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

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

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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_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.

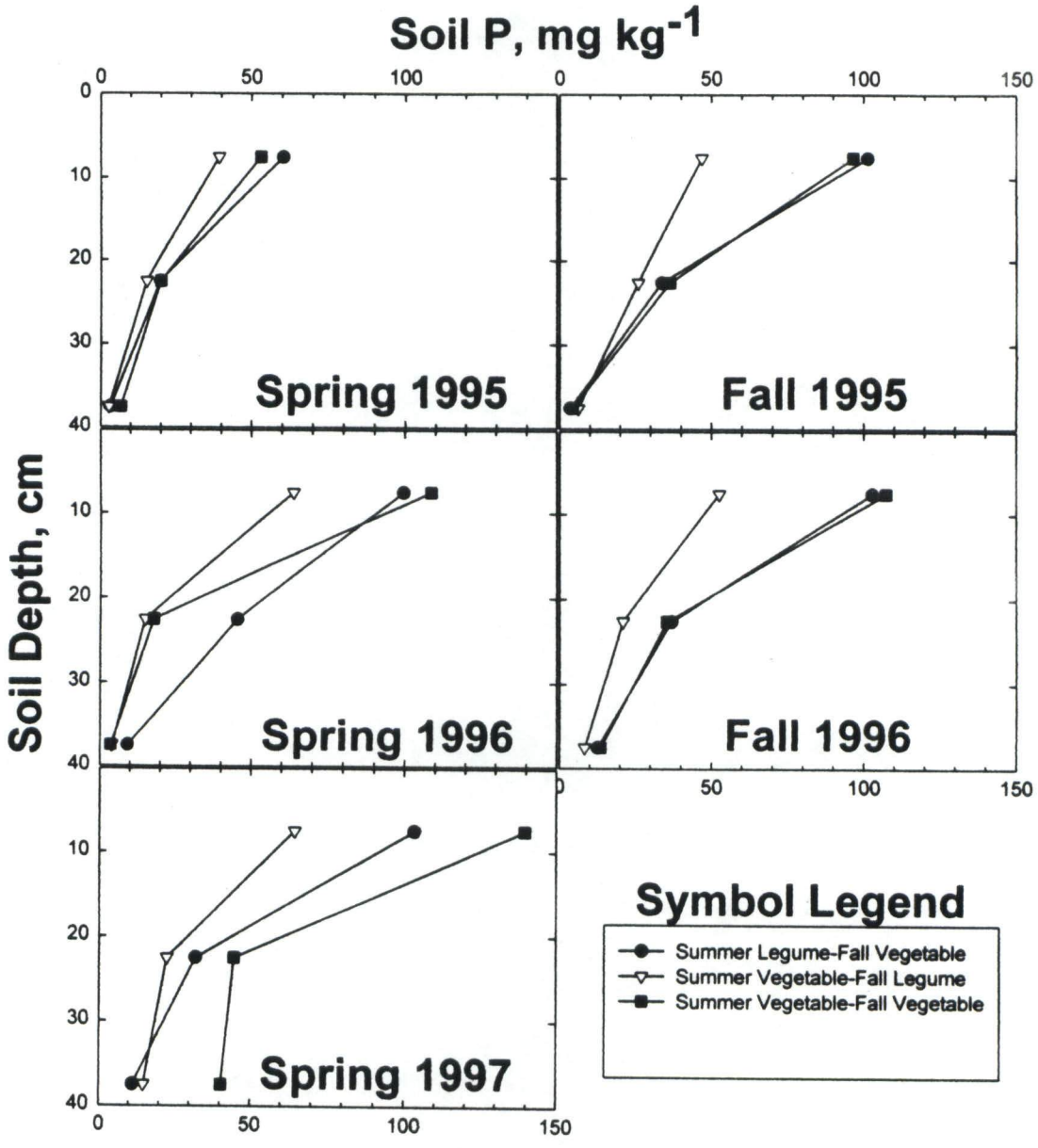

Fig. 1. Residual soil P vs. soil depth following poultry litter fertilizer application rates for three cropping systems for three years.