ONE PASS OR TWO, WHAT WOULD A PRE DO? Jeffrey L. Gunsolus, Lisa M. Behnken, Fritz R. Breitenbach, Jodie K. Getting, Milton J. Haar and Thomas R. Hoverstad, Professor, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN 55108, Regional Extension Educator, Integrated Pest Management Specialist, University of Minnesota, Rochester, MN 55904, Scientist, Assistant Professor, University of Minnesota, Lamberton, MN 56152, and Scientist, University of Minnesota, Waseca, MN 56093.

Since the introduction of glyphosate-resistant soybean and corn in 1996 and 1998, respectively, Minnesota producers have rapidly adopted this technology. By 1999, 48% of the soybean acres were treated with glyphosate, and by 2005 48% of the corn acres were treated with glyphosate. Concurrent with this increase in glyphosate use has been a decline in the use of soil-applied residual herbicides. In 1996, 62% of Minnesota's soybean acres and 73% of the corn acres were treated with a soil-applied residual herbicide while the most recent survey data indicate that only 15 % of the soybean acres (2004 data) and 49% of the corn acres (2005 data) were still treated with a soil-applied residual herbicide. What value, if any, does the soil-applied residual herbicide provide to the producer growing glyphosate-resistant corn and soybean?

Field research was conducted in 2004 and 2005 to investigate the effect of time of glyphosate application on weeds 5, 10, 15, 20, and 25 cm in height on weed control, grain yield, and consistency of economic performance. Concurrent with the one-pass glyphosate application treatments (0.84 kg ae ha^{-1}) were sequential treatments of a one-half label use rate of acetochlor in corn and s-metolachlor&metribuzin in soybean followed by a postemergence application of glyphosate applied on the same day as the one-pass glyphosate treatments. Control treatments included a one-half label use rate of acetochlor (corn) and s-metolacholor&metribuzin (soybean) and a two-pass glyphosate application to weeds 10 cm in height followed by an application to late-emerging weeds at 5 to 10 cm in height. All corn and soybean plots were planted in 76-cm rows.

Studies were conducted at nine site-years for corn and 11 site-years for soybean on a wide range of common summer annual grass and broadleaf weeds. Corn was more sensitive than soybean to early-season weed competition. In corn, annual weed populations that exceeded 15 cm in height at the time of glyphosate application resulted in a significant yield decrease. Across nine site-years, the time interval between the 15- and 20-cm period of weed removal was only 3 to 7 days. In soybean, glyphosate application to weeds before they reached 15 cm in height resulted in a significant yield reduction. Soybean consistently tolerated early-season weed competition better than corn. Economic analysis of the consistency of economic return across site-years indicated that one application of glyphosate in corn did not maximize yield or economic return; however, in soybean one glyphosate application, when weeds were 15 to 20 cm in height, did maximize yield and economic return. In soybean, the one-half label rate of s-metolacholor&metribuzin followed by glyphosate did not provide favorable economic returns. In corn, the one-half label rate of acetochlor followed by glyphosate did provide a favorable economic return due to the reduction in early-season weed competition. In corn and soybean, the two-pass glyphosate application treatment provided favorable yield and economic return; however, there is greater economic risk with this weed control tactic in corn than soybean due to the need for more precise early-season weed control in corn. The soil-applied residual herbicide does provide economic value to the producer who grows glyphosate-resistant corn by reducing the risk associated with early-season weed competition. The soil-applied residual herbicide also provides a level of chemical diversification that may reduce the risk of developing herbicide-resistant weeds or weed species shifts.