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Natural Resources Research Update

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Location: Grassland, Soil and Water Research Laboratory

Title: On-farm agro-economic effects of fertilizing cropland with poultry litter

As animal feeding operations increase in size, public and regulatory pressure is being exerted on the animal industry to develop and implement appropriate uses for the wastes produced. One option is applying the litter and manure waste as fertilizer for cultivated crop production. However, this practice must be shown to be cost-effective to be widely accepted by local farmers and must be environmentally sound to be supported by regulators. In the present study, the on-farm economic impacts of traditional (commercial) fertilizer practices were compared with several alternatives strategies using both litter and commercial nitrogen fertilizer. For six years (2002-2007), land management, crop yield, crop price, and fertilizer cost data were collected from six field sites in central Texas and utilized for economic analysis. Varying litter and commercial fertilizer combinations resulted in minimal differences in corn and wheat yields; however, total fertilizer costs increased significantly as litter rate increased in spite of dramatic increases in commercial fertilizer cost. The highest average annual returns were determined for the 1 and 2 tons per acre litter treatments. At litter rates greater than 3 tons per acre, returns were reduced as fertilizer costs increased with no compensating higher yields to provide offsetting revenues. (1)

Another study determined the water quality effects of repeated annual poultry litter application (2). Eight years of data collected on ten field-scale watersheds indicated several significant water quality differences based on litter rate (0-6 t/ac). Increasing litter rates (with corresponding decreases in inorganic N application) increased P concentrations in runoff but reduced extreme high N concentrations on cultivated sites. Runoff N concentrations were much lower on cultivated sites, but P concentrations were similar between cultivated and pasture land uses. Runoff N and P concentrations generally decreased within the year as time since fertilizer application increased, but few long-term trends in N and P runoff occurred, in spite of soil P buildup, due to the dynamic interaction

between transport and source factors. These results support several practical implications, specifically: 1) combining organic and inorganic nutrient sources can be environmentally friendly and economically sound if application rates are carefully managed; 2) high runoff N and P concentrations can occur from well managed fields, which presents difficulty in regulating edge-of-field water quality; and 3) change in the animal industry mindset to view by-products as marketable resources would mitigate environmental problems, provide alternative fertilizer sources, and enhance animal industry revenue opportunities.

1. Harmel, R.D., B. Harmel, and M.C. Patterson. 2008. On-farm agro-economic effects of fertilizing cropland with poultry litter. *Journal of Applied Poultry Research*. 17(4):545-555.

2. Harmel, R.D., D.R. Smith, R.L. Haney, and M. Dozier. 2009. Nitrogen and phosphorus runoff from cropland and pasture fields fertilized with poultry litter. *Journal of Soil and Water Conservation* (In Press).

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