Alternative P-based Manure Applications Evaluated

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Yearly application of livestock manure based on crop nitrogen (N) requirements will result in an accumulation of phosphorus (P) in the soil. A concern with high soil P levels is the nutrient could move off the land in run-off and enter lakes and rivers. Applying manure at a rate to match crop P requirements would reduce the potential off-site effects, but such a manure application strategy could be more costly.

An economic analysis, for a medium sized beef feedlot, of two alternative P-based manure application systems was compared to an N-based system. The two P-based systems were to apply manure annually at a rate to meet crop P requirements, and to apply three times the annual crop P requirement but apply manure to the land once every third year. The systems were evaluated using models of crop production and manure transport. Manure was transported from the feedlot to individual quarter-sections of land, with adequate land to accept all of the manure produced. The cost of manure application included the loading of trucks, hauling to the field (a distance cost), and applying manure to the field.

The system that limited P application to meet annual crop requirements increased the cost of manure hauling and application by $8.70 per head (63%). The higher cost included increased hauling distance and application to the field was more costly because the application rate was lower. A system of applying three times the annual P rate triennially increased costs by $2.74 per head (20%). Increased hauling distance cost was the primary factor for the higher cost. The three times rate also was very close to the N requirement for the crop following manure application. As the cost of P fertilizer increased, the added cost of a P-based system declined. This model showed that moving to a P-based manure application system for beef feedlot manure will be more costly than the current N-based system, and that applying three times the annual rate P requirement triennially was less costly than an annual P-based rate.