Farms for the Future

Sensenig Family
Sensenig Dairy
Transformation Team Case Study

USDA *Farms for the Future Project*
Funded Through a USDA Grant

CENTER FOR Dairy EXCELLENCE

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Farm History and Executive Summary

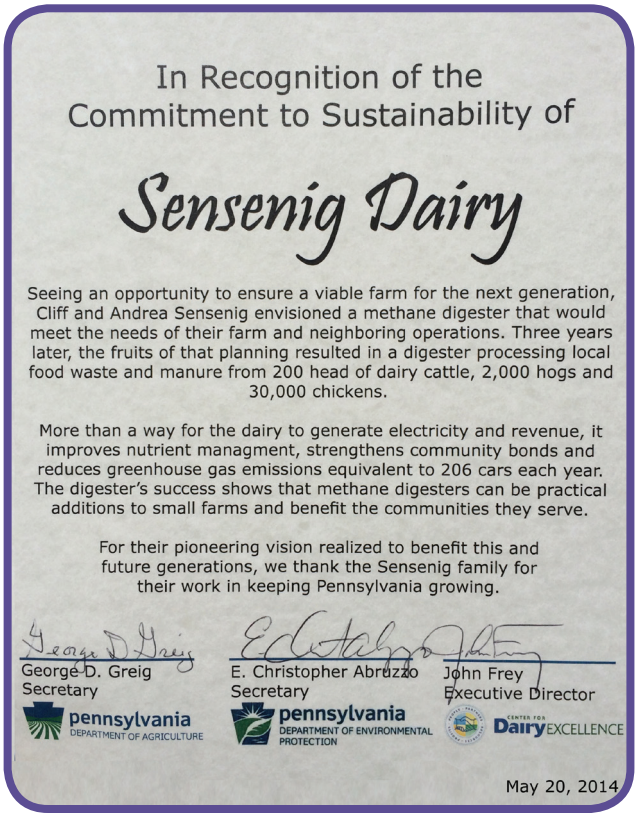
Cliff and Andrea Sensenig, Lancaster County, installed an anaerobic digester for cross-species livestock that includes manure waste from the families' 150 dairy cows and 3,000 finisher hogs and 30,000 laying hens from neighboring farms. This digester was the first in the country to incorporate manure from three species, presenting unique challenges and opportunities for the Sensenig family.

A feasibility study that explored cash flow and availability of grants was instrumental in determining if the project could move forward. When the study illustrated that the digester was financially viable for this small dairy farm, the family aggressively sought grants, with the help of their Transformation Team.

Grants funded approximately 75% of the digester costs, as detailed in this case study. The Sensenigs attribute their grant success to experienced professionals with the digester's manufacturer, RCM, and their Transformation Team.

After securing funding, this project required 21 different approvals and permits from 12 different agencies and organizations, navigated through by their Transformation Team leader. Through planning, funding, permitting, building and installing, it took three years for Cliff and Andrea to see their transformative business idea become a reality, with an operating digester.

Today, the digester is exceeding projected expectations, generating more revenue in electricity sales and food waste tipping fees for the business, while supporting renewable energy in their community.



In Recognition of the
Commitment to Sustainability of

Sensenig Dairy

Seeing an opportunity to ensure a viable farm for the next generation, Cliff and Andrea Sensenig envisioned a methane digester that would meet the needs of their farm and neighboring operations. Three years later, the fruits of that planning resulted in a digester processing local food waste and manure from 200 head of dairy cattle, 2,000 hogs and 30,000 chickens.

More than a way for the dairy to generate electricity and revenue, it improves nutrient managment, strengthens community bonds and reduces greenhouse gas emissions equivalent to 206 cars each year. The digester's success shows that methane digesters can be practical additions to small farms and benefit the communities they serve.

For their pioneering vision realized to benefit this and future generations, we thank the Sensenig family for their work in keeping Pennsylvania growing.

George D. Greig
Secretary
pennsylvania DEPARTMENT OF AGRICULTURE

E. Christopher Abruzzo
Secretary
pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION

John Frey
Executive Director
CENTER FOR DairyEXCELLENCE

May 20, 2014

Feasibility Plan

Situation Overview:

A. *Why did the farm need a feasibility study?* We needed a feasibility study to move ahead with our digester project and secure funding from banks and other grant sources.

B. *Where did the farm turn for help in developing the plan?* Hostetter & Hostetter, CPA. Our accountant was skeptical in the beginning of the project. Once the numbers illustrated the project's feasibility, he supported the plan and encouraged us to have an attorney review the agreement with RCM, the digester manufacturer.

C. *What peripheral resource people did the team use to build the plan?*

- Banker and accountant, Hostetter & Hostetter
- Red Barn Consulting, Jeff Ainslie
- Fulton Bank, Roger Rohrer and Lamar King

Challenges and Opportunities:

D. *What challenges, if any, developed during the feasibility study process?* Our biggest challenge was finding firm numbers to use in the feasibility study. This project was one-of-a-kind, as it was the first digester in the country to use manure from three species.

E. *How did the team overcome those challenges?* Our family was helped by Center for Dairy Excellence (CDE) resources. The CDE executive director coordinated a meeting with industry professionals.

Actions:

F. *What are the key components to the feasibility study?*

- Cash Flow
- Availability of Grants – without grants, this project would not pay for itself.

G. *Approximately how much did the feasibility study cost?* $12,000

Feasibility Plan...*continued*

Results:

I. *How did the feasibility study help the farm move forward and make better decisions?* The feasibility study numbers needed to look positive, or we would not have pursued this project. Feasibility study results had the power to stop the project in its tracks.

J. *Did the feasibility study reveal any surprising information about various scenarios?* Yes. Honestly, we were surprised to see that all the research and hard work invested into the feasibility study paid off. We didn't think the project would be financially viable, so it was a sigh of relief when we realized the digester could be a positive transformation for our operation.

K. *What might you have done differently in regards to the feasibility study?* Nothing. We were pleased with the study and results.

Modernization and Technology

Situation Overview:

A. *Detail the farm's reasoning behind the decision to pursue a modernization plan.* As a family, we wanted additional cash flow from the farm. We also knew modernization would help keep the next generation, our children, interested in the farm.

B. *List the key variables that impacted the decision to move ahead with the plan.*

- The feasibility study indicated that this project was financially viable and possible.
- Transformation Team funds allowed professionals to gather around the table and plan the digester project with us.

C. *The following modernization areas apply to our farm and describe the incorporation of technology:*

- Milking cow facilities – No upgrade to facilities during the project, but a source of manure for digester.
- Alternate energy – Methane digester
- Bedding – Separated solids

Challenges and Opportunities:

D. *What were the different options the Transformation Team considered as they worked together to pursue this plan? Please describe.*

July 2011

- This project helped our uncle update his dairy farm (which was in dire need of modernization) because he will receive $10,000 worth of solids per year to be used as bedding, which will save money.
- There is a better nutrient profile to the manure coming out of the digester since it is three species (cow, swine, chicken).
- We will be paying $6/ton for the chicken manure shipped to the digester; this in turn opens up more acreage that manure from our farm can be spread on because the neighbor's acreage is included in the land base.
- Department of Environmental Protection (DEP) is currently viewing the project as a waste treatment facility rather than a Concentrated Animal Feeding Operation (CAFO).
- The completed digester includes room for future expansion.
- Building the digester sets us up for a possible transition into robotics or other expanded facility 5 to 10 years down the road.

Modernization and Technology...*continued*

E. *Did any barriers, or bottlenecks, occur during the project, and if yes, how did the team overcome those issues?* Yes. It was difficult to secure solid numbers for a feasibility study since this was the first three specie digester in the country.

Actions:

F *How did the work done on a business plan or feasibility study impact the farm's final decisions?* The feasibility study gave us the information we needed to gain our lender's approval and to achieve the level of comfort to move forward with the project. Without it, we would have had no idea where we were going and what the new finished business model would look like for our family.

G. *How long did the project take, start to finish?* Three years.

Results:

H. *How did the modernization and new technology change the business as it relates to profitability?* The digester has helped with farm income. Electricity sales, in the first year, were higher than projected. We planned for .06 cents/kwh and in 2013 we were at .10 cents/kwh. Electricity rates always will fluctuate, as will tipping fees associated with food waste for the digester.

I. *Can the farm quantify labor savings, energy savings or environmental impact?*

- Labor Savings: Labor actually increased with our project. We now have a full-time employee on the farm.
- Energy Savings: Our electric bill on the farm went up after completing our project to about $1,600 to $1,800/month. With the digester, we generate our own electricity for the farm, realizing those savings each month. We do have a $25 utility transfer charge for using Pennsylvania Power and Light (PP&L).
- Environmental Impact: We are using food waste and other animal waste in our digester, but it has been a learning process. It has helped keep the generator running at maximum capacity, and kept that waste out of landfills.

Modernization and Technology...*continued*

J. *Did the modernization and new technology change management practices on the farm?* While our project didn't change management on the existing dairy, other than using bedded solids, we do have labor associated with the digester itself. Cliff manages the day-to-day digester work load, about 30 to 45 minutes/day, if there are no major issues. A full-time employee spends about 5 to 6 hours/week with digester maintenance, if there are no exceptional problems.

During the course of this project, we also began milking two herds of cows. Our full-time employee's barn has 50 cows, and our existing dairy has 100 cows in a tie-stall for a total of 150 cows.

K. Have you learned anything that has influenced future decision making about technology or given you new enthusiasm for some aspect of modernization? Be interested, research and use your resources to look hard at your options. There are good people in the dairy industry. You need to seek them out and ask lots of questions. A dairy farmer in Mt. Joy, who milks 900 cows, and has a digester, has become a good friend and resource to us, through this process. Our herd sizes are vastly different but we can help each other.

K. *Has the farm shared the new facilities or technology (milking facilities, manure management, etc.) with others in the dairy community? If yes, what was the response from the community?* We hosted an Open House in November 2012 and the response was very good. The people that came to the event were seriously interested in the technology. They were conscious of the Chesapeake Bay and associated environmental issues. They were exploring ways they could be better stewards on their farms.

Site Survey

Situation Overview:

A. *How did the team analyze potential sites for construction?* Watershed management and the location of the creek on the farm played an important role in our decision. A site furthest away from the creek became the easiest digester location. Additionally, we considered a site location which would best accommodate an expanded or new facility at some point in the future.

B. *What variables did the team consider as they reviewed sites?*

- Location of the creek
- Watershed management regulations
- Distance from the house

Actions

C. *How long, from start to finish, was the site survey process?* 1 month

D. Approximately, how much did the site survey work cost? $2,500

Results

E See the resources section of this case study for the project blueprint.

Permitting and Regulatory

Situation Overview:

A. *What was the process the farm went through to prepare for necessary permits?* We first called Red Barn Consulting in August of 2009 about our digester idea. We became serious about the idea in 2010, and three years later, the digester was operational. It's a long process. We had to learn to wait and that the planning and implementation processes can't be hurried.

B. Please list the necessary permits needed for your modernization and technology project. Please also include the approval agency (DEP, County Conservation District, or Township), time to receive permit and cost of permits. For this project, there were 21 different approvals and permits, from 12 different agencies or organizations. Total costs for permits were $40,000, plus an additional $25,000 for engineering costs related to requirements for manure storage and grants. Total permitting costs = $65,000

- Township – Zoning Approval and Permit at Cliff's Farm
- Township – Zoning Approval and Permit at Cleason's Farm
- Township – Zoning Approval and Permit at Elmer's Farm
- Township – Special Exception – Energy Production System on Farm
- Township – Land Development
- Commonwealth Code Inspection Service (CCIS) – Mechanical, Plumbing and Electric (MPE) approvals
- County Planning – Land Development
- Ag Preservation – Retain Clean and Green
- Lancaster County Conservation District (LCCD) – Erosion and Sedimentation (E&S) and National Pollutant Discharge Elimination System (NPDES)
- LCCD/Department of Environmental Protection (DEP) - General Permit (GP) Stream Crossing
- United States Fish and Wildlife Service (USFWS) – Wetlands Determination
- DEP - E&S and NPDES
- DEP – HQ Disturbance w/in 150' Waiver
- DEP - Water Quality Management Part II
- DEP - Food Waste GP
- DEP – Air Quality Exemption
- United States Department of Agriculture (USDA) Rural Energy Assistance Program (REAP) Funding
- USDA Natural Resources Conservation Service (NRCS) – Comprehensive Nutrient Management Plan (CNMP) and NM approval and Environmental Quality Incentives Program (EQIP) funding
- Pennsylvania Economic Development Association (PEDA) – Energy Development Authority Funding
- US Treasury – Section 1603 Funding
- Pennsylvania State Conservation Commission – REAP funding

Permitting and Regulatory...*continued*

Challenges and Opportunities:

C. *Were there setbacks during the permitting process?* Time constraints were the biggest setback for us, during the project. We learned to accept the turn around and wait time.

D. *Which permit was the most challenging to secure?* National Pollutant Discharge Elimination System (NPDES) for water quality was the most challenging for us. We had a grant that required us to spend 5% by the end of 2012. We had just 30 days before the end of the year to secure this permit.

E. *How did you resolve those challenges?* We hired an excellent consultant that walked us through the process, and in essence, held our hand.

F. *What resources or resource people were used in addressing those challenges?*

- Jeff Ainslie, Red Barn Consulting, during planning and permitting
- Molly and Peter Hughes, Red Barn Consulting, during the actual construction process

Results:

G. *Was the local township supportive of the permitting process? Please explain.* Yes. Little Britain Township, Lancaster County, was very helpful during the permitting process. In fact, they even shared cell phone numbers, so we could reach individuals with any questions.

Renewable Energy

Situation Overview:

A. *Please describe what technology was selected and why.* A three species methane digester that is capable of producing up to 200 kW was selected. It's a complete mix digester, sized for expansion, in the future. RCM International was selected to construct the digester. The digester utilizes waste manure and water from our dairy farm, our brother's dairy farm, our uncle's swine facility and our brother's layer house. Andrea's parent's dairy operation has a digester, so we were familiar with the technology and decided to pursue it.

B. *What were the expected results and actual results, in terms of the following?*

- **Environmental benefits**: Phosphorus stays in the solids; nitrogen stays in the liquid after manure is separated, so there is no overload of phosphorus in the soil when it's spread. There also is reduced odor because the gas is powering the generator. There are fewer emissions and a smaller carbon footprint for the farm.
- **Farm benefits**: The digester improves cash flow opportunities and opens the door to other options to increase farm income. We have collected tipping fees from various food waste vendors that in turn, help us keep the digester at maximum capacity. The payback is short, thanks to the grant funding programs.
- **Funding successes, failures and challenges**: To secure grant funding, there was extensive paperwork. Although RCM performed the actual grant writing, we had to supply many details and documents. As an example, we documented 833 emails related to the grant and digester, in 18 months. The RCM staff person previously secured grants in Pennsylvania for this type of project; she was knowledgeable and her responsiveness was appreciated. It takes a special person to sit with farmers and submit grants!
- **Permitting/regulatory success, failures and challenges**: It took three years to complete all the permits for this project. In our opinion, that's too long. There is a growing interest in renewable energy on dairy farms, and finding ways to reduce the red tape and expedite these technology projects is important to explore. One of the permits we needed, as detailed in our Permitting Chapter, was a Bog Turtle Permit. We had an environmental staff person come to the farm and search for bog turtles. Thankfully, there were no bog turtles and the project continued.

Challenges and Opportunities:

C. *What obstacles did the farm overcome while planning for the renewable energy project?* As detailed above, there was a lot of attention to our project (both good and bad) because it was so unique. We were working with a company from across the country (RCM), so there also were time challenges and planning delays. To complete the grants, we had to submit personal information to strangers and trust they would handle it in a confidential manner.

Renewable Energy...*continued*

Actions

D. *Timetable for the project?* Start Date: August 2010
Complete Date: October 15, 2012

E. *Final costs for the project?* $1.9 million

Results

F. *What was the cost benefit/return on investment of the option you pursued?* For our digester project, it was 75% funded through grants, making our return on investment high. Our income, from tipping fees and excess energy, has exceeded our projections during the planning phase. We projected approximately $8,000 per year in tipping fees; for the first four months of 2014, we already collected $25,000 in fees. Our excess energy sales were projected at .06 cents/kilowatt and in 2013, we earned 10.8 cents, and 10.4 cents in 2014.

At only 20,000 engine hours, as of April 2014, we have not experienced expected maintenance costs yet. It's expected that we will incur about $40,000 - $50,000 in costs to rebuild the digester engine when it hits approximately 60,000 engine hours. We've had low acid and sulfur content, which is helpful to engine longevity.

L. *Is the final project meeting initial expectations?* Yes. *If not, when do you expect it to be functioning at 100%?* We are exceeding expectations in both electric sales and tipping fees since our October 2012 start-up.

M. *Have you shared the technology and learning experiences with other dairy farmers?* Yes. *If so, what was their response?* Yes. We hosted an Open House with the Center for Dairy Excellence and the Professional Dairy Managers of Pennsylvania, on November 15, 2012. The reaction was very positive from farmers and industry stakeholders that participated. It was covered in several state farm papers, including *Lancaster Farming* and *Farmshine*.

The people that came to the event were seriously interested in the technology. They were conscious of the Chesapeake Bay and looking at ways they could do a better job on their farms.

Conservation and Environmental Stewardship

Situation Overview:

A. *How does this farm view their environmental responsibilities for both the farm and land? Please describe.* We take our environmental stewardship of the farm and land seriously, as evidenced by our commitment to the digester project.

B. *What conservation and environmental best management practices (BMPs) have been incorporated into the farm plan during the last 5-10 years?*

- Crop residue management
  - No-till practices - 15 years
- Contour farming
- Contour strip cropping
- Filter Strip
- Conservation buffers
- Crop rotations
- Cover crops
- Half acre bee pollinator habitat
- Stream bank, intentionally planted
- Grassed waterways
- Terraces (one being built spring 2014 – no till river terrace)
- Diversions
- Pasture and hay land plantings
- Stream bank protection – all fenced off
- Animal Trails/Walkways
- Structure for water control
- Watering system in pasture, to keep cows out of springs
- Barnyard runoff controls/Heavy use area protection
- Water (manure) storages/Manure Stacking
- Manure Composter
- Milk House Waste (Goes to digester)
- Roof Runoff Management
- Precision Feeding/Feed Management
- Agri-Chemical Handling Facility
- Integrated Pest Management

C. *Does the farm have a Nutrient Management Plan (NMP) or Manure Management Plan?* Yes. *Did this project change the way the farm handles animal manure? Please describe.* We have a phosphorus based nutrient management plan. Even though we now have the methane digester, at the end of the day, we still have a tanker that removes our farm's manure; it just now takes a longer journey.

D. *Are phosphorus levels in your soils rising to excessive levels [200 ppm of P] due to the application of manure generated on the farm? Please describe.* No. We are trying to prevent excessive levels with our deep bedded solids.

Conservation and Environmental Stewardship...*continued*

E. *Is manure applied in the winter months (generally December – February)? Is the manure applied in winter due to not enough storage or for other reasons such as timing, field conditions in spring, etc.?* Yes, but not on top of the snow. We want to apply manure to the cover crops during winter so it's there when the crops start to grow in the spring.

F. *Does the farm have a conservation plan or an agricultural erosion and sedimentation control plan? If yes, what are the key components?* Yes. Cover crops, crop rotation and no-till.

G. *Did a farm expansion require the development of an Odor Management Plan and any odor management Best Management Practices?* No. *How did you become aware of these requirements? Did you find enough experience private sector planners to assist?* While we didn't need an Odor Management Plan, odor reduction was a huge benefit to this digester project. Although the digester is fed dairy, hog and chicken manure, poultry sludge and occasional food waste, we can spread that manure close to neighbors, and they don't complain about odor. Before the digester, our dad would check wind velocity and wind direction before he spread manure because of odor concerns.

H. *Can the farm quantify the environmental impact of the project? Please describe.* Yes. We can measure impact in terms of energy our digester provides to the power grid and the energy savings on our farm, as detailed in the Modernization Chapter. We also benefit from the deep bedded solids, a by-product of the digester that we use as bedding on the farm.

I. *What is the most significant environmental/conservation improvement made on this operation within the last 5 years, and what improvement(s) did it result in?* The most significant improvement is our digester. We are converting waste manure from multiple farms, and multiple species, to electricity that fuels our farm and our neighbors' homes.

The U.S. Center for Dairy Innovation has named our family one of three winners of the 2014 Dairy Environmental Stewardship Awards.

Animal Care and Comfort

Situation Overview:

A. *Can you determine if cow comfort or care was limiting the productivity or profitability of your dairy operation?* No. According to Farmers Assuring Responsible Management (FARM) evaluation inspector from Land O' Lakes, our dairy meets or exceeds all program requirements. Cows were above average for cow comfort and cleanliness.

B. *If you determined that cow comfort or care was a limiting factor, did you make structural and/or management changes to address the deficiencies? Please list structural and/or management changes.* While cow comfort was not a limiting factor, the incorporation of solid separation technology allowed us to use separated solids which has enhanced availability of bedding material. With a large quantity of available bedding material, it's allowed us to apply liberal amounts of bedding.

We now have additional cows at a second facility that has mattresses, with solids on top of the mattresses for added comfort. As compared to chopped straw, our previous bedding material, we haven't noticed a measurable difference in cow comfort since using the separated solids.

C. *What is your farm's approach to administration and documentation around the use of standard operating procedures (SOPs) for animal care?* We have one full-time employee. We keep a close eye and have verbal SOPs. While we do not have written SOPs, we have discussed it extensively, and hope to begin the process in the near future. We know there is real value in having written SOPs.

D. *Have you enrolled in a formal animal care program? If so, what have you learned that's been beneficial to your operation?* Yes. FARM program through Land O' Lakes, our milk cooperative. We learned that we need to continue with our best management practices.

Risk Management

Situation Overview:

A. *The following traditional risk management tools applied to our farm before applying for this grant:* Contract milk with a cooperative – very infrequent forward contracts

B. *Does the farm have a marketing plan? Please describe.* Our marketing plan is to make as much milk as we can on our farm.

Actions:

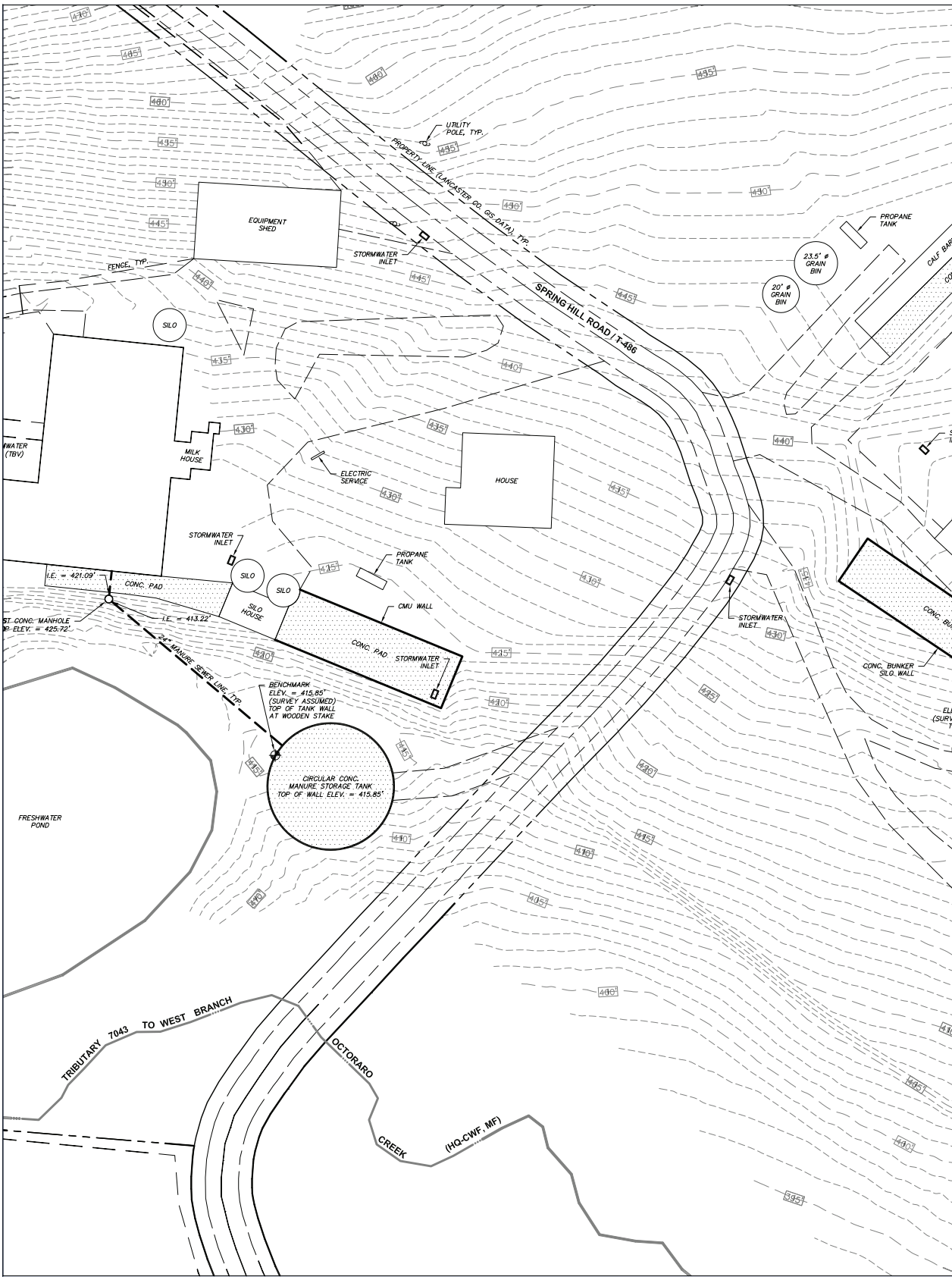
C. *What communication was necessary with the farm's ag lender and what were their requirements for additional ag protection through risk management to move the project forward? Please describe.* For our project, our accountant ran projections and reviewed our finances before giving the project a green light, but nothing specific to risk management.

Results:

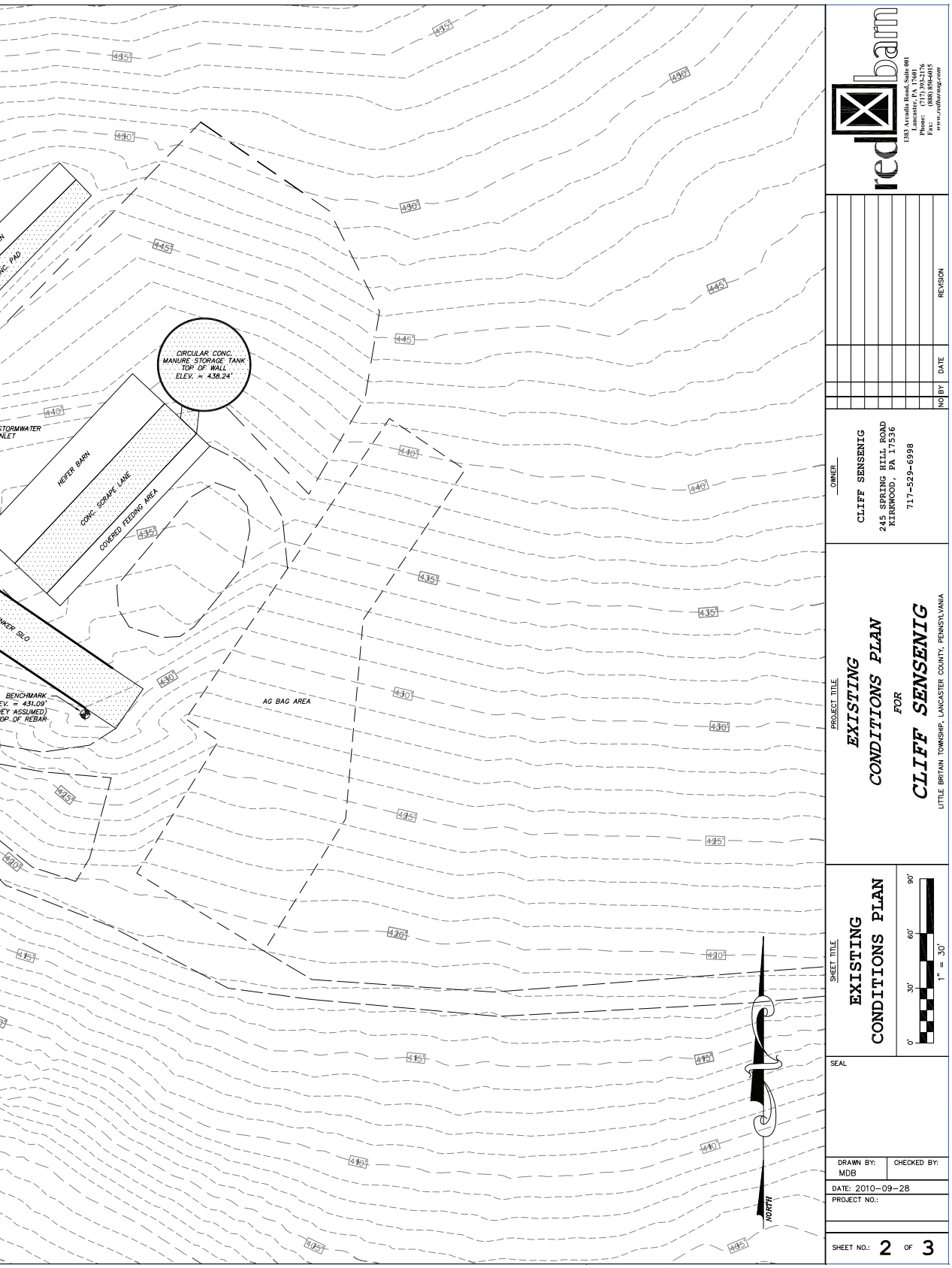
D. *Can the farm quantify the change in business profitability attributed to implementation of new risk management tools? Please describe.* Currently does not apply, but we are recognizing the value of available risk management tools and will continue to explore our options.

Resources and Contact Information

Blueprint



Resources and Contact Information...*continued*



Resources and Contact Information...*continued*

Open House Power Point

The Sensenig Family

Family & Farm Background

Family & Farm Background

- Andrea's background
- Cliff's background
- The history of our farm
  - 1990 – purchased by Earl
  - Purchasing cows
  - Trucking enterprise
- ***Decision point #1 – trucking or farming?***
  - Farming! – 2008 signed papers to purchase the farm
  - Many rewards & many challenges

Family & Farm Background

- ***Decision point #2 – how to grow the operation to improve our bottom line?***

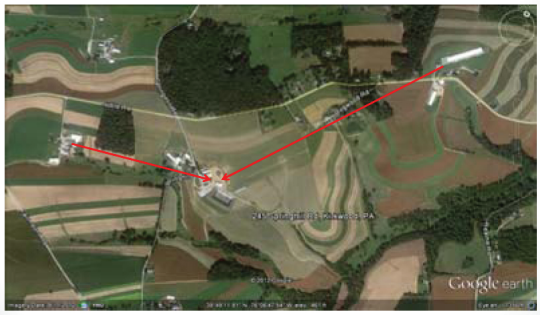
Family & Farm Background

- Digester?
  - Kreider Family experience
  - Economics
  - Diversification
  - How do we get there? Center for Dairy Excellence
  - **Transformation Team**
    - Cliff & Andrea
    - Facilitator
    - Accountant
    - Lender
    - Other farm service providers
    - Extended family

Analyzing the Digester Opportunity

- Small farm - can it be feasible?
- Expand the base by incorporating other farms
  - Family & a history of working together
- Food waste
  - Opportunity
- Many logistical challenges
  - ~3600 LF to Cleason's / ~1500 LF to Elmer's
  - Dairy / Layer / Swine manure mixing

Analyzing the Digester Opportunity



Learnings…just to name a few!

- Permitting – time & cost
- Getting to contract
  - Attorney involvement
  - Time & cost
- Time commitment for Cliff during construction
- Challenges of running projections
  - Utility pay prices have not stayed the same
- Things that have "not been done before but *should* work!"
  - 3 species
  - Moving manure from and to the hog farm
  - Using our bedded pack
  - Calcium chips in layer manure
  - Splitting the existing heifer barn pit in 3 chambers

Jeff Ainslie

Transformation Team Facilitator
Permitting & Engineering

red barn

TT Process & Highlights

- **2** The most important people on the team – Cliff & Andrea
- **1** Facilitator to organize meetings, take notes & facilitate discussion
- **3** Wise minds that were critical to the process
  - ***Earl Sensenig***
  - ***Herb Kreider***
  - ***Roger Rohrer***
- **6** The number of formal meetings we held
- **Countless** The number of informal meetings, phone conversations and early AM texts/emails, etc that took place
- **859** The number of days from concept to groundbreaking
- **19** The number of approvals needed to complete this project
- **9** The number of gov't agencies or entities involved in those approvals
- **30** The number of days since the generator sent power out the line

Robert Hostetter, CPA

Transformation Team Member
Financial Analysis

Sensenig Digester – Considerations for the Analysis

- What are the variables that impact the analysis?
- How are we arriving at the values we assumed?
  - Do they make sense?
  - Are there example farms we can use data from?
- What are the implications of any grants received?
  - Taxes, etc?
  - How do we plan around the uncertainty of funding?
- What does the sensitivity analysis tell us?
  - What variables have the biggest impact?
  - What does the operator have control over?
  - What do they not have control over?

Digester Analysis Example

Manure Digester Project - Example Cash Flow Analysis - 2012
Transformation Team Summary Financial Analysis

****Each farm's situation is different: consult your accountant/tax advisor for how this example may apply to you.****

Project Cost/Grants Received/Bank Financing:			
Total Project Cost:			1,500,000.00
Grants to Offset Cost:			
Grant # 1		(345,000.00)	
Sec. 1603 Federal Grant - 30%		(450,000.00)	
Grant # 2		(275,000.00)	
Grant # 3		(215,000.00)	
Total Grant Offsets:			(1,285,000.00)
Difference = Bank Financing Needed for Project Cost			215,000.00
Due to Timing of Grant Receipts and Length of Project being 1 Year:			
Additional Bank Bridge Financing Needed: 4.5% int for:		700,000.00	31,500.00
Total Bank Financing Needed:			246,500.00
Monthly Payment Calculation for Total Bank Financing:			
Term - Years:	11		
# of Monthly Pmts	132		
Annual Interest Rate:	4.5%		
Monthly Payment:	$2,371.02		

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0970	cents / kwh	103,006.14
Electricity Savings	232,700	# of kwh	$ 0.0970	cents / kwh	22,571.90
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	20	tons	$ 20.00	$ / ton	20,800.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					173,678.04
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$ / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					28,452.19
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(102,709.76)
Net Excess Annual Overall Cash Flow					**70,968.28**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(36,988)
Net Cash Flow for First Year after First Year Costs Subtracted					**33,979.97**

Example – Reduced Funding

Manure Digester Project - Example Cash Flow Analysis - 2012
Transformation Team Summary Financial Analysis

****Each farm's situation is different: consult your accountant/tax advisor for how this example may apply to you.****

Project Cost/Grants Received/Bank Financing:			
Total Project Cost:			1,500,000.00
Grants to Offset Cost:			
Grant # 1		(345,000.00)	
Sec. 1603 Federal Grant - 30%		(450,000.00)	
Grant # 2		(275,000.00)	
Grant # 3		-	
Total Grant Offsets:			(1,070,000.00)
Difference = Bank Financing Needed for Project Cost			430,000.00
Due to Timing of Grant Receipts and Length of Project being 1 Year:			
Additional Bank Bridge Financing Needed: 4.5% int for:		880,000.00	39,600.00
Total Bank Financing Needed:			469,600.00
Monthly Payment Calculation for Total Bank Financing:			
Term - Years:	11		
# of Monthly Pmts	132		
Annual Interest Rate:	4.5%		
Monthly Payment:	$4,516.95		

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0970	cents / kwh	103,006.14
Electricity Savings	232,700	# of kwh	$ 0.0970	cents / kwh	22,571.90
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	20	tons	$ 20.00	$ / ton	20,800.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					173,678.04
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$ / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					54,203.45
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(128,461.02)
Net Excess Annual Overall Cash Flow					**45,217.02**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(4,920)
Net Cash Flow for First Year after First Year Costs Subtracted					**40,296.66**

Example – $.065/kwh vs. $.08/kwh

Manure Digester Project - Example Cash Flow Analysis - 2012
Transformation Team Summary Financial Analysis

****Each farm's situation is different: consult your accountant/tax advisor for how this example may apply to you.****

Project Cost/Grants Received/Bank Financing:			
Total Project Cost:			1,500,000.00
Grants to Offset Cost:			
Grant # 1		(345,000.00)	
Sec. 1603 Federal Grant - 30%		(450,000.00)	
Grant # 2		(275,000.00)	
Grant # 3		(215,000.00)	
Total Grant Offsets:			(1,285,000.00)
Difference = Bank Financing Needed for Project Cost			215,000.00
Due to Timing of Grant Receipts and Length of Project being 1 Year:			
Additional Bank Bridge Financing Needed: 4.5% interest to carry 700,000			31,500.00
Total Bank Financing Needed:			246,500.00
Monthly Payment Calculation for Total Bank Financing:			
Term - Years:	11		
# of Monthly Pmts	132		
Annual Interest Rate:	4.5%		
Monthly Payment:	$2,371.02		

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0650	cents / kwh	69,024.74
Electricity Savings	232,700	# of kwh	$ 0.0650	cents / kwh	15,125.50
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	20	tons	$ 20.00	$ / ton	20,800.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					132,250.24
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$. / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					28,452.19
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(102,709.76)
Net Excess Annual Overall Cash Flow					**29,540.47**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(41,419)
Net Cash Flow for First Year after First Year Costs Subtracted					**(11,878.91)**

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0800	cents / kwh	84,953.52
Electricity Savings	232,700	# of kwh	$ 0.0800	cents / kwh	18,616.00
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	20	tons	$ 20.00	$ / ton	20,800.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					151,669.52
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$. / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					28,452.19
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(102,709.76)
Net Excess Annual Overall Cash Flow					**48,959.76**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(44,332)
Net Cash Flow for First Year after First Year Costs Subtracted					**4,627.49**

Example – Food Waste Volume

Manure Digester Project - Example Cash Flow Analysis - 2012
Transformation Team Summary Financial Analysis

****Each farm's situation is different: consult your accountant/tax advisor for how this example may apply to you.****

Project Cost/Grants Received/Bank Financing:		
Total Project Cost:		1,500,000.00
Grants to Offset Cost:		
Grant # 1	(345,000.00)	
Sec. 1603 Federal Grant - 30%	(450,000.00)	
Grant # 2	(275,000.00)	
Grant # 3	(215,000.00)	
Total Grant Offsets:		(1,285,000.00)
Difference = Bank Financing Needed for Project Cost		215,000.00
Due to Timing of Grant Receipts and Length of Project being 1 Year:		
Additional Bank Bridge Financing Needed: 4.5% interest to carry 700,000		31,500.00
Total Bank Financing Needed:		246,500.00

Monthly Payment Calculation for Total Bank Financing:	
Term - Years:	11
# of Monthly Pmts	132
Annual Interest Rate	4.5%
Monthly Payment:	$2,371.02

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0970	cents / kwh	103,006.14
Electricity Savings	232,700	# of kwh	$ 0.0970	cents / kwh	22,571.90
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	40	tons	$ 20.00	$ / ton	41,600.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					194,478.04
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$. / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					28,452.19
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(102,709.76)
Net Excess Annual Overall Cash Flow					**91,768.28**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(50,754)
Net Cash Flow for First Year after First Year Costs Subtracted					**41,014.73**

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0970	cents / kwh	103,006.14
Electricity Savings	232,700	# of kwh	$ 0.0970	cents / kwh	22,571.90
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	60	tons	$ 20.00	$ / ton	62,400.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					215,278.04
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$. / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					35,000.00
Bank Loan Payments					28,452.19
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(102,709.76)
Net Excess Annual Overall Cash Flow					**112,568.28**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(53,874)
Net Cash Flow for First Year after First Year Costs Subtracted					**58,694.73**

Example – Various Changes

Manure Digester Project - Example Cash Flow Analysis - 2012
Transformation Team Summary Financial Analysis

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Project Cost/Grants Received/Bank Financing:			
Total Project Cost:			1,650,000.00
Grants to Offset Cost:			
Grant # 1		(345,000.00)	
Sec. 1603 Federal Grant - 30%		(495,000.00)	
Grant # 2		(275,000.00)	
Grant # 3		(215,000.00)	
Total Grant Offsets:			(1,330,000.00)
Difference = Bank Financing Needed for Project Cost			320,000.00
Due to Timing of Grant Receipts and Length of Project being 1 Year:			
Additional Bank Bridge Financing Needed: 4.5% int for:		815,000.00	36,675.00
Total Bank Financing Needed:			356,675.00

Monthly Payment Calculation for Total Bank Financing:	
Term - Years:	11
# of Monthly Pmts	132
Annual Interest Rate	4.5%
Monthly Payment:	$3,430.76

Annual Cash Inflows/Cost Savings from Digester:					
Electricity Generated 180 kw Capability	1,061,919	# of kwh	$ 0.0650	cents / kwh	69,024.74
Electricity Savings	232,700	# of kwh	$ 0.0650	cents / kwh	15,125.50
Renewable Energy Credits -REC Credits	-	# of credits	$ -	$ / credit	3,000.00
Carbon Credits ($ per metric ton):	2,000	metric tons	$ 4.00	$ / metric ton	8,000.00
Tipping Fees ($ / ton) per week	40	tons	$ 20.00	$ / ton	41,600.00
Bedding Savings - Farm Cost Savings					8,000.00
Bedding Sales: $/yard	600	yards	$ 6.00	$/yard	3,600.00
Heat Savings for Residence					2,000.00
Heat Value - Corn drying, etc. - Propane Cost					2,700.00
Tax Savings: Zero b/c income generated will offset depreciation benefit					-
Total Annual Cash Inflows/Cost Savings					153,050.24
Annual Cash Outflows from Digester:					
Manure Purchase Cost	400	# of tons	$ 6.00	$ / ton	2,400.00
Genset Operating Cost/Maintenance	1,061,919	# of kwh	$ 0.03	$. / kwh	31,857.57
Daily Labor Needs - includes labor and payroll tax cost needed for operation					15,000.00
Bank Loan Payments					41,169.11
Insurance Expense - Estimate					5,000.00
Total Annual Cash Outflows					(95,426.68)
Net Excess Annual Overall Cash Flow					**57,623.55**
Additional First Year (Costs)/Savings Only:					
Tax Estimate: Consider differences in grant taxability and Federal - PA depreciation differences and Income Tax					(34,242)
Net Cash Flow for First Year after First Year Costs Subtracted					**23,381.33**

Summary Conclusions

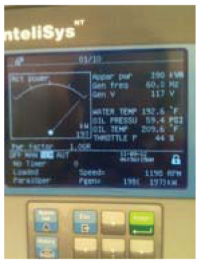
- Assemble a team to help you do your homework
- Identify all of the variables – you can't afford to miss any of them!
- Look to others with real experience to help you validate your assumptions
- Run a sensitivity analysis to determine the big impact factors in your analysis
- Engage your lender in the process

C. Lamar King

Transformation Team Member
Agricultural Lending Officer

Fulton Bank
AGRICULTURAL SERVICES GROUP

The Sensenigs – What's Next?



Resources and Contact Information...*continued*

Video

2014 U.S. Dairy Innovation Sustainability Award Winner Video
http://www.usdairy.com/sustainability/us-dairy-sustainability-awards/current-winners

Case Study

Case study, 2014 U.S. Dairy Innovation Sustainability Award
http://www.usdairy.com/~/media/usd/public/sensenig_casestudy_sust4012_r2.pdf

Article

Lancaster Farming, November 2012
http://www.lancasterfarming.com/-Co-op-Digester-Has-Dairy-Couple-Hopeful-for-the-Future-#.VA3q0xZMGSo

Contacts:

Please call the Center for Dairy Excellence to make contact with any of these individuals or organizations to learn more about their role in successfully completing this project.

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Robert Hostetter, CPA, Hostetter and Hostetter

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