



# FPPC

Farm Pilot Project Coordination, Inc.  
"Technologies for Nutrient Management"

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**TO:** Mr. William Boyd - Leader, Manure Management Team, ENTSC - NRCS

**FROM:** Bob Monley, General Manager, FPPC  
Aimee Walker Thomas, FPPC Administrative Program Manager

**COPY:** Elvis Gravis, NRCS, Acting Director, ENTSC  
Jeff Porter, NRCS – Manure Management Team, ENTSC  
Bruce Newton, NRCS - Director WNTSC  
Dr. Emil Horvath, NRCS, Acting Director CNTSC  
Richard Salem, Executive Director & Board Chairman, FPPC  
Jule Doran, FPPC Controller  
Dr. Robert Carnahan, FPPC Board Director  
Robert Zaytoun, FPPC Board Director  
Hilliard Eure, FPPC Board Director  
Lawrence Clark, FPPC Board Director  
Preston Burnette, Research Engineer  
Fernando Faria, FPPC President  
Jane Corson Lassiter, NRCS/FPPC Regional Director  
Aimee Walker Thomas, FPPC Program Manager  
Joe Petrucce, Senior Engineer

**RE:** 2<sup>nd</sup> Quarter Report for April 1, 2012 to June 30, 2012

This report is intended to update the NRCS and the FPPC Board of Directors on the status of the innovative technology pilot projects.

## Executive Summary

The screening effort to find the best of the best plant nutrient methodologies from 40 white papers submitted have resulted in 3 top tier proposals. These proposals have been rewritten into full proposals and are being targeted for funding. FPPC has submitted a proposed amendment to the 2010 Cooperative Agreement to reflect the timetable needed to perform adequate crop trials.

Analysis of the SC gasifier project has revealed significant problems in the energy balance of the system resulting in insufficient BTUs available for transfer to the ElectraTherm unit. A third party analysis is being sought to help factor the varying technical opinions about the capacity of the gasifier.

**OPERATIONS** .....

## 1. Full Proposals targeted for funding include

### **PROJECT PROPOSAL #1**

#### ***“Impact of Cover Crops, Nitrogen Timing, and Nitrogen Source on Nitrate-Nitrogen Export”***

Iowa State University

Project Team: Matthew J. Helmers, Ph.D.; Daniel Andersen, Ph.D., E.I.T.; Xiaobo Zhou, Ph.D., E.I.T.

Hot Spot: Iowa & Mississippi River Basin affecting Hypoxic Zone in Gulf of Mexico

#### **Proposal Summary**

Corn and soybean producers in Iowa and throughout much of the United States corn belt are increasingly challenged to maximize crop production to supply feed, fiber, and more recently biofuels (especially ethanol from corn) while at the same time managing soils by utilizing fertilizers and animal manures efficiently and minimizing negative impacts on water quality. In particular, there is concern about nutrient export from subsurface drainage and surface water runoff to water systems in Iowa and the Gulf of Mexico. In an effort to reduce the areal extent of the hypoxic zone, the 2001 Hypoxia Plan called for a 30% reduction in N loads to the Gulf of Mexico. More recently, the EPA SAB's 2007 hypoxia assessment identified both N and P as major contributors to the Gulf hypoxia and the 2008 Action Plan called for a dual nutrient strategy of 45% reductions in both N and P loads.

#### **Project Objectives**

1. Determine the effects of nitrogen fertilizer application timing on nitrate-N leaching losses along with the potential impacts on crop yield;
2. Determine the effects of nitrogen fertilizer source on nitrate-N leaching losses along with potential impacts on crop yield;
3. Determine the effects of cover crops (annual and perennial) on nitrate-N leaching losses and crop yield; and
4. Compare the nitrate-N leaching losses and crop yield in a no-till system to a conventional tillage system.

This project is leveraging other funds to ensure project completion. Specifically the Climate and Corn-Based Cropping Systems Cap is providing partial funding for collection of data on the impacts of tillage and cover crops on nitrate-N loss. The Iowa Department of Agriculture and Land Stewardship is providing funding to be used to aid in data collection and analysis. FPPC has requested ISU share Phosphorous data also if/when available.

Iowa State proposes an evaluation period through the end of 2014.

### **PROJECT PROPOSAL #2**

## ***“Reducing Nitrous Oxide Emissions in Corn Production by Optimized Manure and Fertilizer N Applications Combined with Nitrification Inhibitor Use”***

Purdue University

Project Team: Tony J. Vyn, Ph.D.; Brad C. Joern, Ph.D.; Rex A. Omonode, Ph.D.

Hotspot: Indiana Corn Belt – Wabash River, Mississippi River Basin

### Proposal Background and Summary

Liquid fertilizers such as urea ammonium nitrate (UAN) and manure are some of the most common sources of nitrogen (N) used for corn production in the Midwest Corn Belt. However, excessive application of these fertilizers has been shown to negatively impact water and air quality through N losses to surface and ground water, and nitrous oxide (N<sub>2</sub>O) emissions from soil-to-atmosphere. Depending on the source, timing and method of application, up to 7 kg/ha of N can be lost as N<sub>2</sub>O emissions for every 100 kg of N applied (more commonly, 1 to 3% of the N fertilizer applied). In extreme cases, total N<sub>2</sub>O-N losses of up to 47 kg N ha<sup>-1</sup> (equivalent to 38% of NH<sub>3</sub> fertilizer applied) have been reported.

For all the experiments, N<sub>2</sub>O emissions from treatment plots will be measured using the vented chamber procedure. Soil samples from the zone of application will be collected from the top 30 cm. soil depth in each treatment plots before and immediately after treatment application (time zero), and weekly thereafter for up to 12 weeks. Nutrient use efficiency will be assessed by the difference in corn N uptake (whole-plant and grain alone) and/or quality of grain produced due to the different treatments. Greater or similar N uptake and/or grain yield at lower than current recommended N rates when these are applied with Instinct™ would indicate greater NUE.

Deliverables will include valid research data on rates of soil N mineralization following UAN and swine manure applications, seasonal/cumulative N loss at N<sub>2</sub>O from swine manure applied at different timings, optimal UAN rate to both simultaneously reduce N<sub>2</sub>O, improve NUE and/or corn yield as affect by Instinct™ amendment.

### Project Objectives

1. Effect of timing of application of swine manure with and without Instinct™ on soil mineral N cycling (e.g. nitrification) and N<sub>2</sub>O emissions;
2. Optimal N fertilizer application rates that simultaneously reduce N<sub>2</sub>O emissions and maintain or improve corn NUE; and
3. Effect of tillage and Instinct™ applications on N<sub>2</sub>O emissions from banded UAN during corn production.

## ***“Integrated Nutrient Management for High Yield Corn in a Poultry-Grain Production System”***

University of Maryland / University of Delaware

Joshua M. McGrath, Ph.D. - University of Maryland

Hong Li, Ph.D.; J. Thomas Sims, Ph.D.; Amy L. Shober, Ph.D. – University of Delaware

Hot Spot: Chesapeake Bay Watershed – Delmarva Peninsula

### Project Background and Summary

To achieve high yields with minimal environmental impact requires very efficient nutrient management practices in Delmarva, where soils are sandy and highly leachable and shallow groundwater is hydrologically connected to ecologically sensitive surface waters. NH<sub>3</sub> emissions from the poultry houses in the Chesapeake Bay region are being considered for their impact to water quality and given the increasingly high costs of N and documented concerns about nitrate contamination of ground and surface waters on Delmarva, strategies and technologies that optimize N use efficiency using the 4R's (right source, rate, time and place) are critical.

Delmarva is also the site of one of the most geographically concentrated poultry industries in the USA, producing upwards of 600 million broiler chickens per years. The poultry litters (PL: manure and bedding) generated are valuable fertilizers which can increase yields therefore overall nutrient use efficiency compared to inorganic fertilizer alone.

### Project Objectives

1. Evaluate the combined potential of ammonia control technologies for poultry litter, subsurface placement of poultry litter with Nitrapyrin, and sensor-guided variable rate N application to increase N use efficiency and attain high irrigated corn grain yields
  - a. Ammonia control technologies (ACT) will be used to mitigate NH<sub>3</sub> loss from litter in the poultry houses
  - b. The poultry litter subsurfer is a new approach to inject poultry litter into the soil
  - c. “Greenseeker technology” is a sensor technology uses a sprayer mounted sensor to guide in real time a variable rate N application at side-dress
2. The effect on N use efficiency in irrigated corn production will be evaluated using appropriate statistical approaches.

This project will require crop evaluation through the end of 2014.

2. A request to modify the 2010 Cooperative Agreement has been submitted for review.
3. Jane Lassiter participated in a visit to Ireland hosted by Enterprise Ireland (Irish Government). This delegation included and focused on poultry to energy system deployed by BHSL in the UK and Ireland.
4. The efforts to resolve the energy problems at the Marc Marsh farm included having the designer visit the site for an inspection of equipment, restart with system optimized for maximum gasifier output and a lowering of the energy threshold of the ElectraTherm unit.

To date these efforts have not been effective at matching the gasifier output with the ElectraTherm input energy needs.

FPPC entered into an agreement with NC State to develop a model that would better predict performance of the gasifier. This model appears to show promise for a multitude of thermochemical processes.

5. Recent staffing changes have included the addition of Joe Petrucce, who has joined the FPPC team as a Senior Engineer.

**Progress at active pilot demonstration sites is summarized below.**

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**Emissions and Nitrogen Capture (#6.08)**-----

**Project purpose:**

The objectives of this project include:

- Identify the benefits of land application of Bio-char and its effect on crops and soil health (carbon sequestration, water retention, etc.);
- The application of Nitrapyrin to help stabilize nitrogen when poultry litter is applied and its ability to slow migration; and
- The characterization of ammonia adsorption using Bio-char as an activated or non-activated sorption media and evaluation of its utility in swine and poultry house

**Project Status:**

Biochar testing conducted by Dr. Reddy, North Carolina A&T has ended and results are expected in November.

**Thermal Energy from Dry Waste (#6.12)**-----

**Marc Marsh Farms, South Carolina**

**Project purpose:**

To harness the energy value of poultry litter utilizing gasification and poultry litter as a fuel. Electricity will be produced to offset ventilation/cooling costs for the farm.

**Project status:**

Gasification/Heat exchanger system continues to operate intermittently due to hurdles encountered. Testing and data collected is limited to when the system is operating continuously. Major issue that is being dealt with is the operation of the heat exchanger as it affects the draft of the gasifier.

A full system documentation was conducted by FPPC now that the system is complete.

Final connections to the electric company's grid are projected for mid-October and visitor Field Day projected for mid-November.

**Thermal Energy and Ash By-Product (#6.09)**-----

**Old Mills Farm, Virginia**

**Project purpose:** Phase I -To derive energy and nutrient benefits by gasifying poultry litter and converting the sterile Phosphorous rich ash into a manageable by-product that can be utilized as a pathogen free fertilizer for the nearby tomato and vegetable crop. The intent is to reduce the typical poultry litter land application in Delmarva by converting the gasified phosphorous rich ash to a viable pathogen free fertilizer for the nearby vegetable crop.

**Project status:**

Project has received funding to continue work, scope of work to be finalized in the fourth quarter.

**Effluent Treatment Methods (#6.07A) -----  
Multiple dairy sites, Florida**

**Project purpose:**

Develop a graded approach for treating liquid waste utilizing a cost effective system composed of incremental solid separation steps. Multiple pieces of equipment will be linked and connected into an optimum system and will rely primarily on low cost mechanical solids separation methods. The contribution from each piece of equipment will be determined based on the amount of solids and nutrients removed from the liquid waste stream.

**Project Status:**

The system was run at two increased flow rates, 14 and 21gpm. The 14gpm run was as clear as the standard 7gpm runs. Since the 21gpm run was not as clear, a set of samples was sent to AEL to run the standard testing procedures to determine the effectiveness of the higher flow rate.

This begs the question, “what has changed in the last 4 weeks?” The only thing is that perhaps the farmer has changed the feed to the animals. Even though this is not very unusual it is surprising that this change has allowed for the system to run at a higher feed rate. The potential feed change has not been verified with the landowner.

The large tank, scraper and associated plumbing have been removed from the trailer system. The old tank will remain at the farm until a decision has been made as to whether the new tank is performing at an optimal level.

The new tank from Glenn Industries has been delivered to the trailers at M&B Dairy. The installation started the following day. The tank was placed on the trailer in the location as the original large tank in an effort to take advantage of the off trailer plumbing and the scraper supports. Support brackets were added to the vertical scraper supports which were modified horizontally which allowed for use of the scraper on the small tank. If the decision is to stay with the small tank, it can easily be removed. By modifying just the cross support FPFC will be able to keep all of the other components in place for a quick change back to the old tank style. There are slight difficulties arising from reusing some of the fittings from the old tank; they appear to have been over tightened during the original installation. Replacement parts should arrive shortly. The next steps will include design and testing of a floating intake and solids capture for scrape dairies.



Before removal of 52 in tank



Tank & Frame removed.



Preparing to lift New Tank.



Deck view of separator





Feed & Effluent flows



Sludge & Effluent flows



Feed nozzle in separator

## Attachment A

Final report status of twenty (20) completed pilot demonstration projects is listed below:

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- A. Swine, North Carolina -----**  
**Super Soil Systems, USA (#3.09)**  
**Goshen Ridge Farms, LLC - in Clinton, NC**  
*"Solids Removal System to Reduce Environmental Impact of Swine Production"*  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- B. Swine, North Carolina -----**  
**Air Diffusion Systems (#3.02)**  
**Cavanaugh Farm No. 1 - swine farm in Wallace, NC**  
*"Advanced Microbial Treatment System (AMTS) at Cavanaugh Farm No. 1"*  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website
- C. Swine, Iowa -----**  
**Global Resource Recovery Organization (GRRO) (#3.05)**  
**Burt Farm & Livestock Co. - swine farm in Marshalltown, IA**  
*"Pork Nutrient Management Demonstration"*  
**Report Status:** The final report has been reviewed, issued and is posted on the FPPC website.
- D. Dairy, Florida -----**  
**Royal Consulting Services, Inc. (#3.08)**  
**Posey Dairy in Lake Placid, FL**  
*"Florida Dairy Nutrient Management Demonstration"*  
**Report Status:** The final report has been reviewed, issued and is posted on the FPPC website.
- E. Poultry, North Carolina -----**  
**McGill Environmental Systems (#3.06)**  
**Farms in Sampson County, NC**  
*"Nutrient Management Technology for Animal Feeding Operations"*  
**Report Status:** The final report has been reviewed, issued and is posted on the FPPC website.
- F. Poultry, North Carolina -----**  
**Cape Fear Resource Conservation (#3.03)**  
**Central Processing Facility in Duplin County**  
*"Demonstration Optimum Fertilizer of Ash from the BEST Solution for Swine and Poultry Manure Management"*  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.

- G. Poultry, North Carolina -----**  
**Mountain Organic Materials (MOM) (#3.10)**  
**Randy Johnson and David Parsons Farms, Wilkesboro, NC**  
*“Demonstration of Poultry Manure and Mortality Forced Aeration Composting Bin Systems”*  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- H. Poultry, Alabama-----**  
**Renewable Oil, Inc. (ROI) (#3.07)**  
**Mills Poultry Farm in Russellville, AL**  
*“Demonstrating BioOil Technology for Poultry Litter Nutrient Management”*  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- I. Poultry, Texas -----**  
**RMG Strategies, Ltd and Microorganics (#3.11)**  
**Jacobs Ranch in Carmine, TX**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- J. Dairy, Florida -----**  
**AJT/Agrimond (#3.01)**  
**Watson Dairy in Trenton, FL**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- K. Dairy, Wisconsin -----**  
**Skill Associates – Phase I & II(#5.08)**  
**Weise Farms in Greenleaf, WI**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website
- L. Dairy, Florida-----**  
**Royal Consulting, Inc. (#4.01)**  
**Butler Oaks in Lorida, Florida**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- M. Dairy, Florida -----**  
**QED Occtech (#4.02)**  
**Branford–DPS Dairy in High Springs, Florida**  
**Report Status:** The final report is currently under review to be re-posted on the FPPC website.
- N. Dairy, Florida-----**  
**Chemical Lime Co. (#3.04)**  
**Aprile Dairy in Riverview, Florida**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.

- O. Swine, Iowa-----**  
**Global Resource Recovery Organization, Inc. (#3.13)**  
**Mobile Deployment System, Eldora, Iowa**  
**Report Status:** The final report has been reviewed, issued and posted on the FPPC website.
- P. Dairy, Colorado -----**  
**Applied Chemical Magnesias Corp. (ACM) (#3.12)**  
**Bella Holsteins, Inc. in Platteville, Colorado**  
**Report Status:** The final report has been issued, reviewed, and posted on the FPPC website.
- Q. Dairy, Utah-----**  
**Utah State University (#5.4.04)**  
**Blaine Wade Dairy near Ogden, Utah**  
**Report Status:** A final report has been issued, reviewed, and will be posted on the FPPC website.
- R. Dairy, Vermont-----**  
**AWS, LLC (#6.02)**  
**North Williston Cattle Company (Whitcomb Farm)**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- S. Dairy, New York-----**  
**AWS, LLC (#5.05)**  
**Noblehurst Farms**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- T. Dairy, Vermont -----**  
**BioProcess Technologies (#5.02)**  
**North Williston Cattle Co.**  
**Report Status:** A final report has been issued, reviewed, and is posted on the FPPC website
- U. Swine, Illinois-----**  
**Enviowaste Technology, Inc. (#4.09)**  
**Rensing Family Farms, Inc.**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- V. Swine and Dairy, Michigan-----**  
**Phase 3 Developments & Investments, LLC (#6.06)**  
**Geerlings Hillside Farm**  
**Report Status:** A final report has been issued, reviewed and posted on the FPPC website.

- W. Dairy/Mixed Waste, California-----**  
**Agricultural Waste Solutions, Inc. (#5.06)**  
**Inland Empire Municipal Site, Chino**  
**Report Status:** A final report has been issued, reviewed and posted on the FPPC website.
- X. Swine, North Carolina-----**  
**Super Soil Systems USA (#4.05)**  
**Goshen Ridge Farms in North Carolina**  
**Report Status:** A final report has been issued and is currently under review.
- Y. Dairy, Ohio-----**  
**Crossroads RC&D / Wastewater Services, Inc. (#4.07)**  
**Andreas Farm, Royer Farm**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- Z. Dairy, Virginia-----**  
**Virginia Dairymen's Association (#4.15)**  
**D&D Dairy, Dayton, Virginia**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- AA. Dairy, Pennsylvania-----**  
**Nutrient Control Systems, Integrity (#5.07)**  
**Mercer Vu Farms in Mercersburg, Pennsylvania**  
**Report Status:** The final report has been reviewed, issued and is posted on the FPPC website.
- AB. Dairy, Texas -----**  
**Reaction Energy Corp. (#4.16)**  
**Fisher Dairy, Yantis, Texas**  
**Report Status:** A final report has been issued, reviewed, and posted on the FPPC website.
- AC. Dairy, Florida -----**  
**Pretreatment Methods and Evaluation (#5.12)**  
**Report Status:** A final report has been drafted and is being reviewed.
- AD. Swine, Hawaii -----**  
**Limited Resource Farm – University of Hawaii (#6.13)**  
**Janong Natural Farms, Kurtistown, Hawaii**  
**Report Status:** Final report is being reviewed for posting on FPPC website.
- AE. Poultry, Wisconsin -----**  
**R&J Partnershi[ (#5.04)**  
**Creekwood Farms, Lake Mills, WI**  
**Report Status:** Project report is being drafted.
- AF. Dairy, Florida -----**  
**White Technologies Inc – US Environmental Products Inc. (#5.09)**

**North Florida Holstein, Bell, FL**  
**Report Status:** Project report being drafted

**AG. Dairy, Florida -----**  
**FPPC Polymer Study (#5.09a)**  
**North Florida Holstein, Bell, FL**  
**Project Status:** Project report is being written.

**AH. Swine, Iowa -----**  
**Puck Custom Enterprises (6.4.03)**  
**Project Status:** Awaiting report and review

**AI. Swine, North Carolina (#6.4.14)**  
**North Carolina A&T**  
**University Farm, Greensboro, North Carolina**  
**Report Status:** A final report has been issued, reviewed, and to be posted on the FPPC website.

**AJ. Dairy, Florida -----**  
**FPPC Effluent Treatment Methods (#6.07)**  
**M&B Dairy, Lecanto, FL**  
**Project Status:** Final report is being written  
**Dairy, Florida (#4.12 and project 6.03)-----**

**AK.AWS, LLC and FPPC**  
**Dual purpose pellets derived from dairy solids**

**Process description:**

- FPPC will work with AWS, LLC to develop a mobile pellet plant leveraging the knowledge gained during the previous belt press demonstrations.
- Dual use pellet is for either fuel or fertilizer
- The system will consist of a belt press, pelletizer and fluidized bed dryer.

**Project Status:**  
Developing the final report is still in progress.

**AL.Poultry, Virginia (#6.4.06)-----**  
**Virginia Polytechnic Institute and State University**  
**Heatwole Poultry Farm**

**Process Description:**

- Pyrolysis conversion of poultry litter to bio-fuel oil and bio-char
- Unit employs a fluidized bed and modern controls for managing the system operation

**Project Status:**  
Project ending final report to be written.