PUBLICATIONS
1998
HORTICULTURE
FIELD DAY REPORT - 1998

TEXAS A&M UNIVERSITY AGRICULTURAL RESEARCH and EXTENSION CENTER
at OVERTON

Texas Agricultural Experiment Station
Texas Agricultural Extension Service
Texas A&M University

June 18, 1998

Research Center Technical Report 98-2

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EFFECT OF CROPPING SYSTEM ON RESIDUAL SOIL P FROM POULTRY LITTER APPLICATION OVER FIVE SEASONS


Background. Applying poultry litter at rates sufficient to meet crop needs for nitrogen (N) results in phosphorus (P) accumulation that can lead to non-point source pollution of surface waters. Legumes are able to use significant amounts of P. An advantage of using legumes for removing excess P is that no additional N fertilizer has to be applied since legumes can obtain N from the atmosphere through N\textsubscript{2} fixation. Including warm- and cool-season legumes for hay or silage may be one way to reduce excess soil P. A three-year study was initiated in spring 1995 at the Texas A\&M University Agricultural Research and Extension Center at Overton. The purpose was to investigate the use of warm- and cool-season legumes in rotational cropping systems to remove excess P supplied by poultry litter.

Research Findings. The cropping systems studied were: summer legume-fall vegetable, summer vegetable-fall legume, and summer vegetable-fall vegetable. The litter rates applied were based on soil test nitrogen requirement of the vegetable crop and percent N and moisture content of the litter. Litter was applied at the recommended rate and 2 or 4 times this rate. The summer legume crop was 'Iron and Clay' cowpea and the fall crop was crimson clover. The vegetable crops were: watermelon - spring 1995; broccoli - fall 1995; tomato - spring 1996; collards - fall 1996; squash - spring 1997. The percent N, dry matter, and tons per acre of litter applied to each vegetable crop for each season were: spring 1995 - 3.4% N, 57% DM, 1.0 tons/A; fall 1995 - 3.4% N, 51% DM, 3.7 tons/A; spring 1996 - 3.3% N, 60% DM, 3.0 tons/A; fall 1996 - 3.3% N, 60% DM, 4.0 tons/A; spring 1997 - 3.4% N, 61% DM, 1.7 tons/A.

Utilizing a cropping system approach to reducing soil P accumulation proved to be very effective (Fig. 1). In comparing 5 seasons of data, it was found that a system of planting a summer vegetable and following with a fall cover of crimson clover reduced soil P in the surface 0-15 cm (0-6 in.) dramatically. A system of planting a fall vegetable followed by a cover crop of Iron and Clay cowpea also reduced P accumulation over time but not as great as the above mentioned system. The greatest accumulation was when litter was applied to a vegetable crop continuously for both seasons.

Application. This study helped to identify a vegetable cropping system that reduces P accumulation, thus reducing the chance for non-point source pollution of surface waters. Utilizing a system of applying litter to a summer vegetable crop and cover cropping with a winter legume effectively reduces P accumulation.
**Acknowledgment.** This study was supported in part by the Southern Region Sustainable Research and Education Program.

**Fig. 1.** Residual soil P vs. soil depth following poultry litter fertilizer application rates for three cropping systems for three years.