CHAPTER 7
SUMMARY AND CONCLUSIONS

Sorption of P by acidic agricultural soils can limit crop production by P deficiency. For the past decades, application of animal waste to soil has received much consideration as a valuable source of P and as a potential source of nonpoint groundwater pollution. This research was initiated to evaluate the rate of poultry litter-yard waste compost (PYC) to minimize runoff losses of P while maintaining an adequate level of P fertility. Experimentation for this research entailed laboratory studies to select medium to high P fixing capacity soils for subsequent field, greenhouse, and laboratory incubation studies; and to evaluate the rate of P mineralization, for consideration for subsequent greenhouse and field studies to evaluate the plant availability of P in PYC. Conclusions reached during the course of this investigation are summarized as follows:

1. Phosphorus adsorption capacity was higher on eroded Piedmont soils and on mine tailings than on Atlantic Coastal Plain and Ridge and Valley soils. Soils with high P adsorption capacities contained relatively low levels of organic matter and high levels of clay minerals and Al and Fe hydrous oxides. Maintenance of an adequate level of P availability in these soils will require P input from organic or inorganic sources.

2. Phosphorus released in quartz sand was about twice that in sandy loam soil.This result suggested that the mineralized P from PYC could have been sorbed by clay minerals and hydrous oxides of Al and Fe in the sandy loam soil and, therefore, that P was released slowly into soil solution. Hence, to avoid P fixation, P mineralization data from quartz sand was reliable to that from a sandy loam soil.

3. There was a relatively slow rate of P mineralization from PYC during the first 14 days of incubation and there after the P mineralization rate increased. In contrast, P mineralization

from PL was relatively high during the incubation study. Overall there was less P mineralization from PYC than from PL. Slower release of P from PYC by mineralization has a potential to increase P uptake and decrease P fixation when compared with the more rapid P mineralization from PL.

4. The PYC application enhances by P availability of increasing mineralizable P and by increasing the concentration of OH^- which displaces $H_2PO_4^-$ into solution by reaction with layer silicates and Al and Fe oxides. Consequently, the higher amount of P soil solution would increase P availability for plants. The increase in P availability explains the increase in corn grain yield on Vance sandy loam with application of PYC when compared with the control. High corn yields of 10170 to 11740 kg ha^{-1} were obtained from PYC application on the Vance soil.

5. The N concentrations in young corn plants grown in the field on the PYCtreatments were below the sufficiency range for normal plant growth. This relationship may reflect dilution of N in plants as growth increased from correction of P deficiency. In addition the relationship may be explained by slow N mineralization under lower temperatures during the early part of the growing season. Later in the growing season, N mineralization may have increased as soil temperatures increased. The mineralized N from the PYC application may have contributed to the high corn grain yields on the Vance soil on the PYC treatments.

6. It would be desirable from the standpoint of more PL utilization to prepare composts from low substrate ratio substrates. Hence, in this research composts were prepared from 15:1, 20:1, and 25:1 C:N substrates, which consisted of PLand YW. The composting process was complete after only four months for the PYC from the 20:1 and 25:1 C:N ratio substrates. Yard waste compost without PL may require somewhere between two to

three years for complete composting as opposed to four months with PL addition. The composting was incomplete in four months (presence of undigested leaves and NH_3) for the PYC from the 15:1 C:N ratio substrate. The latter compost resembled poultry manure rather than a high quality compost after the 4-month composting period.

7. Overall the feasibility of composting two waste materials (one that is a possible pollutant and one that fills landfills) to become a soil amendment that improves soil fertility and structure was demonstrated by growing high yields of corn on a soil with low yield potential.