Residual and Added Effects of Manuring on Alfalfa-Corn Rotation

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An alfalfa-corn rotation can be an economically viable and sustainable system for dairy farms. The alfalfa-corn rotation is a predominant cropping system followed in dairy farms of northeastern USA. Alfalfa being a deep rooted perennial could assist reducing high levels of NO_3-N in the soil profile after continuous cropping with annuals.

Application of excess manure to alfalfa has been shown to be feasible, economically sustainable, and an environmentally sound alternative strategy. Therefore it is essential to study and understand the residual effects of manure and alfalfa, its effect on corn yield in the alfalfa-corn rotation, and for its influence on groundwater quality. Manure management in dairy farms in a system approach could help to minimize the nitrate contamination of groundwater, if not preventing it.

Research Results

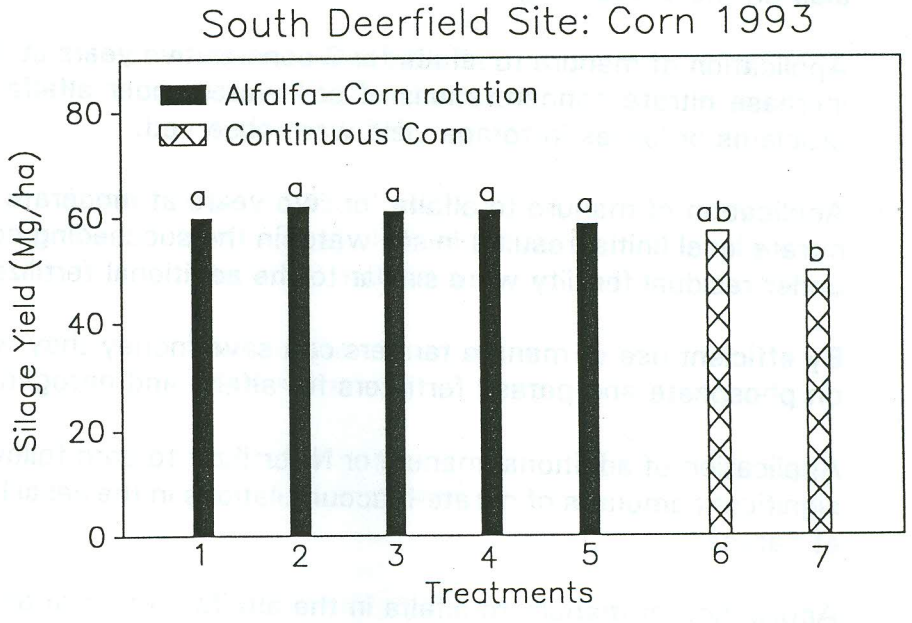

Figure 1. Residual and added effects of manuring on silage corn yields

Treatments:
1. No nitrogen
2. Low manure residual
3. High manure residual
4. Low manure (100 lb N/ac)
5. 100 lb N/ac NH_4NO_3
6. 200 lb N/ac NH_4NO_3
7. 110 lb N/ac from manure + 90 lb N/ac from NH_4NO_3

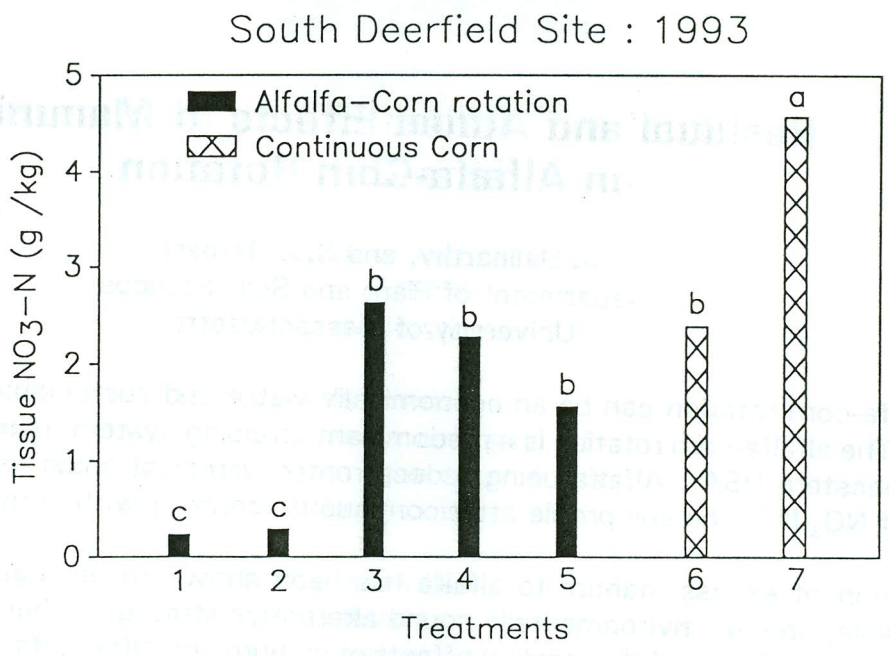

Figure 2. Nitrate accumulations in basal internode of corn stalk at harvest

Summary Results and Conclusions

- Manure at moderate rates (we applied approximately 5,000 gal. liquid manure/ac/yr) can be applied to alfalfa without any adverse effects on alfalfa and also on the succeeding corn.

- Application of manure to alfalfa for 3 consecutive years at moderate rates did not increase nitrate concentrations of soil water under alfalfa. No additional weed problems or losses in forage yield were observed.

- Application of manure to alfalfa for two years at moderate rates did not increase nitrate level (initial results) in soil water in the succeeding corn. Corn silage yields under residual fertility were similar to the additional fertilized corn silage yield.

- By efficient use of manure farmers can save money they would spend otherwise on phosphate and potash fertilizers for alfalfa and nitrogen fertilizer for corn.

- Application of additional manure or N fertilizer to corn following alfalfa resulted in significant amounts of nitrate-N accumulations in the basal internode of corn stalks at harvest.

- Application of manure to alfalfa in the alfalfa-corn rotation will enable farmers to reduce overapplication of manure to corn fields, increase total land area for spreading, and prevent nitrate pollution of groundwater.

- Dairy farmers can increase their profits by efficient management of manure and nitrogen fertilizer.

- Studying the long term impact of manure applications to alfalfa on groundwater pollution in alfalfa-corn rotations enables us to plan environmentally and economically sustainable manure/nutrient management practices for dairy farms.