

Nutrient Management FACTSHEET



Ministry of
Agriculture

Order No. 381.010-1
May 2014

Efficient Liquid Manure Application Systems

Practical Information for BC's Agriculture Industry

This factsheet provides information on five Efficient Liquid Manure Application technologies available to BC producers and custom applicators.

Introduction

The conventional means of applying manure in BC is to broadcast apply it onto the surface of tillage or grassland using a splashplate. Manure is broadcast on both tillage and grassland, but in hotter summer months spreading can cause burning on grassland. The method of manure application can significantly impact the nutrient losses in the soil.



Efficient liquid manure application systems offer a number of advantages over broadcasting:

- reduces odours and ammonia emissions
- ability to place nutrients directly into the seedbed
- reduce loss of nutrients to the environment
- increases ability to offset fertilizer costs

Currently there are five Efficient Liquid Manure Application (EMA) technologies available to BC producers and custom applicators. They consist of:

- an aeration system (Aerway)
- trailing hose
- trailing shoe
- shallow injection
- deep injection
- or alternately incorporation by the producer

With recent technological improvements, more manure applicators are using liquid manure injection equipment than ever before.

Application Systems

Trailing Hose

The trailing hose system is one of two banding techniques currently available in BC. In a trailing hose system, manure is pumped from the tank through a chopper/distributor manifold to a series of hoses. The hoses are dragged along the surface and lay manure in bands along the soil just below the crop canopy.

The result is reduced odour, reduced ammonia loss, and more uniform distribution of manure.

The system is designed primarily for grassland, but can also be used on pre-seed and side-dress applications in cornfields as well. The implement can often be fitted on existing manure tanks.



Width	6 m to 24 m
Field Types	Tillage and Grassland
Availability	1 Custom Applicator in BC

Trailing Shoe

The trailing shoe applicator consists of a series of shoes that are fitted along a boom at the rear of the applicator unit. Manure is pumped from the tank or dragline through the chopper/distributor manifold into separate hoses that run to each individual shoe.

The shoe parts the crop and the hose follows and applies a band of manure below the crop canopy. Once the unit has passed, the grass will spring back and cover the band of manure.

To achieve odour and air reduction benefits the grass should be at least 8 cm to achieve the intended canopy coverage effect.

The result is reduced odour, reduced ammonia loss, and more uniform distribution of manure.

The system is designed primarily for grassland, but can be used on corn land as well. The implement can often be fitted on existing manure tanks assuming they are compatible.



Width	3 m to 9 m
Field Types	Mainly grassland, but tillage as well
Availability	1 Custom Applicator in BC

Aeration

Aeration involves the use of an aerator (e.g. Aerway) to perforate the soil creating holes for the manure to collect in. With a perforated surface, there will be increased manure absorption into the soil and less opportunity for overland run-off and Ammonia loss.

The field can be aerated in a separate pass before or after manure is surface broadcast onto the field. Alternatively, the aerator can be mounted either in front or behind the manure application unit to aerate the field and apply manure in one pass.



Width	3 m to 9 m
Field Types	Tillage and Grassland
Availability	3 Custom Applicators in BC

Shallow Injection

Shallow injection involves the application of manure below the surface of the soil leaving the surface of the manure band exposed. The application unit uses an opener such as a knife, disk coulter, or chisel to cut vertical slots approximately 2 cm to 5 cm deep.

A hose applies the manure into the space. The manure is not covered, but is contained in the slot. The reduced exposure to the air lowers volatilization and surface runoff losses.

The technique can be used in grassland as well as corn land. The result is reduced odour, reduced ammonia loss, and more uniform distribution of manure.



Photo Source
Virginia State University
No-Till Fact Sheet series

Width	3 m to 9 m
Field Types	Tillage and Grassland
Availability	2 Custom Applicators in BC

Deep Injection

Deep injection application systems inject manure at depths ranging from approximately 5 cm to 20 cm. The system involves a series of tines or shanks that are dragged through the soil. Using a similar chopper or distribution system to the banding and shallow injection systems, manure is delivered through hoses running from the manifold to each tine and is deposited at the end.

The result is reduced odour, reduced ammonia loss, and more uniform distribution of manure. In some cases, press wheels or rollers fitted behind the tines cover the slots.



Due to the mechanical soil disturbance and impact on crop roots, deep injection is only applicable to pre-seed tillage on corn land.

Width	3 m to 9 m
Field Types	Tillage
Availability	Currently no Custom Applicators in BC

Value

Time Comparison

Application time is a critical component to a manure application process. The difference between Surface Broadcast and EMA systems is due to additional time required to operate EMA equipment, additional weight of equipment, and additional horsepower, which translates into higher labour, fuel and machine use costs.

	Load (min)	Loads per hour	Gallons per hour	Width (m)	HP	Operating Costs Relative to Surface Application (%)
Surface Broadcast	12	5	30,000	6 - 27	260	NA
Trailing hose	12	5	26,400	6 - 24	260	+7%
Trailing shoe	13.5	4.4	26,400	3 - 9	260	+11%
Shallow injection	13.5	4.4	26,400	3 - 9	280	+13%
Deep Injection	13.5	4.4	26,400	3 - 9	280	+10%

Fertilizer Savings

All efficient manure applicator systems offer some financial benefit to the producer in terms of fertilizer savings.

Application Method	Slurry Volume (gallons/acre)	NH ₃ loss Reduction (% of TAN)	Available N from Slurry (kg N/acre)	N from Purchased Fertilizer	Fertilizer Savings per acre
Surface Broadcast	6000	NA	15.5	44.5	NA
Broadcast and Incorporate	6000	77%	38.5	21.5	\$17.27
Trailing Hose	6000	36%	26.3	33.7	\$8.13
Trailing Shoe	6000	64%	34.8	25.2	\$14.45
Shallow Injection	6000	75%	38.1	21.9	\$16.93
Deep Injection	6000	95%	44.1	15.9	\$21.44

The information provided in this factsheet is available in the 2012 *Efficient Manure Application Report* by P. Kitchen, A Suess & S. For more information or to receive a copy of the report see contact information below.