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	n
	Edit/View Search/Filter
Custorrer/Farm ID:	1
Farm name:	Windward Faim
Last name:	Walace
First name:	Tievor
Address:	RR#1
City/Town	Blackie
Province:	AB
Postal code:	TOS 1K3
Residential phone:	(403)555-1234
Business phone:	() ·
Fax	() •
eMail:	WindwardFarm@:elsu.net
E Read only	Add a new producer
Sort by C Customer ID C Farm name C Last name C First name C Address C City/Town	C 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 ol):	4
Field size:	160 ac 💌
	LLD to Soil Group Scil Map of Alberta
Soil group:	Black (Northeast)
Ecoregion:	Aspen Paikland
Ecodistrict	Red Deer Plan
Add a new	held 🔚 Delete the selected held
 Sort by Field ID# 	
C Field descripti	an G Aspending
O Soil group	
C Ecodistrict	C Descending
C Range	
🔿 Township	

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: Car	nola Soil	Informat	ion Curren	t Crop: Fee	d barley	1						
Sample depth:	0.6", 6.12	21, 12-241										
Soil sampling time:	Sping		T									
Suil Test Results:												
Soil test laboratory:	Nowest		•									
Depth ND3-N	Р К	504-5 st	oilpH soilEC	Soiltexture		Zn	Cu	Mn	Fe	В	C	CEC
06" 22 1	0 100	15	6.5 0.1	Medium	-	21	0.3	4.2	3.1	1.1		
6-12" 8		10	6.8 0.2	Medium	*							
12-24" 2		13	7.1 0.3	Medium	Ŧ							
Macro nutrient	unit: op	m orug∕g	*			Micro nut	ient unit:	s ppm	or ug/g		Ŧ	

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 R	elease (ENR)
Soil test OM: 7.8 %	Soil group OM: 7.2 %
PNR test: Phosphate Borate	Lab analysis: 60 ppm
Lab calculated ENR:	•
AFFIRM calculated ENR: 49.9 lb/ac Alert messages for ENR calculations:	Calculate ENR

 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









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 Nutrie	ent Calculator					×
	Fertilizer Type		Fertilizer Cost		Actual Nutrier Cost	nt
Nitrogen Fertilizer	Urea (45-0-0) Granular 🔤	·	550	\$/tonne	0.54	\$Ab
Phosphate Fertilizer	Monoammonium Phosphate (11-52-0) Granular 🖉	-	450	\$/tonne	0.28	s/lb
Potassium Fartilizer	Muriate of Polash (0-0+60) Granular 🖉	-	300	\$/tonne	0.23	S/Ib
Sullur Fertilizer	Ammonium Sulfate (20-0-0-24S) Granular	1	320	\$/tonne	0.21	S/Ib
Boron Fartilizer		1		\$/tonne	0.00	\$/lb
Chlorine Fertilizer		1		\$/tonne	0.00	\$/lb
Copper Fertilizer		1		\$/tonne	0.00	\$/lb
Iron Fertilizer	_	1		\$/tanne	0.00	\$/lb
Manganese Fertilizer		1		\$/tonne	0.00	\$/lb
Zinc Fertilizer		1		\$/tonne	0.00	s/lb
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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).

r Cop Price	Year	Crop Name	Sale Price	Yield Unit
	2007	Cv/RS wheat	150.00	lonne
Year: 2007	2007	Feed barley	150.00	lonne
Crop name: CWRS wheat	2007	Canola	390.00	lonne
Expected sale price(\$) 160.00 / Ionne 💌	2007	Field peas	170.00	lonne
Expected price for economic analyss(\$)				
4.36 / bu				

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, P_2O_5 , K_2O , 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 Aq-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.

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	Fick 3		151 Field case	170.00			0	31	1	15								11.00	1,742.02
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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).

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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.

	Field D	Subtiek D	Totel Stre (Acres)	Spread- able Size (Acres)	Sitorage Distance (Miles)	Predominant Soi Type (Kame, Texture, Map Symbol, Sicpel Cange)	Stope % (If Not Arrel)	imigister Mitth Wester	
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F	3		136	105	1	RCCKYVIEW (RKV) SIL (ADRK1/UL0.5-2%)			1
4	6		37	95	1	ROCKYMEW (RKV) SIL (ADRKMUI 0.5-2%)			1
l)		32	82	1	RCCKYVIEW (RKV) SIL (ADRK1/IUI 0.5-2%)			
ł	-		135	195	1	RCCKYVIEW (RKV) SIL (ADRK1/IUL0.5-2%)			
F			70	70	1	RCCKYVIEW (RKV) SIL (ADRK1/UL0.5-2%)			
F	3		36	33	1	ROCKYVIEW (RKV) SIL (ADRKI/IUI 0.5-2%)			
k	Э		47		1	ROCKYVIEW (RKV) SIL (ADRK1/IUI 0.5-2%)			
ŀ	4		117	117	1	ROCKYVIEW (RKV) SIL (ADRK1/IUI 0.6-2%)			
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l	2		30	\$3	1	ROCKYVIEW (RKV) SIL (ADRK1/IUI 0.5-2%)			
ľ		1							•

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.

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8		2002	5.7	- 79	Modified Kelowna	425	333	1,791	16			7.2
C		2003	4.4	20	Modified Kelowna	215	- 554	2,647	9 9			7.5
D		2003	7.2	- 36	Modified Kelowna	37	511	2,857	- 55			7.5
C		2000	4,9	37	Modified Kelowna	201	619	2,711	137			7.7
F1		2003	6.8	36	Modified Kelowna	336	463	2,782	118			7.8
F3			6 B	- 36	Modified Kelowna	336	483	2,782	118			7.8
G			7	15	Modified Kelowna	300	496	2,790	295			7.9
н		2003	7	15	Modified Kelowna	338	496	2,790	295			7.9
1		2003	5.4	54	Modified Kelowna	324	587	2,503	123			7.5
12		2003	5.B	129	Modified Kelowna	719	467	2,429	38			7.2
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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.

٦	edilD Subde C	d Clop Meer	Farned Crop (C - Second Crop M Double Cropping) Crima Info	11ek 36e) (14.ehe)	r Tek Units	Leguine % Stantt	Default I Rec (LoCA	Deraut P300 Tec LKPQ	Cefeut <20 Rec (Lbox)	Cleton NiRec (LKP)	
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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.

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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 ٠
- 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.

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Figure 7.2.15 Alberta MMP Animal Information

Manure Analysis Information

If manure is not being sent for analysis or if manure volume is not being estimated directly, the software generates estimates for volume and nutrient content to allow manure application rates and an allocation strategy for the operation.

If manure volume is being estimated and manure nutrient content is determined through manure testing then the 'Analysis' window can be used (Figure 7.2.16). Values from the manure analysis (NH_4 -N, total P_2O_5 , total K_2O , maximum available N, available P_2O_5 Available K_2O and Dry Matter) as well as the estimated volume can be entered. Once entered these values will override the estimates developed by MMP. The user can also enter the date of the analysis and the lab where it was conducted.

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Figure 7.2.16 Alberta MMP Manure Analysis 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.

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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).

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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.