



Utilizing Solid Cattle Manure in a Direct Seeding Operation: A Producer Profile

One of the biggest challenges all cattle producers in a low disturbance seeding system face is how to maximize the economic benefits of solid cattle manure through surface spreading. Howard Peters who farms northeast of Osler, Saskatchewan says he shares this problem that plagues the cattle industry. Under the name Star Valley Farms, Howard and his family keep a dairy herd of approximately 300 cows. He states manure in his operation can pile up in a hurry, and estimates his operation produces approximately 1,500 – 1,800 Mt of fresh cattle manure (including bedding straw) which must be spread onto his land base.



Howard Peters Bunning Lowlander Range manure spreader.

The Peters seed approximately 1,800 acres annually. They began direct seeding in 2002 when they purchased a 30 foot John Deere 1820 air drill on 10 inch row spacing with a 1910 model air cart. They use an Atom Jet side band opener set-up to deliver dry fertilizer. The crops grown in their rotation include wheat, canola, peas and barley for seed and silage. Since beginning direct seeding, Peters says he has taken a slightly different approach to manure management.

Peters views solid cattle manure as a significant resource on their farm because of its nutrient and soil amending qualities. The high cost of energy and fertilizer has compelled him to apply the manure more effectively. To do this, the Peters use many sound manure management practices to help maximize the economic benefit of applying solid cattle manure on their farm

Some of these manure management practices include:

- 1) Manure nutrient analysis to determine nutrient composition of manure
- 2) Soil testing to determine nutrient status of soil

- 3) Matching crop nutrient demand to total nutrients applied (in manure and commercial fertilizer)
- 4) Strategy for application - applying manure at proper rates and frequency
- 5) Avoiding excessive manure application to prevent overloading the soil

Peters says one problem related to manure nutrient analysis is that the nutrient composition varies from load to load. Changes in feed composition, rations or even climate can cause significant changes in manure quality. Another problem with solid cattle manure is the variable rate at which nutrients are released. Solid cattle manure has a higher percentage of nutrients in the organic form that must go through the mineralization process in order to be converted to the inorganic form – the form that is plant available.

University of Saskatchewan soil science researcher Jeff Schoenau states cattle penning solid manure that contains lots of straw could have 10-20% of the nitrogen available immediately in the inorganic fraction. The remainder must be mineralized from the

organic fraction and this process could take up to several years. Peters says manure testing will give him an indication of what nutrients are being applied to the field.

Troy McInnis, agrologist with Australian Laboratory Services (formerly ETL) states that representative manure samples must be submitted to the manure testing labs for accurate analysis. He states that nutrient variability will be decreased if producers can mix several manure sub samples together into one sample.

The manure test, however, does not determine the rate of plant available nutrients in any given year. For this reason, Peters likes to soil test his land base annually, to determine the nutrient capacity of the soil. He says it is much easier to make nutrient recommendations from soil tests. Depending on the crops grown and the pre-set yields chosen, Peters uses various commercial fertilizer blends to top up the nutrients that are lacking. He has noticed an increase in P concentration on the manure applied land and for this reason he says he may drop phosphorous from the fertilizer blend altogether.

Schoenau states most crops require an N:P ratio of around 10:1. Solid cattle manure characteristically has a high P content and, as such, could have an N:P ratio of around 3:1 to 4:1. He is not surprised in the P buildup on continuous manure-applied soils. Phosphorous derived from solid cattle manure when applied to the soil will be readily adsorbed to the soil particles. Like nitrogen, phosphorous must be mineralized into phosphate to be made plant available.

So when does Peters spread the manure? He says the majority of spreading is done in late fall or early spring, prior to seeding. He realizes that spreading solid cattle manure without full incorporation increases the risk of manure nutrient losses to the atmosphere but he does achieve some incorporation with his seeding operation.

To spread manure, the Peters use the 7.5 Mt Bunning Lowlander Range manure spreader with side extensions. The extensions allow them to heap up the spreader to haul approximately 9-10 Mt of solid cattle manure per load. The width of spread of the manure provided by this particular model is approximately 30 feet.

A key aspect of the spreader is the PTO driven vertical beaters located at the back of the machine. The beaters operate at a speed of approximately 400 revolutions per minute. The floor of the manure spreader has a 16-19 mm marine chain, which is pre-stretched and rust resistant. Two large bolts located at the front of the machine maintain the tension on



The PTO driven vertical beaters operate at a speed of approximately 400 RPM.

the floor chain. Located in front of the beaters is a hydraulic slurry door, which opens vertically.

The application rate can be controlled by three means, including ground speed, opening size of the slurry door, and speed of the hydraulically driven live floor. Regardless of the application rate, the end result is a consistent manure spread that is uniform and devoid of any solid piles. This is ideal for cattle producers who direct seed, as a secondary operation to incorporate solid manure is not required. The uniform spread of the Bunning system also enables the Peters to apply the solid cattle manure on their hay land and pastures to meet nutrient requirements.

Peters says he makes a judgment call regarding how much manure gets spread on each field. If the fields are low in nutrients he will go with a heavier spread. To accomplish this, he adjusts the tractor ground speed. A common application rate for most fields is approximately 5-6 Mt per acre. Peters is very careful not to over-apply the manure. He states that over

loading the soil with nutrients derived from manure could be very toxic to the crop, resulting in poor seedling emergence and reduced yields. Secondly, excess manure application can cause significant crop lodging, which will result in a slow and challenging harvest.

Karen Bolton, manure management specialist with SAF, states the over-application or repeated application of solid cattle manure at rates, which greatly exceed the crop nutrient removal, on any given parcel of land can cause many environmental problems such as:

1. Transport of nutrients to ground water and surface water bodies through leaching and overland flow.
2. Increase nutrient losses into the atmosphere through denitrification and volatilization.
3. Accumulation of manure salts especially in areas of poor drainage, which could lead to the development of saline and sodic soils.

The Bunning spreader has the option of coming with load cells, which can provide digital readouts and printouts of load weights and rates per acre. Having an on-board computer can help producers meet regulations with effective manure application while avoiding over-application, especially around environmentally sensitive areas.

The Peters are very happy with the Bunning manure spreader. Peters says corral cleaning and manure

hauling are much quicker with the Bunning system because of the increased capacity, durability and speed of spread. He likes the consistency and fineness of the spread, and says the spreader leaves no piles in the field. As a result, he can direct seed on the manure-applied land without having any manure plugging issues with his John Deere drill.

Peters states the biggest challenge he has is complaints from neighbors regarding the manure smell. He hopes one day suitable technology will be developed for placement of solid cattle manure below the surface with minimal disturbance. This would help minimize the nutrient losses, address the smell issue, and retain the soil physical properties provided by direct seeding. Until then Peters says he will utilize all the manure he can resource.

Table 1. Average nutrient content of fresh cattle pen manure samples in Saskatchewan.

	Fresh cattle manure (with straw bedding) lbs/ton
Nitrogen (N)	13
Phosphorous (P ₂ O ₅)	9.2
Potassium (K ₂ O)	14.4
Sulphur (S)	3

Adapted from: Saskatchewan Agriculture and Food's, "Nutrient Value of Manure"

For More Information

1-800-213-4287 or www.ssca.ca

Greenhouse Gas Mitigation Program for Canadian Agriculture

Initiative sponsored by the Government of Canada, Action Plan 2000 on Climate Change



Agriculture et
Agroalimentaire Canada

Agriculture and
Agri-Food Canada



Canadian Cattlemen's
Association



Canadian
Pork
Council

Conseil
canadien
du porc

Dairy Farmers
of Canada



Les Producteurs laitiers
du Canada



The Soil Conservation
Council of Canada