FPPC

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

July 1st, 2006

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

From: Bob Monley, General Manager, FPPC Inc.

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Re: Quarterly Report for period from April 1st thru June 30th, 2006

This quarterly 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 proceeded with the seven (7) project proposals conditionally approved by the Board. Site visits were conducted to verify proper site location, resolve any outstanding issues with the technology providers and assure that all project participants are properly aligned. A meeting to update the Board is being scheduled to report findings and finalize any new recommendations. Additional project proposals are being solicited through two (2) RFPs issued in the last month.

A successful, second annual Technology Summit was conducted on May 10th-12th in St. Petersburg, Florida. Favorable post-summit feedback as well as information regarding presentations is posted on the FPPC website at www.fppcinc.org.

OPERATIONS ----------

1. **Technology Summit:** The May 10-12, 2006 Technology Summit was marked as a great success. This year's program was expanded to include an RFP workshop to help guide those wanting to submit better proposals. In addition, approximately 35 participants stayed Friday afternoon to take advantage of a site visit to a nearby pilot demonstration at Butler Oaks farm.

2. **Technical Component:** A technical problem common to treating the waste stream from digesters has been reported at separate dairy sites in New York, Vermont and Utah. All three principal investigators are independently reporting difficulty in removing fine solids before subsequently treating the soluble nutrients. Apparently the electro-coagulators at two dairy farms and the bio-filter at another are bridging with fine solids (judged to be less than 10 microns in size). The net result is that the expected performance of the effluent treatment equipment is adversely impacted.

   First efforts to dilute the waste stream and retest were not effective in improving performance of the effluent treatment. Investigative efforts to find alternative pretreatment methods continue. The addition of Bentonite, polymers, the use of hydro-cyclone separation and redesigned bio-filters are exploratory efforts being pursued.

3. **Agreements:** A cooperative agreement for $ 5.6 million between NRCS and FPPC covering fiscal year 2006 is now in effect. Projects funded through this agreement will be targeted for conclusion by 2009.

4. **World Pork Expo:** In June, FPPC senior staff attended the World Pork Expo in Des Moines, Iowa. During that time, FPPC was able to meet various equipment suppliers and encourage potential technology providers to respond to the outstanding RFP opportunities. Suppliers of commercial grade belt conveyors and scrapers were targeted throughout the visit. Meetings were also conducted with current and prospective pilot project participants to analyze the status of their projects.

5. **Audit:** The field work for the annual A-133 annual audit of FPPC Inc. is complete and a close-out session with the audit firm of Lewis, Birch, and Ricardo is being scheduled. This year, site visits were undertaken with auditors at Watson Dairy and at Branford dairy farm in north Florida. The purpose of the site visit was to check the equipment status and to see the field demonstration project.

6. **Request for Proposal:** Currently, FPPC has two active RFP with responses due in August. The first is aimed at full scope pilot demonstration systems while the second is more narrowly focused in scope. The second RFP targets suppliers of belt and scraper systems with commercial interest in developing the next generation of separation systems for hog confinements.

7. **Website:** The FPPC website has been updated and re-organized to provide visitors to the site with better access to information and active projects. Additional development is underway that will provide visitors with links to pertinent current information affecting their business and waste resources from throughout the country.

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Progress at active pilot demonstration sites is briefly summarized below:

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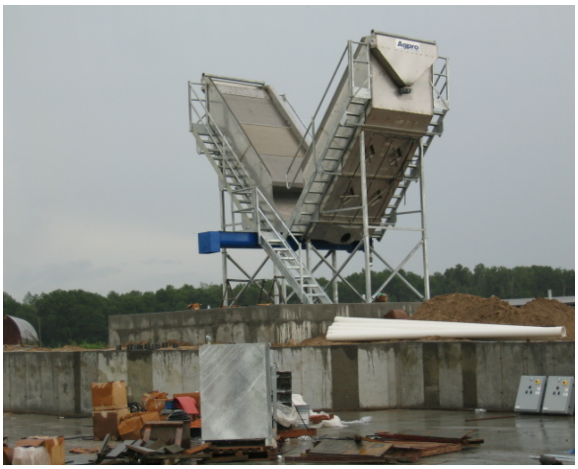
Dairy Farm, Florida (#4.02)----------
QED Occtech
Branford–DPS Dairy in High Springs, Florida

The process includes:

- A system to capture nutrients from the waste stream of the 2050 dairy cows by combining QED's tangential flow separator and chemical treatment.

Project Status:

To date, QED is in the final stages of project construction (see photographs of screens and tangential flow separator). Free stall barns are also under construction at Branford dairy. Once construction is complete and the electrical power is installed, project treatment can begin. The project is running approximately one week ahead of schedule.



FPPC conducted a site visit at Branford dairy on June 15th to check progress and to correlate pilot project status during the recent A133 audit.

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

The process includes:

- This dairy project seeks to capture nutrients in a phosphorus rich watershed next to Lake Okeechobee using a vat separator and chemical treatment.

- Solids will be harvested, subsequently introduced into an in-vessel composter and marketed as a peat substitute by South Dade Soil and Water Conservation District.

Project Status:
In May and in the midst of the final stages of construction, the Butler family hosted a site tour of 35 visitors from the 2006 Technology Summit.

Photograph - shows the in-vessel composter utilized for processing dairy manure

During May the chemical injection system was installed. With the dairy cows now in their new free stall barns, nearly all systems have become operational.

One vat separator is filling with manure during this start-up period and enough solids from one week were introduced into the composter. As more manure is dried, added testing will occur and the system can be optimized for correct moisture and volumes.

Swine Farm, Iowa (#3.13)----------
Global Resource Recovery Organization (GRRO)
Mobile Deployment

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:

On June 6th, FPPC visited GRRO in Iowa to determine the status of the second generation project. During the meeting, the economic viability of operating the tempest dryer with the high cost of diesel fuel was discussed. In addition, the increasing value of the nutrients derived from hog confinements and being land applied as fertilizer was highlighted. Based on financial analysis, it would be prudent to deploy the next generation mobile tempest dryer to other farm site locations where the economic opportunities are more likely to be realized.

Of the multiple sites now being considered, six (6) demonstration sites offer stronger business incentives and at the same time will provide a broader exposure to varied animal agriculture applications in poultry, swine, and dairy sectors.

Research is also being done on a solid separation bolt on technology that will assist GRRO in a pretreatment stage of their mobile deployment project. Currently, another manufacturer proposes to add pretreatment of manure pumped directly from the hog house pits. The benefits and cost advantages of processing solids waste in this manner is being studied.

GRRO has firmed up their business relationship for feedstock mixing in the generation system. The system will incorporate mixing equipment manufactured by Cementech.

Dairy Farm, Utah (#4.04) ----------
Utah State University, Center for Profitable Uses of Agricultural Byproducts
Blaine Wade Dairy in 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) will be supplemented by a new electro-coagulation unit to concentrate nutrients from the effluent of the IBR.
- Individual contributions of nutrient reduction of the screw press, settling basin and the electro-coagulator units will be quantified.
- The observed treated water exiting from the installed IBR system is nearly odorless.

Project Status:

A trial electro-coagulation unit has been selected and has been deployed on site on a lease basis for the demonstration project. This system is not large enough to handle the entire waste stream but is big enough to get needed performance data.

Recently, however, a quotation was received from another manufacturer for a full scale unit. Costs for EC treatment are beginning to fall into a category that might be acceptable for some applications. One system has been quoted at $ 69,000 for a system large enough to treat effluent from the IBR anaerobic digester at the Wade Dairy.

Preliminarily, it appears the EC unit does effectively remove phosphorus and nitrogen. The power requirements are estimated at 400 kWh/day or about $20 worth of electricity per day for a dairy with close to 1000 animal units. The IBR can produce five to six times this much power so an anaerobic digester combined with an EC unit may be acceptable for some situations. The cost of the power required calculates out to about $1/thousand gallons of influent – which does not address the plaguing problem of reliability and maintenance cost. (Current experience is based on taking apart the EC unit at the Wade dairy about every 30 minutes for cleaning.) So there are still hurdles to cross such as learning how to clean in place, before this becomes a viable technology.

Completion of the project experimental work is anticipated by the end of summer followed closely by a final report. Dudley Voorhees visited the Wade dairy site in May to observe the treatment operation at the Wade dairy demonstration project.

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

The process includes:

- 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 & Phosphorous to form a crystal precipitate.
- Uses mechanical cellulose separator, 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 various farmers to use as a slow release fertilizer. The remaining liquid flows to a lagoon for solids settling.

Project status:

Colorado State continues to make progress against the revised plan of work. To better understand the potential differences of other Colorado dairy farms when compared to the Bella Holstein dairy, each waste stream was characterized. The waste stream was also sampled at sequential points to ascertain the suitability of phosphorus (P) removal technology at various locations - see Tables 2 - 4. Note, Tables 1 through 4 are appended to this report.

Current efforts are underway to determine why the Brucitic marble may behave differently than its close treatment cousin – struvite.

After consultation with Dr. Ron Sheffield from the Department of Biological and Agricultural Engineering at the University of Idaho, the third lagoon at Bella Holsteins was chosen as the site for struvite comparison in this study. This location was chosen due to its low percentage of total solids, which reduces the risk of clogging the system. Other conditions, such as pH and elemental concentrations, also make this location satisfactory for P removal via struvite production (see Table 1).

In order to evaluate the broader applicability of phosphorus removal via struvite production and different systems for animal waste management, the characteristics of each dairy's wastewater must be accounted for. In addition, the successful application of struvite production technology at each dairy may depend on appropriate stage of the treatment process within the dairy's waste management system.

Poultry Farm, Alabama (#3.07) ----------
Renewable Oil Inc., (ROI)
Mills Poultry in Russellville, Alabama

The process includes:

- Mobile processing plant to burn poultry litter.
- Poultry litter would be removed from houses and burned.
- Pyrolisis process produces nutrient rich ash and vapor that is converted to bio-oil.

- Bio-oil and ash would both be available as marketable products.
- Bio-oil produced is a low-grade fuel for heaters to warm poultry houses.

Project status:

A 40 hour test run of the project was completed in early January, 2006, with the run being monitored by Mississippi State University (MSU). Renewable Oil Inc. has analyzed results from the MSU test run, but is now resolving reporting errors in the data. The final report has been drafted and will be released once the data errors are resolved.

In the meantime, since the Daniel Mills Farm has been sold, ROI will be working with FPPC to close out the project and to disposition equipment.

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

The process includes:

- This technology system deploys a mobile platform for solid separation capable of serving multiple farm sites.
- 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 memorandum of understanding has been signed by the technology provider. A meeting was held to review the previously completed project and to confirm the new project scope. Initial funding has been provided to advance system deployment at Goshen Ridge, which requires site work and testing larger scale waste streams with the mobile system.

Dr. Ray Campbell hosted Lauren Seigel from FPPC and Susan Mcloud from NRCS during their visit to the Goshen Ridge farm in May.

Poultry Farm, Texas (#3.11) ----------
RMG Strategies, Ltd and Microganics
Jacobs Ranch in Carmine, Texas

The process includes:

- The use of “Bio-Regen Animal” product contains “Carboxx” and Bacillus microbes, a natural, supersaturated, highly soluble, high reactivity humic acid (HRHA)
- The ultra-pure formula provides a capacity to capture and absorb a wide array of impurities found in soil or wastewater
- This process will provide a 75% nutrient reduction in the waste water column, concentrating nutrients in the sludge layer while decreasing odor.
- Poultry and swine lagoon application have been targeted as pilot projects

Project Status:

The project was ended one month early due to a build-up of solids and insoluble, inorganic feed mineral supplements into the lagoon system. Because of the pending potential for regulatory action, the facility owner and managers decided to implement a dredging operation at both primary lagoons which included lagoon being treated.

Although, the treated lagoon exhibited accelerated organic decomposition, resulting in reduced sludge accumulation and decreased odor emissions in comparison with the control, laboratory results to date have been inconclusive in showing measurable nutrient reduction. This may have been, in part, due to the inability to consistently collect samples without introducing other variables. Also, with the loss of crucial treatment time due to 8 months of contamination of the treated lagoon from the adjacent control lagoon and continuing build up of the insoluble mineral supplement in the treated lagoon, both natural and added treatment technologies were interrupted.

A final report is being completed for the Jacobs Ranch facility which will fully document lessons learned. Testing at a second site, a hog farm in North Carolina, is yet to be scheduled.

Dairy Farm, Florida (#3.01) ----------
AJT/Agrimond
Watson Dairy in Trenton, Florida

The process includes:

- Sand/grit removal.
- Solids separation.
- Primary anaerobic treatment and secondary aerobic treatment with enhanced aeration.
- Suspended solids precipitation using polymers.
- Anoxic treatment for de-nitrification prior to land application.

Project Status:

FPPC and Agrimond continue to provide ongoing monitoring and support twice a week at the farm site. (This effort includes assuring the cleaning of the sand trap to prevent carryover). In the next quarter, system problems, farm management practices and the maintenance strategy will be reevaluated.

Despite ongoing operational issues, laboratory test samples continue to show encouraging treatment results. Data from the past seven weeks exhibits some variability and can be usually attributed to a system interruption. The challenge has been observing a mechanical problem and taking corrective action quickly enough to avoid unfavorable system response.

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

The process included:

- Use of chemical lime to reduce nitrogen and phosphorous loading in dairy wastewater.

- Screening and sand removal.
- Dewatered effluent treated with lime to precipitate P and N.
- Ammonia captured as ammonium nitrate.
- Treated water recycled as flush water.

Project Status:

FPPC anticipated significant project problems and took action last quarter to salvage and disposition system equipment.

With the sale of the Aprile dairy in Riverview last month, the pilot project was redirected. The testing and chemical treatment scope using lime additions has now been transferred and scheduled with QED at the Branford dairy site. The next step is to receive and review the final report in September.

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The following projects await completion of due diligence efforts and/or final contract negotiations before funding release :

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A. Dairy Farm, Erath County, Texas (#4.06) ----------
Coaltec Energy USA

This proposed project will utilize dry scraped dairy manure and a gasification process to transform dairy waste into a useful energy form. The remaining ash in the gasifier will be developed as an off-farm phosphorus-rich fertilizer or soil amendment.

Project Status:

After numerous efforts and failing to reach agreement and receive proper written assurances, Waco City leaders and Coaltec Energy were advised that FPPC is rescinding grant approval for a pilot project in the Bosque watershed. Coaltec Energy has requested approval of two alternate dairy sites in the Chino/Tulare area of California. This request is currently being evaluated.

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

This project will combine a continuous thermo-chemical process (TC) developed by the University of Illinois and an electro coagulation (EC) technology to produce bio-oil and remove nutrients from swine waste.

Project Status:

Following the successful site visit in late January, this proposed pilot project awaits final funding commitments. The technology provider has re-applied for available funding at the state level, but the next steps require firming up of state and local cost share commitments followed by development of the finalized plan of work.

Planned development requires Innoventor to scale up the engineering design from the University of Illinois working lab model to a 1,000 hog scale prototype suitable for farm use. Good progress on this effort continues as 60% of the prototype installation has been completed on the farm and evaluation is targeted for August.

C. Swine farm, North Carolina (#5.03) ----------
North Carolina State University - Lake Wheeler

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 and reduces 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:

FPPC staff, Susan McLoud and Frank Bourdeaux met with John Classen and Mark Rice to review the status of construction at the Wheeler Farm facility. A focused RFP (or a request for bid) was issued to multiple manufacturers of both belt conveyor systems and scraper systems. A bid meeting with potential suppliers is being scheduled at Lake Wheeler in August to provide vendors familiarity with the new facility prior to submitting a final bid.

D. Swine - Springer Farms, Independence, Kansas (#5.01) ---------- QED Occtech

This operation has 1200 sows, 1600 nursery pigs and 3700 finishing hogs. The farm owner plans to isolate and reduce Phosphorus levels in the waste stream to allow continued use of the irrigation system since he is constrained by land application of nutrients. In addition, Mr. Springer reports that Potassium levels along with his clay base soil create a crusting effect not allowing the soil to absorb wastewater.

An important benefit of the nutrients reduction goals in the project is the ability to use reclaimed water rather than well water. His experience indicates dramatic improvement with mortalities when fresh water is utilized in lieu of current wastewater.

Finally, Mr. Springer is pursuing an efficient transfer method of hauling solids to nearby land and has targeted a composting system. This will also address mortalities, the plowing under of manure and will offer odor benefits. In the future, Mr. Springer visualizes the possibility of eliminating accumulated sludge in the existing lagoons.

Project Status:

FPPC engineer, Dudley Voorhees and NRCS William Boyd met the farm owner and had the opportunity to fully discuss the project with QED's Neil Beckingham and Ivan Bristow during the site visit in June. The consensus was that the proposed project at this site would offer an appropriate farm demonstration project.

E. Mercer Vu Dairy farm, Pennsylvania (#5.07) ---------- Nutrient Control Systems

This free stall dairy farm is located 1.5 miles from Mercerburg, PA and currently has 1200 milking cows, with a planned increase to 1400 by year end 2006. The proposed project upgrades the existing treatment system, making waste treatment of manure more operationally friendly and cost effective.

The existing process will be enhanced with fine sand removal, added solids separation capability and a conveyor, blower & controls, building expansion, windrow turner and

curing pad to support a composting operation. Other improvements are aimed at aerators and flush water pump & controls, chemical feed systems and belt filter press, and manure storage lagoon.

This project is the first FPPC demonstration located in the Chesapeake watershed. Since it is in a nutrient sensitive area, this project has the potential of serving as an outreach for many others to observe and model.

Status:

FPPC field coordinator, Dudley Voorhees, and WRA consultant, Pete Hubbell have verified the merits of the pending project during their site visit in May.

F. Noblehurst Dairy farm, New York (#5.05) ---------- Fluid Management of New England

This dairy has approximately 1200 milking cows and is located in Linwood, New York. This farm has made a sizable investment in digester facilities. The singlet oxygen generation (SOG) and electro-coagulation (EC) will 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 modular units.

Project Status:

A site visit was conducted by FPPC's field coordinator, Dudley Voorhees. Based on preliminary testing of the waste stream from the digester at Noblehurst, a pretreatment stage will be necessary to drop out the insoluble solids (below 10 microns). The proposal is being modified to incorporate this capability.

G. Poultry farm, Wisconsin (#5.04) ---------- R&J Partnership

This poultry farm located in Kewaskum, Wisconsin raises pullets and houses approximately 210,000 birds. The composting technology utilizes chicken manure and mortality carcasses, along with a carbon source for conversion into a stable, organic fertilizer. A bio-filter acts as 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 into the final composting process. The 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 commercial size operation and will demonstrate stability, uniformity and consistency of higher grade compost for the fertilizer marketplace.

Project Status:
A site visit was conducted by FPPC's senior staff and NRCS representative, Bill Boyd. Contractual agreement is proceeding.

H. Dairy waste at Inland Empire, California (#5.06) ---------- Agricultural Waste Solutions, Inc.

This project utilizes a regional model and leverages the centralized location for processing animal waste at the Inland Empire Utilities Agency site in Chino, California. Key elements of the pilot demonstration include the AGS gasification process, a newly designed centrifuge and the ability to utilize use this equipment which is available on site. The improved centrifuge will remove moisture and is designed to uniformly condition the feed stock entering the gasifier.

The project will fund a year's operation and testing. Variations and combinations of confined animal waste will be introduced as feedstock and tested to optimize gas production performance of the waste to energy process.

Project Status:
A plan of work and contractual agreement are in the final stages of negotiation.

I. Whitcomb Dairy farm, Vermont (#5.02)---------- BioProcess Technologies

The Whitcomb Farm has a 250 cow milking herd in Williston, Vermont and is located on the banks of Winooski River a tributary of Lake Champlain. Much of the farm land in the Champlain Valley is saturated with phosphorus from the application of manure. The proposed demonstration is a collaborative effort of the Vermont NRCS, the Lake Champlain Basin Program, the Vermont Agency of Agriculture, EPA, Vermont Agency of Natural Resources, and the Poultney/Mettowee Conservation District.

The existing Whitcomb system incorporates a solid separator, a digester, composting capability and effluent treatment. The proposed project will take the biological effluent treatment, which utilize bio-filter towers to the next level. The performance of the biotowers is currently adversely affected by the bridging of non soluble, small particle solids coming from the digester. The bio-filter units, which can remove N, P, & K from the effluent exiting the digester, which then has the potential of delivering water reduced in nutrients and more suitable for irrigation.

Project Status:

A site visit was conducted by General Manager, Bob Monley and NRCS representative, Bill Boyd to validate a proper site and to better understand the technology and the treatment system being promoted in Vermont.

A revised proposal has been received which builds on the positive experience initially gained at the Whitcomb farm and incorporates a modified bio-filter design deemed more suitable for treating the effluent waste stream.

Report status of completed pilot demonstration projects are listed below:

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A. Swine Farm, North Carolina ----------
Super Soil Systems, USA (#3.09)
Goshen Ridge Farms, LLC - swine farm 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 Farm, 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 comments have been submitted to the technology provider on March 10th.

C. Swine Farm, 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 corrosion damage detected during the pilot.

D. Dairy Farm, 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 Farm, 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 Farm, 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 Farm, 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.

Appendix 1 – Tables 1, 2, 3 and 4

Table 1. Test results from Bella Holsteins.

Location	Total solids	TDS	TSS	pH	Mg - Total	PO_4 - Ortho	P - Total	Ammonia N
Before SS	4.517%	4400 mg/L	22400 mg/L	8.29	330.6 mg/L	142.90 mg/L	270.49 mg/L	551.89 mg/L
SS overflow	1.686%	3960	13140	8.16	227.0	95.78	174.13	424.22
After SS	1.722%	4430	14600	8.19	250.0	109.85	191.81	447.28
2nd lagoon	1.719%	4360	14350	7.24	238.0	165.24	194.38	512.36
3rd lagoon	0.926%	4700	5950	7.39	198.1	134.95	137.51	598.02
4th lagoon	0.938%	5260	4600	7.83	209.1	105.88	108.73	625.21
4th lagoon out	1.369%	5410	10100	7.90	270.1	102.51	186.25	626.85

(Notes: TDS = Total Dissolved Solids, TSS = Total Suspended Solids. SS = Solid Separator.
PO_4 - Ortho is expressed as mg/L of PO_4, P - Total is expressed as mg/L of P.
There is an overflow outlet at the top of the sand trap prior to the SS at Bella.
"After SS" and all other lagoon samples were taken at the mouth of the inflow pipe in each lagoon.
The last sample was taken from the shore near the pump in the 4th lagoon.)

Table 2. Test results from dairy A, a large conventional dairy in northern Colorado. (Exact size unavailable at this time.)

Location	Total solids	TDS	TSS	pH	Mg - Total	PO_4 - Ortho	P - Total	Ammonia N
Before SS	3.070%	5710 mg/L	36000 mg/L	7.84	552.9 mg/L	31.82 mg/L	205.35 mg/L	187.81 mg/L
After SS	2.616%	5630	29000	7.72	546.4	48.04	182.57	167.22
2nd lagoon	0.414%	3050	2600	7.82	230.5	14.75	22.98	98.02
2nd lagoon out	0.436%	2930	1400	7.49	228.8	15.48	22.76	99.67

(Notes: "2nd lagoon" was taken from an opening in the pipe flowing between the first and second lagoons.
The last sample was taken from the shore near the pump in the 2nd lagoon.)

Table 3. Test results from dairy B, a natural (neither conventional nor organic) dairy in northern Colorado with fewer than 1000 cows on site.

Location	Total solids	TDS	TSS	pH	Mg - Total	PO_4 - Ortho	P - Total	Ammonia N
Before SS	10.032%	7220 mg/L	66900 mg/L	7.34	891.4 mg/L	712.98 mg/L	665.09 mg/L	779.24 mg/L
After SS	7.247%	8500	78600	7.35	817.4	639.54	540.67	462.11
Lagoon out	2.324%	7440	19000	8.06	366.2	128.52	183.41	435.75

(Notes: "After SS" and "Lagoon out" were taken at the inflow pipe and far end of the lagoon, respectively.)

Table 4. Test results from dairy C, a conventional dairy with more than 1000 cows on site.

Location	Total solids	TDS	TSS	pH	Mg - Total	PO_4 - Ortho	P - Total	Ammonia N
Before SS	6.457%	10900 mg/L	36450 mg/L	7.56	714.5 mg/L	22.49 mg/L	506.27 mg/L	1029.65 mg/L
After SS	5.643%	11700	31300	7.64	720.1	19.95	513.29	1046.13
Settling pond out	6.244%	11600	85600	7.67	731.0	23.99	532.45	1532.13
Lagoon, far end	5.746%	13800	61000	7.38	923.3	16.33	521.63	1037.89
Recycling tank	5.574%	12300	65000	7.65	796.2	23.80	480.28	1334.43
Recycled liquid	5.425%	15400	17740	8.49	711.2	7.40	484.84	897.86

(Notes: Liquid in the recycling tank comes from the lagoon and is used to wash the barn floors. "Recycled liquid" sample is from a stream flowing into the SS from the barns.)