Impacts of integrated crop-livestock systems on nitrogen dynamics and soil erosion in western Iowa watersheds

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[1] Agricultural land uses impact leachable nitrogen (N) and erosion, indicators of the potential for nitrate and sediment contamination of water resources. This paper evaluates the potential impact of alternative land uses on leachable N, soil organic nitrogen (SON) and erosion in western Iowa watersheds using a combination of widely available models and georeferenced data. The alternative land uses increase land area under perennial cover, integrate livestock with cropping systems, and reduce inorganic fertilizer use. We used the Water Erosion Prediction Program (WEPP) to estimate erosion and a N-budget model to estimate leachable N and changes in SON. The N model described here is widely applicable because it utilizes commonly available georeferenced data on soils, crops, and livestock. Maximum annual erosion rates were estimated to be 22 Mg ha_1 under current conditions, double the regional maximum at which soil is maintained as a medium for plant growth (T). Under alternative land uses, erosion was between 1.1 Mg ha_1 and 5.5 Mg ha_1, well below T. Annual leachable N was as much as 43 kg ha_1 for current conditions, but consistently less than15 kg ha_1 under alternative land uses. Maximum SON losses were 23 kg N ha_1 under current conditions while SON increased by as much as 18 kg N ha_1 under alternative land uses. These results indicate that erosion may be minimized, leachable N could be decreased and SON may be increased by better accounting of N inputs and altering the distribution and species composition of crop and pasture systems.

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