

Chapter 7.2

AFFIRM and Alberta MMP Software



➔ learning objectives

- Identify information required to use the Alberta Farm Fertilizer Information and Recommendation Manager (AFFIRM).
- Identify information required to use the Alberta Manure Management Planner (MMP).
- Describe the output each software program can generate.



Important Terms

Table 7.2.1 Key Terms and Definitions

Term	Definition
Estimated Nitrogen Released (ENR)	An estimate of the total amount of crop available nitrogen that is released in the soil from the organic N pool over the growing season. It is related to soils organic matter content, moisture and temperature.
Farm Optimization	Systematic allocation of N fertilizer in 4.5 kg (10 lb) increments to those fields that will provide the highest economic return (i.e. the highest investment ratio) (IR) until all target investment ratios are achieved or the budget is exhausted.
Investment Ratio (IR)	The ratio of marginal return to marginal cost based on crop revenue and fertilizer costs. An investment ratio of 2:1 means that there is a two-dollar return for every one dollar invested.

There are two nutrient management planning and decision-making software tools available to Alberta producers free of charge. This chapter presents the basic information required for using AFFIRM and MMP software applications. This chapter is intended to be a general introduction to the software and is not intended to be a user guide. Please refer to the detailed user guides for full explanations and complete instructions for using these programs.

AFFIRM

The AFFIRM decision support software was developed by AF specialists to calculate crop nutrient requirements based on Alberta research and production economics. AFFIRM uses farm-specific information to generate fertilizer recommendations and to compare various cropping and economic scenarios. The software is used by extension specialists, farm consultants, agricultural retailers, producers, and students to select optimum fertilizer rates.

Records and Required Inputs for AFFIRM

The AFFIRM program has a series of windows to input farm-specific information. To generate fertilizer recommendations AFFIRM requires the following information:

- Producer and operation information
- Field location and soil group
- Soil information (including soil, previous crop and crop to be grown information)
- Fertilizer nutrient costs
- Expected crop price
- Farm fertilizer budget for farm optimization

Producer and Operation Information

In this window provide the name, address contact information for the operation and or producer (Figure 7.2.1).

Customer Information

Edit/View Search/Filter

Customer/Farm ID: 1

Farm name: Windward Farm

Last name: Wallace

First name: Trevor

Address: RR#1

City/Town: Blackie

Province: AB

Postal code: T0S 1K3

Residential phone: (403)555-1234

Business phone: () -

Fax: () -

eMail: WindwardFarm@elsu.net

Read only

Add a new producer

Delete the selected producer

Sort by

Customer ID

Farm name

Last name

First name

Address

City/Town

Ascending

Descending

Figure 7.2.1 AFFIRM Producer and Operation Information

Field Location and Soil Group

Field location information is necessary to develop farm specific recommendations (Figure 7.2.2). AFFIRM can determine the soil group from the legal land description for the field (e.g., section-township-range-meridian). AFFIRM also allows the user to manually select the soil group from the 'Soil Map of Alberta'.

Field Information

Field ID#: 1

Field description: Field 1

Quarter section: NW

Section: 1

Township: 46

Range: 27

Meridian (W of): 4

Field size: 160 ac

LLD to Soil Group

Soil Map of Alberta

Soil group: Black (Northeast)

Ecoregion: Aspen Parkland

Ecodistrict: Red Deer Plain

Add a new field

Delete the selected field

Sort by

Field ID#

Field description

Soil group

Ecoregion

Ecodistrict

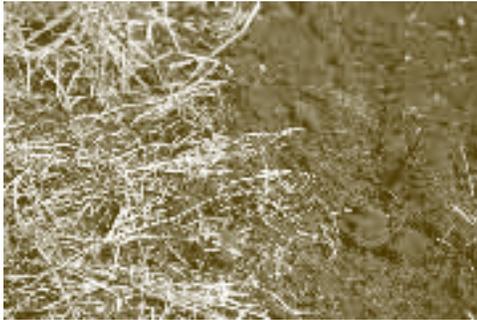
Range

Township

Ascending

Descending

Figure 7.2.2 AFFIRM Field Location and Soil Group Information



Soil Information

AFFIRM requires several pieces of information about each field (Figure 7.2.3):

- Previous crop, yield, tillage and residue management
- Soil analysis information including time of sampling time and depth(s), nitrate-nitrogen (NO₃-N), phosphorus (P), potassium (K), sulphate-sulphur (SO₄-S), soil pH and soil electrical conductivity (EC)
- Additional soil test information including micronutrients zinc (Zn), copper (Cu), manganese (Mn), iron (Fe), boron (B) and chloride (Cl), and CEC is optional
- Soil texture

Previous Crop: Canola | **Soil Information** | Current Crop: Feed barley

Sample depth: 0-6", 6-12", 12-24"

Soil sampling time: Spring

Soil Test Results:

Soil test laboratory: Norwest

Depth	NO3-N	P	K	SO4-S	soil pH	soil EC	Soil texture	Zn	Cu	Mn	Fe	B	Cl	CEC
0-6"	22	10	100	15	6.5	0.1	Medium <input type="text"/>	2.1	0.3	4.2	3.1	1.1		
6-12"	8			10	6.8	0.2	Medium <input type="text"/>							
12-24"	2			13	7.1	0.3	Medium <input type="text"/>							

Macro nutrient units: ppm or ug/g

Micro nutrient units: ppm or ug/g

Figure 7.2.3 AFFIRM Soil Information

AFFIRM will calculate estimated nitrogen released (ENR) from soil organic matter (Figure 7.2.4). At a minimum, the software will use an average organic matter level for the appropriate soil zone. Actual soil analysis results for organic matter can be entered manually and will be used by AFFIRM to calculate ENR. AFFIRM also allows the user to enter a lab-calculated ENR.

Organic Matter (OM) and Estimated Nitrogen Release (ENR)

Soil test OM: Soil group OM:

PNR test: Lab analysis:

Lab calculated ENR:

AFFIRM calculated ENR:

Alert messages for ENR calculations:

- The ENR calculation is an estimate of the nitrogen release (mineralized) from soil organic matter and available for crop growth. It is dependent upon soil moisture and temperature during the growing season, residue management and landscape position.

Figure 7.2.4 AFFIRM ENR Calculator

tip



To get the latest version of AFFIRM, go to Ropin' the Web (search keyword: AFFIRM). A tutorial guide is also available for users at this site.





Fertilizer Nutrient Costs

AFFIRM fertilizer recommendations are based on expected yield responses of crops from research results and an economic analysis of marginal fertilizer cost to marginal yield returns. To make this economic analysis AFFIRM requires estimates of crop nutrient costs in \$ per lb (Figure 7.2.5). A calculator is built into AFFIRM to calculate individual crop nutrient costs based on the cost per tonne of individual fertilizers.

Fertilizer Nutrient Calculator

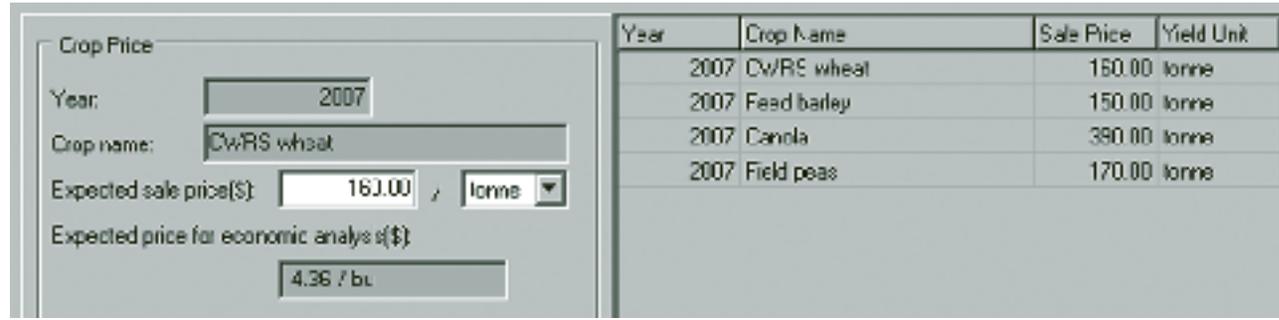
	Fertilizer Type	Fertilizer Cost		Actual Nutrient Cost	
Nitrogen Fertilizer	Urea (46-0-0) Granular	550	\$/tonne	0.54	\$/lb
Phosphate Fertilizer	Monoammonium Phosphate (11-52-0) Granular	450	\$/tonne	0.28	\$/lb
Potassium Fertilizer	Muriate of Potash (0-0-60) Granular	300	\$/tonne	0.23	\$/lb
Sulfur Fertilizer	Ammonium Sulfate (20-0-0-24S) Granular	350	\$/tonne	0.21	\$/lb
Boron Fertilizer			\$/tonne	0.00	\$/lb
Chlorine Fertilizer			\$/tonne	0.00	\$/lb
Copper Fertilizer			\$/tonne	0.00	\$/lb
Iron Fertilizer			\$/tonne	0.00	\$/lb
Manganese Fertilizer			\$/tonne	0.00	\$/lb
Zinc Fertilizer			\$/tonne	0.00	\$/lb

✔ Save
✕ Cancel
🗑️ Clear

Figure 7.2.5 AFFIRM Fertilizer Nutrient Cost Calculator

Expected Crop Price

Expected crop prices (dollars per tonne, bushel, ton or pound) are essential for AFFIRM's economics-based fertility recommendations (Figure 7.2.6).



Year	Crop Name	Sale Price	Yield Unit
2007	CWRS wheat	160.00	tonne
2007	Feed barley	150.00	tonne
2007	Canola	390.00	tonne
2007	Field peas	170.00	tonne

Figure 7.2.6 AFFIRM Crop Price Calculator

Field Recommendations

AFFIRM produces fertilizer recommendations for individual fields based on the crop selected, soil test information, previous crop history, soil zone, irrigation management and spring soil moisture (Figure 7.2.7). Fertilizer recommendations for N, P₂O₅, K₂O, and S are presented for dry, medium and wet moisture conditions.

Nitrogen recommendations are linked to the crop yield response and economic analysis. AFFIRM uses soil zone precipitation probabilities, spring soil moisture levels, soil test nitrogen and fertilizer nitrogen to calculate crop yield response. The crop yield response data in combination with crop prices, fertilizer nitrogen costs and investment ratio is used for the economic analysis to determine the optimum nitrogen fertilizer rate. The investment ratio (IR) is the ratio of the value of the expected yield increase from an additional 4.5 kg of fertilizer relative to the cost of the additional 4.5 kg of N fertilizer:

IR = Value of yield increase from additional 4.5 kg of N fertilizer (\$) ÷ Cost of additional 4.5 kg of N fertilizer (\$)

An IR greater than 1 indicates a profit is made (i.e., the additional yield produced from the extra fertilizer applied was enough to cover the extra fertilizer cost). An IR less than 1 indicates a loss, even though you may increase yield (i.e., marginal cost of fertilizer is more than marginal value of crop yield increase).

The user can change crop prices, fertilizer nitrogen costs, spring soil moisture conditions and IRs to test various cropping scenarios on fertilizer requirements. The economic analysis is presented in both tabular and graph formats.

AFFIRM provides alert messages to help with the interpretation of soil information. The messages will also help determine the impact on crop production and fertilizer management.

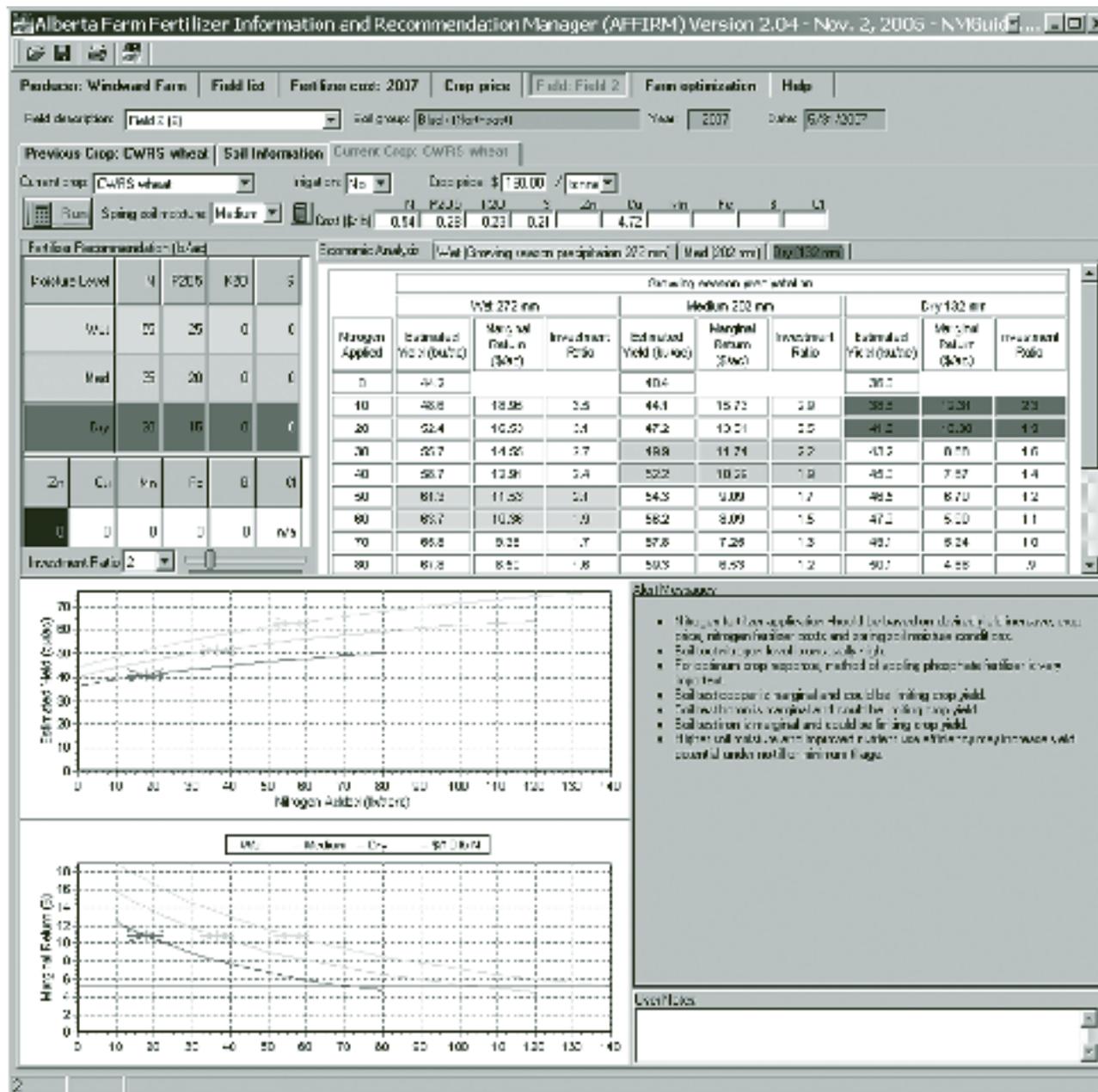


Figure 7.2.7 AFFIRM Field Recommendations

Farm Optimization

A unique feature of AFFIRM is the whole-farm fertilizer optimization function (Figure 7.2.8). The fertilizer budget for the entire operation needs to be entered into the program. AFFIRM then provides fertilizer recommendations per field with the aim of optimizing return on fertilizer investment.

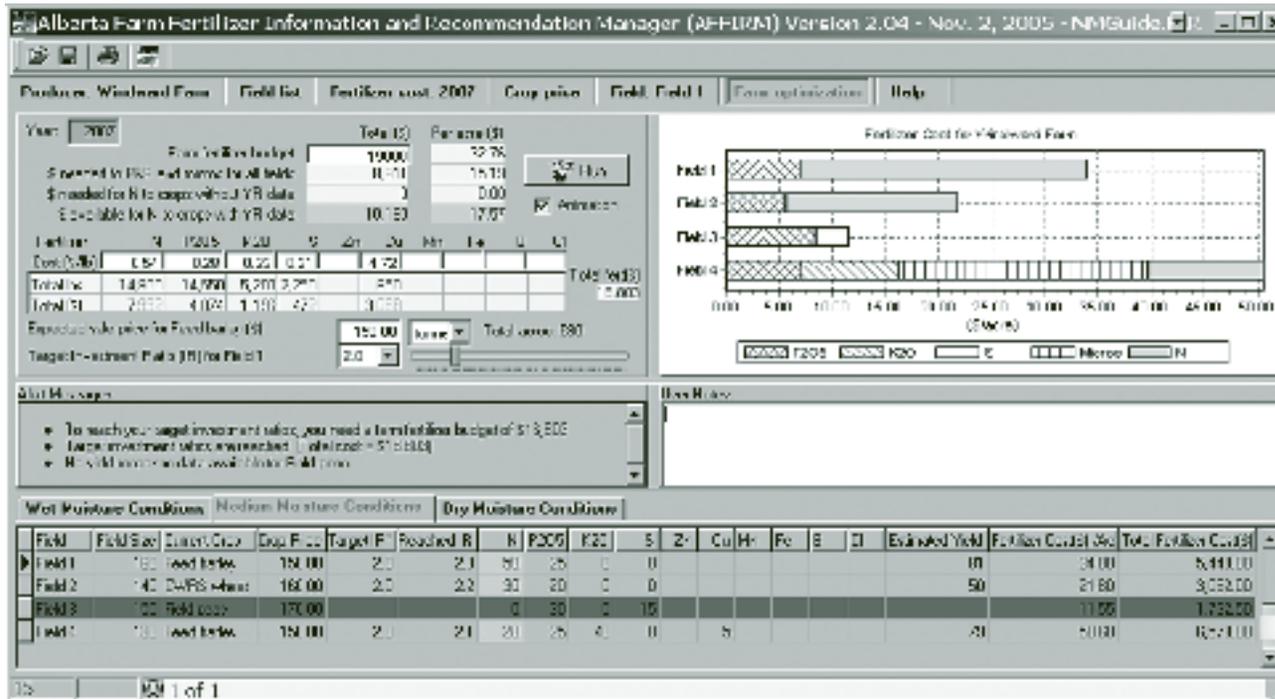


Figure 7.2.8 AFFIRM Farm Optimization Fertilizer Budget

tip



To get the latest version of MMP, go to [Ropin' the Web](#) and search keyword: **Alberta MMP**.

Guides and sample plans help you develop a nutrient management plan. For assistance in using MMP, contact Alberta's Ag-Info Centre toll free at 310-FARM (3276).

The end result of the AFFIRM optimization model is a whole-farm summary of where to allocate fertilizer, based on the farm fertilizer budget and the individual field and crop target investment ratios (Figure 7.2.9). Alert messages help to assess if the total budget allocated to achieve the target investment ratios is sufficient to cover fertilizer costs.



Figure 7.2.9 AFFIRM Farm Optimization Results and Alert Messages



Alberta MMP

The Alberta MMP software uses information about an operation's animals, manure storage, fields, crops and application equipment to plan manure applications (where, when, and how much). The software helps determine if an operation has sufficient total land base, seasonal land availability, manure storage capacity, and application equipment to manage its manure in an environmentally responsible manner. The Alberta MMP is based on Alberta soil, climatic and crop production information and is able to generate Alberta-specific reports, including record summaries that comply with AOPA record keeping requirements (refer to Chapter 7.1). The software gives the user the option of working in metric or imperial units.

Records and Inputs for Alberta MMP

The MMP program has a series of windows to input farm-specific information to develop a manure allocation strategy and prescribes manure application rates. MMP allows input of the following information:

- Producer and operation information
- Animal information
- Field description
- Livestock rations
- Field risk assessment
- Manure analysis information
- Soil analysis information
- Manure equipment information
- Crop information
- MMP recommendations
- Manure storage information
- MMP reports



Producer and Operation Information

The program requires general information about the operation including name, mailing address, contact information, county and length of the manure management plan (i.e., starting year, starting month, years in the plan) (Figure 7.2.10).

The screenshot shows the 'Manure Management Planner - SJ Farms Beef.mmp' window. The 'General' tab is active, displaying the following fields:

- Operation:** SJ Farms
- Address:** 334
- Town:** Madge, Province: AB, Phone Code: 403
- Contact:** Farm address
- Office Phone:** (403) 716-4111, Home Phone: (403) 716-4111
- E-mail Address:** sjfarms@home.ns
- Notes:** (Empty text area)
- County:** ROGERS/MEAD
- Starting Year:** 2000, **Starting Month:** September, **Years in Plan:** 0

At the bottom, there is a menu bar with options: File, Edit, View, Save, Run, Tools, Help, About, Exit. Below the menu bar is a status bar with the text: 'Create a new manure management plan'.

Figure 7.2.10 Alberta MMP Producer and Operation Information



Field Description

The program requires information about each field (Figure 7.2.11). This includes field identification, total area, spreadable area, average slope (in % grade), predominant soil type, irrigation, and field ownership. The distance of the field from the manure source can also be entered, which will be used to prioritize fields for manure application.

Manure Management Planner - SJ Farms Beef.mmp

General Fields Assessment Soil Tests Crops Storage Animals Rations Analysis Equipment Nutrient Mgmt

Field ID	Subfield ID	Total Size (Acres)	Spreadable Size (Acres)	Storage Distance (Miles)	Predominant Soil Type (Name, Texture, Map Symbol, Slope Range)	Slope % (if Not Ave.)	Irrigated with Water
* A		132	80	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
B		116	105	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
C		37	95	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
D		32	82	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
E		186	186	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
F		70	70	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
F3		36	33	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
G		47		1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
H		117	117	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
I		32	32	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
I2		30	33	1	ROCKYVIEW (RKY) SIL (ADRK1/MUI 0.5-2%)		
		55	55				

Soil Info

New Open Close Save Save As Tools ? Help About Exit

Create a new manure management plan

Figure 7.2.11 Alberta MMP Field Description

Field Risk Assessment

The assessment window provides space to enter specific information that helps to characterize each field's natural risk of surface water contamination. Some of the information requested includes length of slope, presence of water bodies, presence of any conservation buffer strips and drainage. Although this information is not critical to developing manure application rate recommendations or allocating stockpiled manure, it can impact decision making for a particular field.

Soil Analysis Information

Soil analysis results for each field are used to calculate manure application rates (Figure 7.2.12). Space is provided to enter information for test year, organic matter content (%), P (along with the method that was used), K, Mg, Ca, Na, Al, soil and buffer pH, estimated or measured CEC, NO₃-N, EC and SO₄-S.



Manure Management Planner - S.J Farms Beef Farm

General Fields Assessment **Soil Tests** Crops Storage Animals Rotation Analysis Equipment Nutrient Mgmt

Field ID	Soil Test ID	Test Year	OM (%)	P	P Test Used	K	Mg	Ca	Na	Al	Levels Ave in 100g	Soil pH
A		2003	6.3	24	Modified Kelowna	226	548	2,370	71			7.3
B		2002	5.7	79	Modified Kelowna	426	333	1,791	16			7.2
C		2003	4.4	20	Modified Kelowna	216	554	2,647	69			7.5
D		2003	7.2	36	Modified Kelowna	357	511	2,657	55			7.5
E		2003	4.9	37	Modified Kelowna	261	519	2,711	137			7.7
F1		2003	6.8	36	Modified Kelowna	306	463	2,702	118			7.8
F2			6.8	36	Modified Kelowna	306	463	2,702	118			7.8
G			7	15	Modified Kelowna	300	490	2,790	295			7.9
H		2003	7	15	Modified Kelowna	336	496	2,790	295			7.9
I		2003	5.4	54	Modified Kelowna	324	587	2,503	123			7.5
J		2003	6.8	129	Modified Kelowna	718	467	2,429	38			7.2

New Open Close Save Save As Tools ? Help About Exit

Enter the field's nitrate nitrogen level (or click the Calc button to calculate the depth-weighted average nitrate level)

Figure 7.2.12 Alberta MMP Soil Analysis Information



Crop Information

The planned rotation over the course of the MMP along with expected yields for each crop and year is entered using the 'Crops' window (Figure 7.2.13). If soil analysis information is unavailable MMP will use default N recommendations for the crop based on yield and soil zone.

Default fertilizer recommendations can be overridden by entering customized recommendations appearing on a soil analysis report or from some other source. The program also provides space to identify the source of the custom recommendations.

To account for N contributed by legume N-fixation, there is a column that allows entering the percentage of a forage stand made up of legumes.



Manure Management Planner - SJI Arms Beef.mmp

General Fields Assessment Soil Data Crops Storage Animals Relations Analysis Equipment Product Mgmt

Field ID	Subfield ID	Year	Planned Crop (1 st Second Crop if Double Cropping)	Yield (kg/ha)	Yield Units	Legume % Stand	Default N Rec (L/ha)	Default P205 Rec (kg/ha)	Default K2O Rec (kg/ha)	Custom N Rec (kg/ha)
A		2004	Forage Grass-30% Legume	2	T	30	22	35	0	
A		2005	Forage Grass-30% Legume	2	T	30	22	35	0	
A		2006	Forage Grass-30% Legume	2	T	30	22	35	0	
F		2004	Forage Grass	2	T	0	22	0	0	
E		2005	Forage Grass	2	T	0	22	0	0	
E		2006	Forage Grass	2	T	0	22	0	0	
G		2004	Hay, Silage	6	T	0	22	10	0	
G		2005	Hay, Silage	6	T	0	22	10	0	
G		2006	Hay, Silage	6	T	0	22	10	0	
E		2004	Forage Grass	2	T	0	22	10	0	
E		2005	Forage Grass	2	T	0	22	10	0	

Enter a phosphorus recommendation or 0 to instead of the default (kg/ha)

Figure 7.2.13 Alberta MMP Crop Information

Manure Storage Information

This window is used to enter information about each storage facility (Figure 7.2.14). Based on the dimensions, it can estimate the volume or pumpable capacity for each storage facility.

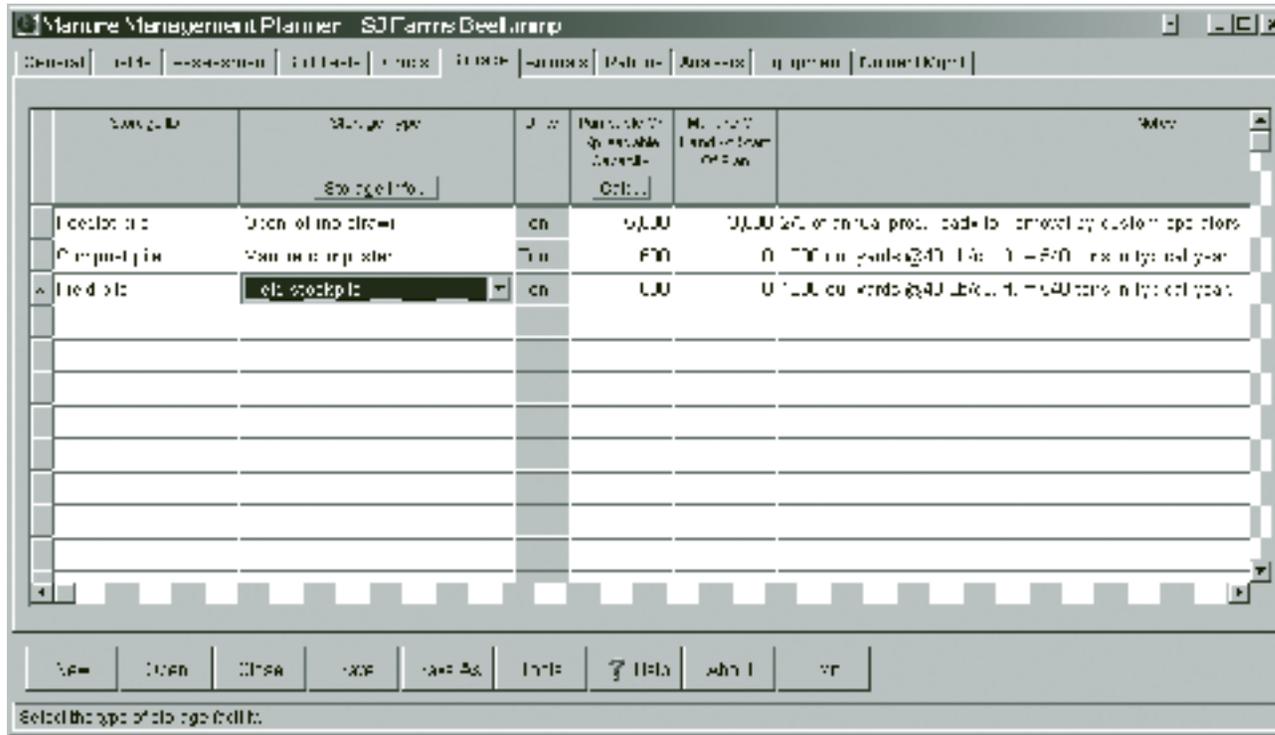


Figure 7.2.14 Alberta MMP Manure Storage Information





Animal Information

Information about animals in the operation can be entered using this window (Figure 7.2.15). The information requested in this window includes:

- Class, type, number and average weight of animals
- Length of the manure collection period (start and end)
- Percentage of manure collected
- Estimated volumes of water and bedding added to the manure

This window can be used to identify which of the storage facilities or sites will be used to store the manure generated by each group of animals. This information is used to estimate the volume of manure available for land application from each source.

The screenshot shows the 'Manure Management Planner' software window. The title bar reads 'Manure Management Planner - SD Farms Deel Farm'. The menu bar includes: 'Home', 'Assessment', 'Access', 'Tools', 'Storage', 'Animals', 'Manure', 'Storage', 'Equipment', 'Admin', 'Quit'. The main window contains a table with the following data:

Animal Group	Animal Type and Production Phase	Average Weight (kg)	Animal Count	Manure Period	Animal Percent Weight	Manure Collected (kg)	Bedding Water (kg)	Bedding (kg)	Manure Storage Facility
✓ Feedlot	Beef Cows	700	1,200	Jan-Feb	10%	100		4	Feedlot
Feedlot	Feedlot Cows	700	1,200	Jan-Feb	10%	100		4	Feedlot
Cow Pasture	Beef Cows	700	1,200	Jan-Feb	10%	100		4	Feedlot

At the bottom of the window, there are buttons for 'Home', 'Open', 'Close', 'Save', 'Save As', 'Print', 'Help', 'About', and 'Exit'. Below the buttons is a status bar that reads: 'Select the type of animal housed in the facility.'

Figure 7.2.15 Alberta MMP Animal Information



Manure Equipment Information

Information about the equipment to be used during field application can be entered in the ‘Equipment’ window (Figure 7.2.17). Most of the information that is requested on this window is either available in the manufacturer’s specifications for the equipment, or can be determined during calibration and uniformity testing. The information in this window is used to estimate the number of loads of manure required per field and to develop a time budget for each field.

Equipment ID	Spreader Or Application Type	Spreader Or Pump Capacity	Capacity Units	Minimum Application Rate	Rate Units	Application Width Or Area	Width Or Area Units
* McKee Spreader	Eolic spreader	3.8	Ton	3	Ton/A	3	Feet
JD 00C	Eolic spreader	3.2	Ton	3	Ton/A	3	Feet

Figure 7.2.17 Alberta MMP Manure Equipment Information

MMP Recommendations

The 'Nutrient Management' window summarizes the recommended manure application rates by field, and allows the user to view the status of storage facilities and fields on a month-by-month basis (Figure 7.2.18).

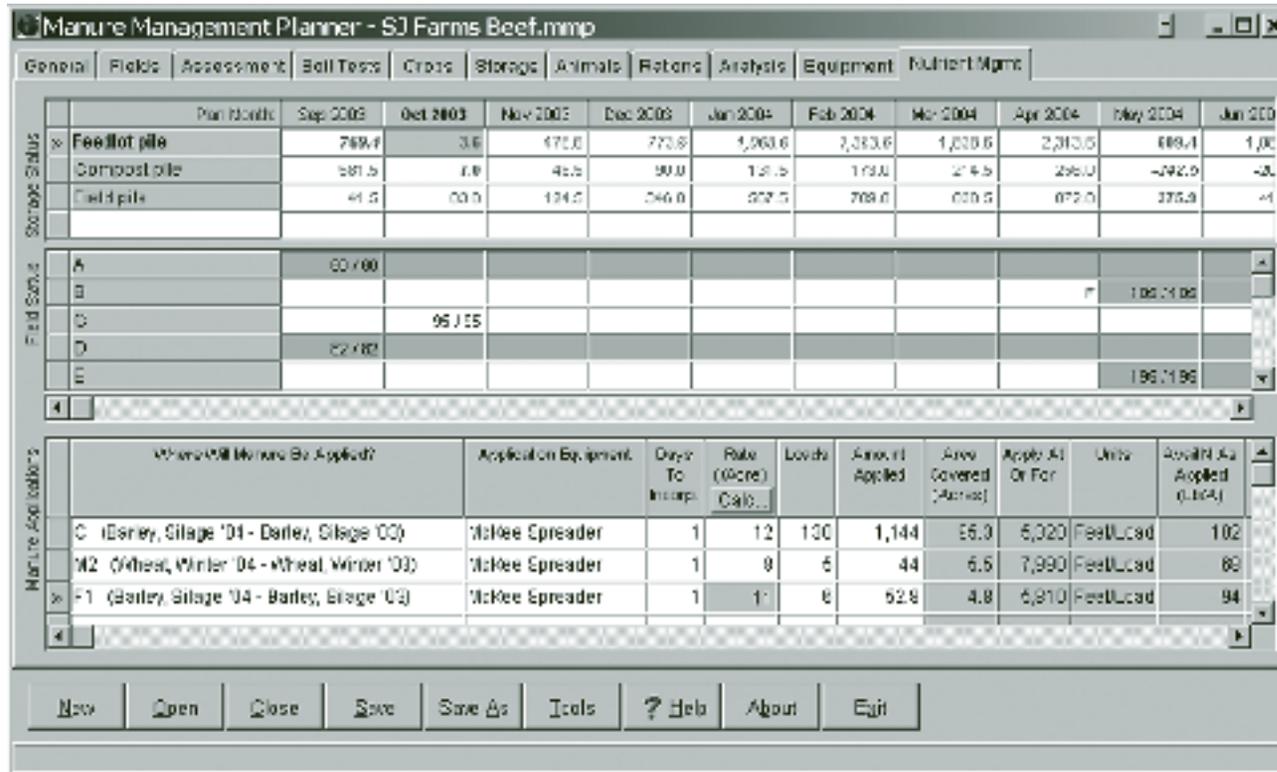


Figure 7.2.18 Alberta MMP Recommendations



The MMP software can generate several reports that serve as manure management plans, and can also generate completed forms that comply with record keeping specifications under AOPA (Figure 7.2.19).

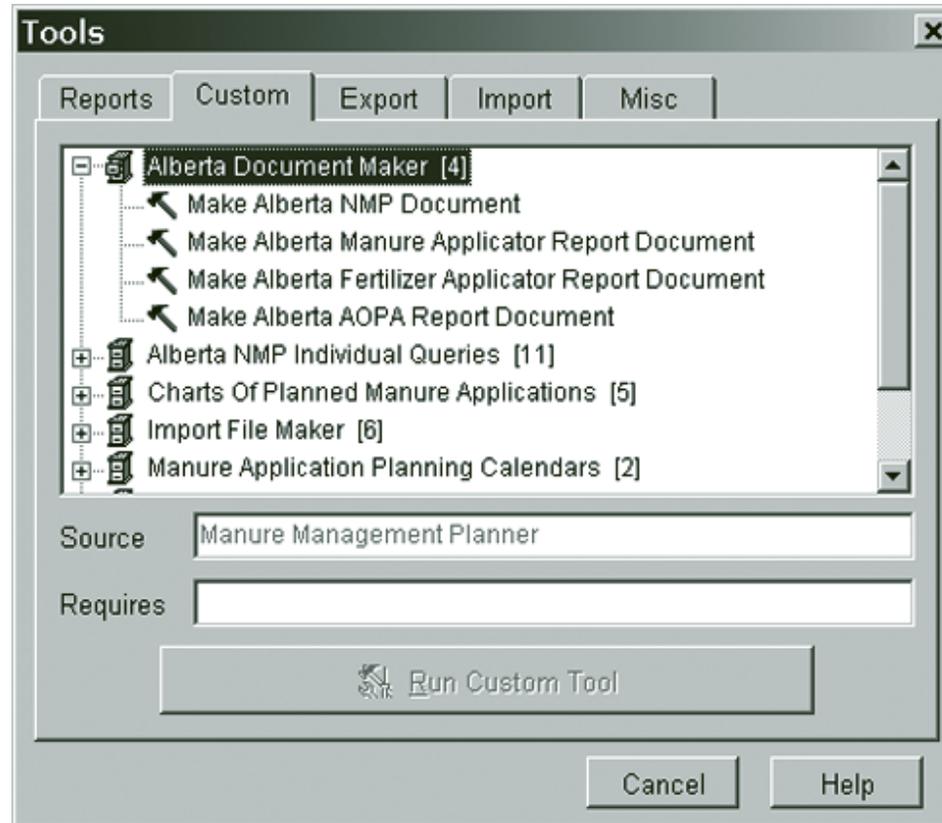


Figure 7.2.19 Alberta MMP Custom Reports Options

summary

- The AFFIRM software generates a fertilizer use strategy for an operation based on soil analysis, moisture conditions and production economics for selected crops with the goal of optimizing return on investment in fertilizer.
- AFFIRM provides individual field fertilizer recommendations and whole farm optimization summaries based on budget limits and production economics.
- The Alberta MMP software uses information about an operation's animals, manure storage, fields, crops and application equipment to plan manure applications. The software helps determine if an operation has sufficient total land base, seasonal land availability, manure storage capacity and application equipment to manage its manure in an environmentally responsible manner.
- The MMP software will prioritize fields for manure application based on cropping strategy and distance from the storage facility. It also has the ability to generate several different reports, including completed forms that comply with AOPA standards for manure management record keeping.