AGRICULTURAL INNOVATIONS GROUP

Recommendations for a Healthy Lake Champlain and a Vibrant and Sustainable Agricultural Economy

AUGUST 2014

The Environmental Mediation Center (EMC) would like to thank the following for their active participation in developing this report. The following people and organizations, while not necessarily supportive of each and every part of the report, are supportive of the general conclusions in this report.

Jennifer Alexander (Agronomy Conservation Assistance Program), Tom Eaton (Agricultural Consulting Services), James Ehlers (Lake Champlain International), Sally Flis, PhD. (Bourdeau Brothers), Marty Illick (Lewis Creek Association), John Roberts (former dairy farmer and current Agency of Agriculture Small Farms Water Quality Specialist) and Denise Smith (Friends of Northern Lake Champlain).

James Maroney participated in the meetings and filed a separate response.
Others also participated in some of the discussions and the EMC wishes to thank them for their contributions as well.

Kim Greenwood (Vermont Natural Resources Council) and Lori Fisher (Lake Champlain Committee)

The EMC and the Consensus Building Institute (CBI) also extend their thanks to the following for their support of the LCPPI project.

United States Department of Agriculture Natural Resource Conservation Service
United States Environmental Protection Agency
Green Mountain Coffee Roasters
High Meadows Fund

Background

The Agricultural Innovations Group (AgInG) is part of the Lake Champlain Phosphorus Pollution Initiative (LCPPI), a project facilitated by the EMC and CBI. The LCPPI consisted of two related but separate initiatives.

First, the Agricultural Working Group (AWG), consisting of farmers and agricultural service providers working in conjunction with the Agency of Agriculture and the Department of Environmental Conservation, evaluated a “Certainty Program” and developed recommendations that could be included in the Lake Champlain Total Maximum Daily Load (TMDL) Implementation Plan that the State submitted to EPA. Second, the Agricultural Innovations Group (AgInG) consists of members of Vermont’s agricultural community as well as members from the environmental community. The AgInG was formed to consider long term approaches to developing feasible and innovative strategies to reduce phosphorus pollution from the agricultural sector while maintaining a vibrant agricultural economy. The AgInG believes that these goals are not mutually exclusive and that it is a false choice to state that one needs to choose one or the other.

The AWG issued a final report in December of 2013. This report was submitted to the Vermont Legislature. The report provides additional background information and should be read in conjunction with this report. The AgInG supports the recommendations of the AWG calling for increased resources for compliance and updated regulations to yield certain and timely reductions of phosphorus pollution from the agricultural sector.

The AgInG met nine times in 2013 and 2014. The AgInG invited experts including Don Meals from Ice Nine Environmental Consulting, Tom Boucher and Sean Breen from Native Energy, David Dunn from Green Mountain Power, Rick Johnson from Clearas, John Forcier from Forcier Consulting, Rob Crook from Floating Islands Solutions, and staff from the Vermont Land Trust, Vermont Housing Conservation Board, and the Vermont Pasture Network to answer questions and help formulate recommendations. Other invited guests included staff from the Agency of Agriculture, Department of Environmental Conservation, and Natural Resources Conservation Service. During these meetings the AgInG discussed a variety of strategies and developed the list of recommendations to reduce phosphorus pollution contained in this report.

Phosphorus is a valuable commodity, not a waste product. Recognizing that phosphorus is a valuable resource vital to agriculture and not a waste product is key to meeting the twin goals of reducing phosphorus pollution while maintaining a viable agricultural economy.

Phosphorus is a critical nutrient in soil and essential for plant growth. However, mismanagement of phosphorus application and soil loss results in excessive phosphorus run-off into waterways. Excessive phosphorus in waterways causes accelerated eutrophication and algae blooms that are harmful to the Lake Champlain Basin ecosystem including human and animal health. Failure to control rates of human caused eutrophication has resulted in significant economic losses for Vermont residents, businesses and tourism.

Reducing phosphorus pollution does not require eliminating or even drastically reducing agriculture's usage of phosphorus in a watershed. The goal is to use only as much phosphorus as necessary and use strategies to keep the phosphorus where it is needed. Thus, phosphorus pollution from the agricultural sector can be reduced by promoting practices that improve soil health, applying phosphorus more effectively so that it remains in the soil for plant uptake, and by utilizing innovative technologies that recycle phosphorus where needed.

Algae bloom

Comprehensive Approach Needed

To date the cumulative impact of the State's efforts have shown only modest reductions in levels of phosphorus entering Lake Champlain. These efforts need to be significantly expanded and implemented, especially programs that promote better soil health. On the ground improved agronomic practices should be complimented by more dramatic steps to reduce phosphorus pollution.

The AgInG believes that the State must adopt a comprehensive approach that includes a mixture of voluntary and regulatory programs and bold and innovative ideas in partnership with the private sector. In addition, legacy phosphorus in stream corridors and lake sediment will continue to cause problems for decades. There must also be actions specifically aimed at addressing legacy phosphorus.

This report, therefore, also includes the following recommendations; 1) use secondary treatment technologies in digesters to address water quality, 2) develop a community digester with integrated nutrient recovery for energy conversion; 3) address legacy phosphorus through floating islands that reduce phosphorus at points of in-flow and in the Lake itself; 4) develop a water quality certification program to incentivize best management practices; 5) adopt voluntary and mandatory low cost, easily implementable recommendations in the near future. These recommendations, along with the recommendations of the AWG, are intended to serve as a roadmap for addressing phosphorus pollution from the agricultural sector.

Innovative Recommendations to Reduce Phosphorus Pollution

Secondary Treatment Technology for Digesters and a Community Digester with Integrated Nutrient Recovery for Energy Conversion

Conventional Digesters

Anaerobic digesters on farms convert manure into energy, heat, clean bedding material for livestock, and liquid that contains phosphorus. Currently there are approximately 12 digesters on farms in Vermont.

Conventional single stage digesters reduce a small amount of phosphorus pollution by capturing phosphorus in solid form that is turned into bedding for livestock and recycled in a closed loop back into the digester and by reducing runoff from liquid application because the

liquid, when applied to the land is absorbed better than solid or semi-solid manure. Although conventional digesters produce energy and have other environmental benefits, when implemented as stand-alone technology, they do not make a significant contribution to improving water quality. In addition, biodigesters are expensive and even with grants and long-term contracts aimed at making them more affordable, digesters are beyond the means of most farmers in Vermont.

Digesters with Secondary Treatments

Digesters utilizing secondary treatment technologies can significantly reduce phosphorus pollution. Digesters that use post-treatment technologies such as decanter centrifuging the effluent can isolate and separate 45 -50% of the phosphorus. The phosphorus is concentrated in a solid form or “cake” and can be applied in a more targeted manner where it is needed or can be turned into a product for sale and transported out of the Lake Champlain Basin.

Secondary biological treatment technologies such as algae reactors can also reduce phosphorus by utilizing algae and other organisms to recover phosphorus and other nutrients from wastewater. The treatment results in clean water and a biomass. The biomass contains the nutrients, which can be harvested and processed to create bio plastics or fertilizer. This technology is currently in use in several states by a variety of different agricultural and industrial businesses.

Digesters with secondary treatments are effective in reducing phosphorus pollution but there is an added cost to implement the technology. Given the even greater financial challenges, significant financial aid would be necessary to see any large-scale implementation.

Community Digester

In areas where there is a high concentration of dairy farms, it could be more efficient and economical to build a community digester. The challenge has been that community digesters are not economical on a larger scale when they are only are used for manure because of high transportation costs.

Vermont’s Act 148 changes the economic equation. Starting in July 2014, Act 148 phases out landfilling organic waste such as food scraps. The organic waste has a high-energy value, which makes sending the organic waste to a digester more efficient than composting. Community digesters become more economically feasible processing a combination of farm waste and community organic waste.

A community digester would provide renewable energy, heat, livestock bedding, and phosphorus and other nutrients in a form that can be applied effectively or turned into a marketable product and transported out of the basin.

Many farmers have phosphorus deficient fields that require application of phosphorus to maximize productivity. If farmers contribute the manure to a community digester, they would need to have access to adequate phosphorus to strategically apply to their fields in accordance with nutrient management plans designed to keep the phosphorus in place.

Recommendations

a) Grants and other financial incentives should be developed for secondary treatment technology for digesters so that they are no more expensive than a conventional digester. Programs should be developed that enable farmers to add the two stage separation processes to their planned and existing digesters at little to no additional cost. All future digesters should incorporate the secondary treatment technology.

b) A community digester handling farm and organic waste should be developed as a pilot project. Green Mountain Power is currently evaluating a community digester project in St Albans. This project may be viable for development of an innovative public/private initiative.

c) Farmers should be involved in developing the pilot project from the beginning in order to ensure that they understand its benefits and contribute towards developing a system that provides them with livestock bedding and phosphorus in a form they can utilize effectively. Farmers should be involved in exploring and evaluating whether any infrastructure such as pipelines should be developed as part of the project.

d) Any excess phosphorus from the pilot project could be turned into a solid phosphorus cake and exported out of the basin and sold as a fertilizer. Research should be conducted to explore other possible products and their potential market.

e) If the St Albans community digester pilot project is successful, research should be conducted in other locations with high concentration of dairy farms such as Addison County to explore the feasibility of additional community digesters. The organic waste stream available due to Act 148 could contribute the necessary additional fuel to make the projects economically feasible.

Floating Islands to Address Legacy Phosphorus

Even if phosphorus levels were drastically reduced in runoff, scientists agree the legacy phosphorus in the river corridors, river channels, and lake sediment, will continue to cause phosphorus pollution in the Lake for decades. According to recent estimates, river corridors and river channels contribute approximately 20% of the phosphorus entering the Lake. Phosphorus in lake sediment also significantly contributes to algal growth when it is remobilized. As a result, there is a need to address the legacy phosphorus in the river corridors and lake sediment in order to see measurable benefit any time soon.

Unfortunately there are few solutions that address legacy phosphorus. Although in other smaller bodies of water alum has been applied to seal the phosphorus in lake sediments, scientists agree that would not be effective for Lake Champlain. An innovative and promising solution to address legacy phosphorus is to utilize manmade floating vegetated islands to absorb excess nutrients.

The floating islands are constructed with porous plastic and foam that are anchored to the lake bottom. The phosphorus is removed from the water by plant and biofilm uptake on the island

matrix and plant roots. Vegetation that is harvested or removed from the islands may be able to be fed to livestock, utilized to create a marketable product, or composted.

In addition, phosphorus and other nutrients are channeled into higher trophic levels of the lake ecosystem. Periphytons, a complex mix of algae, bacteria, and microbes that are attached to most submerged surfaces in aquatic ecosystems serve as food for macro invertebrates and some juvenile fish. Every 100 pounds of fish caught removes approximately 1 pound of phosphorus.

Floating Island

Recommendations

a) Addressing the legacy phosphorus requires a comprehensive approach that includes phosphorus in river corridors and lake sediment. There is no reason to wait until the phosphorus load reductions have occurred before confronting legacy phosphorus. Fully addressing the legacy phosphorus will take decades and delaying the implementation of the effort will only delay the completion date.

b) Today's river corridors and their readjusting stream banks contribute large quantities of soil laden phosphorus primarily during major storm events. Therefore, strategies such as floodplain restoration and perpetual active river area conservation easements are necessary to achieve restored fluvial equilibrium conditions and reduce soil and phosphorus mobilization.

c) Although floating islands may be too costly and not ideally designed to work in rivers and streams, they can be placed at the points of inflows from the watersheds to address phosphorus entering the Lake from the streams and rivers.

d) Floating islands have been used to clean nutrient pollution from other lakes in the US but not the scale of Lake Champlain. Floating islands may not be able to address the Broad Lake and other large segments of the Lake but may be well suited to address bays. The State should investigate the feasibility and effectiveness of this technology as soon as possible. Assuming the results are promising, a pilot study should be developed in a bay to test the feasibility and cost effectiveness of this technology.

e) St Albans Bay would be an ideal location for a pilot study. The pilot study should include both floating islands at the points of inflow from the watersheds and floating islands to capture remobilized phosphorus in the sediment. Some of the floating islands would extend from the shoreline to facilitate the harvesting of plant materials.

f) A field size pilot study with 3,000 square feet of floating islands would likely cost approximately $100,000. Floating islands to address all of St Albans Bay would require approximately 2.5 acres of islands at a cost close to $2,500,000.

Water Quality Certification Program for Agricultural Operations

A water quality certification program would incentivize farmers to undertake conservation measures over and above existing regulatory requirements to address phosphorus pollution. Farmers participating in the program would be eligible for certain benefits and could market their product with a certified label for a premium. Standards reflecting best management practices would be developed for different types of farming operations. The certification program should address all sources of nutrient and pollutant runoff from farms including land base, productions areas, and whole farm nutrient balance (including import and application of nutrients). Once the standards were developed, independent certifiers would inspect farms that applied for certification.

There are other existing labeling programs that do not have specific standards for water quality such as organic certification and fair trade. If it is not feasible to develop an independent certification for water quality, it may be possible to work with existing programs to see if specific water quality standards could be adopted.

Recommendations

a) A water quality certification program should be developed as soon as possible. The draft Vermont Agricultural Water Quality Excellence Program (VAWQEP) developed by the Agency of Agriculture could serve as the framework for a certification program because it addresses all sources of pollution from farming. The AgInG looks forward to more details when available before consideration of full endorsement.

b) Non-monetary incentives alone such as increased priority for receiving funding for conservation programs are not adequate and may not maximize pollution reduction per dollar spent. Any certification program should not reduce available resources to farms that are not in compliance with existing regulatory mandates. Funding conservation programs on these farms should remain a priority.

c) Increasing the cost share percentage for participating in conservation programs may be helpful but alone is not adequate to incentivize large participation in the program.

d) The strongest incentive would be a monetary payment. Ideally, the products from certified farms would be processed separately and marketed for a higher premium so consumers pay for the extra payments to the participating farmers. Although this concept is appealing, there are considerable logistical challenges for marketing certain products such as fluid milk separately. There are fewer logistical challenges to market certified value added dairy products such as cheese and yogurt at a higher price point.

e) Market research should be undertaken to determine whether it is economically viable to market various products for a premium to fund the payments to the participating farmers. At that point the Agency of Agriculture and others can discuss next steps for the certification program.

f) Initially, tax credits should be utilized as an incentive for farmers to participate in the program. The amount of the tax credit should be significant enough to attract farmers to participate in the program.

g) The Agency of Agriculture should partner with non-profit organizations to develop the certification process. Non-governmental certifiers should ultimately lead the program and that would bring additional credibility to the certification process.

Cover cropping

Easily Implementable Recommendations

Enforcement and Compliance

Voluntary programs alone will not make adequate progress reducing phosphorus pollution. Vermont needs to have a balance of voluntary and mandatory programs. The AgInG agrees with the AWG that the Vermont Agency of Agriculture, Food and Markets needs additional resources devoted to compliance and enforcement of regulations.

Recommendations

The Accepted Agricultural Practices (AAPs) need to be updated to include required practices that more effectively and swiftly promote soil health and reduce nutrient and sediment runoff from lands in agricultural use.

Increasing Use of Proven Technologies

Manure injection, drag line systems, no-till farming, and cover cropping are all proven technologies that promote soil health and reduce nutrient runoff. These technologies are available now, relatively affordable, and effective. Adoption of these technologies improves the farm's productivity and the lake's water quality.

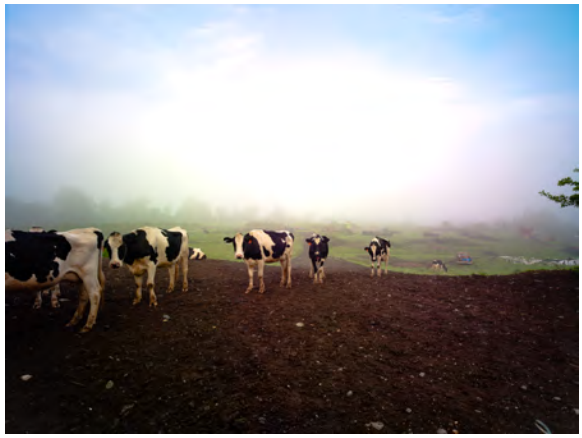
Recommendation

The State needs to develop innovative strategies to increase the use of these proven and affordable technologies. Although the Natural Resources Conservation Service has programs that provide a cost share for some of these technologies, these technologies have not been widely adopted in Vermont. Additional financial incentives such as state tax credits should be developed in order for these technologies to become standard statewide.

Increasing Pasture Based Livestock Farming

Pasture based dairy farming increases the soil's ability to hold nutrients and as a result reduces nutrients in the runoff. Pasture based farming can improve animal health and increase farm profitability for some farms by reducing inputs and other costs. However, pasture based farming does not work for all farms and requires a certain ratio of livestock to available pasture to be feasible.

Recommendations



a) Increasing pasture based livestock farming requires 1) a comprehensive outreach program to educate livestock farmers about the benefits of pasture based farming in order for them to make an informed determination whether pasture based farming will work on their farm, and 2) one-on-one technical assistance for farmers making the transition.

b) The Vermont Pasture Network (VPN) and other groups have been providing these services with funding from NRCS and other sources. Long-term funding for these organizations is essential to increase pasture-based livestock farming.

c) A fund should be established to assist farmers transitioning to pasture based farming. During the transition, farmers experience lower profitability due to increased costs and lower production. The Natural Resource Conservation Service's Environmental Quality Incentives Program (NRCS EQIP) contracts can help farmers pay for some of the necessary infrastructure such as fencing. The lower production during the transition is a barrier to increasing pasture based farming. A short-term subsidy for transitioning farmers similar to what the organic industry provides for transitioning organic farmers may enable more farmers to successfully transition to pasture based farming.

d) Funding for infrastructure for transitioning farmers should be as flexible as possible. NRCS EQIP contracts are essential for large infrastructure projects. For smaller projects, funding should be available with a faster turnaround time, less paperwork, and more flexibility.

e) Pasture or grazing management plans are essential to ensure that the transition to pasture based farming will be successful. Periodic farm visits are necessary to ensure that pasture management plans are being followed.

f) For farms that receive funding from an NRCS EQIP contract, NRCS conducts an inspection to ensure that the farmer is in compliance with the Grazing Management Plan. For farmers who transition to pasture based farming without an NRCS EQIP contract, there needs to be a similar inspection program if the farm receives any government funding to assist with the transition.

g) The inspection program should not be carried out by technical service providers, such as VPN, who assist the farm during the transition period. The farmers need to be able to turn to the technical service providers for assistance without fear of ramifications for being out of compliance.

Water Quality Safeguards in Agricultural Conservation Easements

A conservation easement is a voluntary legal agreement ensuring property will not be subdivided or developed. In many cases, funding for the purchase of such easements utilizes public funds and confers a financial benefit on landowners. Conservation easements are used to preserve tracts of land with significant and productive agricultural soils and play an important role in the permanent preservation of farmland. However, while conservation easements preserve land for agricultural use, they generally do not emphasize significant environmental safeguards to protect water quality beyond compliance with AAPs.

Recommendations

a) The Agency of Agriculture, the Department of Environmental Conservation, Vermont Housing and Conservation Board, Vermont Land Trust, and other organizations should work together to develop increased environmental safeguards to protect water quality to be included in conservation easements. These safeguards could require the approval of management plans or prohibit certain farming activities in environmentally sensitive areas.

b) These organizations should develop selection criteria for enrollment based, in part, on the ability of the landowner to continue abiding by current federal and state regulations and implementing enhanced environmental safeguards to protect water quality into the future.

c) For farmers who are not interested in a conservation easement or do not have a sufficient acreage to qualify, an independent environmental easement program should be developed that protects water quality. This easement could be available for smaller tracts of land and require the approval of management plans or prohibit certain farming activities in sensitive areas.

Reducing Imports of Grain Crops

Dairy farmers typically use silage crops such as corn, grass, hay; and grain crops such as corn grain and soybeans to feed their herd. Many New England based farmers grow silage crops but do not grow grain crops. Growing grain crops requires additional equipment such as combines and drying equipment. Many dairy farmers do not have adequate acreage to grow both silage and grain crops for the size of their herd nor the equipment needed.

Most of the purchased grain crops are imported from out of state. The imported grain crops contain phosphorus, which ends up in the manure and remains in Vermont when it is applied to the land. Reducing imported grain crops would help restore the phosphorus balance and reduce phosphorus pollution entering Lake Champlain.

However, growing grain crops requires a major investment to purchase combines and drying equipment. Most dairy farms do not have adequate acreage dedicated to growing grain crops to justify the expense of purchasing the equipment.

Recommendations

a) Coops or custom applicators may be able to invest in the equipment necessary to grow grain crops in Vermont. Coops could purchase combines and set up a program for member farms to use the equipment. Coops could also establish facilities to dry, grind, and store the grains.

b) Dairy farmers should be encouraged to find the right balance between herd size and acreage devoted to silage crops and grain crops. Agricultural service providers and feed dealers can work with dairy farmers to establish the right balance.

Individual Response to the AgInG Report
from James H Maroney, Jr.

The AgInG Final Report Suggests: “The AgInG was formed to develop innovative strategies to reduce phosphorus pollution from the agricultural sector while maintaining a vibrant agricultural economy. The AgInG believes that these goals are not mutually exclusive and that it is a false choice that one needs to choose one or the other.”

My Response: A “vibrant agricultural economy” is a desirable goal but it must be subordinated to the attainment of clean water. Agriculture must adapt to the absolute value “clean water,” not the other way round. The central operating premise of conventional dairy farming is premised upon maximizing production without regard to its effects upon exogenous systems like water and air quality. Conventional agriculture cannot, therefore, be moderated: one is either applying artificial fertilizers and herbicides and maximizing production or one is not farming “efficiently” as defined by the precept. Vermont agriculture is 80% dairy and dairy is 80% conventional, which means that this statement contradicts the purpose of the AgInG.

Report: “Phosphorus is a critical nutrient in soil and essential for plant growth. However, mismanagement of phosphorus application and soil loss results in phosphorus run-off into waterways.”

My Response: Mismanagement of phosphorus begins with the promulgation of the Accepted Agricultural Practices Rules, which permit importing thousands of tons of grain feed supplements, which are high in P. High P feed supplements are imported to boost milk production, without regard to their effect upon exogenous systems like water and air quality.

Report, *Recommendations:*

My Response: The AgInG’s recommendations have, as their starting point, the probity of conventional dairy. No environmentalist, setting out to achieve water quality, would make these recommendations. They will not achieve our WQSs.

Sincerely yours,

James H. Maroney, Jr.
June 30, 2014