



FPPC

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

January 3rd, 2007

To: Mr. William Boyd - Leader, Manure Management Team
East National Technical Support Center - NRCS

From: Bob Monley, General Manager, FPPC, Inc.

Copy: Carolyn Adams, NRCS – Director ENTSC
Jeff Porter, NRCS – Manure Management Team, ENTSC
Bruce Newton, NRCS - Director WNTSC
Ron Williams, NRCS - Director CNTSC
Richard Salem, Executive Director & Board Chairman, FPPC Inc.
Robert Zaytoun, FPPC Board Director
Dr. Robert Carnahan, FPPC Board Director
Hilliard Eure, FPPC Board Director
Susan McLoud, NRCS - Manure Management Team, ENTSC
Sara Royer, FPPC Treasurer
Frank Bordeaux, Executive Director – N.C. Agricultural Finance Authority
Peter Hubbell, Principal - Water Resource Associates
Frank Lancaster, N.C. Agricultural Finance Authority
Lauren Seigel, FPPC Operations Associate
Dudley Voorhees, FPPC Field Coordinator

Re: Quarterly Report for period from October 1st through December 31st, 2006

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

Executive Summary

Since the last report, FPPC has issued another request for proposal with responses due February 15th, 2007. To achieve a better balance, this RFP encourages greater participation from technology providers at poultry and swine farm sites and deemphasizes dairy farm applications. At the same time, FPPC is formulating a separate RFP aimed at technologies that are more appropriate for the limited resource farmer.

To date, FPPC has completed eleven (11) pilot demonstrations and is currently reviewing drafts of five (5) final reports. In addition, FPPC is currently pursuing another nineteen (19) approved initiatives in eight additional states.

OPERATIONS -----

1. **Additional staffing:** In November, Ms. Shetal Patel accepted a position with FPPC to help spearhead the business opportunities for application of commercial waste treatment technologies. Shetal has a Bachelors degree in chemical engineering as well as an M.B.A. As FPPC's Business Development Manager, Shetal will be initially focused on evaluating economic viability and particularly on second generation projects.
2. **Nutrient Management Workshop:** In early November, FPPC and the NRCS conducted an interdisciplinary workshop for the purpose of evaluating the effectiveness of alternative manure treatment systems. A total of 46 states and US territories were represented by the NRCS at this event. Dr. Robert Burns, on sabbatical with the NRCS from Iowa State helped organize and lead this event. This event provided technical information to environmental engineers and an interactive forum for discussing technology provider claims. This discussion examined to what extent various systems or unit processes are likely to capture or reduce nutrients in the waste stream. It is anticipated that as a result of the workshop and the NRCS networking experience it will be easier to assess alternative treatment systems as well as encourage more pilot demonstrations in each region. A mini session is being planned for the FPPC Board of Directors in the first quarter of 2007.
3. **Board action:** The FPPC's Board of Directors met in early December to discuss the current status of pilot projects.
 - The results of the recent Phase I testing at the Wisconsin dairy were presented by Skill Associates and an additional \$300,000.00 in funding was approved for continued development of the manure burner at the Wiese Farms.
 - The proposed demonstration and development of NutraCycle's belt press proposal was reviewed based on site visits having been made. A reduced scope and deployment at existing dairy sites where the FPPC project infrastructure already exists was favored over development of a new demonstration site. Scope agreement with NutraCycle and negotiations are being pursued.
 - The Board was advised of promising new initiatives and continuing University sponsored research from the state of Utah. This research is aimed at energy alternatives and the production of bio-oil. Conly Hansen's recent proposal was judged technically premature but will ultimately build on the favorable experience at an established FPPC demonstration dairy site. Current development efforts are being directed at designing an appropriate larger scaled system and will be reconsidered by FPPC for farm scale application in the near future.
 - The Board also revisited its prior decision to pursue joint venture partnerships with second-generation technology providers and third-party technology providers in an effort to accelerate the market testing of economically feasible systems. A decision was made and the Chairman and General Manager were requested to work with counsel in restructuring this approach. The FPPC Board approved, in concept, a multi-year omnibus contract with Clean Water International, Inc., a support subsidiary, to be provided up to \$5 million for use in licensing, integrating, deploying, and operating technology systems that represent complete "solutions set". The initial term of the contract will be for three years, subject to

extensions and increases in funding levels, from time to time. Clean Water International will submit projects for review to FPPC's Professional Review Panel with approval by its Board prior to funds being disbursed pursuant to the contract.

The NRCS is reviewing to assure that proper funding authorization exists and to determine the best means of implementing this concept.

4. **Innovative Environmental Technologies Symposium:** FPPC has been invited to speak at an upcoming symposium in February. The symposium is being hosted by the Virginia Cooperative Extension to discuss cost effective nutrient solutions for economic viability, optimum agronomic use, and the future of agriculture. The target audience will be dairy and poultry producers of the Chesapeake Bay area facing nutrient management issues.
5. **Technology Summit:** FPPC has begun the initial planning for the 2007 Technology Summit. The Summit will be held at the Renaissance Vinoy Resort in St. Petersburg, Florida on May 9-11, 2007. The negotiated group rate will meet the established government per diem rate for the area.

I. Progress at the active pilot demonstration sites is briefly summarized below:

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Dairy, Florida (#4.02) -----
QED Occtech
Branford–DPS Dairy in High Springs, Florida

The process includes:

- The treatment system will capture nutrients from the waste stream of the 2050 dairy cows by combining QED’s tangential flow separator, nitrification, denitrification and composting methodologies. The entire system is designed to accommodate new free stall barns with flushed systems
- Will take advantage of a new sand separator
- Double - slope screen solid separator
- Activated sludge biological treatment
- Takes advantage of two in-vessel drum composters

Project Status:

The flush system is not yet operable and so treatment is intermittent but is running in a batch mode. With the ability to operate the waste treatment system, results of the initial sampling should be available in January. The composting system (not a QED/FPPC) is currently being commissioned.

Dairy, Florida (#4.01) -----
Royal Consulting, Inc.
Butler Oaks in Lorida, Florida

The process includes:

- This dairy project seeks to capture nutrients in the phosphorus rich watershed next to Lake Okeechobee
- Solids are collected in a vat separator and is subsequently effluent is decanted and treated chemically.
- Solids are harvested and introduced into an in-vessel composter. This compost will be marketed as a peat substitute by South Dade Soil and Water Conservation District.

Project Status:

FPPC conducted a site visit to the farm in October.

The system, including the drum dryer, is now 100% operational; however, portions of the manure solids and sludge were too wet to be directly added to the mix. In October, Royal Consulting began adding ground wood chips to the soil amendment. This reduces the overall moisture of the input recipe thus meeting the desired moisture. The wood chips are a byproduct of a local grinding facility and can be added to the soil amendment at little cost. Other proposed additions include grass clippings from nearby turf operations; these would be used in a similar fashion to the wood chips.

Royal Consulting returned the screw press to the manufacturer since it did not perform as specified and was not being used. A gas heater was purchased for experimentation to assist

drying in the digester. Experiments to define different methodologies for manure drying, including but not limited to dehumidifying the air, will be conducted in the coming months.

Swine and Poultry, Iowa (#3.13)-----
Global Resource Recovery Organization (GRRO)
Next generation system

The process includes:

- System will incorporate dry manure transfer and or bolt on technologies that help to offset the cost of the tempest dryer removing the greatest share of moisture
- Pre-Separation Cyclone (liquid removal)
- Modular designed cyclonic drying system (Tempest dryer) on modular mobile platform
- Development of value added/commercial grade product - slow release fertilizer.

Project Status:

GRRO has almost completed the rebuild of their Tempest dryer. The only additions left are the wiring and the addition of the supports and cables. GRRO anticipates the completion of the dryer by January.

Currently, GRRO has initiated conversations with a California based company to test the dryer on poultry sites during the winter months. This testing will include poultry manure mixed with byproducts from the production plant. GRRO will also test the dryer on cheese waste from another facility nearby. Once these tests are complete the dryer will return to Iowa for testing of hog manure at a local facility which has a scrape system in all barns

Dairy, Utah (#4.04) -----
Utah State University, Center for Profitable Uses of Agricultural Byproducts
Blaine Wade Dairy near Ogden, Utah

The process includes:

- This system utilizes an existing induced blanket reactor (IBR) type of anaerobic digester converting organic carbon in the manure to methane and carbon dioxide.
- The (IBR) effluent will be treated by a new electro-coagulation unit.
- Individual contributions of nutrient reduction of the screw press, settling basin and the electro-coagulator units will also be quantified.

Project Status:

Conly Hansen has begun drafting the final report recognizing that the electro-coagulator continues to be interrupted with the need for excessive maintenance caused by the solids carryover from the digester. Based on the problematic operation, Conly has requested deploying an available Houle solid separator, available on site, as a pretreatment means of eliminating the solids problem. This no-cost request is a change of scope which is currently being evaluated.

Swine, Kansas (#5.01) -----

QED Occtech

Springer Farms in Independence, Kansas

The process includes:

- A nutrient management system designed for a waste stream for total 3000 animals from sow to finish
- Combines a special designed tangential flow solids separator with solids feeding a composting operation
- Treatment will have sufficient capacity to allow cleanup of the existing lagoons
- Treated effluent water will allow recycling of water instead of use of fresh well water
- Clean water will favorably affect production costs by lowering mortality

Project Status:

A meeting was held in Tampa on December 6th to review project status and to discuss the need to evaluate the economic viability of the 2nd generation technology. FPPC and QED will follow-up in January and complete their analysis in the 1st quarter of 2007.

Status on farm site:

- preliminary design, civil engineering - completed
- permit application has been submitted – QED has met with Kansas Dept of Health and Environment and Kansas Pork Association to communicate and support project efforts
- computer modeling of tangential flow separator to handle higher loads from hog manure waste stream as well as lagoon cleanup operation – partially complete

Dairy, Pennsylvania (#5.07) -----

Nutrient Control Systems

Mercer Vu Farms in Mercersburg, Pennsylvania

The process includes:

- Upgrading the existing treatment system, making waste treatment of manure more operationally friendly and cost effective.
- Fine sand removal, added solids separation capability and a conveyor, blower & controls, building expansion, windrow turner and curing pad to support a composting operation.

Status:

Nutrient Control Systems has ordered equipment to complete the necessary upgrades for the sand separation system and the manure separation system. FPPC is planning a site visit at the time when installation is anticipated complete in January. The construction for the composting pad is complete. Once the separation upgrades are operating satisfactorily, Nutrient Control Systems will begin converting the settling cell to produce flush water for flushing the barns. Once significant flush water quality can be produced, Nutrient Control Systems will begin installation of the chemical conditioning system. This process is expected to take two months.

Dairy, Vermont (#5.02)-----
BioProcess Technologies
North Williston Cattle Co.

The process includes:

- The existing system incorporates a solid separator, a digester, composting capability and effluent treatment.
- The proposed project will take the biological effluent treatment to a new level of effectiveness by upgrading pretreatment of fine suspended solids and optimizing organic treatment in the bio-filter towers

Project Status:

BioProcess continues to look for a solid separation system that will produce 1–1.5% suspended solids. In October, BioProcess accompanied FPPC on a site visit to Georgia to see a potential belt press technology created by NutraCycle LLC that would produce the results needed. Discussions are currently being held between BioProcess, NutraCycle, and FPPC.

Dairy/Mixed Waste, California (#5.06)-----
Agricultural Waste Solutions, Inc.
Inland Empire Municipal Site, Chino

The process includes:

This project utilizes a regional model and a centralized location at the Inland Empire Utilities Agency site in Chino, California. Key elements of the pilot demonstration include the AWS centrifuge and gasification unit. The one-year testing program will test dairy, swine, beef, poultry, horse, digested sludge, food waste and mixes of wastes for their produced energy value. The demonstrations and tests will simulate a large range of farm waste systems, from high-volume flushes to dry-lot manure systems, in order to evaluate energy production, efficiency, costs, automation and maintainability. The improved centrifuge will remove moisture and is designed to uniformly condition the feed stock entering the gasifier.

The system consists of a skid-mounted centrifuge, a skid-mounted gasifier, an intermediate solids hopper, augers from the centrifuge to the hopper and from the hopper to the gasifier. All equipment sits on a 25 by 35 foot concrete pad, with a gas compressor and storage tank. Utilities are plumbed to the pad, and the gasifier can run on either natural gas or its produced gas from the storage tank.

Project Status:

Agreements are in place and initial gasification and debugging has begun. The next efforts will involve achieving significant continuous run time.

Dairy, Colorado (#3.12)-----
Applied Chemical Magnesias Corp. (ACM)
Bella Holsteins, Inc. in Platteville, Colorado

The original process included:

- Easily-assembled recovery system that utilizes the reaction capabilities of inexpensive, milled brucitic marble to extract between 75% - 90% of most nutrients
- Uses magnesium source to react with Nitrogen and Phosphorous to form a crystal precipitate.
- Uses a series of reaction tanks (sized for the anticipated flow) with simple mechanical (paddle) agitation, and a hydro-cyclone separator and drying screen for the recovery of the precipitate.
- Precipitated crystals and liquid are sent to the drying screen; crystals are separated from the liquid then stored for farmers to use as a slow release fertilizer. The remaining liquid flows to a lagoon for solids settling.

Note: The plan of work was modified to add technical expertise available from Colorado State University and Idaho State (Dr. Ron Sheffield) and to determine why the brucitic marble was not reacting in the prescribed manner:

- Determine if there was something unique about the dairy and or waste stream that may contribute to the poor results
- Determine why brucitic marble may behave differently than its close treatment cousin – struvite which is successfully utilized in Idaho.

Project status:

The fourth quarter of 2006 brought the close of the fieldwork phase of the project and the beginning of sample and data analysis. Analysis of wastewater samples shows an average of 14.6% reduction of total phosphorus (P) for the “conventional” process using hydrochloric acid and anhydrous ammonia, and an average of 12.8% P reduction using acetic acid and potassium hydroxide solution. Magnesium (Mg) levels in the wastewater were high, and showed an average of 11.7% reduction with the conventional process and 12.0% reduction using the newly developed process. Reactor product samples were examined using X-ray diffraction which indicated that the minerals were in amorphous rather than crystalline form, so further analysis was performed with a scanning electron microscope. Amorphous particles containing a 1:1 ratio of Mg and P were identified with the scanning electron microscope, suggesting that amorphous struvite had indeed precipitated from the wastewater inside the reactor. Product, wastewater, and data analysis is ongoing.

Preparations for the next phase of the project, beneficial application of the product, are underway. A P solubility study comparing products at a range of pH is scheduled to begin early in the first quarter of 2007, as is a greenhouse study to evaluate the effectiveness of different treatments as P fertilizers at acid, neutral, and alkaline soil pH.

Swine, North Carolina (#4.05) -----
Super Soil Systems
Goshen Ridge Farms in North Carolina

The process includes:

- This 2nd generation technology system deploys a mobile platform with mobile solid separation capability
- It can be deployed to serve multiple farm sites of different scales, however three (3) 800 hog production sites are being interconnected to replicate the waste output of one large swine facility and to test the scalability of this concept.
- The project goal is to demonstrate lower overall cost by spreading the capital investment across several site owners with operations that are significantly different in scale.

Project Status:

A meeting was held in Raleigh on November 15th to review project status and to discuss the need to evaluate the economic viability of the 2nd generation technology. FPPC and SuperSoils will follow-up in January and complete their analysis in the 1st quarter of 2007.

In the interim, the following summarizes the project construction status at Goshen Ridge:

- Tank has been installed for the lift station for the second production unit and pumps are on order. This unit is 50% complete
- Interconnecting waste water piping and clean water return is 50% complete
- A separated water collection tank has been installed near the first production unit. Repair and upgrades on the existing have been made for the 2nd generation technology.
- The mobile solids separation unit has been thoroughly tested and is ready for operation.

Poultry, Wisconsin (#5.04) -----
R&J Partnership
Weiss Poultry Farm in Kewaskum, Wisconsin

The process includes:

- Utilizes chicken manure and mortality carcasses, along with a carbon source for conversion into a stable, organic fertilizer.
- A bio-filter acts as a scrubbing mechanism to take out noxious odors associated with composting process.
- A key element in the process is the ammonia capture and the re-introduction of N into the final composting process.
- Leachate is collected in tanks and is re-used during the process. The net effect is that the Nitrogen value remains elevated.

This project scales up from last year's smaller prototypic demonstration effort to a farm scale - commercial size operation and will demonstrate stability, uniformity and consistency of higher grade compost for the fertilizer marketplace.

Project Status:

FPPC visited the site in October and clarified questions about the plan of work (ie. essential tracking of Nitrogen levels) as well as marketing concerns for the final product. Agreements are nearly finalized.

Dairy, New York (#5.05) -----
Fluid Management of New England
Noblehurst Dairy Farm

This dairy has approximately 1200 milking cows and is located in Linwood, New York. This farm owner has made a sizable investment in digester facilities and waste to energy capability. The technology provider has proposed a bolt-on technology (i.e. singlet oxygen generation (SOG) and electro-coagulation (EC)) to be used to remove nutrients from the waste leaving the digester, freeing recycled water for wash-down and irrigation. Electro-coagulation and the singlet oxygen generator will be installed as prefabricated modular units.

Project Status:

Initial testing of the dairy waste exiting the digester revealed a problem with solids carryover and effective treatment of the effluent. A search for a suitable pretreatment step has resulted in evaluation of four alternatives and a recommendation of one. In January, FPPC will travel to the Noblehurst dairy site and work with NutraCycle and Fluid Management of New England to properly integrate and cost a belt press ahead of the electro-coagulation unit.

Dairy (#6.02) -----
Nutracycle LLC
Belt press application

Status: Planning to visit two dairy sites to confirm site specific application scope and cost. This project will incorporate two technologies from two separate vendors at one site.

Dairy, Ohio (#4.07) -----
Crossroads RC&D / Wastewater Services, Inc.
Andreas Farm, Royer Farm

The process includes:

- microbial enhancement
- dewatering and complete solid separation
- package plant to treat effluent
- able to achieve nutrient and water quality levels acceptable for discharge

Progress:

FPPC visited both farm sites during due diligence efforts in October. Project requirements for all parties were introduced in the kickoff meeting and current contractual agreement is in the final stage of review.

Dairy, Florida (#5.09)-----
White Technologies Inc.
U.S. Environmental Products, Inc.
North Florida Holstein, Bell, Florida

The process includes:

- Vacuum dewatering bed

Progress:

Negotiation for scope and agreements is in the final round of review.

Swine, North Carolina (#5.03)-----
North Carolina State University
Lake Wheeler Farm

A newly designed swine production facility is currently being constructed at NC State University at the Lake Wheeler Field Laboratory near Raleigh, North Carolina. This project will leverage the new construction investment with a new separation process that mechanically isolates feces from urine while reducing odor. The project will pilot cost effective ways to accomplish early separation of solids using a belt system and compare its performance to a scraper system.

Project Status:

During the fourth quarter of 2006, FPPC received a bid proposal from one vendor that would supply the belt system at the Lake Wheeler Farm. After consulting with NC State, FPPC requested that the vendor resubmit the proposal attempting to cut the cost by one half. The vendor resubmitted the project at half the cost and half the scope. FPPC continues to work with this vendor while NC State has re-approached two other local manufacturers.

Dairy, Florida (#3.04)-----
Chemical Lime Co.
Aprile Dairy in Riverview, Florida

Process objective:

- Cost effectively remove nutrients with the chemical addition of lime and a metal salt.

Project Status:

The chemical treatment scope and testing using lime was transferred to the QED project at Branford Dairy at the time the Aprile Dairy was sold. This project utilized lime, Alum salts and polymers with a unique configuration of mobile hardware.

Thus far, QED reports that they are very encouraged by the initial unofficial results. Discussions with Chemical Lime and University of Florida indicated that they had no issue with what metal salt is used so we have kept the use of ferric sulfate in preference to aluminum salts (in order to make sure the compost product is the same and therefore not a

lower value). The key is going to be economics (chemical addition rates) which we are working on making sure are within what can be afforded by the farmer.

Results will be documented in the final report at the conclusion of that project. QED continues to work with the University of Florida (Roger Nordestedt) on this project.

II. Funding for the following proposals has been reallocated to projects that can be initiated without further delay:

**Swine, Illinois (#4.03)-----
World-Wide Bio Energy
C&J Boorman Farm, Kinderhook, Illinois**

This project proposes to develop and combine a continuous thermo-chemical conversion technology (TCC) from the University of Illinois and an electro-coagulation process (EC). The purpose of the demonstration is to capture nutrients and produce bio-oil.

Project Status:

A letter has been sent to the technology provider advising them FPPC is withdrawing its present support until the project scope is better defined and full project funding is realized. The technology provider has been encouraged to resubmit his proposal during the next RFP cycle.

**Dairy, California (#4.06) -----
Coaltec Energy USA**

This project proposes to utilize a gasification process to transform dairy waste into a more transportable waste form with byproducts available for energy purposes.

Project Status:

The technology provider has been advised that FPPC will no longer consider alternative siting requirements and scope changes without a competitive evaluation in the RFP cycle. Funding will be reallocated based on availability of approved projects at that time.

Attachment A

III. Final report status of eleven 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: Demonstration project has been completed and final report submitted but awaiting final data from ARS.
- 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: Demonstration project completed – final report has been reviewed and written review comments have been submitted to the technology provider. An independent third party will be authorized to resolve/document technical comments while the technology provider foregoes receipt of final payment.
- 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: Demonstration project completed and final report has been received. The final report will be revised to reflect the effects of wear and corrosion detected during operation.
- 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 - 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 - 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 - 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 - 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 – reviewed, issued and posted on the FPPC website.

I. Poultry, Texas -----

RMG Strategies, Ltd and Microganics (#3.11)

Jacobs Ranch in Carmine, TX

Report Status: Demonstration project complete – final report has been received and is currently being reviewed by FPPC.

J. Dairy, Florida -----

AJT/Agrimond (#3.01)

Watson Dairy in Trenton, Florida

Report Status: Demonstration project complete – final report has been received and is currently being reviewed by FPPC.

K. Dairy, Wisconsin -----

Skill Associates – Phase I (#5.08)

Weise Farms in Greenleaf, Wisconsin

Report Status: Initial data gathering and testing of the manure combustion process has been completed and documented. A report has been submitted and is being reviewed.