

MANAGING MANURE

By Lisa Fields

“Nutrient Boom” invention could optimize manure application efficiency

Doug Young's commitment to nutrient management goes far beyond his role as managing member of Spruce Haven Farm and Research Center in Union Springs, NY. Young's vision for animal agriculture inspired him and other producers to form the Ag Waste Solutions company several years ago.

The Cornell Nutrient Management Spear Program's (NMSP) Nutrient Mass Balance was a key influence in Young's vision.

“Most farms have some nutrient inefficiency, which doesn't benefit the environment or farm economics,” he said. “That limits our ability to keep farms in business producing food for the world's people into the future. Applying the Nutrient Mass Balance to our farm made me realize where we could gain efficiency by reducing nutrient imports from feed and fertilizer purchases and optimizing manure nutrient use by the crops. It convinced me that nutrients utilized within a farm's system can be produced on the farm with very low importation from off-farm sources. When farms have a closed nutrient loop, the soils are well nourished, crops perform well, and animals can be healthy and productive. That means a solid bottom line for the farmer. It also means clean air and water resources, better carbon sequestration and a brighter future for agriculture.”

The challenge of improving nutrient efficiency took Young overseas to see the initiatives of European countries. He was impressed by the methods used in Denmark to utilize manure nutrients and protect air and water resources.

“When I was there several years ago I felt they were 20 years ahead of us,” he said. “Their practice of only spreading manure on actively growing crops meets the crop's needs while keeping nutrients on the field and away from surface and groundwater. The Danish manure distribution systems minimize volatilization of gases, protecting air quality, too. Their systems aren't the best fit for the US though, as they primarily grow ryegrass, and their manure application equipment is too costly for our market.”

Young was not deterred, and

Nutrient Boom allows application of liquid manure to growing crops.

worked with Cuff Farm Services to invent a way to apply liquid manure to actively growing corn or hay in the US.

“Applying manure during the growing season addresses several nutrient efficiency challenges that out-of-season applications present,” he said. “Actively growing corn has enough leaf canopy to reduce odor and loss of ammonia nitrogen, and it reduces the risk of manure run-off. The manure substitutes for purchased fertilizer. In contrast, out-

of-season manure applications often require injection to avoid nutrient losses and environmental risks.”

The “Nutrient Boom” delivers manure to the surface of the ground in growing crops through flexible hoses attached to a boom applicator. It moves across the field at up to 600 gallons per minute and applies manure at rates from 5,000 to 20,000 gallons per acre. The Nutrient Boom is pulled across the field by a 5 horsepower motor on a Cadman© hard hose traveler.

Manure is supplied to the boom either directly from manure storage or pumped from frac tanks fed by semi-tankers hauled to the field. The boom has two folding wings and a center framework support on wheels. Housed on the center support are cylinders to raise or lower the boom wings, the distribution motor that delivers the manure out to the boom hoses and a separate motor to pump the manure from the source to the boom. Each boom and reel set-up costs about \$90,000. The Nutrient Boom has the unique ability to apply manure to a growing crop over a wide time window. The boom height allows application on corn up to 10 feet tall and covers

48 corn rows in a single pass, disturbing a low percentage of plants. An additional benefit is that the rig leaves a relatively light footprint on the soil. A light tractor (typically 90 horsepower) can be used to move the boom across a field, and use of a sprayer unit is being examined. In all cases, each pass covers 120' of field width.

“We had some interesting responses when we unveiled the concept. Secretary of Agriculture Tom Vilsack said ‘Wow, who makes that?’ when he saw a picture of the boom



Spruce Haven Farm and Cuff Farm Services' “Nutrient Boom” delivers manure to the surface of the ground in growing crops through flexible hoses attached to a boom applicator.

at a White House press conference. “Later, I was invited to give a presentation about the Nutrient Boom to 25 senior staffers from the EPA and USDA in Washington, DC. That was quite encouraging,” he said.

The Nutrient Boom saw its first public use in 2013 at two Ohio State Extension field days, and in 2014, with a field trial in Ohio and on a NY dairy farm. The Ohio Corn Marketing Program and Ohio Dairy Marketing Research Fund sponsored the boom through Glen Arnold, Ohio State University Extension Nutrient Management Field Specialist.

“Getting the Boom in the public eye was a big step toward building interest in this concept and showed us some needed adjustments,” Young said. “My son Drew worked with two booms in Ohio and learned what needs to be monitored and when. He developed an efficient set-up procedure from arrival at the field with the equipment to pulling the boom into the field ¼ mile, getting the pumps going, ready to distribute nutrients.”

Mechanical and control system adjustments to the Nutrient Boom are planned for this winter.

“We changed the bushings on the fold seams of the boom, and fit a commercially available grinding unit to our pump,” Young said. “That took care of any trash larger than the 1.25 inches that the pump can currently handle. A challenge we encountered in Ohio was very wet weather on clay soils. A solution for using it in those conditions could be having a cover crop so the tires are moving over sod residue instead of exposed soil.”

The NMSP, led by Dr. Quirine Ketterings, is working with Young to help evaluate the invention. In 2014, they gathered data from the Patterson Farm in Cayuga County, where the boom was used in a corn field with tillage treatments split between no-till and zone-till.

“It is great to work with Doug on evaluation of this new technology,” Ketterings said. “This year, we compared side-dressing of manure with application of water at the same rate to evaluate the benefits of manure beyond application of water. Additional work is needed, but if manure can be applied to a growing crop like corn, it not only benefits the environment, but it can also enhance crop production. It would also allow for quicker planting of corn in the spring. The approach Doug has taken with this unit addresses compaction issues that could occur with tanker-based manure applications in wet springs as well.”

“I view the Nutrient Boom as a tool to help take nutrient management to the next level of efficiency. That drives me to keep at it, addressing the challenges to achieving optimal function as they arise,” Young said. “Getting a system on the ground that can deliver manure in an environmentally sound manner without compacting the soil is a major breakthrough. Protection of the soil resource is necessary for carbon sequestration and that’s the goal we need to achieve.” □

Manure rate research partnership with NMSP is valuable to farm
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Russell described the current and potential role of yield monitors. “Our John Deere forage harvester has a HarvestLab® monitor that measures by-the-second as you harvest,” he said. “Given weather impacts on crops, you should view three to five years of field data to determine any trends. With yield maps layered with soil and fertility maps, you can accurately determine whether or not yield differences are due to variations in the field. That takes much of the uncertainty out of field research results. If we upgrade our technology in the future for variable input applications, we’ve got the baseline field data to use it effectively.”

As Southview’s farm management team looks to the future, they’re discussing manure injection options. “Tanker weight can lead to soil compaction, which we could avoid with a drag hose system,” Russell said. “We have one drag hose set-up now but we’d need a second one to make a complete shift. The advantage is protection of the soil to continue good crop performance. As the equipment is a major investment, all the pros and cons must be weighed through the team process. I sat down with John Hanchar to compare the economics of the two systems. The drag hose system looked better close to home. We’re still gathering information to learn if that’s true on farther away fields given the factors of travel time and equipment set-up.”

“I met with Dave to gather data for a Partial Budget Analysis,” Hanchar said. “The purpose of the analysis is to estimate the expected change in profit associated with a proposed change in the farm business. The analysis includes only the income and expense items that are expected to change. When comparing two manure handling systems, machinery and all related expenses, labor and fertilizer expenses, and possibly corn silage yield, and income will typically change.”

The partial budget is an analysis of those common items distilled to reflect expected differences in income and costs attributed to the proposed change in manure handling system. The economic analysis is in its final phase, so conclusions can’t be stated yet.

“Economic analysis is part of a whole farm approach to decision making that involves many other factors,” Hanchar said. “It’s always rewarding to work with people like Dave and businesses like Southview Farms that take the initiative to seek out financial analyses for the decision making process.”

Russell summarized the relevance for Southview of NMSP’s manure rate study.

“It gave us the opportunity to acquire sound data on crop performance under the three manure rates we typically use,” he said. “Documenting the correlation between those rates and soil P and K levels at the end of the growing season was highly useful to our nutrient management program. We will definitely apply the data to deciding on field specific manure rates.” □

Lisa Fields was a Cornell Cooperative Extension Agriculture Educator in Schoharie County, NY from 1993-2004, followed by several years as a self-employed consultant in Agronomy and Farm Business Management. A lifelong resident of NYS, she relocated to New Mexico in 2012 where she continues to enjoy writing for the NMSP under sunny skies and surrounded by the spectacular Gila National Forest.