



1. Why use AFFIRM v3?

There are numerous factors that need to be considered when making fertilizer decisions. AFFIRM v3 is a full spectrum nutrient recommendation software that incorporates a marginal economic analysis into the recommendation process. Based on the principles of limiting factor identification and diminishing returns, this interactive decision support tool will assist you in determining where best to allocate your resources to optimize the earning potential of your farm. The ability to run different scenarios will allow you to understand and quantify many factors involved in determining your crop nutrient requirements.

2. What information is required to use AFFIRM v3?

Checklist - Required field and farm information to use AFFIRM v3:

- ✓ Field legal land location or soil group
- ✓ Previous crop grown (yield, residue management, soil and growing season or irrigation moisture, fertilizers used including rates, time of application and placement)
- ✓ Current crop to be grown
- ✓ Irrigation (if applicable)
- ✓ Soil test results and sampling technique (time and depths)
- ✓ Soil test methods used for soil analyses based on the laboratory used
- ✓ Manure test results or selected book values for each source of manure
- ✓ Manure management (rate, time and placement of manure application; weather conditions)
- ✓ Spring soil moisture conditions
- ✓ Fertilizer products (N, P₂O₅, K₂O, S and micronutrients) for crop to be grown
- ✓ N fertilizer time of application and placement (method of application)
- ✓ Fertilizer nutrient costs
- ✓ Expected crop price
- ✓ Farm fertilizer budget

3. How is AFFIRM v3 different from AFFIRM v2?

If you previously used AFFIRM v2, the first difference you will notice is the means of access. New programming techniques allowed for re-design of this decision support tool. AFFIRM v3 is now a web-based application accessed through My Alberta Digital Identity (MADI). By registering for My Alberta Digital Identity, you are creating an account that allows you to be identified by government online without paper documents or face-to-face visits, while protecting your information and privacy. There is no cost for a My Alberta Digital Identity. Your My Alberta Digital Identity contains only the information needed to create and register your account. When you access another participating Alberta government online service, only the portions of your Digital Identity needed by that service are shared.

Other enhancements include:

- For AFFIRM v3, adjustment coefficients have been updated to reflect new agronomic management research and knowledge.
- The list of soil test laboratories has been updated to reflect the current laboratories conducting soil analyses in the province.
- The expanded list of crops that represent cereals, oilseeds, pulse, forage and specialty crops grown on either dryland or irrigation within the province.

- The nutrient sources impacting recommendations have been expanded to include estimated nitrogen release from soil organic matter (soil mineralizable nitrogen), nitrogen from previous crop residue, manure nutrients and fertilizer products.
- Nutrients available from manure sources are affected by manure analysis (laboratory or book values) timing of application, placement, rate and weather conditions.
- The expanded fertilizer products list to include new fertilizer products such as enhanced efficiency nitrogen fertilizers.
- Nutrient stewardship of fertilizers and manures reflects the nutrient availability of the fertilizer and manure sources, timing of application and placement.
- The yield response equations used for economic analysis and nitrogen fertilizer recommendations have been updated using new field research based on:
 - **Water Supply** that includes spring soil moisture, growing season precipitation based on long term probabilities, and irrigation level;
 - **Nitrogen Supply** that includes soil test nitrate, estimated nitrogen release from soil organic matter, nitrogen from previous crop residue, manure nitrogen and fertilizer nitrogen.

4. What operating system does AFFIRM v3 require to run?

AFFIRM v3 is a web-based application. As such, a web browser is required to utilize AFFIRM v3. This means that AFFIRM v3 can be used on Windows and Apple computers and tablets that have a web-based browser.

5. What is the layout/design of AFFIRM v3?

The format of AFFIRM v3 focuses on the farm level with individual fields or sub-fields recommendations and whole farm optimization. AFFIRM v3 is composed of sequentially ordered screens to enter information about the farm and individual fields or sub-fields, fertilizer and manure nutrient sources, and economic factors (fertilizer costs and expected crop prices).

6. How does AFFIRM v3 handle the screen presentation?

AFFIRM v3 is designed to be adjusted for various screen sizes to best fit the information that is on the screen.

7. How is my information saved and stored in AFFIRM v3 and is it secure?

AFFIRM v3 saves your entered information in an online secure database within the Government of Alberta that is only accessible to the owner or individual who created the farm in AFFIRM through MyAlberta Digital Identity. AFFIRM v3 does not save the results of the recommendation process.

8. Are there examples and supporting documentation that comes with AFFIRM v3?

The **Tutorial Guide** takes you through a step by step process for accessing AFFIRM v3 and developing a nutrient management strategy that fits your operation. Tips are offered throughout the tutorial and print screens help you to follow along.

The **User Manual** provides detailed information on each of the 4 modules included in AFFIRM v3 (including an example of the economic calculations) and identifies the limitations that exist. Current

Alberta Agriculture and Forestry references are listed for additional information on those factors impacting crop nutrient requirements.

A **Help** icon within the menu bar of AFFIRM v3 provides access to the User Manual within AFFIRM.

9. Can AFFIRM v3 be used with other software?

The new version of AFFIRM v3 cannot be used with other decision support software or applications.

10. Is AFFIRM v3 a record-keeping program?

Yes, AFFIRM v3 may prove to be a very useful record-keeping tool for you. You are able to store crop management information such as crop variety and yield, moisture conditions, fertilizer application, manure management, and crop residue management. The stored soil test information may be used to track soil fertility trends, while documenting details in the user comment section may provide answers to questions in succeeding years. As well, AFFIRM v3 will record fertilizer costs and crop prices each year that may be used to track production economics over time.

11. If I am a consultant, how do I use AFFIRM v3 for multiple clients?

AFFIRM v3 allows you to have multiple farms that represent various clients for your consultation.

12. Is AFFIRM v3 only suitable for Alberta conditions?

AFFIRM v3 was developed using research data from Alberta with Alberta soil and climate conditions. It is possible to use AFFIRM v3 outside of Alberta, but the user must be careful that the precipitation probabilities and soil types (organic matter, texture, etc.) are similar and the soil laboratory are the same or use the same analytical procedures.

13. Can AFFIRM v3 import information (i.e. AFFIRM v2 or laboratory results)?

Presently AFFIRM v3 does not have the capability to import information from older versions of AFFIRM. Differences in laboratory report formats creates difficulty for importing the laboratory information. The potential for this option will be re-evaluated when developing the next version.

14. How do I enter my historic information?

AFFIRM v3 is designed to store field data on a yearly basis. When a new farm is created, AFFIRM v3 will request you to enter the first year that you will be analyzing data for nutrient management. Once you have set this year, additional fertilizer costs will continue to the next year. It is important to set the appropriate year, as you cannot enter data preceding this entered year.

15. Can I export information and recommendations from AFFIRM v3?

No, AFFIRM v3 has no export function to transfer information.

16. How do I remove my information from AFFIRM v3?

Deleting individual fields or the entire farm will remove your information stored in AFFIRM v3.

17. Why is soil sampling and soil test results important?

Soil sampling and soil testing is essential to measure soil nutrient levels and other chemical and physical soil properties that will influence crop growth. It provides a snap shot of the soil at the time of sampling. Over time, soil test results vary or change, some more quickly than others depending on the management of soil, nutrients and crops, and climate. Soil properties such as particle size or soil texture will not change over time, but may vary spatially, so where you soil sample is very important. Soil texture has a significant influence on moisture retention, the ability of crops to tolerant drought conditions, crop growth and subsequent fertilizer requirements. Soil nutrient levels may vary annually such as nitrate nitrogen. Most soil test will vary by depth. For soil nitrate and sulfate levels, sampling depth is very critical and sampling depths to 60 cm (2 ft) in 15 cm (6 in) increments is the most reliable for making fertilizer nitrogen and sulfur recommendations. Whereas, the surface 15 cm (6 in) is used for phosphate, potash and most micronutrient fertilizer recommendations. If you only a surface sample for all nutrients, AFFIRM v3 will estimate the subsurface levels for nitrate and sulfate which can greatly affect nitrogen and sulfur recommendations. Soil pH and soil salinity will also affect crop growth. Crops vary in their ability to tolerate salinity, or acid soil conditions and affects fertilizer recommendations.

18. What is the Estimated Nitrogen Release (ENR)?

The Estimated Nitrogen Release (ENR) provides an indication of the mineralizeable (release) nitrogen of the soil over the growing season. The ENR is related to the soil organic matter level, and influenced by soil moisture and soil temperature, residue management and landscape position. As a first approximation, the ENR calculator uses the legal location and soil test area soil organic matter levels to estimate the ENR. With specific soil organic matter tests or ENR soil tests, better predictions of ENR can be calculated. There are specific laboratory soil tests to measure ENR. These tests will provide field specific estimates of nitrogen release that are more precise than estimates based on regional soil organic matter levels. The calibration for the nitrogen recommendation and or yield response to applied nitrogen fertilizer in AFFIRM v3 is based on soil groups and the typical ENR for cultivated soils in Alberta. Fields or sub-fields within soil zones may have higher ENR due to higher organic matter levels or the result of management practices such as manure applications. The ENR values are used to adjust nitrogen fertilizer applications and the crop yield response to nitrogen fertilizer.

19. How does AFFIRM v3 take into account the previous crop residue nitrogen?

Above and below ground residues from previous crop in rotation can provide a source of N to the crop to be grown in the current cropping year. If the above ground crop residue remains on the field and incorporated into the soil, then the nitrogen mineralized from the above and below ground residue is taken into account to adjust fertilizer nitrogen requirements. If the above ground crop residue is removed, then only the nitrogen that would be mineralized from the below ground crop residue is taken into account to adjust fertilizer nitrogen requirements.

20. How does AFFIRM v3 manage and estimate nutrients from manure?

AFFIRM v3 calculates the nutrients available from manure application as a contributing source for crop production and determining fertilizer requirements. AFFIRM v3 can utilize specific laboratory manure analysis or book values for manure sources, combined with how the manure is applied, the weather conditions at the time of manure application and the rate of manure application to calculate the quantity nutrients available from manure sources for crop production. AFFIRM v3 also factors in the previous 2 years application of manure to gauge the nutrients available for crop production.

21. What is the difference between laboratory manure analyses and book values?

AFFIRM v3 has the option of using a manure analysis specific to a manure source or book values which provides an estimate of nutrient content of the manure based on manure type (livestock, solid or liquid). The laboratory analysis is the most accurate reflection of the nutrient content of the manure, while the book values may not provide a reliable estimate for the manure.

22. How does AFFIRM v3 manage nutrient stewardship

Nutrient stewardship requires the implementation of nutrient beneficial management practices (BMPs) that optimize the efficiency of nutrient use. The goal of nutrient BMPs is to optimize crop productivity by matching nutrient supply with crop requirements and to minimize nutrient losses. Selection of BMPs varies by location, and those chosen for a given farm are dependent on local soil and climatic conditions, crop choice, management decisions and other site specific factors. The nutrient stewardship concept applies globally, but varies depending on field and site specific characteristics such as soil, cropping system, management techniques, climate and equipment. The four factors that influence all nutrient decisions include 1) nutrient source; 2) time of nutrient application; 3) placement of nutrient application; and 4) rate of nutrient application.

AFFIRM v3 allows the user to select nutrient stewardship options that includes:

- Nutrient source – soil tests, soil mineralization, crop residue, manure and fertilizer products
- Time of application – fall, spring, in-season
- Nutrient placement – method of application (i.e. broadcast, seed-placed, banding, injection)
- Fertilizer economics – nutrient costs, crop prices, economic return and fertilizer budget.

AFFIRM v3 uses these factors to determine the rate of nutrient application.

23. Are AFFIRM v3 fertilizer recommendations based on target yields?

Fertilizer recommendations generated by AFFIRM v3 is not based on target crop yields. AFFIRM v3 identifies soil factors (nutrient levels, pH, salinity and soil moisture) that may limit crop growth and generates fertilizer recommendations to correct nutrient deficiencies and adjust for soil limiting factors. Where available, AFFIRM v3 generates a crop yield response to fertilizer nitrogen and moisture conditions, and identifies appropriate fertilizer nitrogen rate based on economic analysis to optimize economic returns.

24. Why don't some crops have an economic analysis?

In order to conduct an economic analysis, AFFIRM v3 needs to predict a yield response for added fertilizer nitrogen at a specific moisture level for a crop with non-linear regression equations. The development of such equations requires intensive field research to collect the required data (i.e. yield, soil nitrogen level, fertilizer nitrogen rates, spring soil moisture conditions, growing season precipitation or

irrigation levels). There is limited research information to develop yield response equations. The yield response equations that have been developed represent a small number but significant portion of annual crops grown in Alberta and nitrogen fertilizer products. There is a vital need for field research to maintain or increase the number of crops with this information. Crops without yield response will still receive a fertilizer recommendation based on the research information available.

25. How is the individual field economic analysis different from the whole farm optimization?

The economic analysis involves the analysis of added returns to added costs of additional applications of fertilizer to an individual field. Based on your comfortable profit margin, the economic analysis determines the recommended N rate for that particular field. The whole farm optimization module then incorporates the P_2O_5 , K_2O , S and micronutrient costs of all fields, and based on a set budget, will determine how the available dollars for N application should be allocated by field and crop. According to the results of the economic analysis, AFFIRM v3 will optimize your investment by allocating N fertilizer (in 10lb increments) to those fields with the highest economic return potential until a target investment ratio is achieved or when available dollars has been exhausted.

26. Why can't P_2O_5 , K_2O , S and micronutrient recommendations be altered in the farm optimization?

The P_2O_5 , K_2O , S and micronutrients have been optimized at the field level based on soil test levels, crop selection, soil test zone, and moisture level prior to the whole farm optimization. The farm optimization process focuses on allocating the dollars for nitrogen to maximize production and returns after the cost of the P_2O_5 , K_2O , S and micronutrients have been covered. This is not the best way, but given the limitation of our data, it is the best we can do. If we had research data for crop response to all nutrients, then a multi-nutrient optimization would be possible. The experimental design would require a huge number and level of interactions to get all possible combinations of nutrients and fertilizer rates.

27. Why doesn't AFFIRM v3 give the same recommendations as my laboratory report?

The intent of AFFIRM v3 is not to reproduce fertilizer recommendations and target yield predictions made by various private laboratories. Rather, AFFIRM v3 makes use of the recommendations outlined in the Soil Test Recommendations for Alberta: Technical Manual, soil test calibration research and the yield response equations developed by Alberta Agriculture and Forestry and when necessary soil and fertilizer research from western Canada. Soil test laboratories have various mechanisms for developing fertilizer recommendations that may or may not include research from Alberta Agriculture and Forestry.