



Livestock agriculture is fundamentally important to Alberta's agricultural economy, generating at least 42% or \$4.2 billion of annual farm cash receipts. (Oct 2009)

Chapter 1. INTRODUCTION

Agricultural intensity and land use have resulted in a greater need to improve manure handling and application practices. Issues driving this need are the:

- Increasing size of livestock operations and concentration of animals
- Increasing rural/urban interface
- Growing societal concern for the environment
- Increasing input costs, resulting in a growing need to maximize the economic nutrient value from manure

Livestock operations are growing in size while non-farming populations are moving into the rural areas. Odour from these operations tops the list of neighbour complaints. Therefore, it is becoming increasingly

important that operators handle the greater volumes of manure in ways that minimize odour.

There is greater societal concern, shared by the agriculture sector, for protecting water resources. For livestock producers, this means greater attention to (and possibly investment in) manure storage capacity and facilities, equipment calibration for and timing of manure application, setback distances from water supplies and water bodies, and in-field practices to minimize soil erosion and runoff.

As synthetic fertilizer costs have increased, manure has become a more valuable resource. By understanding what nutrients are available in manure and what the crops and soils need, farmers can fine-tune what they apply on their fields, maximize the economic nutrient value from manure, and often reduce input and labour costs.



A MANURE MANAGEMENT SYSTEM MAY CONSIST OF THE FOLLOWING COMPONENTS:

- housing (barn, feedlot, wintering site, etc.)
- manure storage facility (lagoon, earthen manure storage, holding pond, etc.)
- manure application to land and crops
- manure treatment facility (composter, solid-liquid separator, digester, etc.)

As producers better understand the value and the importance of safe storage, handling and application of nutrients, they start using nutrient management planning. Producers adopting this “systems approach” benefit the agricultural industry, environment, rural communities and society.

1.1 LEGISLATION

Livestock producers need to know what legislation pertains to their operation for due diligence. There is environmental legislation from federal, provincial and municipal governments. Table 1.1 lists several of the provincial and federal acts, regulations and codes that relate to environmental aspects of livestock operations. Each government level has its own set of rules for environmental concerns. Compliance with the requirements of one level of government does not automatically ensure compliance with other levels.

Your operation must meet the legal requirements described in the acts, regulations and codes. For more information on regulatory requirements, contact the various government departments and agencies and/or lawyers. It is recommended that the actual legislation be consulted.



Know the rules

Good stewardship requires knowledge of and compliance with current regulatory requirements as established by federal, provincial, and local governments.

Copies of Alberta's acts and regulations are available online at www.qp.alberta.ca or in hard copy from the Queen's Printer. To order printed copies, call toll-free within Alberta, dial 310-0000 then 780-427-4952.

Federal laws are available at laws.justice.gc.ca.



Table 1.1 Selected Alberta and Federal Acts, Codes and Regulations with Relevance to Agriculture

Act, Code, Regulation	Who's Responsible	Website
<i>Agricultural Operation Practices Act</i>	Alberta Agriculture and Rural Development (administration)	www.agriculture.alberta.ca/aopa
	Natural Resources Conservation Board (enforcement)	www.nrcb.gov.ab.ca
<i>Agricultural Pests Act</i>	Alberta Agriculture and Rural Development	www.agriculture.alberta.ca
<i>Animal Health Act</i>	Alberta Agriculture and Rural Development	www.agriculture.alberta.ca
<i>Canadian Environmental Protection Act</i>	Environment Canada	www.ec.gc.ca
<i>Code of Practice for Compost Facilities</i>	Alberta Environment	www.environment.alberta.ca
<i>Environmental Protection and Enhancement Act</i>	Alberta Environment	www.environment.alberta.ca
<i>Fisheries Act</i>	Canada Department of Fisheries and Oceans	www.dfo-mpo.gc.ca
<i>Historical Resources Act</i>	Alberta Culture and Community Spirit	www.culture.alberta.ca
<i>Navigable Waters Protection Act</i>	Transport Canada	laws.justice.gc.ca
<i>Pesticide Sales, Handling, Use and Application Regulation</i>	Alberta Environment	www.environment.alberta.ca
<i>Private Sewage Disposal System Regulations and Standards of Practice</i>	Alberta Municipal Affairs	www.municipalaffairs.alberta.ca
<i>Public Health Act</i>	Alberta Health and Wellness	www.health.alberta.ca
<i>Public Lands Act</i>	Alberta Sustainable Resource Development	www.srd.alberta.ca
<i>Soil Conservation Act</i>	Alberta Agriculture and Rural Development (administration)	www.agriculture.alberta.ca
	Counties/Municipalities (enforcement)	
<i>Species at Risk Act</i>	Environment Canada	www.ec.gc.ca
<i>Transportation of Dangerous Goods Act</i>	Transport Canada	laws.justice.gc.ca
<i>Various Safety Code Acts</i> (Electrical Code, Fire Code, etc.)	Alberta Municipal Affairs	www.municipalaffairs.alberta.ca
<i>Waste Control Regulation</i>	Alberta Environment	www.environment.alberta.ca
<i>Water Act</i>	Alberta Environment	www.environment.alberta.ca
<i>Wildlife Act</i>	Alberta Sustainable Resource Development	www.srd.alberta.ca



Agricultural Operation Practices Act (AOPA)

Alberta Agriculture and Rural Development (ARD) is the provincial ministry responsible for developing and updating AOPA to ensure that it meets the needs of the livestock industry and the public. ARD also has Confined Feeding Operation (CFO) Extension Specialists available to assist producers with technical information and solutions on manure management.

The Natural Resources Conservation Board (NRCB) is an agency of the Government of Alberta. It is responsible for regulatory functions under AOPA, processing applications and ensuring compliance with the Act and its regulations.

All operations handling manure fall under Alberta's *Agricultural Operation Practices Act*. For more information or assistance with manure management, contact: ARD CFO Extension Specialists or NRCB staff.

ARD CFO EXTENSION SPECIALISTS

Morinville: 780-939-1218
Red Deer: 403-755-1475
Lethbridge: 403-381-5885

NRCB STAFF

Lethbridge: 403-381-5166
Red Deer: 403-340-5241
Morinville: 780-939-1212
Fairview: 780-835-7111

1.2 WHAT'S IN THIS MANUAL?

If you are a livestock producer, you're already living with the reality of accountability regarding manure management. This manual will help you adapt and fine-tune your operation to get the most from your efforts.

Some Key Definitions:

Manure – feces, undigested feed, urine, bedding, wastewater and runoff. It can also contain pathogens and antibiotics.

Manure Management – managing manure through its entire cycle, from the animal to land application.

Nutrient Management – the responsible use of nutrients from livestock manure, other biological sources and/or commercial fertilizers to meet crop requirements while protecting water, soil and air resources. Nutrient management also includes managing the nutrients in the livestock feed as part of influencing the nutrients in livestock manure.

This manual's intention is to help you select and implement the right beneficial management practices for managing manure and other nutrient materials in your operation. You'll see some recurring themes.



1.3 THEMES

The concept of a systems approach

- Always considering the entire system from animal to field, through planning, implementation and evaluation.

The value of nutrient management planning

- Accounting for all nutrients and thereby reducing input costs.

The importance of managing all liquids

- Managing all liquids around facilities, storage areas, and handling equipment, and during nutrient application – regardless of whether you’re managing solid manure, liquid manure, and/or other biological materials (such as milking parlour washwater or silage leachate).

The need for due diligence

- Matching nutrient storage and handling systems to your needs, sampling and testing for all nutrients, calibrating application equipment, applying at calculated rates, meeting setback distances, monitoring storage sites, monitoring application operations, developing contingency plans for spills, and keeping accurate records.

1.4 MANURE AS A RESOURCE

Manure has value both as a source of nutrients and as a soil conditioner – two good reasons for managing it as a resource.

To make the most of its potential, manure has to be stored, handled and applied in ways that retain its value, suit your operation, reduce the risk of environmental contamination and are affordable.

Table 1.2 Typical Nutrient Amounts and Values in Different Types of Manure

Manure Type	Nutrient Amount*						Approximate Total Nutrient Value*
	Nitrogen		Phosphate P ₂ O ₅		Potash K ₂ O		
	kg/m ³	lb/1000 gallons	kg/m ³	lb/1000 gallons	kg/m ³	lb/1000 gallons	
Dairy, Liquid	2.5	24.9	1.1	11.4	2.9	29.1	\$27.98/1000 gal
Swine, Liquid	2.7	27.2	2.3	22.5	2	19.8	\$28.72/1000 gal
	kg/tonne	lb/ton	kg/tonne	lb/ton	kg/tonne	lb/ton	
Dairy, Solid	2.9	5.8	1.8	3.5	5	10	\$8.18/ton
Poultry, Solid	26.3	52.5	19.4	38.8	12	24	\$47.80/ton
Beef, Solid	7.2	14.3	4.9	9.8	8	16	\$16.84/ton
Swine, Solid	5.8	11.5	3.1	6.1	2.8	5.5	\$9.78/ton

* Nutrient amounts and values in this chart are based on the following assumptions:

- manure is incorporated into the soil within 24 hours of application, estimated 25% ammonia-N loss
- all nutrients are required by this year's or subsequent crops for long-term value
- nitrogen is \$0.47/lb; phosphate is \$0.33/lb; potash is \$0.43/lb
- 1 m³ = 1000 litres
- imperial gallons reported
- numbers rounded to nearest decimal point
- approximate total value only considers value of nutrients; it does not attribute value to soil conditioning benefits of manure



THE MANURE AND COMPOST DIRECTORY is a website to facilitate the trade of manure and compost. It is available on the ARD website, www.agriculture.alberta.ca.

1.5 OTHER BIOLOGICAL MATERIALS

Manure is not the only biological nutrient material generated on farms or brought to farms for use as a nutrient source that needs to be managed.

Examples of on-farm source biological materials include: milking parlour washwater, silage leachate, and greenhouse wastewater.

Examples of off-farm source biological materials include: municipal sewage biosolids, paper biosolids, food processing byproducts, abattoir wastewater and drilling mud.

Like manure, these materials add nutrients and organic matter to the soil and therefore must be managed as a resource. Test the material so you know what is in it (including possible hazardous substances like heavy metals) and manage it appropriately. Using off-farm source biological materials requires approval from Alberta Environment.

1.6 MANURE ISSUES

Management of livestock manure and other biological materials is a challenging issue facing agriculture in Alberta. It's complex, with dimensions ranging from environmental concerns at a societal level, to nuisance concerns for neighbours, to health concerns for your family, farm workers and farm animals. It's all about managing risk while conducting your farm business.

Table 1.3 Concerns and Management Goals for Manure-Related Issues

Manure-Related Issue	Concerns	Management Goals
Economic	<ul style="list-style-type: none"> is generally a net cost to livestock operations 	<ul style="list-style-type: none"> improve soil quality and fertility reduce dependency on off-farm inputs
Environmental	<ul style="list-style-type: none"> has potential risk of groundwater and surface water contamination has potential risk of nutrient accumulation 	<ul style="list-style-type: none"> increase soil water-holding capacity increase soil biological diversity match nutrient removals with additions
Nuisance	<ul style="list-style-type: none"> produces offensive odours can be a source of flies 	<ul style="list-style-type: none"> minimize odour, flies mitigate neighbour complaints
Human Health	<ul style="list-style-type: none"> can contain pathogenic organisms 	<ul style="list-style-type: none"> minimize risks to human health



1.7 AGRICULTURE'S RESPONSE

Over the past decade, manure-related issues have been addressed head-on by many, often diverse, groups involved in Alberta's agricultural community. Farm

organizations, government agencies, municipalities, environmental non-governmental organizations and other partners are continuing to work actively and collaboratively.

Snapshots of manure management tools:

AMBIENT AIR QUALITY MEASUREMENT STUDY
A CALL TO ALL CONFINED FEEDING OPERATIONS IN ALBERTA

NEW on Hopin' The Web
Manure & Compost Directory and Manure & Compost Handling Custom Services Directory
Linking buyers, sellers and services of manure and compost in Alberta.
Post a WANTED or FOR SALE listing or search online map for listings in your region.
For more information, contact Alberta Agriculture and Rural Development
Ag-Info Centre toll free at 310-FARM (3278)
www.agriculture.alberta.ca

Nutrient Management Planning Suite
AFFIRM
Alberta Farm Fertilizer Information & Recommendation Manager
Alberta Manure Management Planner

NUTRIENT MANAGEMENT Planning Guide

Government of Alberta in Agriculture and Rural Development
Alberta.ca > Agriculture and Rural Development > Decision Making Tools > Ammonia Emissions Estimator
Ammonia Emissions Estimator - Step 1 of 3
Ammonia losses from livestock facilities and manure storage pose environmental and agronomic problems. Ammonia volatilization varies greatly depending on the environmental conditions and manure management. This calculator attempts to revise a tool that has been developed by University of Nebraska to calculate ammonia emissions from livestock operations. This calculator provides an approximation of ammonia emission based upon currently available information from USDA-NRCS Agricultural Waste Management Field Handbook and LPEB Lesson 21: Manure Storage Structures. The calculator is a simple tool for the producers to use to perform a quick ammonia losses calculation. Accurate ammonia loss estimates from manure are needed to improve nutrient management recommendations and test the value of ammonia abatement techniques.
Select Animal Species and Production Stage:
Enter Herd Size of this Animal:
Calculate
Gratitude and appreciation are extended to Rick Koelsch and Rick Stowell of the University of Nebraska for granting permission to use their fact sheet [Ammonia Emissions Estimator](#) as the basis for this calculator.

Government of Alberta in Agriculture and Rural Development
Alberta.ca > Agriculture and Rural Development > Decision Making Tools
Manure Transportation Calculator: information page
Manure Transportation Calculator (MTC)
What is MTC? | What does MTC do? | System requirements | Links | Feedback and Questions | Download Manure Transportation Calculator (MTC)
What is MTC?
The Manure Transportation Calculator (MTC) is a Windows-based (Excel) program developed by ARD. The Transportation Calculator can be used to determine the net impact of using (transporting and applying) manure or chemical fertilizer as a nutrient source in selected fields under different rotational systems. The calculator determines the net cost of application and transportation, based on the distance between the field and the source of manure, and estimates the net economic benefit gained from the manure application based on the nutrient requirements for each field and crop.
The user inputs information about the supply of manure, nutrient content, fertilizer market values, cropping rotation, yield goals, transportation/application method, and costing variables. The program allows for the evaluation of up to six different fields and 5 years worth of crop rotation. The program has the ability to compare the impact of management decisions in two different fields against each other. The MTC can be useful as both a planning tool for manure application as well as for making decisions regarding beneficial management practice adoption.
What does the MTC do?
The MTC utilizes industry data combined with the user's data to determine the volume of available manure supply, cost of application and crop fertility demand. The



Beneficial Management Practices – Environmental Manual for Livestock Producers in Alberta

Sampling and testing manure for nutrient levels is a beneficial management practice. Like all BMPs, it integrates production targets with environmental goals.



Many farmers' questions about nutrient management have been answered through on-farm applied research and demonstration projects.



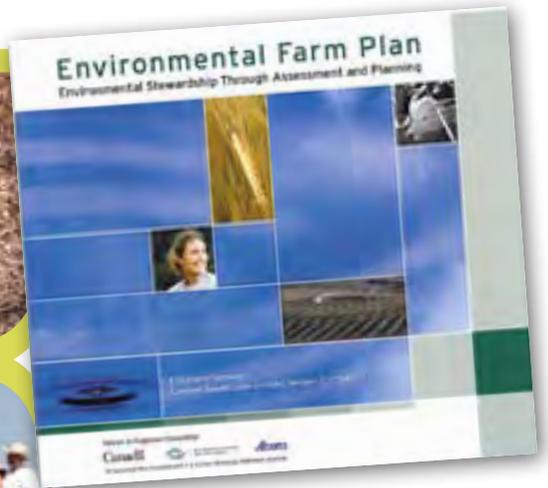
Research and advisory staff are working with producers to reduce manure-nutrient levels through improved livestock nutrition and feed.



Improvements in manure-treatment technology may reduce the volume of material to be managed and help to provide on-farm energy.



Advisory staff work with producers to help them manage manure from their operations in an economically and environmentally responsible manner.



Environmental Farm Plan – each participating producer develops a semi-detailed site assessment by rating components of the farm's environmental management system and completing an action plan.

2009-2013 Growing Forward Stewardship Plans Program
Manure Management Funding List
Grant funding cost share of 50% of eligible expenses to complete the project (\$50,000.00 funding maximum)

The Growing Forward Stewardship Plans Program Terms and Conditions govern the administration of the Stewardship Plans Program and application to Alberta Agriculture and Rural Development to be considered for funding. A grant agreement that outlines the terms and conditions of the grant must be entered into to be eligible to receive funding under the Stewardship Plans Program.

Activity codes 301, 302, 303, 305, 306, 307, and 308 may require a permit under the Agricultural Operation Practices Act (AOPA). Applicants should contact an AEG CFO Extension Specialist prior to applying (Contact 310-0000 to locate a CFO Extension Specialist in your area).

Activity Code	Project	Eligible Costs	Ineligible Costs
301*	<p>Improved Manure Storage (liquid)</p> <p>PURPOSE: Increase the capacity of an existing manure storage facility, or construct an additional storage facility to protect water quality by eliminating the need for spreading manure in winter conditions and reducing the risk of storage overflow.</p> <p>Improve the environmental integrity of an existing manure storage facility to protect water quality.</p> <p>Relocate a storage facility that poses a significant risk to water quality of the environment, and properly decommission the existing facility.</p> <p>Funding of projects under this activity is subject to the availability of funds and the capacity of an operator (based on permitted operational capacity).</p>	<p>Concrete or steel tanks (purchase and construction)</p> <p>Construction costs of earthen manure storages</p> <p>Synthetic liners (purchase, installation, and earthworks)</p> <p>Decommissioning of old storages (if part of a new replacement manure storage project)</p> <p>Storage compartment of a solid-liquid separation treatment system</p> <p>Structural improvements to existing manure storage (to improve environmental integrity)</p> <p>Included in all of the above:</p> <ul style="list-style-type: none"> • Contractor costs for construction • Cost of construction materials • Applicant's equipment use at custom rates • In-kind labour (at set program rates) • Engineering design and fees • Geotechnical costs 	<p>Manure collection systems (e.g., stacked floors, or others)</p> <p>Manure storage ventilation systems</p> <p>Repair and maintenance of manure handling equipment</p> <p>Routine maintenance of existing storage systems</p> <p>Transfer systems &/or equipment to move manure between storages or from storage to field.</p> <p>Electrical services</p> <p>Fencing and signage for safety</p> <p>Transportation, hauling or application costs of manure requiring removal to carry-out the project</p> <p>Decommissioning of manure storage that is not part of an improved manure storage project</p>

The costs of some on-farm improvements to nutrient management practices and systems can be burdensome for individual farmers. In some cases, they can get assistance from municipal, provincial and federal programs.