



## PLANT NUTRIENTS AVAILABLE TO PLANTS

The average pounds of nitrogen (N), phosphorus ( $P_2O_5$ ), and potassium ( $K_2O$ ) per ton of litter at 15% moisture from Table 1 is around 58 lbs. N, 52 lbs.  $P_2O_5$  and 40 lbs.  $K_2O$ . Producers can use an average value of pounds of nutrients per ton to determine how much litter to apply per acre, when the exact analysis is not available.

A litter sample should be taken each time a house is cleaned out to establish an average value of nutrients on a producer's farm.

Using average amounts the value of plant nutrients in average broiler litter can be determined. Nitrogen as ammonium nitrate sells for around 0.25 cents per pound of actual nitrogen. The price of  $P_2O_5$  and  $K_2O$  are 0.25 and 0.15 cents per pound, respectively. Using these prices, and the average nutrient values, we can determine the value of nutrients in a ton of broiler litter. (N=\$14.150,  $P_2O_5$  = \$13.00,  $K_2O$  = \$6.00) The total value of plant nutrients in an average ton of broiler litter is \$33.50. This figure represents the total value, not the value of plant nutrients that will be available for plant use. Much of the soluble nitrogen is lost before it enters the soil.

Nitrogen in broiler litter is in two main forms: Urea/ammonium and organic. Twenty-five to 30 percent of the nitrogen is in the urea/ammonium form while 70-75% is in the organic form. The urea/ammonium form is readily available similar to commercial fertilizer. In the organic forms, the nitrogen is tied up and microorganisms are required to release the nitrogen for plant use.

Organic nitrogen is released to the soil solution slowly over time. It is estimated that 60% of the organic N is released the first year, 15% the second year and 5% the third year. Organic N is released by microorganisms. Microorganism activity is determined by temperature, moisture, soil pH and other factors. Their greatest activity is in warm weather with sufficient moisture. This means that organic N is released faster in the summer, followed by spring, fall and then winter. Organic N will not leach from the soil as does urea and ammonium N. Organic N will provide for a long term, slow release nitrogen source.

Phosphorus in broiler litter is similar to phosphorus in fertilizers. Phosphorus is tied up by soils into insoluble compounds, with a small amount made available to plants. Phosphorus moves very little through soils. The majority of phosphorus remains in the top few inches of the soil unless it is plowed deeper.

Potassium is usually available for plant use. As a general rule, plants only recover 50-70% of the potassium applied to soils.

Nitrogen in broiler litter is only partly available the first year litter is applied (Table 1).

**Table 1.** Nitrogen Available for Plant Use from One Ton of Broiler Litter

	Total	Year 1	Year 2	Year 3
Organic N (20% loss)	43.5	26	6.5	2.0
Ammonium N (30% loss)	14.5	10.2		
Total	58.0	36.2	6.5	2.0

It is estimated that 36.2 pounds of nitrogen are available for plant use the first year. However, if broiler litter is applied to the same field over several years, about 44.8 pounds of nitrogen will be available the third year (Table 2).

**Table 2.** Pounds of Nitrogen Available for Plant Use in the Year of Application in Succeeding Years from One Ton of Broiler Litter.

Broiler Litter Applications	Year 1	Year 2	Year 3	Year 4
Year 1	36.3	6.5	2.0	
Year 2		36.3	6.5	2.0
Year 3			36.3	6.5
Totals	36.3	42.8	44.8	8.5