Decision Tools for Dairy Farm Actions to Reduce Nitrogen, Phosphorous and Sediment Losses: A Critical Evaluation and Defining a Path Forward.

Steering Committee Members:

- Mr. Curt Gooch, PRO-DAIRY, Dairy Environmental Systems and Conference organization, 425 Riley- Robb (607) 255-2088 cag26@cornell.edu
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- Mr. Greg Albrecht, AEM Coordinator, CNMP Specialist, NYS Ag&Markets | Division of Land and Water Resources 309 Roat St., Ithaca, NY 14850 (607) 229-4654 greg.albrecht@agriculture.ny.gov
- Dr. Julie L Stafford, PhD, Industry Liaison, Cornell Institute for Food Systems Industry Partnership Program, Stocking West 110F 411 Tower Road 607-255-0860 jls653@cornell.edu
- Mr. Doug Young , Managing Partner, Spruce Haven Farm and Research Center, Auburn, NY, 315-252-2043 gdyoung456@aol.com
- Mr. Pete Wright P.E., Senior Consultant, Cornell PRO-DAIRY Program, 585-314-5314 pew2@cornell.edu 425 Riley- Robb

Workshop Description:

The proposed workshop will focus on the evaluation of existing dairy environmental models and the potential to aggregate and integrate key components of each model into one user-friendly model. The focus of the models to be evaluated are in the areas of mass and nutrient flow in a watershed from the dairy animals, pasture and crop fields including sediment, the farm as a whole including profits, with the weather and climate as driving forces to develop a process based model. Although there are a number of models that identify individual components of a sustainable dairy farm operation there is no good way at present to determine the relative importance of the variety of practices a farm could undertake to become more sustainable. The integrated model, targeted for use on a farm by farm basis, would assist all dairy farmers in making informed decisions about selecting and implementing specific best management practices (BMPs) that are available to reduce dairy farming impact on the watershed. Farms need a comprehensive decision tool to help them determine the best use of their limited capital and management to meet impending total maximum daily loading (TMDL) targets.

Farm decisions including the type of equipment purchased, buildings constructed, and even pasture layouts often define the operations impact on the environment for a relatively long time. Knowing the potential impact on downstream watersheds and the farms recognition as sustainable operations are vital for the farms future. These decisions are ongoing and the information helping farms make sustainable decisions is needed now.

Objectives and Outcomes:

- Evaluate existing tools/models to determine impacts of dairy farm activities on watershed quality.
- Explore paths to integrate these tools to compare impacts of practices on watershed quality and farm viability.
- Determine methods to find the most important sustainable decisions dairy farms could make to reduce their environmental impact on water quality.
- Identify tools or processes addressing these major impacts that could become decision tools for individual dairy farms.
- This work could also be a role model for other farm enterprises in the watershed or other watersheds.
- A long-term goal would include communicating the findings to other community stakeholders.
- It is expected that the tools/models should help inform the larger scale Chesapeake Bay (CB) Model.
- The CB Stakeholders need appropriate on farm decisions to continue to improve the water quality.

Urgency and reason the CB STAC Workshop is the appropriate vehicle:

All six states (and Washington, D.C.) in the CB watershed developed, and are now implementing, Watershed Implementation Plans (WIPs) that describe the contributions each state will make toward improving water quality in the CB. Each state has also developed two-year goals, called milestones, which outline short-term steps toward the long-term objectives described in the WIPs. Individual dairy farms in the CB watershed are asking, "what is the best implementation plan for my specific farm and/or field." The proposed workshop would provide a relevant path forward after the Chesapeake Bay Program (CBP) Midpoint Assessment is completed.

Background:

The novel nature of taking a systems approach is that we are able to integrate quantitatively across sources of knowledge (i.e., animal nutrient and energy needs, field losses of nutrients and sediment, farm practices and their feasibility and yield potential considering soil type, topography and weather, climate change, multiple stressors, human dimensions) to achieve an improved basis for adaptive management. We can also simulate and ultimately try out different versions of the future before utilizing limited resources (funding) to implement change. The potential is to have a systems simulation that in effect creates a memory of the future.

We need to combine the sources and find the interactions among the components, not just look at each "theme" in isolation. They do not exist that way around the Bay. It is important to uncover the best models and plan how to make them accessible to change behavior and the environment/watershed quality.

The steering team has extensive experience in conference planning and implementation. Curt Gooch led an Ag Sustainability Conference last summer that provided information on portions of the models and tools that would be explored in this workshop. Potential Workshop participants and their expertise are listed below. The formal presentations will be on the first day of the two day workshop with discussions on methods to integrate and then simplify the tools for farm use on the second day. It is anticipated that this will stimulate both continuing collaboration and the development of tools for farm sustainable decisions.

This proposal addresses each of those themes identified by the STAC to contribute to the CBP goals: **Climate change** and weather extremes are one of the driving forces behind the need for development of a comprehensive tool. Historical and projected weather data will be incorporated into the model to determine farm practices therefore; future climate change will be addressed. **Adaptive management** is the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn. Adaptive management is the process of hypothesizing how ecosystems work, monitoring results, comparing them with expectations and modifying management decisions to better achieve conservation objectives through improved understanding of ecological processes. An adaptive management approach deals with the uncertainty inherent in managing natural ecosystems by treating policies or practices as experiments. The first step in this process is to determine a hypothesis for farm action. Although improvements in the ecosystem at the downstream end of the watershed are the main goals of the CBP, upstream there are **multiple stressors** on living resources including dairy farms. Tools that will assist in their decision making taking into account the farm viability and resources would advance an understanding of the management implications of each proposed agricultural practice proposed for water quality improvement. These **human dimensions** of the proposed practices are needed. Without taking into account the capital and management abilities of the farm the practices will not be implemented or the farm will suffer economic stress which may impact other environmental areas. Farmers currently can monitor lots of data all the time in order to stay profitable. They are monitoring interest rates, markets, feed costs, bedding costs, energy costs, labor costs, nutrient costs, crop yields, feed efficiency, daily gain, milk production, reproduction, etc. Farming requires not only critical decisions made on the basis of this information, but also the ability to prioritize among the various options to improve profits, improve their environmental footprint, and improve their image to their neighbors, processors and ultimately consumers. The innovative tools for **nutrient management** that would include both water quality impacts and economic and management impacts on the farm will help dairy farms as they work toward the need for demonstrating sustainability.

Anticipated speakers/moderators/key participants:

- Mr. Curt Gooch, PRO-DAIRY, Dairy Environmental Systems and Conference organization, 425 Riley- Robb (607) 255-2088 cag26@cornell.edu Moderator
- Dr. Jacqueline Lendrum, NYSDEC CB Program Coordinator , Albany, NY 518-402-8086 (8165) jlendrum@dec.ny.gov State of the CB TMDL and needs of dairy farm action.
- Mr. Greg Albrecht, AEM Coordinator, CNMP) Specialist, NYS Ag&Markets | Division of Land and Water Resources 309 Roat St., Ithaca, NY 14850 (607) 229-4654 greg.albrecht@agriculture.ny.gov, Existing AEM tools available to dairy farms.

- Mr. Doug Young , Managing Partner, Spruce Haven Farm and Research Center, Auburn, NY, 315-252-2043 gdyoung456@aol.com Need for a process based model to inform farm decisions.
- *Dr. C. Alan Rotz, ARS, al.rotz@ars.usda.gov (814) 865-2049 USDA-ARS Integrated Farm System Model relating crop practices to yield and farm profitability.
- Dr. M. Todd Walter, Professor, Biological and Environmental Engineering, 222 Riley Robb (607) 255-2488 mtw5@cornell.edu Field tools predicting specific nutrient and sediment losses.
- *Dr. Michael Van Amburgh Professor, Animal Science, 272 Morrison Hall (607) 254-4910 mev1@cornell.edu Cornell Net Carbohydrate and Protein System (CNCPS) determining feed inputs and milk and manure outputs.
- *Dr. Arthur T. Degaetano, Professor, Earth and Atmospheric Sciences, Room 1119 Bradfield Hall 607-255-0385 atd2@cornell.edu Addressing weather data and climate change predictions.
- *Dr. Quirine M. Ketterings, Professor, Animal Science,323 Morrison Hall (607) 255-3061 qmk2@cornell.edu Farm practice impacts on nutrient and soil loss.
- *Cool Farm Alliance 3 Linden Road, Hartland, VT 05048 USA (802) 436-4062 info@coolfarmtool.org Simple tools for farm response to environmental issues.
- Mr. Pete Wright P.E., Senior Consultant, Cornell PRO-DAIRY Program, 585-314-5314 pew2@cornell.edu 425 Riley- Robb Manure management needs relating to environmental issues and climate change

*not contacted yet

These Speakers will be asked to help integrate the models available now to address: How a process based model might potentially be integrated to study interactions among components so that we all can bring this to the next level, rather than studying each area in isolation? And: What specific BMP(s) should a farm undertake in each specific field that will maintain the farm's viability and have the most impact on water quality improvements downstream considering the capital and management resources of the farm?

Proposed Budget	Task 1 Pre Conference Jun-Jul	Task 2 Conference August 2016	Task 3 Post Conference Report November 2016	Project Total
Travel		$4,650		$4,650
Supplies, and communication	$500	$3,300	$1,000	$4,800
Total Direct	$500	$7,950	$1,000	$9,450
TOTAL BUDGET	$500	$7,950	$1,000	$9,450

We anticipate 30 participants including science experts, agency collaborators, and farm practitioners. The budget includes: Task 1: supplies to prepare and distribute a paper describing the current status of integration among the models to potential participants, and to support the steering committee. Task 2: the conference site at Cornell University and costs including meals, travel costs include bringing non federal modeling and farm tool experts to the workshop. Task 3: publication and distribution of the final report to interested parties. Priority of the travel funding will be to: 1) Bring a representative of the Cool Farm Alliance from Vermont, 2) bring the past modeler from DMI 3) bring a collaborator from Europe. Cornell University will provide personnel costs from PRO-DAIRY and the Cornell Institute for Food Systems, the time to prepare the conference and final report would be borne by those programs. At this time we are not aware of any additional potential fiscal partners supporting the workshop. **Although the timing is flexible the workshop should be held as soon as practicable due to the need to address farms concerns.** We would aim for August 2016, with the report out in November 2016. We are not aware of any previous STAC-funded workshops applied for by these individuals or workgroup.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Rachel Dixon
Chesapeake Research Consortium
645 Contees Wharf Road
Edgewater, MD 21037

February 25, 2016

Dear Ms. Dixon:

This letter expresses the New York State Department of Environmental Conservation's (NYSDEC) support of the proposed responsive STAC workshop entitled, "Decision Tools for Dairy Farm Actions to Reduce Nitrogen, Phosphorus and Sediment Losses: A Critical Evaluation and Defining a Path Forward."

Agriculture is the largest source of nutrients delivered from New York to the Chesapeake Bay and to achieve New York's goals for load reductions in the Chesapeake Bay watershed, farms must be engaged in a way that allows evaluation of each farm's specific circumstances to determine the best path to economic and environmental sustainability. This workshop will bring together experts in a variety of fields to advance the science of best management practice implementation and to provide tools that will help farmers and conservation professionals achieve the goal of economic and environmentally sustainable agriculture in the watershed.

The summer 2016 timing of this workshop is important as the results will inform the Chesapeake Bay Program's Midpoint Assessment and New York's Phase III Watershed Implementation Plan, which will outline New York's path to achieve its nutrient and sediment reduction goals by 2025.

In closing I reiterate NYSDEC's support of the proposed workshop and the benefits it will provide for farmers throughout the Chesapeake Bay watershed.

Sincerely,

Jacqueline Lendrum, Coordinator
Chesapeake Bay Watershed Program

c: Peter Wright, P.E., Cornell PRO-DAIRY Program
Dr. Wei-Xing Zhu, Binghamton University – State University of New York
Dr. Katherine Bunting-Howarth, New York Sea Grant, Cornell University