

DEVELOPING TECHNOLOGY FOR SUBSURFACE APPLICATION OF POULTRY LITTER IN NO-TILL SYSTEMS

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ABSTRACT

Poultry litter provides a rich source of crop nutrients, but applying litter on the soil surface can lead to water-quality degradation, odor problems, and significant nutrient losses. Because surface-applied litter is completely exposed to the atmosphere, rainfall runoff can transport phosphorus and other nutrients into streams, lakes, estuaries, and bays; and much of the ammonia nitrogen volatilizes into the atmosphere before it can enter the soil. For tilled cropping systems, incorporating manure into the soil has proven to be a successful technique for decreasing nutrient losses and odors, but existing farm implements have not been capable of applying dry poultry litter under the surface of no-till systems. Our goal is to develop management options that allow no-till producers to decrease nutrient losses from poultry litter, thus protecting air and water quality while increasing soil productivity. We established field plots to test the hypothesis that nutrient losses could be decreased by using a knifing technique to apply dry poultry litter beneath the surface of perennial grassland. Results showed that subsurface litter application decreased nutrient losses in runoff more than 90% compared to those from surface-applied litter, and prevented the volatilization of ammonia-N. In fact, nutrient losses from subsurface litter were statistically as low as those from plots receiving no litter. Furthermore, subsurface-applied litter produced greater yields than surface-applied litter, possibly by retaining more N in the soil. However, subsurface litter application will not become a practical management option for no-till producers until the technique is fully mechanized. We initially tested single-shank and four-shank prototypes that successfully placed dry poultry litter under the surface of rocky perennial pasture and other no-till systems, but these prototypes have limited capacity and litter distribution capabilities. Therefore, we have constructed a larger (eight shank) tractor-drawn prototype that can transport five tons of dry untreated litter directly from the poultry house and rapidly apply it under the surface of no-till fields at the desired rate. Initial field testing indicates the eight-shank prototype decreases nutrient losses by more than 90% compared to surface-applied litter.