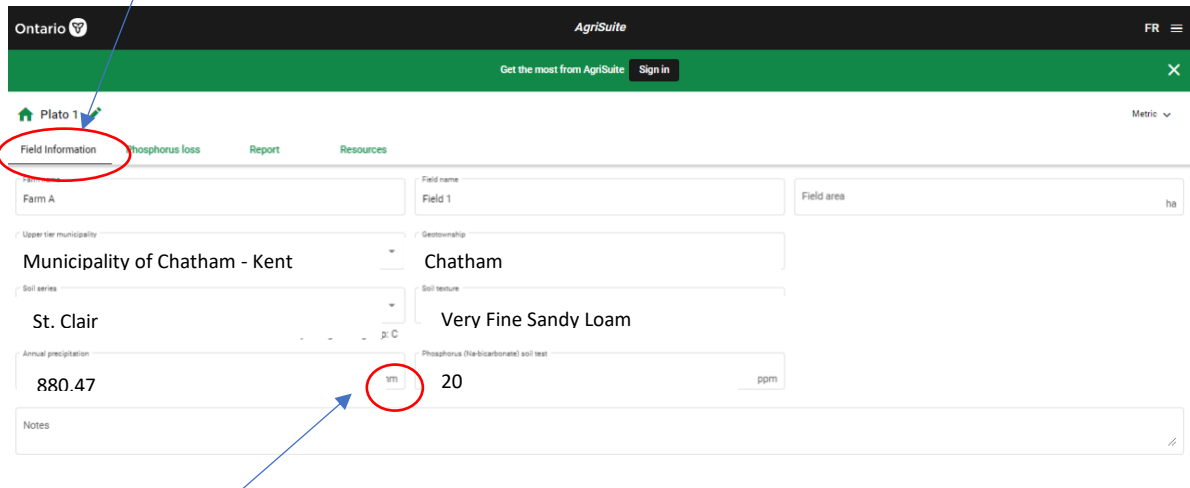# PLATO INVESTIGATION

PLATO, (Phosphorus Loss Assessment Tool for Ontario *from OMAFRA*) is a calculator that can be used to estimate the risk of phosphorus loss from a farmer's field. PLATO takes into consideration the many **variables** (factors) that can affect the results of the calculations.
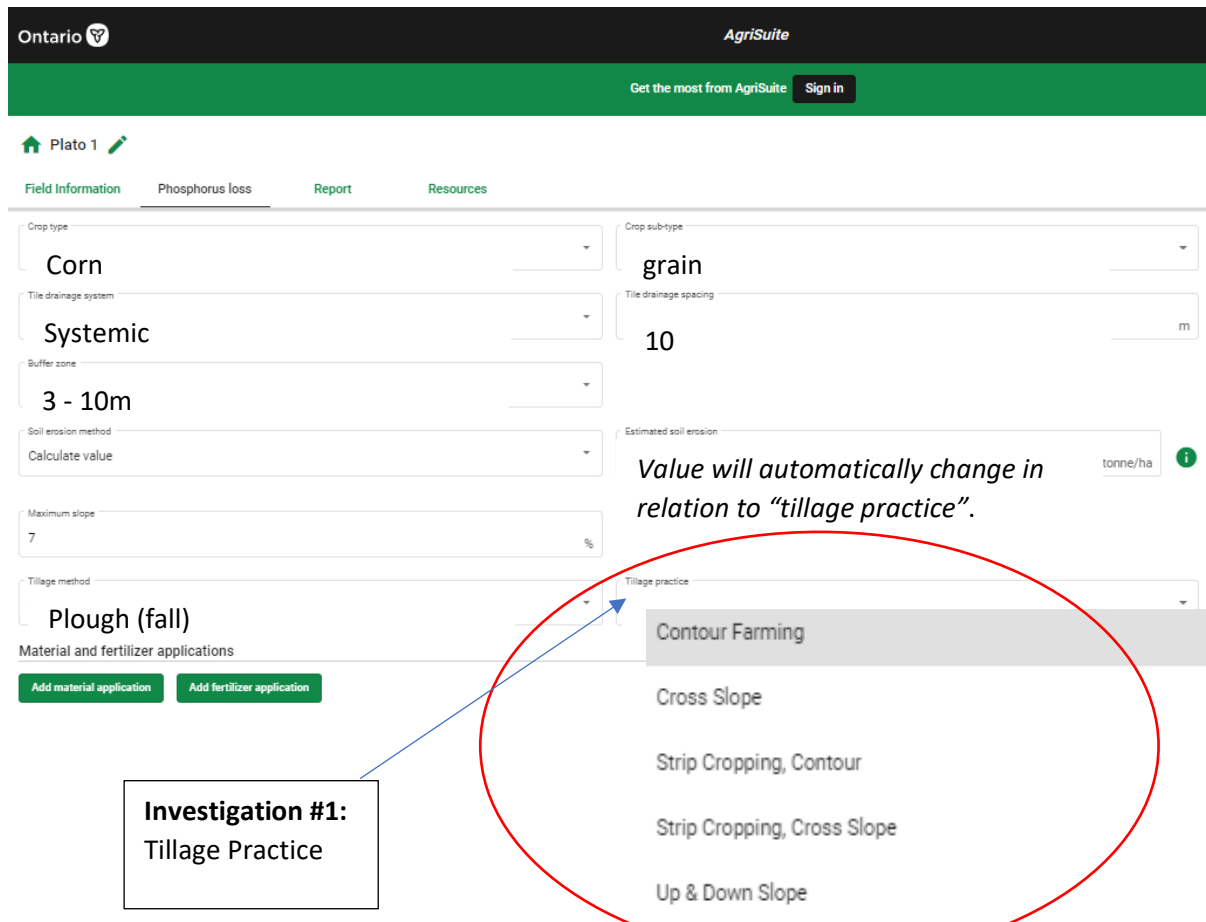
To clearly observe how each variable affects the calculated phosphorous index, input the following base data and then conduct the investigations as directed.

1. Field information page

Note: Use metric units

2. Go to the **Phosphorus Loss** page and input the data indicated below. "Tillage Practice" information will be manipulated in Investigation #1.

Investigation #1: Tillage Practice
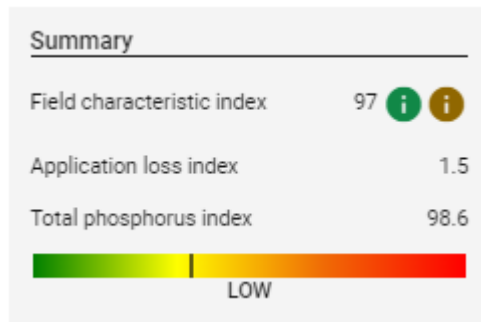
Conducting an Investigation

In order to determine the specific cause of an outcome in an investigation, a **fair test** is conducted where only one variable at a time is changed. The **Independent Variable** is the factor that is changed by the investigator i.e., type of tillage practice. The **Dependent Variable** is the factor that is measured and occurs as a result of that change i.e., total phosphorus index. To ensure a fair test is conducted, other variables that could affect the outcome are kept the same. These are called **controlled variables**.

Using PLATO, conduct the following investigations:

Investigation #1: Tillage practice

Investigate the effect the type of tillage practice has on the total phosphorus index by changing the type of tillage practice i.e., up & down slope, contour farming. Observe the new calculations in the summary chart and then record the summary information.

Example summary chart:

a) Type of tillage _____

Summary
_____

Field characteristic index _____

Application loss index _____

Total phosphorus index _____

b) Type of tillage _____

Summary
_____

Field characteristic index _____

Application loss index _____

Total phosphorus index _____

c) Type of tillage _____

Summary_____

Field characteristic index   _____

Application loss index   _____

Total phosphorus index   _____

d) Type of tillage _____

Summary_____

Field characteristic index   _____

Application loss index   _____

Total phosphorus index   _____

e) Type of tillage _____

Summary_____

Field characteristic index   _____

Application loss index   _____

Total phosphorus index   _____

Conclusions:

1. Does the type of tillage affect the total phosphorus index? _____

2. According to the data collected, what type of tillage practice allows for the greatest loss of phosphorus from the field? _____

3. What type of tillage practice would you recommend in order to have the least amount of phosphorus entering the watershed? _____

Investigation #2

Investigate the effect of the **source** of phosphorus used on the total phosphorus index. Remember that in order to conduct a fair test, only **one** variable should be changed each time and all other variables should be controlled or kept the same.

An example investigation would be testing to see if the type of animal (sheep, swine, beef, chicken…) manure applied affects the total phosphorus index. In that case whether the manure is solid or liquid would need to be kept the same as well as the method of application (tanker, deep hose, spreader...). Application rate would also need to be kept constant. Controlling all other variables that could affect the outcome ensures that the results you see is because of the variable you want to test (independent variable) and not because of other factors.

a) Go to "**Material and fertilizer applications**" and begin by clicking on "**Add material application**".

b) Set **Application rate** at "50 tonne/ha" and **Application method** as "spreader". See example:

c) Click on **Edit material types**. Choose a set of criteria you wish to investigate. See example below.
   Remember to change only one variable between each test i.e., Type (of manure)

c) Record the data found on the Summary chart. *(Data may be recorded in your science journals or observation charts provided by your teacher).*

Conclusions and Applications:

Based on your observed data, what recommendations might you make to reduce the phosphorus index and subsequent loss of phosphorus into the watershed? _____
_____

Extensions:

Many factors/variables related to **Material application** can be investigated. Variables such as the application method, the form (solid/liquid), the wet/dry/basis, the time of application, application rate *or* a comparison between application of manure or fertilizer as source of phosphorus can be made. *Reminder: Choose only **one** variable to test at a time. Record and analyze your data and make recommendations based on that data.*

Further Explorations:

Explorations into how different factors affect phosphorus loss can also be conducted. Remember to change only one factor at a time in order to get a clearer "cause and effect relationship".

Here are some other possible explorations/investigations:
- What is the effect of the amount of rainfall on the phosphorus loss index? (Does using different sources of phosphorus vary these outcomes?)
- What is the effect of soil type on the phosphorus loss index?
- Does the method of application affect the amount of phosphorus lost in runoff?
- Does the type of crop grown affect the amount of phosphorus lost in runoff?
- How does buffer zone width affect the amounts of phosphorus that enter nearby watershed?
- How does the time of year phosphorus is applied affect the phosphorus loss index amounts? (Does using a different source of phosphorus vary these outcomes?)

4R Stewardship

4R Stewardship works to increase production and profitability for farmers while enhancing environmental protection and improving sustainability. To achieve those goals, the 4Rs incorporate the:

- Right Source of fertilizers that are in – or are easily converted to – compounds best used by the target crop.
- Apply the Right Rate of fertilizer to match nutrient supply with crop requirements.
- Apply fertilizer at the Right Time so nutrients will be available when crop demand is high.
- Apply or maintain fertilizer in the Right Place where the crop can access the nutrients most effectively.

Based on the results of your investigations using **PLATO**, develop a pamphlet or ad campaign promoting **4R Stewardship** as a means of reducing phosphorus loss to nearby watersheds. Include the benefits of using **Plato** as farmers plan their upcoming growing year.