IL S. Weller **Purdue University** West Lafayette, IN

<u>Abstract</u>

Research was conducted from 2006-2009 to compare differential response of weeds and crop yield to farmer approaches to weed management with approaches based on university scientist recommendations in a continuous cotton system in North Carolina and Mississippi. A greater diversity of herbicides, even at a higher input cost, increased net return by minimizing early season weed interference with cotton in North Carolina but not in Mississippi. The difference between the states most likely was a reflection of higher weed populations in North Carolina compared with Mississippi. Results from these experiments indicate that implementing a greater diversity of herbicides in cotton will increase economic return in the short term in weedy fields and that this approach most likely will pay dividends from a resistance management standpoint in the long term.

Introduction

Development of glyphosate resistant weed populations in US crop production systems has made weed management challenging for farmers and their advisors. While resistant populations have become a major issue in all major agronomic crop production regions, controlling glyphosate resistant weeds in cotton has become increasingly problematic. Increasing the diversity of herbicide modes of action (MOA) through sequential or tank mixtures is critical in managing herbicide resistance. Comparing weed management strategies at the farm level can be challenging but is extremely important in determining short and long-term ramifications of these strategies. A study was initiated in six states in the US to compare weed management practices typically used by farmers with recommendations from university scientists in cropping systems including continuous plantings of cotton or soybean as well as rotations of crops. The objective of this paper **is** to compare changes in weed populations, crop yield, and

economic return over time when comparing farmer weed management approaches with approaches recommended by university scientists in a continuous cotton production system in North Carolina and Mississippi from 2006-2009.

Methods

Farmers were asked to split fields in half and manage weeds as they normally would on one side (considered the farmer approach) while on the other side of the field farmers followed university recommendations (considered the university approach). In general, the university approach included additional preemergence or postemergence (POST) herbicides and in most cases included a wider diversity of herbicide modes of action (MOA).Weed populations were determined four times each year by sub-sampling a small section on each acre of each side of the field. Cotton yield was determined each year and net returns were calculated at cotton prices of \$0.60, \$0.80, and \$1.00/pound lint using 2010 Cooperative Extension Service Enterprise Budgets (North Carolina) or Cotton 2009 Planning Budgets (Mississippi). Within budgets, all inputs were held constant except weed management cost (herbicide and application costs). Data for weed management cost, lint yield, net return (cotton prices at \$0.60, \$0.80, and s1.00/pound lint), weed population prior to POST herbicide applications and late in the season, and number of active ingredients were subjected to analysis of variance to compare the main effect of weed management approach (university vs. farmer), year (2006-2009 in most cases), and the interaction of these factors. Farm cooperator was considered a replication in the analysis. The interaction of year by weed management approach was not significant for the parameters evaluated. Probabilities of greater F-statistics are provided to compare weed management approaches.

Results

Higher cotton yields were noted in North Carolina when comparing the university weed management approach with the farmer weed management approach. There was no difference in yield when comparing these weed management approaches in Mississippi. Weed control cost in North Carolina was higher for the university approach than the farmer approach by \$22/acre. While not statistically different, the weed management cost in Mississippi of the university approach exceeded that of the farmer approach by \$9/acre. Although net return was not affected by weed management approach in Mississippi, net return in North Carolina was higher using the university approach compared with the farmer approach, especially when the price of cotton was \$0.80 or \$1.00/pound (p < 0.10). The diversity of active ingredients in both North Carolina and Mississippi was greater using the university approach compared with the farmer approach. Weed populations at the time of early POST applications were higher using the farmer approach compared with the university approach but did not differ later in the season after herbicide programs had been completely implemented in North Carolina. In Mississippi, there was no difference in weed population regardless of management approach. The interaction of year by weed management approach was not significant for weed population at POST timing or late in the season in both North Carolina and Mississippi. While some differences in weed population were noted when comparing years, lack of significant interactions of year by weed management approach indicates that these factors are acting independently. The relative short duration of the experiment (4 years) may limit ability to make assessments of long term implications of the more intensive university approach to weed management compared with the farmer approach. Benefits of increased weed management through more intensive and diverse herbicide use in the university approach in North Carolina most likely was associated with reductions in early season weed interference with cotton. Weed populations did not differ late in the season suggesting that effects of weed management most likely are attributable to effects from weeds early in the season. Cotton is very sensitive to early season weed interference and timely weed removal is important in protecting yield. Residual herbicides used in the university approach most likely minimized early season weed interference in many of these fields. Few differences were noted when comparing results of the university approach with the farmer approach in Mississippi. One possible explanation of the lack of differences is the lower overall weed population both at the time of POST application and late in the season. Weed management cost and yield determined net return, and the relatively low weed population in Mississippi compared with North Carolina minimized weed interference and subsequent affects on yield. Weed management cost varied by \$9/acre in

Mississippi, and this is relatively low in terms of having a major impact on net return. Greater diversity of active ingredients through additional herbicide applications in the university approach contributed to greater weed control early in the season in North Carolina, and a greater diversity of herbicide MOAs is important in managing herbicide resistant weed populations.

<u>Summary</u>

Data from this experiment in North Carolina indicated that including a greater diversity of herbicides, even at a higher input cost, and minimizing early season weed interference was beneficial in the short term. In both theoretical terms and in practice, a greater diversity of herbicides would most likely pay dividends from a resistance management standpoint in the long term. With respect to results from Mississippi, greater diversity of weed management while not increasing yield and net return in the short-term would be beneficial in long-term resistance management. Monsanto Company provided financial support for this project. Appreciation is expressed to farm cooperators for their involvement and patience with these trials. Contact David Jordan for additional information and clarification (david_jordan@ncsu.edu).