BENCHMARK STUDY: COMPARISON OF WEED MANAGEMENT PROGRAMS, YIELD, AND ECONOMIC RETURN OF GLYPHOSATE-BASED HERBICIDE PROGRAMS IN A CONTINUOUS COTTON ROTATION

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Abstract

Effective weed management continues to be critical for optimizing cotton yields in the United States. Although glyphosate-based herbicide programs have been very effective in cotton since adoption in the 1990s, recent development of glyphosate resistant weed populations have required adjustments by growers to obtain satisfactory weed control in some fields. Additionally, efficacy of glyphosate on relatively large weeds that are susceptible to glyphosate has led to the grower mindset that applications can be delayed until the majority of weeds emerge. While greater flexibility in application timing has been beneficial in some cases, a higher degree of early season weed interference most likely is occurring with this approach despite the fact that weeds are eventually controlled. The value of residual herbicides or herbicides with a mode of action different from glyphosate has been recommended by Extension Weed Scientists for many years. A considerable amount of small-plot research effectively demonstrates the importance of timely herbicide application in protecting cotton yield from early season weed interference. While small-plot research also suggests that this approach to weed management can minimize weed shifts and prevent or delay the selection of herbicide resistant weed biotypes, large scale, farm size research is invaluable in supporting recommendations to producers on resistance management. To address this need, a multi-state research project was initiated in 2006 in Illinois, Indiana, Iowa, Nebraska, North Carolina, and Mississippi in grower fields to compare farmer-derived weed management programs, primarily consisting of glyphosate, with more robust herbicide programs recommended by university researchers that included glyphosate and herbicides with different modes action that in most cases provided residual weed control. Rotation systems in all states included continuous soybean (all states), rotations of soybean with corn (Illinois, Indiana, Iowa, Nebraska, and North Carolina) or rice (Mississippi), and continuous cotton (North Carolina and Mississippi). A wide array of data related to weed

population dynamics were recorded over a four year period (2006-2009) as well as crop yield on farmer and researcher field sections. Herbicide programs, cost of herbicide programs, and crop value were used to develop economic returns of the two systems.

In North Carolina, where eight growers had continuous cotton rotations, lint yield increased by approximately 112 lbs/acre when pooled over 24 site/year combinations (2006-2008) for the university research program compared with the farmer program. On average, two more herbicide active ingredients were applied for the university research program resulting in a general increase in weed management cost of $23/acre when pooled over site/year combinations. However, the economic return increased by an average of $55/acre for the researcher-based program compared with the farmer-based program. In summary, these data reveal the value of including herbicides other than glyphosate in continuous cotton systems to optimize lint yield and economic return. In the short term, residual herbicides in addition to glyphosate most likely minimized weed interference, especially early in the season. Long term benefits of modifying glyphosate-based herbicide programs by including additional modes of action and residual herbicides most likely will include prevention or delays in selection for glyphosate-resistant weed biotypes.