



Farmers Respond to goCrop™ Integrated Analysis Tools: Cornell's Whole Farm Nutrient Mass Balance Calculator & NRCS's Cover Crop Economics Calculator

Introduction

With the passing of the Vermont Clean Water Bill (Act 64) in 2015, Vermont now has some of the strictest water quality regulations in the nation. The Required Agricultural Practices, a legislative fulfillment of Act 64, require farmers to create nutrient management plans (NMPs) and keep records of their manure and fertilizer applications. The purpose of NMPs is to help farmers grow crops and minimize the risk of nutrient and soil loss to the environment. The development and maintenance of an NMP is complex and time consuming. To help farmers meet this demand, goCrop™ was developed under the direction of University of Vermont Extension Agronomist Dr. Heather Darby. As a web-based tool, goCrop™ provides a comprehensive method to create NMPs and maintain records to meet state regulations. Farmer feedback was solicited each step in the development process to produce an easy to use tool. As an agronomic tool that helps farmers manage crops and soil, goCrop™ already has high-use value to farmers. To add to the capabilities of goCrop™, additional decision-making tools were added that help farmers quickly and efficiently analyze where nutrients are going on their farm with the Whole Farm Mass Nutrient Balance Calculator based on Cornell's model, and to assess the monetary benefits of cover crops with the Cover Crop Economics Calculator based on the Natural Resources Conservation Services (NRCS) spreadsheet. Hosting multiple tools under one platform, makes goCrop™ a convenient one stop location to write an NMP cost-effectively and help farmers make data-driven decisions that promote economically and environmentally sound practices. Farmers were excited to try goCrop™'s newly released features. What follows are accounts of farmers experiences with these analysis tools.

Whole Farm Mass Nutrient Balance Calculator

Unlike the NMP, the Whole Farm Nutrient Mass Balance Calculator (NMB) looks at how nutrients move onto and off the entire farm. The final reports show the balance and ratios of nutrients (nitrogen, phosphorus, and potassium) in tons from farm-grown crops and from imported and exported feed, fertilizer applied, bought or sold animals, amount of milk sold, and other agricultural goods. In the case of Vermont, this tool can be used to assess if a farm is a net importer or exporter of nitrogen, phosphorus, and potassium. Farmers can use this information to determine where nutrients like phosphorus are coming from onto their farm and then can make decisions on how to reduce those nutrient imports. Conversely, reports may show a net removal of nutrients from farm fields and the farmer can use this information to determine if more nutrients should be added to the fields or rations to keep the farm system healthy.

Tim Magnant of Bridgeman View Farm was highly engaged in the process and not content to rely just on his memory, he referred to his invoices to calculate the amount of grain and fertilizer he purchased. He acknowledges that the information he gets out of the tool is only as good as the data he puts in it. After using the goCrop™ NMB tool, Magnant was surprised to see that the majority of phosphorus actually came onto his farm as feed, not fertilizer. Magnant stated, "It taught me things I wanted to know about how things work. I never thought about grain and phosphorus in milk. I thought it was all about the fertilizer." Geoff Sweeney of Sweeney Farm and Olivia Reynolds of Crosswinds Dairy and Daughters also shared this sentiment. Sweeney commented, "I had not thought of grain as an importer of phosphorus...after using this tool, I talked to the feed guy about over mineralization of the animals. They just don't need all of it." After

viewing the reports, Reynolds also noted that not many nutrients are imported, but thought it was interesting that the major importation of nitrogen was fertilizer and the major importation of phosphorus was feed.

Recognizing that feed is a main source of bringing phosphorus onto the farm and that dairy animals often get more phosphorus than they need, can encourage farmers to source lower phosphorus feed options. Farmers are willing to buy lower-phosphorus feed if it has similar quality and cost to the feed they currently purchase. As a NMP tool, goCrop™ helps farmers optimize nutrients from crops, which can lead to higher yields and a reduction in imported feed.

Reynolds works with her NMP daily and uses it as a way to understand field-by-field nutrient balances. Reynolds appreciated that the NMB reports gave her a whole farm perspective. Reynolds intuitively knows the information displayed in the reports, but seeing the numbers really make whole farm nutrient cycling click. She saw in numbers what she was experiencing on the farm. For example, about 30% of the fields do not receive manure. The barrier those fields face to receiving on-farm generated nutrients is distance from the home farm pit. It takes too much time and is not cost-effective to haul manure that far. When examining the Annual Nutrient Balance Report from the goCrop™ tool, Reynolds remarked that the only time nutrients leave the farm are when animals or milk are sold. After looking at the Itemized Report, Reynolds saw that nutrients were most heavily applied on the corn fields in the beginning of the season. She recognizes that this is not the best use of nutrients because there is a higher risk of run-off in the spring and it is not at a time when the plants need it the most.

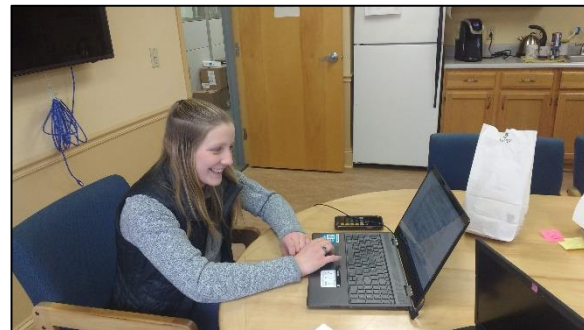


Image 1. Reynolds uses goCrop™'s analysis tools on her laptop.

Although Reynolds found all reports informative, she was most surprised by the results in the Graphical Interpretations Report. Crosswinds Dairy and Daughters fell in the operational zone optimal ranges where nutrient balance and milk production are within feasible limits. She said, "I feel like we are doing our job." Although Magnant saw that he was a net exporter of phosphorus in the Annual Nutrient Balance Report, seeing it illustrated in the Graphical Interpretation Report really made him excited. "Reports are nice because we can see the results. We are doing a good job. This report isn't for me, it's for the naysayers... The reports work in my favor because they show that the agronomics we are doing are working. It's proof. We are doing as good as we can do. This shows me we are doing pretty well."

Cover Crop Economics Calculator

The benefits of cover crops are widely known. They can increase organic matter, increase nutrient availability to crops, and reduce erosion. As a result, cover crops have the ability to protect water quality, improve soil health, and increase cash crop yield. Of course, they also have planting, maintenance, and termination costs. The Cover Crops Economics Calculator (CCEC) considers these factors to assess if cover crops have a net monetary gain or loss in a single season or throughout the duration of an entire crop rotation.



Image 2. Magnant uses goCrop™'s analysis tools on his laptop.

The CCEC gave farmers an opportunity to understand the different values that cover crops bring to their farm. For example, Magnant put in a value of \$10/acre for the positive public relations cover crops provide to his farm. For Beau Rainville of Larose Farm, the highest benefit of the cover crop to his farm is keeping his soil on the field and hence, this prompted him to increase the recommended dollar value for fertility loss due to erosion. However, Nick Manning of Manning Dairy ended up with a report showing that cover crops were not cost-effective. This was due to the cost associated with an estimated yield drag associated with planting short-day corn so that cover crops would establish well. The results in the report piqued Manning's interest in using the tool more to understand the cost-benefit analysis. Manning still plans on planting cover crops because they still benefit his fields by curbing erosion and keeping topsoil in place.

For others, like Magnant and Mike Ferris of Ferris Farm, the reports showed the financial gains of cover crops. Ferris said, "The Cover Crops Economics Calculator helped me realize the monetary value and savings of planting cover crops." Using the Cover Crops Economics Calculator only confirmed what Magnant was seeing on the ground. "Reports show me that it makes me money, but I also know that my system saves me money...I think planting cover crops is the right thing to do and this shows it," shared Magnant. He is realizing the benefits of his healthier soils. He attributes his good soil to the combination of cover crops and no-till practices minimizing soil loss and increasing nutrient conservation and cycling. In fact, he may not even apply starter fertilizer to his corn fields next year. The CCEC reports show that there is an annual \$2,000 benefit for the whole farm to planting cover crops. As Magnant says, "This is not a big number, but as a farmer, can I really afford to throwaway \$2,000?" Both Magnant and Ferris are looking forward to using the tool to run scenarios to pinpoint the most cost effect cover crop system for their 2020 cover cropping plan.

Summary

Farmers are always looking for ways to tweak their operations to make them more successful and cost-effective. The new goCrop™ analysis tools, Whole Farm Nutrient Mass Balance and Cover Crop Economics Calculators, provide a modern way for farmers to assess total nutrient load of their farm and realize the financial benefit of using cover crops. The Whole Farm Nutrient Mass Balance Calculator gives farmers the information they need to identify the main source of phosphorus importation onto the farm and adjust feeding or fertility practices that will minimize nutrient loading and maximize overall farm productivity. For many farmers, the Cover Crops Economics Calculator can be used as a tool to justify the good work they are already doing. By ascribing a monetary value to cover crops, farmers may be more



likely to expand acres under cover crops and espouse the good virtues of cover crops, encouraging other farmers to plant more acres.

To sign up for a free 30-day trial and try the new analysis tools visit: www.gocrop.com

For more information about goCrop™ contact:

Heather Darby or Lindsey Ruhl

UVM Extension Northwest Crops and Soils Team

278 S. Main Street, Suite 2

St. Albans, Vermont 05478

(802) 524-6501

gocrop@uvm.edu

ACKNOWLEDGEMENTS

This project would not have been possible without generous funding from Natural Conservation Resource Services Conservation Innovation Grant, “Innovative Tools to Improve Nutrient and Financial Accounting Conservation Practices on Vermont Farms”, agreement #69-1644-17-156 and Vermont Agency of Agriculture, Food & Markets Clean Water Fund, “Agricultural Clean Water Initiative Program,” grant #02200-ARM-CWF-GOCROP-2017-010.

This Nutrient Mass Balance calculator is based on the WHOLE FARM NUTRIENT BALANCE CALCULATOR developed as part of the Nutrient Management Spear Program, a collaboration among the Cornell University Department of Animal Science, PRODAIRY and Cornell Cooperative Extension. The original calculator and supporting documentation can be downloaded from the Nutrient Management Spear Program Website: <http://nmsp.cals.cornell.edu/NYOnFarmResearchPartnership/MassBalances.htm>. For more information regarding the original calculator contact Quirine Ketterings at the Cornell Nutrient Management Spear Program, Department of Animal Science, Cornell University, 330 Morrison Hall, Ithaca NY 14853, or e-mail: qmk2@cornell.edu.

UVM Extension helps individuals and communities put research-based knowledge to work.



Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. University of Vermont Extension, Burlington, Vermont. University of Vermont Extension, and U.S. Department of Agriculture, cooperating, offer education and employment to everyone without regard to race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or familial status.

© January 2020, University of Vermont Extension