



# Nutrient Management: Completed Leopold Center Grants

Key words	Competitive Grants
Phosphorus Manure Poultry Corn Soybean Alfalfa	<p><b>Developing ecologically sound and profitable alternative fertilizer and manure phosphorus management strategies</b> <i>E2004-29</i>            A.P. Mallarino, Agronomy, Iowa State University</p> <p>Revised guidelines for the Iowa State University phosphorus (P) recommendations and management may be needed. This project utilized fertilizer and poultry manure P and experiments at research farms and producers' fields with corn-soybean or alfalfa-corn rotations to evaluate several P management practices and provide new knowledge about P management.</p>
Riparian buffer Phosphorus Bank stability	<p><b>Economically sustainable riparian buffer to promote bank stability and reduce gully erosion and phosphorus runoff in the Loess Hills</b> <i>2002-E30</i>            J. M. Kelly, Natural Resource Ecology and Management, Iowa State University; Sally Logsdon and Mike Burkhart, National Soil Tilth Lab, Ames</p> <p>This project considered what types and configurations of vegetative buffers might be effective in slowing soil loss at a Loess Hills site. The researchers found that 1) a planted buffer (grass and trees), with periodic harvest of the cottonwood trees, allowed phosphorus entrapment and removal before reaching the stream, and 2) the nearby stream did not extend further into the field, as had occurred in the past seasons.</p>
Grazing Phosphorus Stocking rate Surface runoff	<p><b>Impacts of managed grazing on stream ecology and water quality</b> <i>2002-U19</i>            Jim Russell, Animal Science, Iowa State University</p> <p>This project measured and analyzed the varying effects different grazing systems have on the nutrients that appear in surface runoff. The results demonstrated that sediment and phosphorus loading from upland areas of pastures may be controlled by using grazing management practices that maintained forage height at 4 inches or greater. Similarly, maintaining adequate forage along pasture streams limited sediment and phosphorus loading from stream bank erosion. However, the confounding of stocking management practices with stocking rate and climatic variables make it difficult to define which management practices are most beneficial.</p>
Nitrogen Corn Root health Organic matter Perennial forages Manure	<p><b>Improving farm nutrient management by optimizing organic matter inputs and root health</b> <i>2002-41</i>            Walter Goldstein, Michael Fields Ag. Institute, Troy, WI; and Cynthia Cambardella, National Soil Tilth Lab, Ames</p> <p>Farmer cooperators conducted strip trials to help investigators create a nutrient and organic matter budgeting system that offered whole farm management guidelines to tighten nitrogen budgets for corn. Corn root health also was analyzed. The researchers concluded that more work is needed for the budgeter to be a useful tool to plan sustainable farm systems. On-farm testing of organic matter, nutrients, and corn used to validate the model 1) showed a positive relationship between nitrogen (N) uptake by corn and corn root health, with healthier roots apparently better being more efficient at N uptake regardless of the source of the N, and 2) indicated that corn grown in systems with perennial forages and animal manures tended to have healthier roots. The work raised further questions about N and carbon soil dynamics and root interactions.</p>
Phosphorus Manure	<p><b>Agronomic and environmental soil testing for phosphorus and threshold levels in soils</b> <i>2001-11</i>            A.P. Mallarino, Agronomy, Iowa State University</p> <p>The overall goal of this project was to provide practical information that can be used to improve phosphorus (P) management, improve soil test interpretations for manured soils, develop guidelines for environmentally sound land application of P, and contribute to more efficient use of P resources in agronomic settings.</p>

Poultry Manure Commercial fertilizer Nitrogen Corn Soybean Phosphorus	<p><b>Environmental impacts of use of poultry manure on water quality 1999-68</b>  Rameshwar S. Kanwar, Jeff Lorimor and H. Xin, Agricultural and Biosystems Engineering, Iowa State University</p> <p>The project monitored two application rates of poultry manure and commercial fertilizer nitrogen on corn and soybeans for leaching of nitrate-nitrogen, phosphate-phosphorus, and pathogenic bacteria to subsurface drainage water and shallow ground water.</p>
Manure Manure application Manure distribution Commercial fertilizer	<p><b>Optimizing solid manure application by improving distribution 2001-24</b>  H. Mark Hanna, Thomas L. Richard and Graeme R. Quick, Agricultural and Biosystems Engineering, Iowa State University</p> <p>Improving the uniformity of manure distribution may make it a more effective substitute for commercial fertilizer and allow farmers to take proper nutrient credit for the manure. This work shows what manufacturers need to know to improve equipment performance and what farmers need to know about using manure-spreading equipment effectively.</p>
Phosphorus Manure Commercial fertilizer Leaching	<p><b>Understanding the potential of phosphorus transport to water resources via leaching 2002-40</b>  James L. Baker, Agricultural and Biosystems Engineering, Iowa State University</p> <p>With the pressure of TMDL (Total maximum daily load) regulations, improved management of phosphorus (P) from both manure and fertilizer sources has become increasingly important. Most of the current work to determine practices and policies that will mitigate phosphorus-related problems has been through gross assessments of P leaching into surface water through subsurface drainage tile flows. The general goal of this project was to provide new information and understanding about P movement in P-deficient subsoils, and to determine if such soils significantly lose their capacity to remove P over time.</p>
Livestock Manure Manure testing	<p><b>Livestock and the environment in Sioux County 2000-36</b>  Joel DeJong, ISU Extension Crop Specialist, LeMars; and Kris Kohl, ISU Extension Agricultural Engineering Specialist, Storm Lake</p> <p>The goal of this project was to help livestock producers make better use of their manure. By forming focus groups, the researchers determined common barriers to improving manure management in Sioux County, IA. As a result of the findings, ISU Extension recommendations for manure testing were updated.</p>
Anhydrous ammonia Commercial fertilizer Nitrogen Nutrient application	<p><b>Reducing anhydrous ammonia application by optimizing distribution 2000-34</b>  H. Mark Hanna and James L. Baker, Agricultural and Biosystems Engineering, Iowa State University; Tom S. Colvin, National Soil Tilth Laboratory, Ames; and Michael L. White, Warren County Extension, Indianola</p> <p>Anhydrous ammonia is one of the most popular ways to fertilize U.S. crops. As it has risen in cost, farmers and researchers have been seeking more efficient ways to apply this nitrogen fertilizer. This project found that improved distribution of anhydrous ammonia fertilizer application equipment discouraged excessive nitrogen application. In field tests, plumbing techniques and newer manifold styles improved row-to-row distribution allowing less total fertilizer to be applied.</p>
Corn Zinc	<p><b>Crop response to zinc as a micronutrient in Iowa 2000-04</b>  Randy Killorn and Anna Bickel, Agronomy, Iowa State University</p> <p>The objectives of this study were to measure corn grain yield responses to zinc fertilizers within fields, and to define soil characteristics in responsive areas, thereby providing a basis for differential Zn applications. The most common result was that Zn application had no effect on grain yield. There were six sites (of 12 total) where grain yield was significantly affected on one or more soils. However, there were only nine significant grain yield responses to Zn application in the 61 comparisons. Grain yield decreased in seven instances.</p>

Organic Vegetable production Poultry manure Compost	<p><b>Evaluation of organic soil amendments for certified organic vegetable and herb production 1999-50</b> Kathleen Delate, Horticulture and Agronomy, Iowa State University</p> <p>Responding to increased interest from the state's organic farmers, this study analyzed some of the natural soil amendment/fertilizer products used in the production of organic vegetables and herbs. Using both on-farm and university research sites, yield and postharvest quality of peppers, three herbs, and broccoli were assessed. Increased yields were obtained with vegetables (broccoli and green pepper) fertilized with composted turkey manure, but results with herb crops were not consistent. Compost increased herb (Echinacea and lemon balm) leaf growth, but not root growth. Imported biological fertilizers also increased plant growth and yields but did not provide any advantage over locally produced compost.</p>
Tillage No-till Ridge-till Commercial fertilizer Corn Soybean Phosphorus Potassium	<p><b>Development and implementation of cost-effective fertilization and tillage management alternatives for improving soil quality in corn-soybean rotations 1998-36</b> A.P. Mallarino, Agronomy, Iowa State University</p> <p>Tillage and fertilization treatments for corn were tested in research settings and on producers' farms. Project objective included: development of phosphorus, potassium, and starter fertilization recommendations for corn and soybean under different tillage systems; evaluation of improved diagnostic tools to assess P and K soil fertility in no-till and ridge-till; economic analysis of alternative fertilization and tillage practices; and demonstration of a methodology for on-farm research and demonstrations based on precision agriculture technologies.</p>
Rotational cropping Soil quality	<p><b>Soil quality, yield stability and economic attributes of alternative crop rotations 1998-05</b> Douglas Karlen and Cynthia Cambardella, National Soil Tilth Laboratory, Ames; and Antonio Mallarino, Agronomy, Iowa State University</p> <p>Three long-term rotational crop studies in Iowa and one in Wisconsin were examined for conclusive evidence of rotational effects on soil quality. Long-term yield data also were evaluated to determine if there was a quantifiable relationship between soil quality and yield or yield stability. Quantifying the rotation effects through soil quality assessment proved to be very difficult. As a result, very few significant differences were found between rotations for the soil quality indicators evaluated. No soil quality indicator was consistently sensitive to the rotational effects for all sites.</p>
Manure Education	<p><b>Statewide manure management education initiative 1998-51</b> Gerald A. Miller, College of Agriculture, Iowa State University</p> <p>After manure management was identified as a high priority issue for programming in 1996-97, ISU Extension launched a statewide initiative that made education and individualized assistance on manure nutrient management available to crop and livestock producers in every Iowa county. The initiative involved educational workshops for producers as well as on-farm demonstrations and increased publicity concerning the economic and environmental value of managing manure nutrients for crop production.</p>
Manure Dairy Grazing	<p><b>Dairy manure quantification and characterization in grazing systems 1999-16</b> Wendy Powers and Marjorie Faust, Animal Science, Iowa State University</p> <p>This project examined the amount and nutrient concentration of manure generated by lactating dairy cows managed in an intensive grazing system. These manure nutrient figures can be used to determine the maximum animal stocking density that will safeguard against nutrient runoff or degradation of water quality by concentrated nutrients. This work confirmed that input-output models to predict fecal excretions work well for grazing herds. Nutrient concentrations were different between breeds and seasons. The observed differences between breeds were attributed more to differing management practices than genetics.</p>

Swine Hoop houses Manure Compost Nitrogen Carbon	<p><b>Nitrogen conservation in swine manure composting land—application systems</b> 1999-62 Thomas L. Richard, Agricultural and Biosystems Engineering, Iowa State University; Cynthia A. Cambardella, National Soil Tilth Laboratory Ames; and Thomas E. Loynachan, Agronomy, Iowa State University</p> <p>In the swine production hoop houses, the use of bedding generates large volumes of manure that composts easily. However, composting results in nutrient losses, especially for nitrogen, which then diminishes its value as a fertilizer. This study looked at carbon and nitrogen dynamics in the composting process and subsequent soil mineralization.</p>
Manure Socio-technical dimension	<p><b>Socio-technical and environmental dimensions of swine manure management decisions</b> 1999-69 Clare Hinrichs, Sociology, Iowa State University; and Thomas Richard, Agricultural and Biosystems Engineering, Iowa State University</p> <p>Once strictly a farm management concern, manure management is now a matter of state and societal interest. This qualitative study examines why and how farmers in two Iowa watersheds have made decisions about manure management for their operations. Farmers interviewed explained the motives, logic, opportunities, and constraints that guide their use of particular management practices.</p>
Swine Manure Corn Nitrogen	<p><b>Development of guidelines for application of swine manure to optimize nitrogen management for corn</b> 1996-10 Alfred Blackmer, Agronomy, Iowa State University</p> <p>Results from on-farm trials were analyzed to develop guidelines that will help farmers evaluate and improve their manure-N management, including utilizing swine manure as a cost-effective substitute for commercial fertilizer. The experimental methods included use of the late-spring test for soil nitrate and the end-of-season test for cornstalk nitrate to measure N availability at each research site.</p>
Manure Livestock Education	<p><b>Mahaska County livestock manure/crop nutrient management demonstration project</b> 1995-05 Joe Sellers, ISU Extension field livestock specialist, Chariton; and Alan Seim and Grant Wells, ISU Extension (retired)</p> <p>This demonstration project was developed at the behest of Mahaska County producers, desiring more information relating to the nutrient management of their livestock systems. Multiple demonstration sites were selected, reflective of different production systems and soil characteristics. The effects of various application methods on surface residue were emphasized. After three years, yields and profit measurements for various methods were evaluated. The researchers concluded that producers want more guidance about residue management and consistency of manure nutrient content.</p>
Manure Compost Urban	<p><b>Animal manure-municipal yard waste composting project in Wright County, Iowa</b> 1996-06 Randy Killorn and Don Wetterauer, Agronomy, Iowa State University</p> <p>Two of Iowa's waste disposal problems are manure from livestock confinement facilities and yard waste. Considered separately, they present special difficulties in disposal, but when combined, the researchers discovered they could make a good compost material suitable for use by gardeners and landscapers.</p>
Commercial fertilizer Tillage No-till Ridge-till Banding	<p><b>Fertilizer placement for ridge-till and no-till systems</b> 1995-55 A.P. Mallarino, Agronomy, Iowa State University</p> <p>The overall goal for this project was to identify fertilizer practices that increase profits and decrease phosphorus contamination of water supplies in no-till and ridge-till cropping systems.</p>

	<p>The researchers concluded that though subsurface banding for phosphorus or deep banding for potassium will not always result in economic gains, it a) is not economically detrimental and b) will potentially reduce the contamination of surface water supplies.</p>
<p>Nitrogen Tillage Swine Corn Soybean</p>	<p><b>Impacts of swine manure application and alternative N-management practices on productivity, sustainability and water quality 1997-60</b> Rameshwar Kanwar et al, Agricultural and Biosystems Engineering, Iowa State University</p> <p>For this project, the effects of nine N-management practices under different tillage and cropping systems were evaluated. Forty experimental plots equipped with individual sumps and subsurface drainage metering and monitoring devices were used for the study. Overall results have indicated if the appropriate amount of N from swine manure can be applied, application rates and methods can be successfully managed for corn-soybean systems without damaging the water quality.</p>
<p>Nitrogen Hay Banding</p>	<p><b>Effect of tillage, crop rotation and innovative nitrogen and pesticide management practices on productivity, sustainability and water quality 1993-14</b> Rameshwar Kanwar et al, Agricultural and Biosystems Engineering, Iowa State University</p> <p>In this project, the effects of seven N management practices on water quality were evaluated after collecting data from 40 experimental plots. In comparison with the higher rate of N application, lower rates of N application and strip and hay cropping systems help produce lower concentrations of NO<sub>3</sub>-N in the shallow groundwater. Also, banding of herbicides has resulted in lower herbicide losses to shallow groundwater. The use of the late spring NO<sub>3</sub>-N test (LSNT) and strip cropping show a great deal of promise to protect water quality.</p>
<p>Hoop houses Manure Compost Swine</p>	<p><b>Optimizing swine hoop manure management of soil quality and crop system performance 2000-42</b></p> <p>In this project, investigators looked at the impact of alternative hoop manure management strategies on soil quality and cropping system performance. They found that if the bedded manure pack is being cleaned out in the fall, both direct application and composting have similar crop effects. But for spring clean-out, composting is recommended, as direct application of heavily bedded manure can cause soil immobilization and crop N stress.</p>
<p>Manure Education Nitrogen Phosphorus Testing</p>	<p><b>Manure management education and demonstration project 1992-19</b> Jerry W. Long, Greg Brenneman and Kenneth Muller, ISU Extension</p> <p>This project demonstrated a feasible, economical testing program to evaluate the nutrient content of livestock wastes. A portable kit was used that can test for ammonia nitrogen and phosphorus in both liquid and solid manure, facilitating on-site testing. The results of this on-farm testing kit, which is currently available to producers, were then compared with laboratory analysis to determine the kit's accuracy. By analyzing the nutrient value of manure immediately prior to land application, producers can make more environmentally sound manure management decisions.</p>
<p>Manure Nitrogen Phosphorus Potassium Nutrient application</p>	<p><b>Animal manure utilization in crop nutrient planning 1993-10</b> Gerald A. Miller, Agronomy Extension, Iowa State University</p> <p>This project cooperated with and built on other initiatives aimed at encouraging livestock producers to take credit for the nutrients in their livestock manure. Improved management of the manure resource can help avoid over-application of purchased nutrients and potential pollution of water supplies. Cooperating farmers were instructed in manure spreader calibration and other means for taking advantage of manure's fertilizer value.</p>

This document does not include grants completed prior to 1996.

10-09

Summaries of these and other grants are listed by topic at:  
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