TILLAGE, FERTILIZER PLACEMENT EQUIPMENT AND RESIDUE COMPLIANCE - IS THERE A CONFLICT?[1]

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Conservation compliance is no longer a nightmare for crop producers farming highly erodible land. Instead, it is rapidly becoming reality if those crop producers plan to participate in USDA agricultural assistance programs. In Missouri, farmers are adopting conservation and no-till cropping practices at a very rapid rate. Though not verified, it appears that no-till acres in many north Missouri counties more than doubled from 1991 to 1992. The most cost effective means of reducing soil erosion remains with increasing crop residues on the soil surface after spring crop planting. Thirty percent ground cover is the magic target assigned within many conservation plans.

Now the conflict. Dickey, et. al., (1989) reported that most farmers over estimated percent ground cover when making visual estimates, often by as much as a factor of two. In other words, if the farmer figured he had 30 to 40 percent cover, in fact the field may only have 15 to 20 percent. Dickey, et. al., (1987) further points out that many growers believed they were doing conservation practices as soon as they quit using the mold board plow. So the question comes of how much residue will I have after I plant if I do this or that to the field. How important is the type of residue (corn, wheat, soybean, etc.) and its interaction with cropping practices?

To throw more fuel to the fire, Buchholz (1992) points out that knife injected anhydrous ammonia or UAN solution are more efficient choices of N application in heavy residue cropping systems compared to broadcast UAN or urea. Are most efficient N management practices going to throw fields out of conservation compliance due to tillage caused by the fertilizer knife?

Farmers and dealers are rapidly becoming sensitized to any cropping practices that destroy residue. Even the planter destroys residue. They realize that once it is gone there aren't any field operations, short of spreading straw, that will bring back residues destroyed by tillage.

How much residue is lost from applying anhydrous ammonia? Shelton et. al (1990) evaluated several tillage systems in continuous corn to establish which systems left at least 30% ground cover after planting as a defined target for conservation tillage. No-till, blade plow and plant, field cultivate and plant, and till-plant were

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all able to meet these criterion. However, when anhydrous ammonia knives were pulled through the plots, only no-till met the 30% ground cover need in all reps and all years. The disk or chisel plow and plant systems did not provide 30% ground cover with any consistency, with or without anhydrous knives pulled through the pots. That was work on continuous corn!

Following soybean residue, the anhydrous knife reduced residue coverage by 30 to 35 percent (Burr, et. al., 1986). In that work, Burr, et. al., (1986) found 52% residue coverage following anhydrous application in narrow row soybean residue, compared to 44% for 30 inch rows. The authors point out that the narrow rows offer more upright stalks of soybean residue to remain after the anhydrous knives are pulled through the field. The only systems with 30% ground cover before anhydrous application were no-till plant or blade plow plant (Burr, et. al., 1987). However, no-till averaged 62% ground cover while blade plow was 32% after planting without anhydrous knives pulled through the plots. This work was done on residue from clean tilled soybeans.

General observations from much of our no-till work in corn-soybean rotation suggests 70 to 80% ground cover after planting. Running the anhydrous knife through those plots will retain 50 to 60% ground cover after planting. In the system of no-till, applying a knife injected fertilizer will not cause compliance problems. However, any tillage ahead of planting brings more risk to compliance.

If tillage is necessary for the production system, one may consider a coulter and narrow knife for fertilizer injection. The narrow knife has been observed by growers and dealers to do much less tillage and residue destruction. At present these are just observations and not supported through careful research.

No-tilling soybeans into standing corn stalk residue will also offer a more resident residue base to weathering or destruction when going back to corn in the following year. Considerable corn stalk residue remains as surface residue after two years.

It is obvious in our warmer, moister climate that maintaining crop residues will be more difficult (Burr, et. al., 1992). Weathering over winter destroys from 10 to 35% of soybean residue in Missouri depending on rainfall frequency and amount over that time period. Cooler, dryer climatic conditions do result in less decomposition of surface residues.

Playing it safe may suggest that producers will not wish to knife inject fertilizer for crop production. In heavy residue, broadcast application of UAN solution and urea have given inconsistent results. Ammonium nitrate broadcast has been more consistent. Addition of urease inhibitors to urea products may bring more consistency to those materials broadcast, possibly to the consistency of ammonium nitrate, however at some increased cost. Knifed ammonia or UAN solution remain as excellent N management practices in residue conserving practices.

drilling soybeans in standing corn, uniform spread of straw out the combine, and no-till planting corn, or considering other crop rotation systems. The chisel and disk certainly become suspect for management systems needing high levels of crop residue after planting.

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