MANURE MANAGER

May/June 2018

Draghose Connector Supplement

Presented by: BAZOOKA FARMSTAR

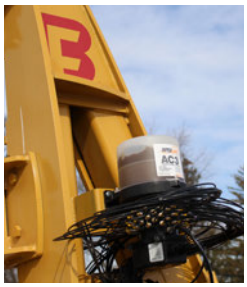
The Draghose Connector

Welcome to the Manure Manager 2018 Draghose Supplement, brought to you by Bazooka Farmstar.

Bazooka didn't invent the concept of manure injection, they just perfected it. As a manufacturer of manure handling equipment, they are committed to manufacturing products that create lasting value for their customers by providing quality, innovative solutions and exceptional service through their network of dealers and in-house employees.

Whether pulling a toolbar or a tank behind a tractor, Bazooka has operators and their fields covered.

Bazooka's Grease Lines



Bazooka Farmstar's first 50-foot Titan has been outfitted with an automated grease bank system, integrated to save operators time on maintenance and to prevent the need for premature part replacements. The grease bank system delivers lubricant to various grease points throughout the toolbar on a timed setting. The Phantom main pins, front parallel links, lift cylinders, double pivot, and float hinges are among the list of grease points the automated system covers. If the toolbar is working, so is the grease bank. The unit is powered by and wired directly to the toolbar. Flow settings of the system can be changed via dial on the front of the unit. Flow settings range from 0-9, discharging grease continuously or delaying the discharge as long as 36 minutes. The grease bank system is convenient to refill, as there is one line located on the pig discharge that restocks the main unit with lubricant.

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Bazooka's Full Throttle Outlaw

Bazooka's Full Throttle Outlaw is a triple section force-feeding boom with optional agitation features that allows for a quick, convenient set-up and easy travel to and from sites. The Outlaw has retained key features of the Full Throttle booster trailer with a 500-gallon capacity fuel tank for longer runtime, as well as a reinforced front deck with integrated tie-down locations for ATV or parts storage. In addition, a 35-foot, triple section force-feeding boom has been mounted to the rear of the trailer and reaches a maximum depth of 19-feet.

Its heavy-duty slew ring allows 270 degrees of boom rotation for simple maneuverability and the flexibility to pump out of those "hard to reach" places. This trailer is available in gooseneck or bumper style hitches and can accommodate 13.5 L (500 HP – 600 HP) engines with a clutch and drive train. The Outlaw's engine/main and knife gate hydraulic functions are regulated via Bazooka Farmstar's Electronic Control System (ECS).

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BY THE NUMBERS – BAZOOKA FARMSTAR

42
Number of years in business

100+
Number of employees

8
Number of different product lines

9 Number of sections of 10-inch hose held on largest capacity hose reel

20
Number of trade shows Bazooka attends each year

Number of dealers
20

11
Number of new products and enhancements the company has introduced in past 12 months

10
Number of states with dealers

45+
Number of variations Bazooka offers on Titan toolbar

INJECTED MANURE
shows its value in crop yields

ABOVE
Researchers believe drag hose alleviates soil compaction concerns that arise with tank application. With this, sidedressing with liquid livestock manure extends custom applicators seasons, increases farmers yields, and lowers their inputs as manure can be applied from the day the crop is put into the ground, until it reaches stage V3 growth. Photo courtesy of Bazooka Farmstar.

Research out of Ohio shows farmers who utilized liquid manure in their corn crop produced 18 to 20 more bushels per acre over those using commercial fertilizers.

Everyone has to understand that manure is not a waste product.
"The manure you have in your pit is like having money in the bank," says Sam Custer, extension educator for Agriculture and Natural Resources at Ohio State University Extension. Explaining the value of manure versus commercial fertilizer, he says the future of the family farm may rely on the number that regulators decide to use as a cap, specifically for phosphorus.

"If we don't make any progress ourselves towards improving water quality in our lakes and streams, the people … may regulate phosphorus," Custer says. "What kind of number will legislators put as a cap before they say no more phosphorus?
He adds that agriculture professionals talk about the 4Rs – right source, right rate, right time, and right place. He believes there is a fifth R they should add – the right data.

"If we don't have the data, we can't make the correct decision with the other rights. There is a wide variation in manure analysis. It's important to get the right data there and know what the analysis is on that."

OSU has been gathering data for more than 10 years on applying liquid manure to growing crops. Research at the university was started in 2006 to see if wheat could be top dressed with pig manure. During the three-year trial, they found no statistical difference between the manure and applied urea.

The manure performed just as well as what the urea did and we encourage our guys to top dress their wheat with swine manure," Custer says.

YEAR	SWINE MANURE I BU/ACRE	28% UAN I BU/ACRE
2016	222	216
2015	154	121
2014	204	204

After they gained some confidence with wheat, OSU's research team bought a tanker to use for injecting corn with swine and dairy manure. After five years, the trials showed that when comparing injected to top dressed swine manure, whether pre-emergent or post-emergent, they lost a tremendous amount of yield by not incorporating manure.

"The first take away here is that incorporation is critical, it's worth about 20 bushels per acre. And that's over a five year average with different weather patterns."

In 2013, Custer started side-dressing research, starting off with a 6,000-gallon tanker with a custom designed tool bar. "We ploughed out so much corn, we figured we would be fired," he recalls.

But the farmer was one of those early adopters and his manure-injected corn did as well as plots treated with 28 percent UAN.

Since then, they have gone with a smaller tanker and gotten better at driving the rows.

"Our goal is to try and cover up all the manure, we don't always get it done so there's some experimentation to figure how to get it done," Custer says.

There have been some compaction issues due to some well-worked cornfields but at harvest, they did not lose any yield, and the farmer did not even need to rip the field.

In a new trial for 2016, they side-dressed with dairy lagoon manure. This has about one-third less nitrogen than swine so they added 28 percent UAN into the manure side dress tanker and applied it. Right before the corn tasseled, they took chlorophyll readings from the two fields to determine nitrogen levels in the leaves and found their dairy manure plots were performing just as well as the 28 percent UAN plots.

"We always shoot to match that nitrogen number," Custer says.

Over the four years that they have experimented with the manure tankers, Custer says they have proven that they can match the 28 percent UAN applications. However, one has to imagine towing a 6,000-gallon tanker full of manure through your cornfield.

"There is a lot of compaction, so it's not what we're suggesting that people go out and do. It's not for everybody. Our goal was to take it to this next step," he said. That step being a dragline hose attached to a custom-designed side dress tool bar, where the tank once stood. Based on previous research, OSU realized the opportunity dragline application might hold. But a glaring concern with sidedressing using a dragline system was the effect the weight of the hose would have on emerging corn plants and the yield they would later produce. The team at OSU began testing on plots with corn between the V1 and V5 growth stages, challenging their concerns.

"We have this hose that is dragged through at various stages of growth, from V1 to V5, going both ways," explains Glen Arnold, a nutrient specialist with OSU Extension. "Our research shows that the first two years that we've done this indicates that you're safe up to V3.

Three years of data revealed no significant damage to corn stand until the V4 and V5 stage. The V4 stands were identical in 2014 and 2016 but, due to a wet spring in 2015, the V4 stand was poor, which lowered the yield.

"In 2014, it was a dry year, so V4 worked," recalls Arnold. "[2015] was really wet and every time we went out with the hose at V4, [cornstalks] snapped off, as opposed to lying over flat when it's dry. At V3 you can get some significantly mature corn to side dress with."

During the university's dragline trials, researchers started in the traditional manner for the first half of the field, spreading diagonally from corner to corner. This built their confidence enough to try spreading the other half of the field dragging the hose perpendicular to the road.

"The first pass was great, then when we came back we had to drag the hose with an extra tractor because the first tractor couldn't do it," says Custer. "That worked well for about half an hour, then we couldn't pull the hose anymore. We agreed shortly after that if you're going to use dragline, diagonal works. Somebody will figure out how to do it perpendicular but I am not smart enough to do that. Our commercial applicators say go diagonal."

One grower he knows who suffered two, six-inch rains in June 2015, a very wet year, found his manure side-dressed corn outperformed his 28 percent UAN corn

CORN GROWTH STAGE	3 YR. POPULATION AVG.	3YR. AVG. BU/ACRE
NO DRAG HOSE	30,214	152.5
V1 (ONE VISIBLE LEAF COLLAR)	30,012	155.4
V2 (TWO VISIBLE LEAF COLLARS)	30,222	154.8
V3 (THREE VISIBLE LEAF COLLARS)	29,853	156.9
V4 (FOUR VISIBLE LEAF COLLARS)	26,755	141.8
V5 (FIVE VISIBLE LEAF COLLARS)	15,683	118.0

Injection versus Broadcast

Injection

- Reduction in ammonia volatization
- Increased organic matter throughout the soil profile
- Reduced odor during and after applications

Broadcast

- Vulnerable to surface runoff in storm and irrigation events
- Stricter guidelines for application times
- Nutrients are not readily available for the crop

ABOVE

OSU has been applying liquid manure to growing corn crops and gathering data for over 10 years. The photo above was taken two days post application with Bazooka Farmstar's sidedress toolbar. Notice how the corn plants can withstand the weight of the drag hose and look seemingly untouched hours after application.

by 33 bushels per acre.

"He says his toolbar is paid for."

Another grower did a cost analysis of his swine manure and found that 6,000 gallons per acre has a nutrient value of $207 per acre for its macronutrients.

"And there's all kinds of micronutrients he didn't calculate," Custer says. "He figures he has $39 per acre in the application cost and that includes rent for the hose and pump."

Looking at some yield numbers, Custer says if you are aiming for 200 bushels per acre for corn and 60 bushels for soybeans in a normal year, if you apply 6,500 gallons per acre as a side dress, every other year, you will meet almost exactly the nutrient needs of the corn and soybean crops.

"It will almost be a balance. There are guys not set up to incorporate and go on the diagonal, so they splash the manure right on top of the corn. It doesn't burn it but you're going to lose about 20 bushels per acre."

> "If you're going to use dragline, diagonal works. Somebody will figure out how to do it perpendicular but I am not smart enough to do that." – Sam Custer

With manure incorporation straight from the lagoon pits to the field crops in mind, Custer encourages all swine producers who are putting up new barns to put them at the center of 150 to 250 acres.

"You can take care of things nicely from the middle and meet all of your nutrient needs for your corn and soybean rotation," he concludes.

With files from Hugh McElhone plus Ohio State University Extension

2012 - 2016 OARDC MANURE SIDEDRESS I BUSHELS PER ACRE

PRE-EMERGENT TREATMENTS	5 YEAR AVG. BU/ACRE	POST-EMERGENT TREATMENTS	5 YEAR AVG. BU/ACRE
Incorporated 28% UAN	142.6	Incorporated 28% UAN	144.8
Swine Manure Surface-Applied	131.6	Swine Manure Surface-Applied	137.5
Swine Manure Incorporated	158.2	Swine Manure Incorporated	163.4
Dairy Manure Surface-Applied + 28% UAN	126.7	Dairy Manure Surface-Applied + 28% UAN	135.2
Dairy Manure Incorporated + 28% UAN	158.7	Dairy Manure Incorporated + 28% UAN	164.6

Chart 1. Ohio Agricultural Research and Development Center (OARDC) Manure Sidedress Plot Results

Proper draghose coupler installation

BY BRAD LAMPE

Layflat hose coupler installation is a **critical** part of a dragline system from both a safety and environmental compliance standpoint. Any mistakes or overlooked issues can lead to serious injury and/or spill. The instructions below are a simple guide to help individuals new to dragline understand the key steps of proper coupler installation and care.

1. Disassemble coupler and install coupler body onto hose until the hose covers the last ring of the coupler body. It should fit snug and require some force to insert.

a. If coupler body fits snug, go to step three. If not, cut one meter from the end of the hose.

b. Quality control pressure testing at the factory may enlarge the end of the hose from normal tolerance.

c. Approximately two extra meters of hose is included in each 200-meter length.

2. Place clamping collars (segments) on hose.

3. Start all stainless-steel bolts with the use of an anti-seize or grease. This is recommended to prevent cross threading during install.

4. Tighten down evenly around the coupler using a 3/8-inch Allen Wrench or an impact drill.

a. Ensure that the gaps between collar segments are equal.

b. Use caution to keep the hose pushed evenly onto the coupler.

c. **Do not** pinch or pleat the hose between the sections as it will cause leakage.

5. Proper torque for 3/8-inch Allen is 50 ft. lbs. dry – 85 ft. lbs. never seized.

6. Install coupler gaskets with open end facing the hose.

7. Insert sleeve in one coupler and install second coupler on sleeve to complete joint.

8. Install Hose Saver Clamp and snug up elastic lock nut.

9. Keep close observation the first day and first week of usage to ensure that the coupler has not moved on the hose. Expansion, contraction and stretching of the hose initially can cause the couplings to loosen over the first few weeks of use.

a. Torque all bolts again after the first day of use.

10. Check torque of **all** drag couplings after each set-up. Check all supply couplings after each set-up to ensure the coupler has remained tight to the larger part of the coupler body.

ABOVE
7.25" coupler affixed to an 8" coupler with Bazooka Farmstar's new, patent pending hose saver clamp.

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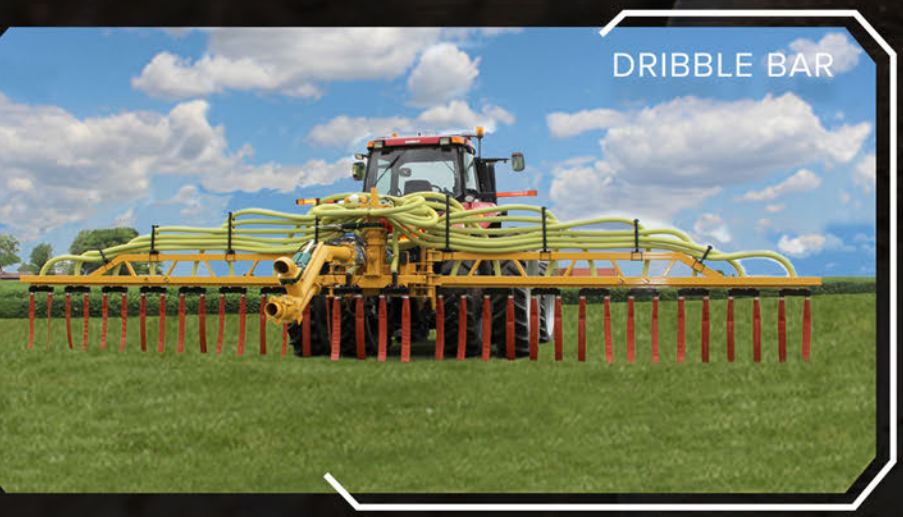


DRIBBLE BAR

- AVAILABLE UP TO 44' IN LENGTH
- HYDRAULIC TIMED MANIFOLD
- NARROW SPACING - 12" OR LESS
- NARROW TRAVEL WIDTH - 5.5'

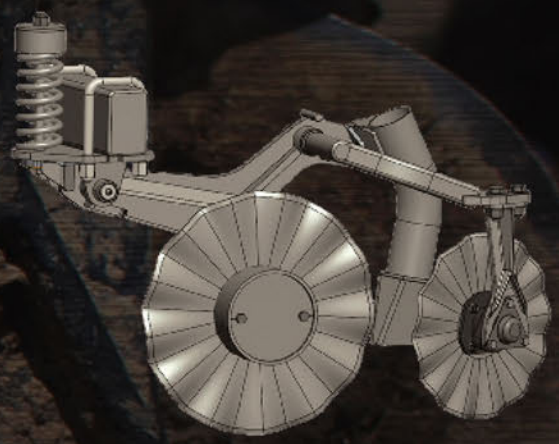
TITAN SERIES BAR

- AVAILABLE IN 32'-50' LENGTHS
- FRONT FOLDING WINGS
- NARROW TRAVEL WIDTH - 12'-13'
- SPACING AVAILABLE IN 16"-30"

GROUND TRACKER SERIES SWIVELING TANK BAR

- INDEPENDENT SWIVEL MOUNTS
- HYDRAULIC TRAVEL LOCKS KEEP SWIVEL MOUNTS STEADY
- SWIVELS 30° IN EITHER DIRECTION
- LOW MOUNT MANIFOLD

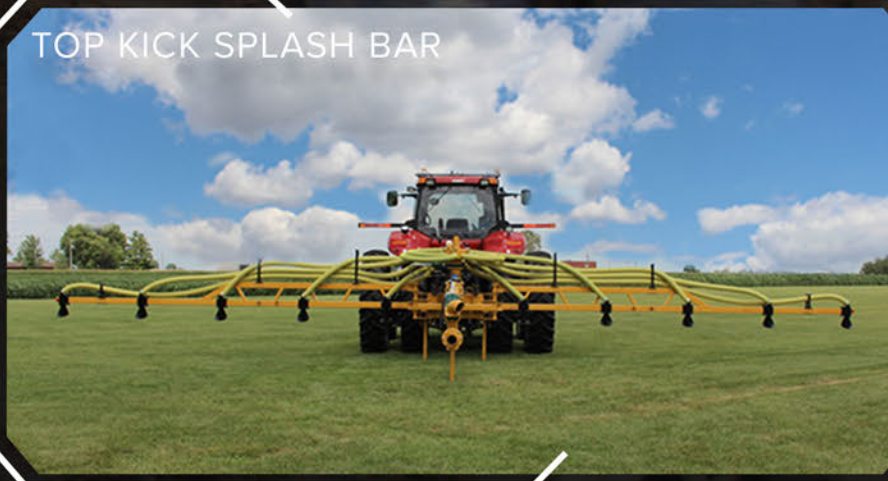
SEE OUR WEBSITE FOR MORE TANK BAR OPTIONS



PHANTOM INJECTOR

- 3,000-20,000+ GPA
- NO-TILL MINIMUM GROUND DISTURBANCE
- ELIMINATES CLOGGING
- CUSTOM CLOSURE ARM
- 6" INJECTION DEPTH

COULTER CAN BE SET AT 4.5° OR 6°



TOP KICK SPLASH BAR

- AVAILABLE IN 30'-50' LENGTHS
- HOODED SPLASH PAN OPTION
- NARROW TRAVEL WIDTH - 7.5'
- HYDRAULIC MANIFOLD

THE SMELL OF MONEY

Manure can play a vital role in crop production and give producers a substantial return on investment

BY SYDNEY GREINER

Liquid waste is more than that foul smell as you drive by a hog confinement building on a windy day. Extensive research and fieldwork have proven that this "waste" can play a vital role in crop production and give producers a substantial return on investment. That old saying "the smell of money" may serve as truth.

Manure type, nutrient availability, and application method are key factors in the realized value of manure.

Liquid gold: In the past, liquid manure was viewed as an over abundant annoyance that was to be disposed of as quickly and conveniently as possible. Fast forward to present day and we recognize the inaccuracy of this perspective.

When incorporated into the soil, nutrient compositions of liquid manure replenish the loss that occurs from crop production and disturbance of the land. Nitrogen, phosphorus, and potassium found in liquid manure derive an economic value that can be calculated down to dollars per acre.

As you will notice from the estimated nutrient values in Table 1, the value of liquid manure is determined by species and facilities, as well as several additional factors including region, diet, storage, agitation, and type of application. The book values have been calculated to represent both organic and inorganic nutrients that comprise liquid waste.

Utilizing the figures from the wean-finish (wet dry) facility in Table 1, let's look at the typical value of liquid manure applied at an assumed nitrogen rate of 200 pounds/acre.

- Nitrogen - $12,244.70 CAD per 160 acres
- Phosphorus - $10,801.57 CAD per 160 acres
- Potassium - $8,461.96 CAD per 160 acres

*Numbers above were calculated by taking the estimated nutrient value * number of liquid gallons it takes to get 200 lbs. of nitrogen applied per acre * 2018 Unit Cost of Primary Crop Production Inputs * 160 Acres.*

Hence, "liquid gold."

Nutrient availability: A significant distinction between liquid livestock manure and anhydrous ammonia, is the combination of organic and inorganic nutrients found in liquid waste. Inorganic nutrients are readily available to crops, while organic nutrients break down over time before they are readily available for the crop.

Liquid swine manure from an anaerobic lagoon provides 90 to 100 percent of first year nitrogen availability, whereas dairy manure only has 30 to 50 percent of first year nitrogen availability [Table 2].

TABLE 1

SPECIES	FACILITY	N	P	K
SWINE	SOW UNIT	25	20	20
	WEAN-FINISH DRY FEEDER	49	40	28
	WEAN-FINISH WET DRY	56	38	43
	GROW-FINISH DRY FEEDER	50	42	30
	GROW-FINISH WET DRY	58	40	45
DAIRY	ALL SIZES	25	20	20

The data displayed in Table 1 was collected by the Iowa State University Extension. These numbers represent the book values of manure nutrients. These are the total pounds per 1,000 gallons of manure.

TABLE 2

SPECIES	FACILITY	N	P	K
SWINE	ANAEROBIC PIT	90-100%	90-100%	90-100%
	ANAEROBIC LAGOON	90-100%	90-100%	90-100%
DAIRY	LIQUID OR SOLID	30-50%	90-100%	90-100%

The data displayed in Table 2 was collected by the Iowa State University Extension. These numbers represent the organic vs. inorganic nutrient availability from various species and facilities.

Although you may see better results from the liquid swine manure upfront, the dairy manure will reduce the cost of inputs on commercial fertilizer long-term, due to the organic nutrient levels available.

The method matters: Among the amount of nutrients and the percentage of those nutrients that are readily available, the method of application stacks up to be equally important in the value earned.

Three common methods are used when applying liquid waste to the soil: irrigation, broadcast top application, and direct injection. Irrigation and broadcast methods are slowly phasing out due to the high levels of nutrient loss from volatilization and run-off. Injecting manure directly into the ground is a growing trend that is projected to continue the upward climb, as it is an efficient and effective way to incorporate manure for row crop production.

Volatilization occurs when nitrogen is in the organic form urea. Nitrogen is changed to NH3 and lost into the atmosphere. This is most likely to occur when temperatures are above 50 Fahrenheit. Note the two percent volatilization loss via direct injection method versus the 40 percent loss of the irrigation method [Table 3].

Conclusion: Manure type, nutrient availability, and application method are key factors in the realized value of manure.

The direct injection method versus top broadcast reduces volatilization by an estimated 23 percent, which correlates to savings of $2,816 CAD.

The above figure was calculated in reference to the previous example of the typical value of nitrogen when liquid manure is applied at an estimated nitrogen rate of 200 pounds/acre.

This number speaks for itself. It truly is the smell of money.

TABLE 3

APPLICATION METHOD	VOLATIZATION LOSS
DIRECTION INJECTION	2%
BROADCAST (INCORPORATION W/IN 24HRS)	5%
BROADCAST (INCORPORATION AFTER 24HRS)	20%
BROADCAST LIQUID (NO INCORPORATION)	25%
BROADCAST SOLID (NO INCORPORATION)	30%
IRRIGATION	40%

The data displayed in Table 3 was collected by the Iowa State University Extension. These numbers represent the amount of nutrients lost in volatilization.

MANAGING MORE MANURE in Manitoba

A behind-the-scenes look at how pig manure will be managed as Manitoba's pork industry slow expands

BY
TREENA HEIN

BELOW
Manitoba Pork is expecting any new hog operations constructed will be spread out around the province. This could result in anywhere from 50 to 100 new barns as well as the expansion of existing operations. Contributed photo

Now that the Manitoba government has lifted the province's long-term moratorium on pork industry expansion, how much more manure is expected to be produced and how will that manure be managed?

Let's look first at the projected pig count.

"Right now we produce about five million market pigs, and we anticipate something on the order of about one million new feeder/market pigs to be added into our system over the next five to eight years," notes Mike Teillet, manager of sustainable development programs at Manitoba Pork. "We expect they will likely be very spread out around the province. We think this could result in anywhere from 50 to 100 new barns as well as the expansion of existing operations."

As to how that translates into manure, Scott Dick says he can't imagine the total volume going up more than one or two percent this year or next. Dick is a co-owner of Agra-Gold Consulting in Landmark, Manitoba, which offers nutrient management and farm expansion planning, well and soil testing and more.

"Only about five new sites are being added this year," he observes. "It will take a number of years to increase feeder barn capacity to satisfy the processing capacity of the Brandon and Neepawa [processing] plants."

Teillet agrees. He says Manitoba could theoretically handle several times the number

LEFT
It will take a number of years to increase feeder barn capacity to satisfy the processing capacity of pork processing plants located in Brandon and Neepawa. Contributed photo

of pigs it now has without creating any environmental issues. Most Manitoba cropland is actually phosphorous-deficient, he notes, and could use more manure to replace the use of inorganic synthetic fertilizers.

Currently, a mere 15 percent of Manitoba's 11 million acres of cropland receives pig manure. Teillet says about 85 percent of that is applied using draghoses from the farmer's main manure storage facility to an injector pulled behind a tractor, or by using injection-like immediate incorporation techniques.

"This greatly reduces odor, nutrient loss and significantly reduces the possibility of runoff, as well as resulting in superior build-up of soil structure," explains Teillet. "We anticipate virtually all new commercial pig operations and expansions will use these manure application techniques. Very little if any surface spreading will occur. There is no need here for manure treatment."

Indeed, Teillet notes the expensive nature of manure treatment in Manitoba, due to the cold climate, and the fact that treatment generally results in nutrient loss.

"In our opinion, 'raw' manure is actually better for the soil and crops and treatment is not necessary or useful," he says. "The only time treatment of manure might be required is if there is too much manure produced in an area to allow it to be applied to cropland in an agronomically and environmentally-sound manner."

Teillet notes that Manitoba Pork has worked closely with the provincial government over the years on regulations, although he explains that the previous government [NDP, which was in power for 16 years up to 2016] "was not a friend of the hog sector and passed numerous laws negatively impacting the sector without consulting us. This was under the guise of protecting Lake Winnipeg because the lake was supposedly being polluted with livestock manure. There of course was never any evidence of this, but despite this they continued to blame us and pass laws against the industry, with the ultimate law being the hog barn 'moratorium' in 2011. Nonetheless, in 2015, we were able to work out a deal after more than a year of negotiations with the NDP government to allow for some pig barns to be built, despite the moratorium."

At this point, Manitoba regulations [see sidebar for more] still may allow for pig barns in the two small areas near Steinbach where livestock production is over-concentrated, but prohibit new such areas from being created.

"New barns will be required to meet a higher standard in those small southeast areas of the province where phosphorus [P] is a problem," Dick observes. "Even in the southeast corner, it took a lot of years for P to build up in the soil. It doesn't happen overnight and won't go away overnight. A long-term approach, which has already been implemented by adding P to Manitoba's regulations, is needed to deal with P there. There is still field spreading of course, and some sites are required to move manure nutrients a greater distance to find phosphorus-deficient fields." There is also some opportunity for farmers to tweak their crop rotation so that P removal is maximized. Hay absorbs about five times more P than pasture, Dick notes, with alfalfa, corn and canola higher than hay.

"So," he says, "some farmers can modify their crop rotation, but things like soil type and amount of rain also affect the uptake of P."

In terms of exactly where new pig barns should or should not be placed, Teillet says it has been the view of Manitoba Pork that it doesn't need to stipulate this, nor could it.

"It is up to individual farmers to decide if, when, where and how big to build," he says. "What we do is to try and encourage them to locate in a good spot if they can. If they are not in a good location (for example too close to a town or in a known area of over-concentration) or if they can't identify enough 'spread fields,' they know it and won't apply."

In the big picture, Dick says that it's positive that a lot has been learned about P management over the last three decades, and that this is now reflected in Manitoba regulations.

"It was sad to see the pork industry couldn't expand during the last few years as manure is a great way to grow crops and recycle nutrients, to improve soil fertility, increase water-holding capacity and so on," he says. "It's been a tragedy, but it's good to see that going forward there is a balanced approach in place for pork industry expansion, with proper siting of new operations in areas that can greatly benefit from manure application."

Saskatchewan's manure scene

The potential for spreading more manure across the province may grow due to industry-government discussions

BY TREENA HEIN

Of all the provinces in Canada, Saskatchewan has perhaps the biggest potential for manure application. Quite simply, it's a matter of a lot of cropland in the province and not a lot of manure available to be applied.

"We have scenario of a lot of land area relative to the current numbers of livestock – this is land that could benefit from the nutrients and organic matter in the manure," says Dr. Jeff Schoenau, a professional agrologist and professor of soil fertility in the department of soil science at the University of Saskatchewan in Saskatoon. Schoenau also holds the Saskatchewan Ministry of Agriculture Soil Nutrient Management Chair in the university's College of Agriculture and Bioresources.

Andy Jansen, manager of agricultural operations with the Saskatchewan Ministry of Agriculture, can provide exact current specifics.

"There are 61.6 million acres of farmland in Saskatchewan, and livestock production in the province only produces enough manure for an estimated three to four per-cent of [that]," he says.

Jansen says the livestock industry in Saskatchewan is relatively small because

ABOVE

There are 61.6 million acres of farmland in Saskatchewan, and livestock production in the province only produces enough manure for an estimated three to four per-cent of that land. Contributed photo

cropping – particularly cereals and pulse crops – has been much more economically attractive. Therefore, much of the cattle in the province is on marginal land and managed extensively on pasture.

"Dairy and poultry are supply-managed and are relatively small industries in the province," he adds.

Jansen observes anecdotally that producers who have manure available do use it, but at the same time, commercial fertilizer is easier to manage. He says most liquid manure in the province is injected into the soil, with the majority involving trailing hose equipment. Schoenau agrees, noting that research he's done in collaboration with staff at PAMI (the Prairie Agricultural Machinery Institute) has found that injection of liquid swine manure is beneficial for improving crop recovery of added nutrients, and is also best in terms of reducing nitrogen volatilization. Injection of swine manure is now standard across the Prairies. Jansen reports that according to one company using boost pumps, that technology has significantly extended the range of injection application.

In terms of solid manure, Jansen says the main enhancement in recent years has been the development and adoption of vertical spreaders, which allow a more uniform application. Schoenau notes that more research into application strategies for solid cattle manure is needed, especially in terms of how to minimize phosphorus loss in snowmelt runoff and so on.

> "There are 61.6 million acres of farmland in Saskatchewan, and livestock production in the province only produces enough manure for an estimated three to four per-cent of [that]." – Andy Jansen

Sands Liquid Manure Services, located in Prince Albert, Sask., has been servicing the entire province for 40 years and handling liquid manure (hog and dairy) for 30 of those.

"We started out with septic service and vac trucks and branched out to hog barn pits with the vac trucks," says longtime employee Mervin Fremont. "Later on, we used large tankers and injection bars for incorporation. The last 18 years, we use a drag hose system with a coulter injector tool bar."

The Sands crews travel with three miles of hose and like to stay in the 2.5-mile range from lagoons. Fremont says over the years, new technologies – flow meters, GPS systems, manure nutrient analysis and remote control floating agitators – have played a big part in better manure nutrient management for the crops being grown in Saskatchewan.

Research across the world has shown manure can enhance soil tilth and provide valuable nutrients, including micronutrients. Jansen notes that solid manure will improve soil tilth and organic matter more effectively and quicker than liquid manures.

"Generally, manure and commercial fertilizer are used together in a crop strategy to provide proper nutrient balance," he says. "Utilizing manure alone requires a significantly higher level of management because manure nutrients are generally not balanced to crop requirements."

Schoenau and his university and PAMI colleagues have been researching manure management in the province since early 1990s, investigating everything from manure types, application rates and methods to their effects on crops, soil quality, nutrient leaching, greenhouse gas emissions and carbon sequestration. He will be continuing manure research at the new Livestock and Forage Centre of Excellence at the University of Saskatchewan, currently under construction [https://wcvm.usask.ca/lfce/#Research].

"It's an initiative that's supported by university, industry and all levels of government," he explains. "There are two main research, teaching and outreach units – beef cattle unit with a feed lot, and a forage and cow-calf unit. For those interested in manure management, it gives me and my colleagues a great opportunity to build on all the manure research that has been done, moving into new areas such as precision application of cattle manure, and understanding its effects on crops, soils, water and air on a watershed basis, through application on landscapes that have never had manure applied before."

Jansen says he and his colleagues are currently seeing growth in the dairy and poultry sectors in Saskatchewan, with also some limited growth in the beef sector. The Saskatchean Ministry of Agriculture is current working on strategies to increase that further. Shelley Jones, manager of the ministry's livestock development section, says at industry's request, the ministry brought together stakeholders in intensive livestock development to identify and address issues impacting sector growth. Ministry staff is now working with these stakeholders to create a better understanding of the agricultural practices and regulatory environments that support growth. She notes that profitability remains the main factor influencing industry growth.

When new livestock operations are given the go-ahead in Saskatchewan, Schoenau notes that their siting partly involves looking at various land areas and the extent to which each area and cropping system can benefit from the manure that will be produced. The economics of transport and techniques to optimize efficiency such as separation are also factored in.

"There has been interest in handling and separation technologies for manure in this province," he notes.

However, he says it's challenging to generate interest these days.

"A lot of farmers would like to have manure, but its low nutrient value limits the economics of long-distance transport," he says. "I do think interest will increase with more manure being available as livestock numbers increase, but on the other hand, fertilizer prices are relatively low right now, so that's also a factor in how much interest is present."

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