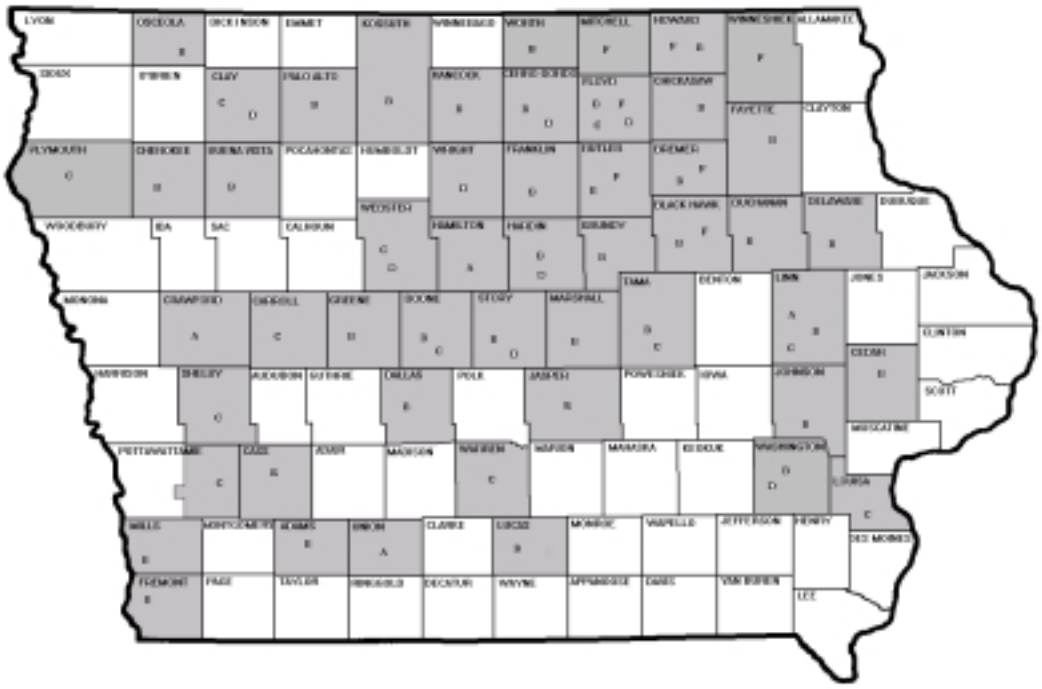
Integrated Farm/Livestock Management Demonstration Program

Crop Year 2001 Executive Summary



A = Producer Focus Groups (4 sites)
B = On-Farm N Demo Network (101 operators)
C = N Requirements & C Status (14 operators)
D = Swine Manure Nutrient Utilization (15 operators)
E = Strip Tillage Effects on Crop Production (2 sites)
F = Manure Delivery Model (12 operators)

Unique partnerships expand the financial and educational resources available to Iowa producers.

IFLM Program Overview

The Integrated Farm/Livestock Management (IFLM) Demonstration Program was created in 2000 as part of the Iowa Water Quality Initiative. This statewide program, administered by the Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation, concentrates on efficient management techniques in livestock and crop production systems in a demonstration/ education setting. It provides a valuable link between sound research and actual in-field application.

Working in cooperation with soil and water conservation districts, Agribusiness Association of Iowa, Iowa Department of Natural Resources, Iowa Soybean Association, Iowa State University, Kirkwood Community College, and USDA National Soil Tilth Laboratory and Natural Resources Conservation Service, IFLM has formed a unique partnership with the realization that we achieve much more working together toward our common goals. These partners expand the financial and educational resources available to Iowa producers to address increasing environmental concerns.

More than 150 farm operators throughout the state voluntarily participated in Crop Year 2001 to demonstrate the effectiveness and adaptability of emerging agricultural systems for nutrient and pesticide management, water and air quality protection and soil conservation. Their ultimate goal is changing farming practices in Iowa, resulting in sustainable farm input management and environmental benefits. The efforts of participating producers are being demonstrated to a statewide audience; and information gained is being widely disseminated to producers, agribusiness, educators, researchers, and private and government agencies.

In Fiscal Year 2001, the IFLM program was initially funded at $850,000; however, the legislature deappropriated $500,000. As a result of that 60-percent budget reduction, additional planning was needed and revisions were required to implement the field program and contracts for the first full crop year. With the available funds, a great deal was accomplished through the following projects.

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Producer Focus Groups
Vision 2020, Iowa State University

Four focus groups were conducted at the following location with the number of participants as identified:

- Marion, August 24, 2000, five
- Denison, August 28, 2000, two
- Webster City, August 29, 2000, three
- Creston, August 30, 2000, one

All of the participants are actively engaged in grain farming, ranging between 400 acres and 1500 acres. Some participants have livestock, while other participants do not. All of the participants at Webster City also were seed dealers.

The focus groups were asked three questions concerning input management and environmental benefits in order to get their input on the type of demonstration/information from the production side of agriculture. Participants were asked to record their responses before beginning the discussion in order to give them time to think through the question. Participants verbalized their responses and questions and discussions followed. One thing that became very evident is that Iowa producers have different farming practices and the research needs should be site specific for the soil types and tillage practices. A second aspect to be considered is whether the livestock operations are pasture or confinement operations. The input of the focus groups yields much useable information. The findings have been summarized below.

The input of focus groups yields usable information.

1. **What aspects of agricultural input management (nutrient, pesticide, manure, tillage) offer the best opportunity (through change) for improvement in both economic efficiency of crop production and environmental benefits due to less pollutants lost to the environment?**

- More efficient manure management, especially with larger confinement units
- Tillage, especially no-till which seems to be decreasing throughout the state
- GMO's for decreased chemical and pesticide use
- Decreased use of nitrogen, chemicals, and pesticides (must use recommended rates for service providers to guarantee results)
- GPS service to better manage input needs according to the site
- Education of the general public to let them know that farmers are working towards environmental benefits

2. **Who/what would make me change my fertilizer, herbicide, and pesticide amounts and application processes that would result in less pollutants lost to the environment?**

- Economics, economics, economics – "Someone needs to show me I can profit by using lower rates."
- Balance between society and individual benefits. Farmers don't purposefully pollute or damage the environment. However, they must stay economically viable.
- My service provider and/or agronomist make the recommendations and the guarantees, and I follow them. If service providers would stand behind reduced amounts, farmers would use reduced amounts.
- GPS – pinpointing where specific amounts of nutrients and chemicals are needed. For several of the producers, GPS has already been economically feasible for liming. GPS use needs to be expanded. Once again the benefits have to outweigh the costs.
- Research, for example Leopold Center, Purdue University, Wallace Foundation
- New products, such as GMO crops that need less chemicals and inputs

3. **What information/education should our programs emphasize in order for you to make informed decisions concerning fertilizer, herbicide, and pesticide use that would offer environmental benefits?**

- Non-tillage economic benefits
- Manure economic benefits
- Find out where, how, and why there is water pollution.
- Demonstrations tailored for large farmers, especially those who rent large amounts of land
- Comparisons of system approaches, with and without livestock
- More research on GMO crops
- OK for export markets
- Resistance tolerance of pests
- Impact on environment compared to use of other chemicals and pesticides
- Redesign Custom Applicator classes so they are updated with the latest research and demonstration results.
- Create a website that links with research that is being done.
- Create a list-serve that I can sign up for to send me the research that pertains to my farming type, soil type, and livestock needs.
- Results need to be better published, especially locally

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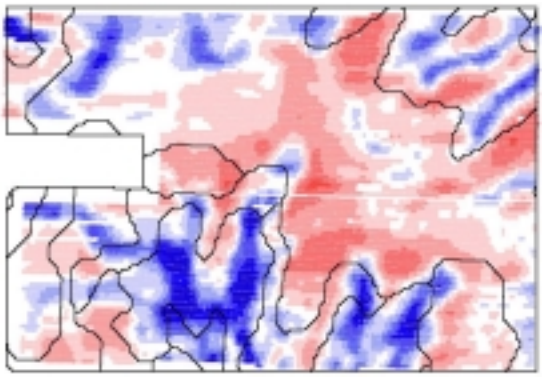
On-Farm Nitrogen Demonstration
Iowa Soybean Association

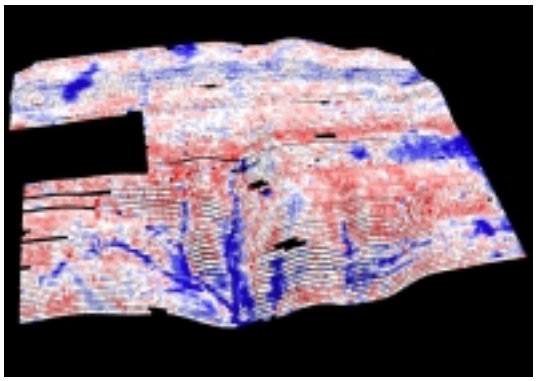
Iowa agriculture is increasingly identified as a primary source of pollution, particularly losses of nitrogen (N) from row crop fields and associated impacts upon local and regional water quality. The form, timing, and application rate of N fertilizers are management aspects that farmers have the ability to control. Effective management of these aspects may minimize negative environmental impacts and increase management efficiency, providing farmers an economic return. Recognizing the need to improve environmental performance, while improving the profitability of farmers, the Iowa Soybean Association, with support from the Iowa Department of Agriculture and Land Stewardship, crop consultants, farmer coops, community colleges, Iowa State University researchers, and the Iowa Soybean Promotion Board, are empowering a network of over 100 Iowa farmers to validate and demonstrate performance of on-farm nitrogen management.



Soil Variation

The purpose of the network is to enable farmers to improve nitrogen management by evaluating their current practice to an alternative or modified management practice. Historic efforts to improve N management have often focused on "telling" and "showing" farmers prescriptions of better management practices (BMPs) and then convincing them to adopt the BMPs. The vision of this effort focuses on enabling farmers to "do" evaluation of alternative practices themselves on their own farms, across entire fields (not small plots), where performance data and information they receive is real world and directly applicable to their situations. The underlying assumption is that farmers who continually evaluate the performance of specific management options will have greater opportunities to "act" upon information and will continue to be more profitable and better stewards of the environment.

To conduct the demonstrations, farmers select management options permitting them to compare the performance of their current practice to a modified alternative that has the potential to increase profitability and environmental performance. Participating farmers were provided financial compensation if their modified practice proved not profitable. For evaluation, farmers utilized a variety of tools, such as Global Positioning System receivers and yield monitors. These tools permit farmers the capability to evaluate yield differences between treatments in replicated strips over 20 acres or more. In addition, tools like color aerial photography, fall corn stalk nitrate samples, and late spring soil N tests were used to collect data and were demonstrated on the majority of the fields. Geographic Information Systems were used to process data providing participants a more clear understanding of management system performance.



Yield Trial

Currently, 37 of the 74 trials showed growers were already applying at least 20 lbs N/a acre less than recommended. Only 13 of the trials had growers applying at least 20 lbs N/acre more than recommended (and 6 of those were economically optimal above the recommended amount). Despite operating within the current BMPs available, the growers involved identified an opportunity for additional improvement by adopting a self evaluation process on their farm. Broad communication and outreach efforts, such as field days, magazine articles, and radio programs, focus on the value of individuals seeing management performance for themselves.

Many of the network participants will continue with their demonstrations for the next growing season. In addition to current participants, the network will expand during Crop Year 2002 to engage 150 participants in more of the counties that are not currently included.

On-farm demonstrations actively engage and educate producers.

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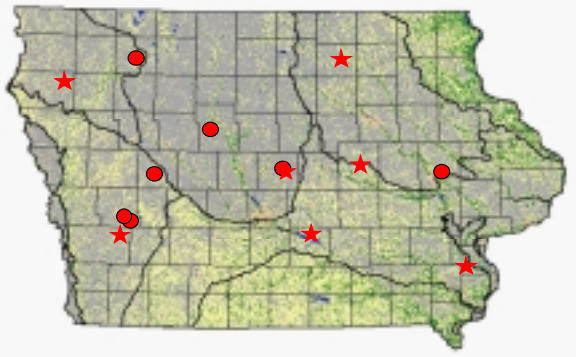
Soil Nitrogen and Carbon Management Project
Iowa State University Extension

Managing soil nitrogen (N) and carbon (C) is important for economical corn production and environmental issues of nitrate movement to water bodies, C sequestration in soil, and carbon dioxide release to the atmosphere. Through on-farm demonstrations this project explores the integral tie between soil organic N and C, and incorporates that relationship into study of corn N requirements, soil N supply, and impacts of N application and soil management on soil C dynamics.



2001 sites. Stars indicate C measurement sites.

Setting appropriate N rates is the greatest opportunity for economic and environmental improvement.

The objectives of this project are: one, demonstrate the importance of soil N supply for corn N fertilization needs and the short- and long-term soil N–C relationships across diverse soils, productivity, and crop management systems; and two, demonstrate the potential of a new soil N test, the Illinois N Soil Test (based on the soil amino sugar organic-N fraction), as a predictor of soil N supply, corn response to applied N, and adjustments to corn N fertilization.

The strategy for this project is to conduct on-farm demonstrations at sites that encompass a range of soil characteristics, tillage, crop productivity, and N application histories. Fourteen sites were identified for the project in 2001, with seven sites specifically identified for soil C sampling and three sites for carbon dioxide flux measurements. A history of N application, manure use, tillage, crop rotation, and yield for each site was obtained from the cooperating producers. The field sites were chosen on criteria of corn after soybean, no manure or primary fertilizer N applied in the fall of 2000 or spring of 2001, and a minimum till or no-till system. Cooperators did not apply N or manure to the area designated for the demonstration site, but the cooperators completed other normal crop management practices. Replicated rates of N (0 to 200 lb N/acre in 40 lb increments) were applied shortly after corn planting to the demonstration area.

Preliminary results show that corn yield level and yield increase from applied N varied considerably between sites in 2001. Overall productivity was high (average maximum yield of 178 bu/acre), with the yield produced with no applied N quite large (average of 153 bu/acre). The measured range in site responsiveness was hoped for the project as this provides a good data set for evaluation of soil N supply, and for this demonstration project evaluation of the new N soil test. In some instances the low yield response to applied N related to producer indicated recent history of N fertilizer application, manure inputs, and management, but not in all cases.

Results of profile soil sampling show the large amount of total C and N in soils, and the variation across the state with different soils and farming practices. The results also show that total C and total N decreases with depth regardless of past history. This analysis trend is typical of Iowa soils. The release of carbon dioxide was measured at the soil surface to monitor the impact of N rate on microbial activity and as an indicator of organic matter decomposition. Higher spring N application rates resulted in higher measured carbon dioxide flux, which indicates that N management can impact C loss and influence the dynamic soil system.

Collecting SPAD meter readings where no N was applied.

Overall the project met and exceeded expectations for the initial year. There were 40 percent more demonstration sites than anticipated; site cooperators and other project partners are excellent to work with; and there is a good range in soils, geographic location, productivity, and tillage for meeting the goals of the project. Seven outreach field days were held in conjunction with ISU Extension and community colleges for local producer and agbusiness groups. Producer interest remains high, and sites are identified for 2002.

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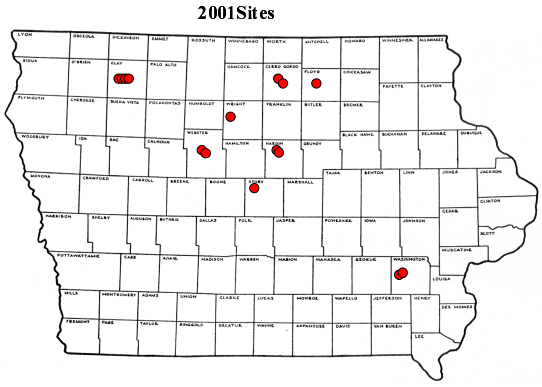
Swine Manure Nutrient Utilization Project
Iowa State University Extension

The goal of this project is to expand knowledge about liquid swine manure nitrogen (N) and phosphorus (P) availability for corn and soybean production in Iowa and to cause change in manure management practices by crop and livestock farmers.

The objectives of this project are: one, work directly with swine producers and custom manure applicators to implement field demonstrations and to calibrate manure application equipment or demonstrate state-of-the-art application equipment – to document current application rates and calibration procedures and share with producers appropriate manure application rates based on their manure analysis, calibration, and tractor speed; two, document crop productivity based on manure N and P nutrients and compare yield and soil test P responses to fertilizer sources; and three, provide information transfer to additional producers and custom applicators via on-farm demonstrations, education programs, and field days (and field signage).



The strategy for this project is to conduct on-farm field demonstrations across Iowa with concurrent data collection to document liquid swine manure N and P availability to crops and compare crop yields with manure to crop yields with commercial fertilizer. In the first two years of the project twenty-three demonstration sites were established in nine counties. Swine manure was applied before corn and soybean crops, and at some sites second-year residual manure nutrient response was monitored. Three field-length manure application strips (strip width matching a multiple of the cooperator's combine header width) are randomized and replicated three times: check = no manure, fertilizer N, or fertilizer P; half = manure applied at a rate to supply approximately half corn N need or soybean grain N removal (75 lb or 100 lb total N/acre, respectively); and full = manure applied at a rate to supply approximately full corn N need or soybean grain N removal (150 lb or 200 lb total N/acre, respectively). Replicated small plots are superimposed within each manure application strip. Four fertilizer application rates of N and P fertilizer are evaluated within the small plots. All other field activities are completed as normal by the cooperator, including grain harvest of the application strips.

Preliminary results show that corn and soybean yield levels and response to manure and supplemental fertilizer varied between sites in 2000. First-year corn yield data suggest that supplementing swine manure application with additional fertilizer N is not a requirement, and a consistent, economical yield response to additional fertilizer will occur only when the manure application does not supply sufficient N to meet corn needs at responsive sites. First-year soybean yield data suggest that swine manure application increases yields on low P-testing soils. Preliminary results from post-harvest soil testing suggest strong correlations between performance of five soil P tests; increases in soil test P resulting from full manure application rates highlight the high crop availability of P in liquid swine manure.

Generally the project has achieved its objectives and exceeded expectations in 2000 and 2001. The number of demonstration sites has increased each year of the project, a trend that is expected to continue for 2002. Field signs indicating the project name, program, and cooperating organizations were located at many sites in 2001. In cooperation with producers, site cooperators, community colleges, IDALS personnel, and ISU Extension eleven outreach field days were conducted in the summer of 2000 and 2001 at the demonstration sites. From January to March, 2001, 968 certified confinement site manure applicators learned about this on-going field demonstration project at 77 certification meetings. Producer interest in the project remains high, and new sites are being identified for 2002.

The project is expected to increase producer confidence in accepting manure as a reliable crop nutrient resource.

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Strip Tillage, Corn Profitability, and Soil Conservation

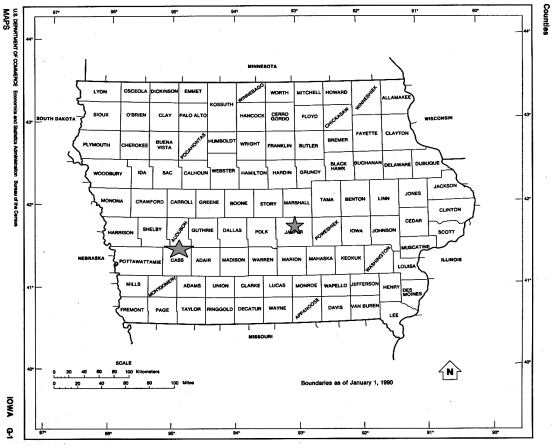
College of Agriculture, Iowa State University

The goal of this project is to facilitate strip tillage adoption for row crop production in Iowa. Many Iowa farmers continue to use tillage systems that result in excessive soil and water loss. Nearly 40% of Iowa's cropped land undergoes tillage practices that leave the surface less than 30% covered with residue after planting.

This project uses tillage demonstrations and outreach at high profile locations to show farm managers, agronomists, and public officials that limiting tillage is more profitable than more intense tillage systems and environmentally more advantageous. The demonstrations focused on a relatively new system – strip tillage – that allows in-row soil tillage while maintaining "no-till" conditions between rows. Farmers, who believe some tillage is necessary for their soil, are being targeted.

The characteristics of this system seem well suited to advance soil and water conservation and enhance profitability of the Iowa farmer – a major goal of IFLM. Financially, strip tillage production costs are estimated to be equal to or less than that for more conventional type systems. Average fall strip tillage corn yields were higher than either conventional tillage or no-till in 2001 at the two different project locations - near Atlantic and Newton.

The value of strip tillage in soil and water conservation could be in the millions of dollars.



★ - Demonstration Sites

If strip tillage were adopted on only one million of the approximately six million acres in Iowa not receiving conservation tillage, potential cost savings, coupled with favorable yields, and soil and water conservation could conservatively be valued at over $5 - $10 million per year to Iowa farmers and public. It is very conceivable that more land 1 million acres will be converted to this system.

Expectations

Expectations of the project are to increase adoption of strip tillage and reduce the use of more intensive tillage systems in Iowa. This will require a sustained effort in that farmers rely on results of these demonstrations over a range of growing conditions to make major changes in their farm management. Demonstrating the economic and environmental advantages is imperative. The results must also be delivered to other farmers and agronomists who manage Iowa's farmland resource. Continued involvement with Monsanto field days, increased activity with Practical Farmers of Iowa, and information delivery through Iowa State University CCA courses is planned.

Outreach

Education occurred through field days, CCA short course credits, and tours. The largest event was held on July 13 at the Atlantic Monsanto farm site. Approximately 600 farmers, agronomists, government agency, and politicians attended this event. Senator Tom Harkin participated in this field day. Other activities directly contacted approximately 200 agronomists, consultants, and farmers interested in the system.

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Hub/Spokes Model of Nutrient Management
Iowa State University

The ISU Northeast Research Farm near Nashua (the Hub) has conducted agronomic research related to soil fertility and nutrient management for the past 25 years, has been considered the premier water quality research site in the Upper Midwest for the past 12 years, and has conducted a well-known Precision Agriculture Demonstration Project for the past 5 growing seasons. Current extension recommendations and public policy related to soil fertility and water quality have been developed from these research findings.

The purpose of this project is to organize similar trials with on-farm cooperators (the Spokes) as an extension/dissemination strategy. The initial effort has focused on nitrogen (N) utilization from manure and commercial fertilizer sources. Manure analysis, the Late Spring Nitrate Test (LSNT) and the Fall Stalk Nitrate Test (FSNT), GPS/GIS technology, and economic response were used to provide cooperators with appropriate information for nutrient management decision-making.

The values of the demonstrations are to: a) increase awareness of and interest in the research work conducted at the Northeast Research Farm, b) confirm research findings on-farm using cooperator farming systems, c) introduce cooperators to the various "tools" used to make nutrient management decisions, and d) demonstrate the economic advantage and environmental impact of various nutrient management practices.

Twelve separate replicated on-farm demonstrations were completed by 9 cooperators in 6 counties. The demonstrations included 6 Manure X N Rate in a C-Sbn Rotation; 2 Manure X N Rate in a C-C Rotation; 2 Commercial N Rate in a C-Sbn Rotation; a N Rate / Time of Application in a C-Sbn Rotation; and N Rate in Corn Following Alfalfa.

Project cooperators made the following observations:

a. On-farm results(Spokes) were generally consistent with research farm results (Hub).
b. Actual manure analysis data varied from common book values.
c. Actual N and P application rates exceeded planned amounts
d. Optimal corn yields can be achieved with manure or alfalfa credits alone.
e. Reduced commercial N rates (50-60# less than the cooperators normal rate)produced optimal corn yields.
f. The Late Spring Nitrate Test results require interpretation based on application methods, materials, timing and weather conditions.
g. Differences in Fall Stalk Nitrate Test results were generally consistent with yield differences.

Nutrient management topics and site tours were included in five summer crop tours/field days attended by over 600 people. Ag students at Riceville High School, Charles City High School and Hawkeye Community College were cooperators and took an active role in sampling, data collection and data interpretation. Research and cooperator results were included in project newsletters, on extension websites, and in crop clinic/crop conference presentations.

Project cooperators will be included in an ISU Documentation of Change study of all IFLM participants.

An expanded Hubs and Spokes Project involving N Rates X Tillage Systems has been funded for 2002. The project for Crop Year 2002 expects to build on this year's success.

The purpose of this project is to organize an on-farm cooperator dissemination strategy.

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IFLM Program Crop Year 2002

In Fiscal Year 2002, $850,000 was appropriated for the IFLM program. The following thirteen projects have been funded for Crop Year 2002, includeing demonstrations in over half of Iowa's counties, as well as several statewide initiatives.

Assessment Tool: An assessment tool will be developed through which farm operators will analyze their operations to gain a better understanding of all of their resources and practices. In turn, the operators and agronomy service providers will have an increased awareness of the integrated approach to systematic resource management.

Baseline Data: This component will summarize and interpret the 2000 corn and soybean production data obtained through USDA to provide a baselines to determine the efficacy of the alternative IFLM demonstration projects. Three major categories of farm input management will be summarized: 1) fertilizer, including nitrogen (N), phosphorus (P), and pottassium (K); 2) pesticide usage; and 3) tillage operations.

Certified Environmental Management Systems for Agriculture (CEMSA): This will include coordination with participants in the On-Farm Demonstration Network, preparation of five-ten agricultural Environmental Management Systems (EMS) prototypes, preparation of case studies and factsheets, and development of outreach strategies.

Cover Crops System: Three producers in Allamakee County will establish demonstrations of cover crops using two different varieties and three different planting dates and rates. These demonstrations will show farmers the soil saving and agronomic advantages of a cover crop system.

Documenting Change: This project will assess changing public perceptions of environmental issues and establish benchmark measures to assess the effectiveness of the IFLM program in protecting Iowa's soil and water resources from risks associated with crop and livestock production.

Eastern Iowa Tillage and Manure Management: Nutrient and tillage demonstration sites will be established in the Elk River, Lower Deep Creek and Mineral Creek Watersheds. Demonstrations will focus on strip tillage and sub-surface placement of P and K fertilizers compared to conventional corn production practices in order to reduce sediment movement from crop fields. Additional demonstrations will focus on refined manure, P and N management, yet maintain corn yields and improve farm profitability, by reducing commercial fertilizer inputs.

Hub and Spokes Manure Delivery Model: The NE Research Farm, "the Hub", will demonstrate three tillage systems consisting of no-till, conventional tillage, and strip-tillage with narrow strips or ridge-till. Three different manure rates and three commercial N rates will be applied. Producer sites, "the Spokes", across northeast and central Iowa will demonstrate the same treatments.

On-Farm Manure and Nitrogen Demonstration Network: The Network enables 100-150 farmers to improve nitrogen (N) management by evaluating their current practice to an alternative or modified practice. The underlying assumption is that farmers who continually evaluate the performance of specific management options will have greater opportunities to act upon information and will continue to be more profitable and better stewards of the environment.

Producer-Oriented Tillage Demonstration: Seven sites will be located around Iowa to demonstrate the differences among fall versus spring tillage systems on corn and soybean production. An additional intensive research site is located at Ames to provide detailed measures on the surface changes under different tillage systems and the agronomic impact. The goal is to demonstrate how reduced tillage can provide both an economic and environmental benefit.

Soil Nitrogen and Carbon Management: Project sites will demonstrate: 1) the importance of soil N supply for corn N fertilization needs and the short and long-term N-carbon (C) relationships across diverse yield, soil and crop management systems; and 2) the potential of a new soil N test as a predictor of the soil N supply and corn response to applied N.

Soil Properties and Interpretation Data: This project will maintain and update the Iowa SPAID in a current and useable form. The results are available to IFLM project coordinators, agricultural producers and service providers, and others in the public and private sectors.

Strip Tillage Effects on Crop Production: The purpose of this project is to increase adoption of strip tillage by demonstrating the crop production and environmental benefits of strip tillage for row crop production. Demonstrations consist of strip tillage, conventional tillage, and no-tillage systems. Early season measurements will include soil moisture, soil temperature, and crop growth. Production costs, crop yields, and profit/loss for each system will be determined. Water runoff and erosion measurements will be recorded.

Swine Manure Nutrient Utilization: The objectives of this project are to: 1) work with swine producers and custom manure applicators on demonstrations to calibrate manure application equipment or demonstrate state-of-the-art application equipment to document current application rates and calibration procedures and share with producers appropriate manure application rates based on their manure analysis, calibration and tractor speed; 2) document crop productivity based on manure N and P nutrients and compare to fertilizer sources; 3) provide information transfer to additional producers, landowners, and custom applicators via on-farm demonstrations, education programs, and field days; and 4) update manure management planning information as data warrants.