

# Introduction to PKalc

*What is PKalc?*

*Uses for PKalc*

What is PKalc? PKalc is a Microsoft Excel spreadsheet that helps you estimate phosphorus (P) and potassium (K) budgets for a field or field area. You decide upon a time frame then enter in P and K additions and crop yields. PKalc uses removal coefficients to estimate cumulative amounts of P and K removed during the period considered. The end result is an estimation of whether you have been adding more or less P and K than crops have been removing.

**PKalc** MidAmerica Business

**Project:** Field 1

**Period from:** Jul-95 **to:** Dec-99

**Comments:**  
 Phosphorus is being mined from the soil  
 Potassium is being mined from the soil

		<b>P<sub>2</sub>O<sub>5</sub></b>	<b>K<sub>2</sub>O</b>
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	94	234
<input type="button" value="Edit"/>	Total removal:	240	259
Est. net change:		-146	-25

Foundation for Agronomic Research: [www.ppi-far.org](http://www.ppi-far.org)  
 Potash & Phosphate Institute / Potash & Phosphate Institute of Canada: [www.ppi-ppic.org](http://www.ppi-ppic.org)

The output generated by PKalc is one page of itemized P and K additions and removals and the resulting estimated budget.

**PKalc**

## MidAmerica Business

Project: Field 1



Period from: Jul-95 to: Dec-99

**Additions**

Date	Nutrient source	Source rate	Rate unit	Product analysis		Analysis unit	Nutrients added	
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
							---- (lb/acre) ----	
Oct-95	Potash	60 lb/acre		0	60	%	0.0	36.0
Oct-96	Farrowing Bldg.	6000 gal/acre		5.2	12.5	lb/1000gal	31.0	75.0
Oct-97	TSP	46 lb/acre		46	0	%	21.0	0.0
Oct-97	Potash	205 lb/acre		0	60	%	0.0	123.0
Apr-98	Starter	140 lb/acre		30	0	%	42.0	0.0
<b>Total additions:</b>							<b>94</b>	<b>234</b>

**Removals**

Date	Crop	Yield	Unit	Removal factors		Nutrients removed		
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
							---- (lb/acre) ----	
Oct-96	Wheat	84 bu		0.5	0.35		42.0	29.0
Sep-97	Soybeans	62 bu		0.8	1.4		50.0	87.0
Oct-98	Corn (grain, bu)	240 bu		0.44	0.29		106.0	70.0
Sep-99	Soybeans	52 bu		0.8	1.4		42.0	73.0
<b>Total removal:</b>							<b>240</b>	<b>259</b>

**Balance**

Comments:	Net	
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
---- (lb/acre) ----		
Phosphorus is being mined from the soil		
Potassium is being mined from the soil		
<b>Net change:</b>	<b>-146</b>	<b>-25</b>

*Potash & Phosphate Institute (www.ppi-ppic.org)*

## Uses for PKalc

It is important to remember that PKalc only estimates nutrient budgets. Errors can exist in quantifying the amount of P and K added, particularly for manures with highly variable analyses or applications with significant spatial variability, as well in estimating quantities of nutrients removed by harvested crop portions. While many tables present one removal estimate per harvest unit of a particular crop (such as 0.37 lb P<sub>2</sub>O<sub>5</sub>/bu corn grain), the actual amount of P and K removed from a specific field or field area can vary significantly from such an estimate. The presence of yield/quality limiting factors, hybrid/variety, and environmental conditions all combine to influence the amount of nutrients taken up in harvested portions of crops. Therefore, when looking at budgets generated by PKalc, the user should remember these and other sources of error. The greater the positive or negative results, the more confidence the user will have that P and K soil reserves are being built up or mined, respectively.

The following table shows what information is and is not generated by PKalc:

PKalc does these:	PKalc does NOT do these:
Totals P and K additions	Provide exact P and K budgets
Totals P and K removals	Utilize soil test data
Estimates P and K budgets (total additions – total removal)	Predict changes in soil test levels  Determine agronomic, economic, or environmental impacts of historical or future P and/or K management

PKalc includes enough flexibility to be customized to local conditions. Crop and nutrient lists can be tailored to local areas. The list of crops from which users can choose is restricted, however, to only those crops for which P and K nutrient removal estimates exist. When they are available, local estimates of crop removal can be entered and must be done in a responsible manner.

PKalc is therefore an assessment tool. It provides an easy way to estimate P and K nutrient budgets. Such budgets can be combined with other information, such as soil test levels and indicators of possible environmental impact, to help farmers and their advisers understand how best to manage P and K under local conditions.

**Notes**

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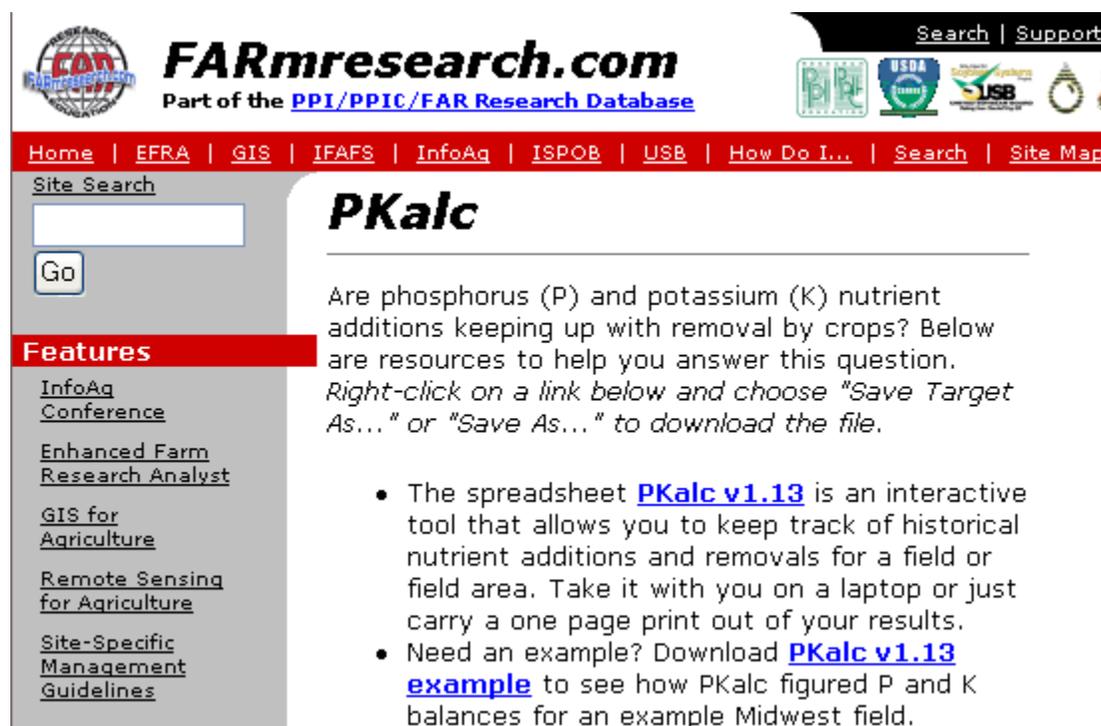
# File Download and Security Settings

*Downloading PKalc*

*Adjusting Security Settings*

This section describes how to download PKalc, save it on your hard disk, and adjust the security setting in Microsoft Excel. These steps are required before you can open PKalc.

You can find PKalc on the web at [www.farmresearch.com/pkalc](http://www.farmresearch.com/pkalc).



The screenshot shows the FARMresearch.com website. The header includes the logo for FARMresearch.com, which is part of the PPI/PPIC/FAR Research Database. There are navigation links for Home, EFRA, GIS, IFAFS, InfoAg, ISPOB, USB, How Do I..., Search, and Site Map. A search bar is located in the top right corner. The main content area is titled "PKalc" and contains the following text:

Are phosphorus (P) and potassium (K) nutrient additions keeping up with removal by crops? Below are resources to help you answer this question. *Right-click on a link below and choose "Save Target As..." or "Save As..." to download the file.*

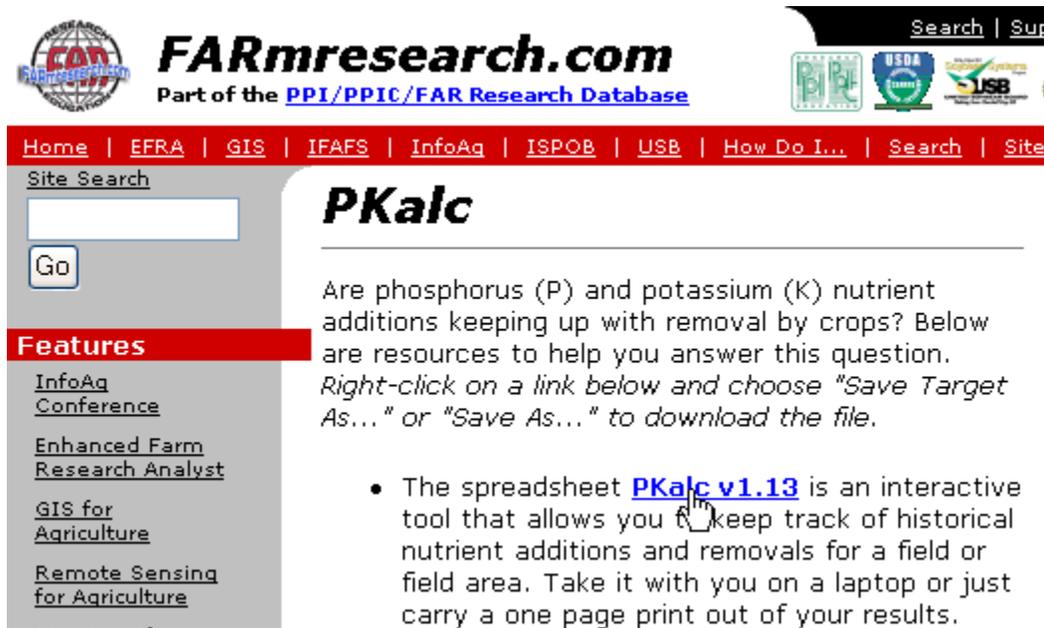
- The spreadsheet [PKalc v1.13](#) is an interactive tool that allows you to keep track of historical nutrient additions and removals for a field or field area. Take it with you on a laptop or just carry a one page print out of your results.
- Need an example? Download [PKalc v1.13 example](#) to see how PKalc figured P and K balances for an example Midwest field.

The left sidebar contains a "Site Search" box and a "Features" section with the following links:

- [InfoAg Conference](#)
- [Enhanced Farm Research Analyst](#)
- [GIS for Agriculture](#)
- [Remote Sensing for Agriculture](#)
- [Site-Specific Management Guidelines](#)

## Downloading PKalc

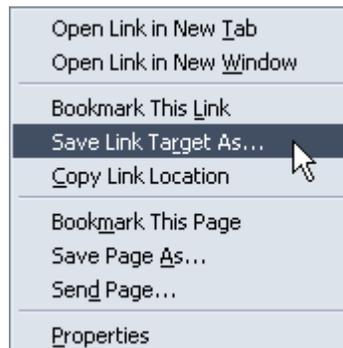
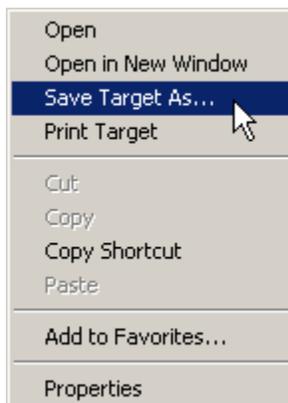
1. Start your web browser and navigate to [www.farmresearch.com/pkalc](http://www.farmresearch.com/pkalc).
2. On the PKalc homepage, **right click** on the hotlink **PKalc v1.13**.



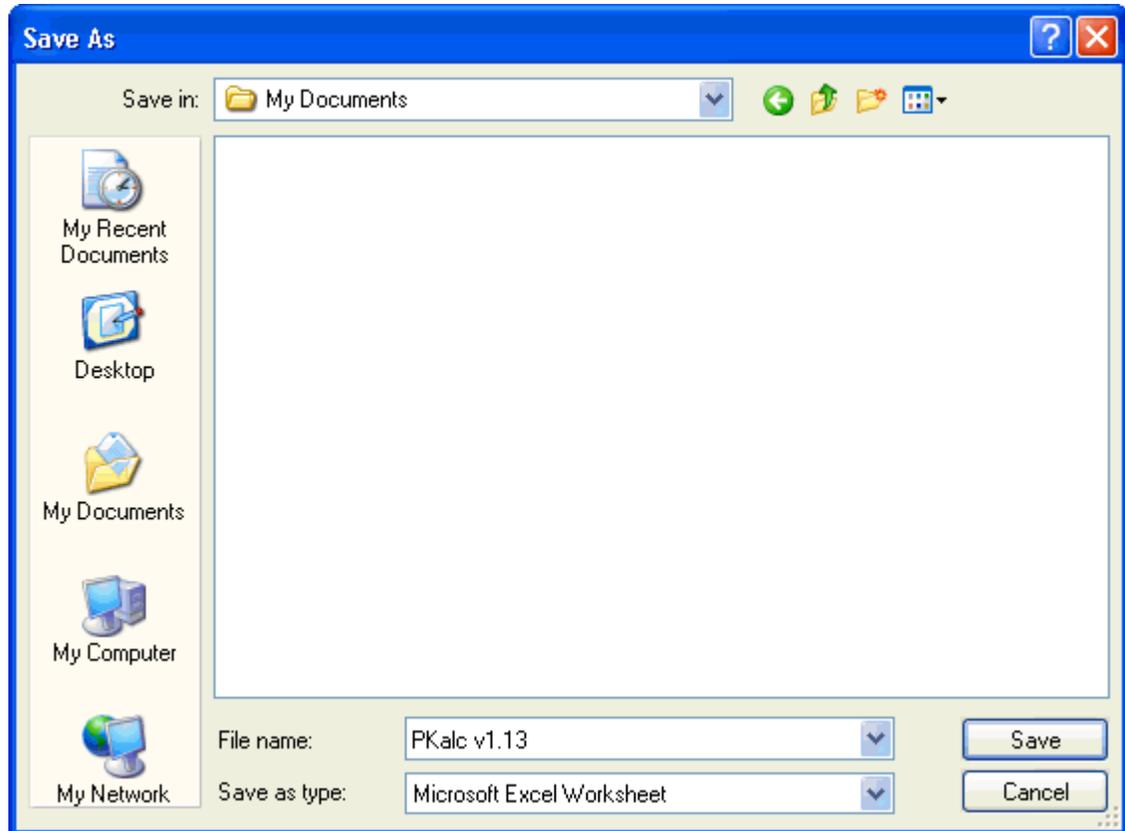
The screenshot shows the FARMresearch.com website. The main heading is "PKalc". Below the heading, there is a paragraph: "Are phosphorus (P) and potassium (K) nutrient additions keeping up with removal by crops? Below are resources to help you answer this question. Right-click on a link below and choose "Save Target As..." or "Save As..." to download the file."

A bullet point lists a resource: "The spreadsheet [PKalc v1.13](#) is an interactive tool that allows you to keep track of historical nutrient additions and removals for a field or field area. Take it with you on a laptop or just carry a one page print out of your results."

3. In the dialog box that pops up, select either **Save Target As** (Internet Explorer) or **Save Link Target As** (Netscape).



4. Choose a file location and then press **Save** in the Save As dialog box.



You have now successfully downloaded PKalc v1.13 from the internet and saved it to your hard disk.

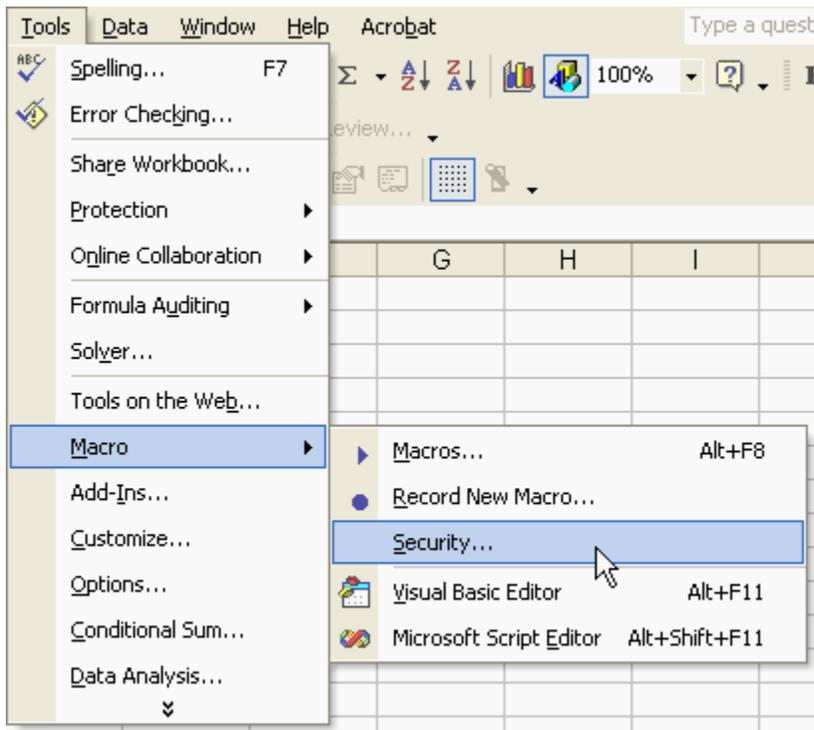
**Note:** the images in this manual use screen captures from a Windows XP computer running Microsoft Excel 2002

## Adjusting security settings

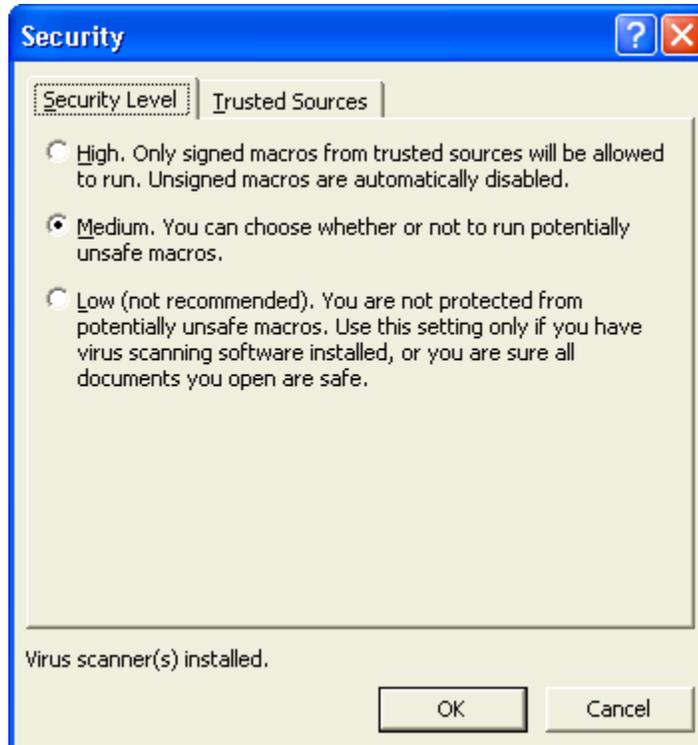
PKalc uses macros (special scripts) that tell the spreadsheet what to do with the data you give it. Macros can be very simple to very complex. They can also be quite beneficial and, in some cases quite hazardous to your system. Using a macro, a hacker can run malicious code on your computer with the potential for damaging your files. To prevent the unauthorized use of macros, Microsoft ships Excel with the macros feature turned off. You can adjust your security settings to allow macros to run and, when you know the source of the macro is a trusted developer, you can allow Excel to run the macro on your machine.

To change the settings in Excel so that you can run the macros in PKalc, we will need to adjust the security settings.

1. Open a blank worksheet in Microsoft Excel. In windows, click **Start | Programs | Microsoft Excel**.
2. On the *Standard Toolbar*, click **Tools | Macro | Security**.



3. In the *Security* dialog box on the Security Level tab, **select Medium**.



Microsoft comes with a default security level of High, automatically disallowing macros to run. Adjusting the security levels to Medium gives you the power to choose whether or not to run macros. For PKalc to function properly, you must enable macros upon opening the PKalc v1.13 file. PKalc has been tested by currently updated anti-virus software and is virus free.

**Notes**

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# Customizing PKalc

*Creating a Customized Nutrient List*

*Creating a Customized Crop List*

In this section, you will learn how to create a version of PKalc that is tailored to the crops and nutrient sources in your area.

The first section demonstrates how to create a customized list of P and K nutrients like that below.

PK nutrient source	Source type	Analysis		Analysis units
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
Potash	Commercial fertilizer	0	60	%
MAP	Commercial fertilizer	52	0	%
DAP	Commercial fertilizer	46	0	%
Starter	Commercial fertilizer	34	0	%
Farrowing Bldg.	Manure (liquid)	4.1	14	lb/1000gal

The second section shows how to create a list of crops and removal coefficients pertinent to your area.

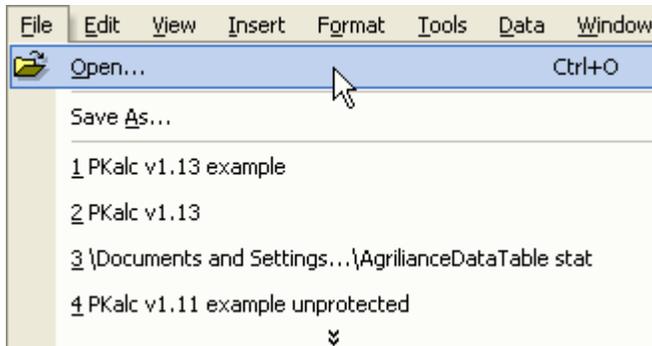
Crop	Unit	PPI removal coefficients		User-defined removal coefficients	
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/unit) -----		----- (lb/unit) -----	
Alfalfa	ton	15	60		
Corn (grain, bu)	bu	0.44	0.29	0.37	
Soybeans	bu	0.8	1.4		
Wheat	bu	0.5	0.35		

This new, customized file will be the one you access regularly when you estimate P and K nutrient balances on fields or field areas.

## Creating a Customized Nutrient List

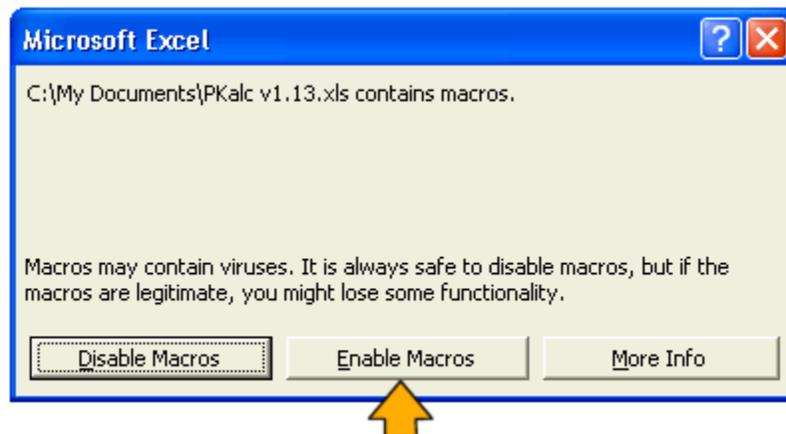
Open the PKalc v1.13 file that you downloaded from the website.

1. **Start Microsoft Excel** and click **File | Open** on the *Standard Toolbar*. Open the file from the saved location.



While the file is opening, a Microsoft Excel dialog box appears, asking if you want to enable macros. This box appears because of the changes you made to your Microsoft Excel security settings in the previous chapter.

2. **Click Enable Macros** in the *Microsoft Excel* dialog box.



You should see a screen that looks like the one below.

**PKalc** Enter Business Name Here

**Project:**

**Period from:**  **to:**

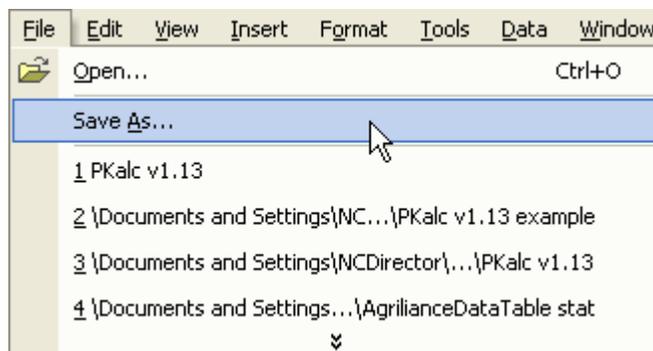
**Comments:**  
Phosphorus removal/additions are balanced  
Potassium removal/additions are balanced

		<b>P<sub>2</sub>O<sub>5</sub></b>	<b>K<sub>2</sub>O</b>
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	0	0
<input type="button" value="Edit"/>	Total removal:	0	0
Est. net change:		0	0

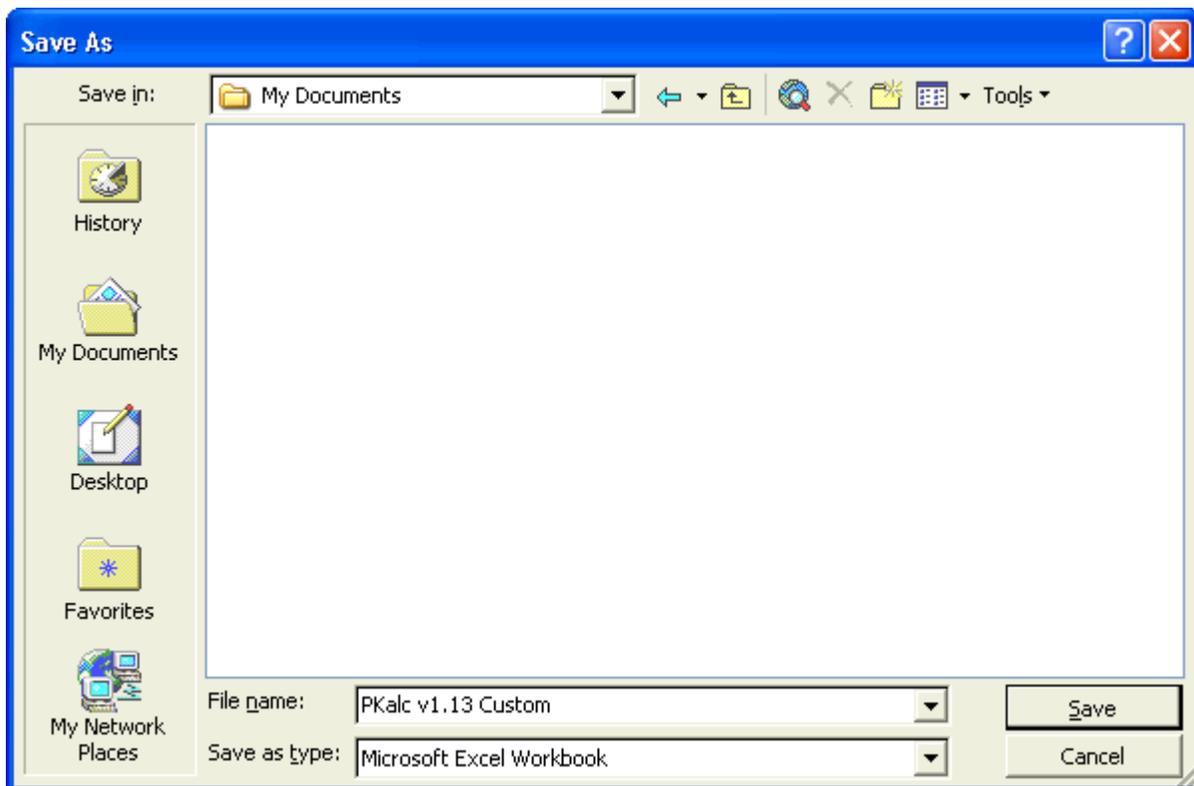
Foundation for Agronomic Research: [www.ppi-far.org](http://www.ppi-far.org)  
 Potash & Phosphate Institute / Potash & Phosphate Institute of Canada: [www.ppi-ppic.org](http://www.ppi-ppic.org)

Before we make any revisions, we will save this file under a new name to maintain the integrity of the original file.

**3. Click File | Save As on the Standard Toolbar.**



4. In the *File name* box, **type PKalc v1.13 Custom** and **click Save**. This will be the name of the customized PKalc spreadsheet.



5. **Type** your business or organization name in the highlighted text field labeled *Enter Business Name Here*. In our example, we use **MidAmerica Business**. **Press** the **Tab** key.

**PKalc**

**Project**

**Period from:**  **to:**

**Comments:**  
Phosphorus removal/additions are balanced  
Potassium removal/additions are balanced

		$P_2O_5$	$K_2O$
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	0	0
<input type="button" value="Edit"/>	Total removal:	0	0
	Est. net change:	0	0

Foundation for Agronomic Research: [www.ppi-far.org](http://www.ppi-far.org)  
 Potash & Phosphate Institute / Potash & Phosphate Institute of Canada: [www.ppi-ppi.org](http://www.ppi-ppi.org)

**Hint:** Many data entry fields contain input messages. These appear as small boxes containing text. They are used to help users understand what type of information should be entered. After pressing the Tab key in step 5, the next field selected is that to the right of the Project label. This field has the input message “Enter a descriptive name for the field or field area”. We simply ignore this message for now, but later we will use this data entry field to input a project name.

**6. Press the Add Nutrients button, located on the right-hand side gray panel.**

**PKalc** MidAmerica Business

**Project:**

**Period from:**  **to:**

**Comments:**  
Phosphorus removal/additions are balanced  
Potassium removal/additions are balanced

**Project**  
Enter a descriptive name for the field or field area  
----- (lb/acre) -----

<input type="button" value="Edit"/>	Total additions:	0	0
<input type="button" value="Edit"/>	Total removal:	0	0
	Est. net change:	0	0

Foundation for Agronomic Research: [www.ppi-far.org](http://www.ppi-far.org)  
Potash & Phosphate Institute / Potash & Phosphate Institute of Canada: [www.ppi-ppic.org](http://www.ppi-ppic.org)

Buttons in sidebar: New project, Add Nutrients, Add Crops, Print Project, Print Crop List

**Hint:** Many cells have a small red triangle in the upper right hand corner. This triangle indicates that there is a comment associated with the cell. Comments are used to inform users quickly about various parts of the spreadsheets. Moving the cursor over red triangle displays the comment, as shown below for the triangle associated with the Add Nutrients button.

**PPi/PPiC:**  
**Add Nutrients** allows you to enter a list of products and their respective nutrient contents

This will bring up a worksheet for entering up to 15 P and K sources, shown below.

Main
Clear form





P/K nutrient source	Source type	Analysis P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O	Analysis units
	none ▼		

For our example, let's assume that the following P and K commercial fertilizer sources are regularly used:

Nutrient source	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	----- (%) -----		
Potash	0	0	60
MAP	11	52	0
DAP	18	46	0
Starter	10	34	0

In addition, the following liquid hog manure source is also used occasionally:

Nutrient source	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	----- (lb / 1000 gal) -----		
Farrowing Bldg.	12.6	4.1	14.0

In the following steps, we enter each of these nutrient sources into the spreadsheet. This procedure creates a list of nutrients we can later access when entering data on individual fields or field areas.

7. **Type Potash** in the first blank field under the column labeled *P/K Nutrient Source* and **press Tab**.

Main Clear form



P/K Sources			
P/K nutrient source	Source type	Analysis <small>P<sub>2</sub>O<sub>5</sub> K<sub>2</sub>O</small>	Analysis units
Potash	none		
	none		

8. **Choose Commercial fertilizer** from the drop down list in the *Source type* column.

Main Clear form



P/K Sources			
P/K nutrient source	Source type	Analysis <small>P<sub>2</sub>O<sub>5</sub> K<sub>2</sub>O</small>	Analysis units
Potash	<div style="border: 1px solid gray; padding: 2px;">                     none                      none  <span style="background-color: #007bff; color: white; padding: 2px;">Commercial fertilizer</span>                      Manure (liquid)                      Manure (solid)                      Lagoon liquid (irrigate)                      none                 </div>		
	none		
	none		
	none		

Associating a type with a source allows PKalc to determine which units are appropriate for the source. These units are automatically entered into the gray Analysis units column. In our example, associating Potash with Commercial fertilizer tells PKalc that the nutrient analyses will be entered as a percent by weight (%).

P/K nutrient source	Source type	Analysis P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O	Analysis units
Potash	Commercial fertilizer		%

**Hint:** Throughout the PKalc spreadsheet, the color gray is used to denote cells that are filled in automatically. White cells denote areas where the user must input data.

9. Enter 0 in the *Analysis P<sub>2</sub>O<sub>5</sub>* column. Press the **Tab** key to highlight the cell under the *Analysis K<sub>2</sub>O* column label. Enter 60 and press the **Tab** key again.

Main Clear form



P/K Sources			
P/K nutrient source	Source type	Analysis P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O	Analysis units
Potash	Commercial fertilizer	0 60	%
	none		

You have now successfully entered the first nutrient source into the spreadsheet. Note that when we input the nutrient analyses, we entered only the values for P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. PKalc has no place to enter the values for nitrogen (N).

**Hint:** Be careful when entering nutrient analysis information. Nutrient analyses are reported as N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O. PKalc only has places to enter the P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O contents. For instance, diammonium phosphate, or DAP, has an analysis of 18-46-0. There is no place to enter the N analysis of 18%. Only the 46% P<sub>2</sub>O<sub>5</sub> and 0% K<sub>2</sub>O can be entered.

Continue entering the remaining nutrient information in the tables on page 16. Be careful to choose Manure (liquid) for the hog manure source. When you have finished, your spreadsheet should look like the following:

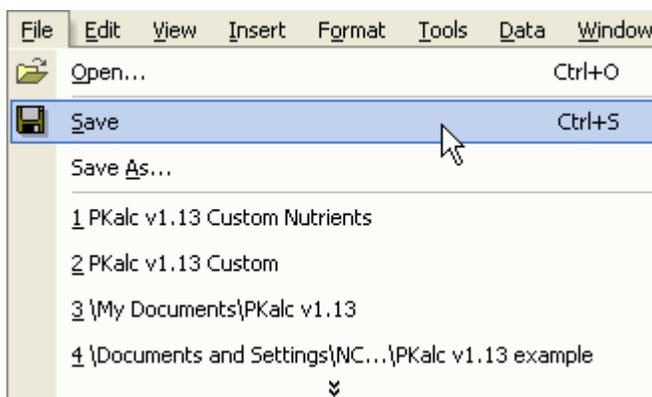
Main Clear form



P/K Sources				
P/K nutrient source	Source type	Analysis		Analysis units
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
Potash	Commercial fertilizer	0	60	%
MAP	Commercial fertilizer	52	0	%
DAP	Commercial fertilizer	46	0	%
Starter	Commercial fertilizer	34	0	%
Farrowing Bldg.	Manure (liquid)	4.1	14	lb/1000gal
	none			
	none			

You now have a customized list of P and K nutrient sources.

**10. Click File | Save.**



**11. Click the Main button in the upper left corner of the spreadsheet to return to the main form.**

Main Clear form

P/K Sources	
P/K nutrient source	Source type

You are now ready to customize your crop list.

## Creating a Customized Crop List

PPI/FAR have removal estimates for 89 crops. You probably don't want to scroll through all 89 every time you want to record a crop yield from a field or field area. Consequently, PKalc allows you to create a much shorter, custom list of crops. You will access this custom list later when you calculate crop removal.

1. Press the **Add Crops** button, located on the right-hand side gray panel on the main form.

The screenshot shows the PKalc software interface for 'MidAmerica Business'. It includes a 'Project' field, 'Period from' and 'to' date fields, and a 'Comments' section. A table displays 'Total additions', 'Total removal', and 'Est. net change' for P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. A right-hand panel contains buttons for 'New project', 'Add Nutrients', 'Add Crops' (highlighted with a yellow arrow), 'Print Project', and 'Print Crop List'. A tooltip for the 'Project' field reads: 'Project: Enter a descriptive name for the field or field area (lb/acre)'. At the bottom, it lists the Foundation for Agronomic Research and Potash & Phosphate Institute of Canada with their respective websites.

This will bring up a worksheet for entering up to 89 crops, shown below.

The screenshot shows the 'Crops' worksheet interface. It features a navigation bar with 'Main', 'Clear form', 'Quick Lists', and 'Add all' buttons, along with filters for 'Field crops', 'Veg. crops', and 'Fruits/nuts'. The main table has columns for 'Crop', 'Unit', 'PPI removal coefficients' (P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O), 'User-defined removal coefficients' (P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O), and 'PPI Notes'. The 'Crop' column contains dropdown menus, and the 'Unit' column contains input fields. The 'PPI removal coefficients' and 'User-defined removal coefficients' columns contain input fields for values in lb/unit.

**Using pre-defined lists**

If you want to use pre-determined crop lists, you can choose any of the four buttons under the *Quick Lists* label at the top of the spreadsheet.



The *Add all* button adds all of the crops listed on p. 22-23. The *Field crops*, *Veg. crops*, and *Fruits/nuts* buttons add only the appropriate subsets of the entire crop list.

To see how this works, let's add all of the field crops.

2. Click the **Field crops** quick list button.



This enters an alphabetically-arranged list of 24 field crops starting with alfalfa and ending with wheat. Associated with each crop are the removal coefficients published by PPI. If you wish to alter the coefficients that PKalc will use to estimate nutrient removal, you can enter your own in the columns labeled *User-defined removal coefficients*. If you leave this column, blank, the PPI coefficients in the adjacent columns will be used by default.

**Note:** If you enter your own removal coefficients, you must do so responsibly. The use of Cooperative Extension publications containing state-specific coefficients is recommended.

Crops		PPI removal coefficients		User-defined removal coefficients		PPI Notes
Crop	Unit	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
		----- (lb/unit) -----		----- (lb/unit) -----		
Alfalfa	ton	15	60			dry matter basis
Bahiagrass	ton	12	35			dry matter basis
Barley (spring)	bu	0.4	0.35			
Bermudagrass	ton	12	50			dry matter basis
Bromegrass	ton	13	59			dry matter basis
Canola	bu	0.91	0.46			
Clover-grass	ton	15	60			dry matter basis
Corn (grain, bu)	bu	0.44	0.29			

### Approximate Removal Rates of Various Crops

Crop	Yield unit	Removal rates		Notes
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
----- (lb/unit) -----				
Alfalfa	ton	15	60	dry matter basis
Almonds (in shell)	ton	50	170	
Apples	ton	3.6	16.8	
Artichokes	cwt	0.22	0.61	
Asparagus	cwt	0.66	2.17	
Avacados	ton	2.38	17.62	
Bahiagrass	ton	12	35	dry matter basis
Barley (spring)	bu	0.4	0.35	
Beans (dry)	cwt	0.93	1.53	
Beans (snap)	cwt	0.41	2.04	
Bermudagrass	ton	12	50	dry matter basis
Blueberries	ton	3	13	
Broccoli	cwt	0.17	0.42	
Bromegrass	ton	13	59	dry matter basis
Brussels sprouts	cwt	0.22	0.61	
Cabbage	cwt	0.092	0.36	
Canola	bu	0.91	0.46	
Cantaloupe	ton	2.3	13	
Carrots (all)	cwt	0.13	0.8	
Cauliflower	cwt	0.18	0.8	
Celery	cwt	0.11	0.5	
Chilies (green-wet)	ton	5.8	24	
Chilies (red-dry)	ton	15	50	
Clover-grass	ton	15	60	dry matter basis
Corn (grain, bu)	bu	0.44	0.29	
Corn (grain, cwt)	cwt	0.79	0.52	
Corn (silage, 67% water)	ton	3.6	8.3	
Corn (sweet)	cwt	0.52	1.51	
Cotton (lint)	bale	14	19	
Cranberries	cwt	0.22	0.61	
Cucumbers	cwt	0.07	0.33	
Dates	cwt	0.14	0.78	
Eggplant	cwt	0.07	0.27	
Fescue	ton	18	52	dry matter basis
Figs	cwt	0.14	0.74	
Flax	bu	1.1	0.65	
Garlic	cwt	0.13	0.27	
Grapefruit	cwt	0.03	0.24	
Grapes (table)	ton	3	13	
Kiwifruit	ton	4.5	12.2	
Lemons	cwt	0.037	0.21	
Lentils	bu	0.62	1.1	
Lettuce (all)	cwt	0.075	0.5	
Limes	cwt	0.04	0.21	

**Approximate Removal Rates of Various Crops (cont'd)**

Crop	Yield unit	Removal rates		Notes
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
----- (lb/unit) -----				
Melons (cantaloupe)	cwt	0.12	0.65	
Melons (honeydew)	cwt	0.12	0.65	
Melons (watermelon)	cwt	0.13	0.27	
Mushrooms	cwt	0.22	0.61	
Oats	bu	0.25	0.2	
Olives	ton	4.5	12.2	
Onions (fall)	cwt	0.13	0.27	
Oranges	ton	1.8	11	
Orchardgrass	ton	17	62	dry matter basis
Other fruits and veg.	cwt	0.22	0.61	
Peaches	ton	2.7	8	
Peanuts	ton	11	17	
Pears	ton	1.7	6.3	
Peas (field)	bu	1.2	0.71	
Pecans	cwt	0.44	0.45	
Peppers (bell)	cwt	0.29	1.2	
Pistachios	ton	24	30	
Potatoes	cwt	0.15	0.56	
Prunes	ton	2	8.7	
Pumpkins	cwt	0.22	0.61	
Radishes	cwt	0.47	2.05	
Raspberries	cwt	0.22	0.61	
Rice (bu)	bu	0.3	0.16	
Rice (cwt)	cwt	0.67	0.35	
Safflower	cwt	1.2	3.8	
Sorghum (grain)	cwt	0.75	0.38	
Sorghum-sudan	ton	15	58	dry matter basis
Soybeans	bu	0.8	1.4	
Spinach	cwt	0.18	0.73	
Squash	cwt	0.1	0.6	
Stone fruit	ton	2.7	8	
Strawberries	cwt	0.38	1	
Sugarbeets	ton	1.5	6.6	
Sugarcane	ton	1.25	3.5	
Sunflower	cwt	1.1	0.6	
Sweet potatoes	cwt	0.23	1	
Tangerines	cwt	0.038	0.25	
Timothy	ton	14	62	dry matter basis
Tobacco (burley)	cwt	0.43	4.7	
Tobacco (flue)	cwt	0.5	5.2	
Tomatoes	ton	0.92	5.7	
Vetch	ton	15	46	dry matter basis
Walnuts	ton	21.4	42.4	
Wheat	bu	0.5	0.35	
Wood (soft and hard)	cord	1.31	3.41	

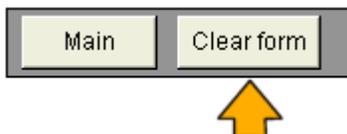
### Creating a crop list manually

You can also enter each crop manually. To demonstrate, let's say we are only interested in the following crops:

Alfalfa  
 Corn grain  
 Soybeans  
 Wheat

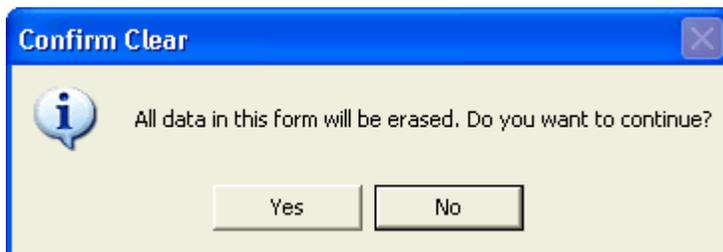
First, we must clear our current list of crops so that we can enter in our new one.

3. Click the **Clear form** button, located in the upper left of the form.

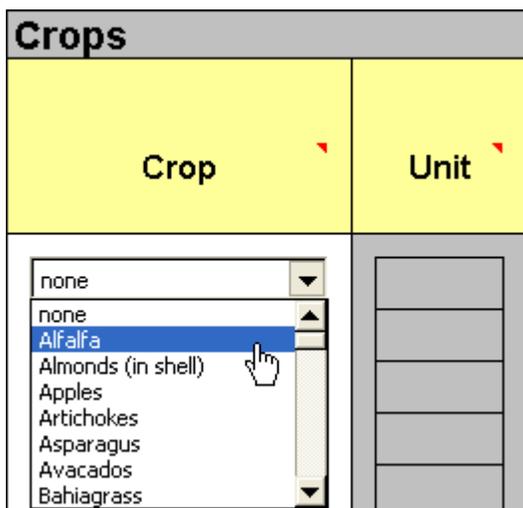


A dialog box appears asking you to confirm that you want to clear the form and continue.

4. Click **Yes**.



5. In the *Crop* column, **select Alfalfa** from the drop-down list.



Under *Crop* complete the list of crops (corn grain, soybeans, and wheat) by choosing one crop from each drop-down list, up to the number of crops considered. When you are finished, the list should appear as follows:

Crop	Unit	PPI removal coefficients		User-defined removal coefficients	
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/unit) -----		----- (lb/unit) -----	
Alfalfa	ton	15	60		
Corn (grain, bu)	bu	0.44	0.29		
Soybeans	bu	0.8	1.4		
Wheat	bu	0.5	0.35		

Now let's enter a different P<sub>2</sub>O<sub>5</sub> removal coefficient (0.37) for corn grain.

- Highlight** the blank cell associated with *Corn (grain, bu)* under *User-defined removal coefficients P<sub>2</sub>O<sub>5</sub>* (move the cursor to the cell and click). **Type 0.37** and **press Tab**.

Crop	Unit	PPI removal coefficients		User-defined removal coefficients	
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/unit) -----		----- (lb/unit) -----	
Alfalfa	ton	15	60		
Corn (grain, bu)	bu	0.44	0.29	0.37	
Soybeans	bu	0.8	1.4		
Wheat	bu	0.5	0.35		

PKalc will now use the user-defined 0.37 lb P<sub>2</sub>O<sub>5</sub>/bu instead of the 0.44 lb P<sub>2</sub>O<sub>5</sub>/bu default PPI coefficient listed under *PPI removal coefficients*.

Crop	Unit	PPI removal coefficients		User-defined removal coefficients	
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/unit) -----		----- (lb/unit) -----	
Alfalfa	ton	15	60		
Corn (grain, bu)	bu	0.44	0.29	0.37	
Soybeans	bu	0.8	1.4		
Wheat	bu	0.5	0.35		

Now that we have completed our custom list of crops, we need to save the file and return to the main form.

- On the *Standard Toolbar*, **click File | Save**.
- Click the Main** button in the upper left corner of the spreadsheet to return to the main form.

**Notes**

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# Estimating Nutrient Budgets

*Defining a Project*

*Creating an Itemized List of Additions*

*Creating an Itemized List of Removals*

*Evaluating Results*

*Printing Results*

In the previous chapter, we learned how to create custom crop and nutrient lists. In this chapter, we will use these lists to estimate a nutrient budget on an example field.

In our example, we consider a field named Field01. The field has been in a corn/soybean rotation. The farmer always requests that 110 lb DAP be applied in the fall prior to the next year's corn crop, as shown in the following table:

Date	P/K nutrient source	Source rate
		(lb/acre)
11/1998	DAP	110
11/2000	DAP	110

This rate is based on historical practice, rather than on soil test levels. This is his only P/K program for the field.

Crop yields during this time period have been:

Date	Crop	Yield
		(bu/A)
10/1999	Corn grain	117
10/2000	Soybeans	36
10/2001	Corn grain	128
10/2002	Soybeans	15

We will use this information to calculate a budget for the field.

## Defining a Project

Projects are specific fields or field areas where nutrient budgets are to be estimated over a specified period of time. We will use crop and nutrient lists that we created in the last chapter.

1. If you quit Excel, open the customized version of PKalc you created in the previous exercise. Click **File | Open**, locate the customized PKalc version (in our case **PKalc v1.13 Custom**) and **click Open**.
2. Click **File | Save As**, select a location to save the file, and type in a name descriptive of the field or field area which you are going to examine. In our example, use the file name **PKalc v1.13 Field01**.
3. In the box to the right of **Project**, type in the name of the field or field area. In our example, name the project **Field01** and press **Tab**.

**PKalc** MidAmerica Business

**Project:**

**Period from:**  **to:**

**Comments:**  
Phosphorus removal/additions are balance  
Potassium removal/additions are balanced

**Project**  
Enter a descriptive name for the field or field area

<input type="button" value="Edit"/>	Total additions:	0	0
<input type="button" value="Edit"/>	Total removal:	0	0
	Est. net change:	0	0

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4. Type in the beginning and ending calendar dates (MM/YYYY) in the boxes to the right of *Period from* and *to*. In our example, **type 11/1998** for *Period from*, **press Tab**, **type 10/2002** for *to*, **press Tab**.

**PKalc** MidAmerica Business

**Project:** Field01

**Period from:** Nov-98 **to:** Oct-02

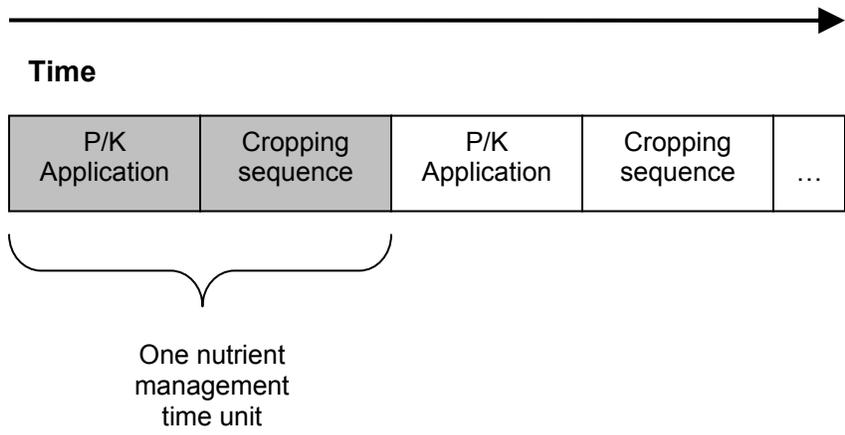
Comments:  
Phosphorus removal/additions are balance  
Potassium removal/additions are balanced

		$P_2O_5$	$K_2O$
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	0	0
<input type="button" value="Edit"/>	Total removal:	0	0
Est. net change:		0	0

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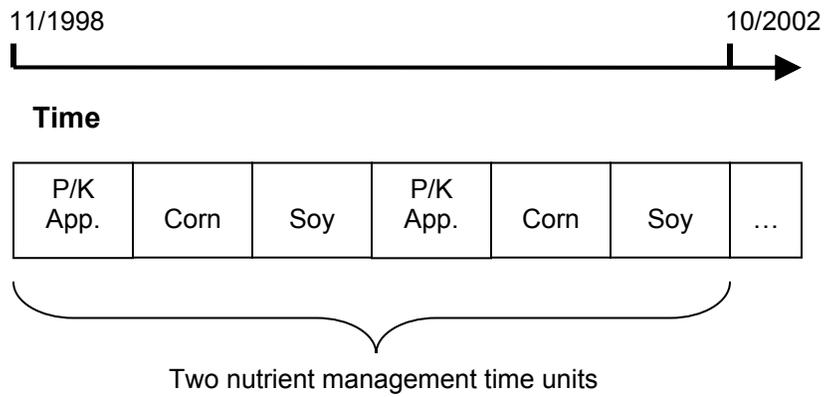
**Note:** Be sure to follow the MM/YYYY format when entering dates. For instance January and December are entered as 01 and 12, respectively. You must also type in the entire year (i.e. 2002). Once entered, PKalc displays the dates differently, using a 3-letter month abbreviation followed by a 2 number year abbreviation.

In most cases, P and K applications are made for the subsequent crop or series of crops. A typical sequence of events is shown in the following diagram:



The period of time from the P/K application through crop harvests up to but not including the next P/K application is, for our purposes, termed a **nutrient management time unit**.

In our example, we consider 2 management time units in a corn/soybean rotation, starting in November, 1998 and ending in October 2002, as shown below:



## Creating an Itemized List of Additions

1. Click the **Edit** button to the left of *Total additions*.

**PKalc** MidAmerica Business

**Project:** Field01

**Period from:** Nov-98 **to:** Oct-02

Comments:  
Phosphorus removal/additions are balance  
Potassium removal/additions are balanced

		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/acre) -----	
Edit	Total additions:	0	0
Edit	Total removal:	0	0
Est. net change:		0	0

New project

Add Nutrients

Add Crops

Print Project

Print Crop List

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This button brings up the *Additions* form. This is where we can enter our itemized list of nutrient additions.

Main
Removal
Clear form

Date	P/K nutrient source	Source rate	Rate units	Analysis		Analysis units	Nutrients added	
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
----- (lb/acre) -----								
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
	none							
<b>Total additions:</b>								

Under *Date*, we can enter the dates (MM/YYYY) of up to 15 P/K nutrient additions.

2. In the first blank under *Date*, enter **11/1998**, which is the date of the first DAP application in our example. **Press Tab.**

Date	P/K nutrient source	Source rate
Nov-98	none	
	none	
	none	
	none	

3. In the drop down list under *P/K nutrient source*, select **DAP**.

Date	P/K nutrient source	Source rate
Nov-98	none none Potash MAP <b>DAP</b> Starter Farrowing Bldg.	

**Note:** The drop-down list of P/K nutrient sources is what we created in the previous chapter.

As soon as we select DAP, information is automatically entered under *Rate Units*, *Analysis*, and *Analysis units*.

Rate units	Analysis		Analysis units
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
lb/acre	46	0	%

- Under *Source rate*, **type 110**, which is the rate of DAP (lb/acre as indicated under *Rate units*) applied on that date. **Press Tab.**

Date	P/K nutrient source	Source rate
Nov-98	DAP	110
	none	
	none	

- Enter the second 110 lb/acre DAP application made on 11/2000.

Date	P/K nutrient source	Source rate
Nov-98	DAP	110
Nov-00	DAP	110
	none	

This completes our itemized list of nutrient additions during the time period we are considering.

- Click File | Save.**



## Creating an Itemized List of Removals

1. Click the **Edit** button to the left of *Total* removal.

**PKalc** MidAmerica Business

**Project:** Field01

**Period from:** Nov-98 **to:** Oct-02

**Comments:**  
Phosphorus is being built up in the soil  
Potassium removal/additions are balanced

		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	102	0
<input type="button" value="Edit"/>	Total removal:	0	0
Est. net change:		102	0

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This button brings up the *Removals* form. This is where we can enter our itemized list of crops and yields.

Removals							
Date	Crop	Yield	Unit	Removal factors		Nutrients removed	
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
				----- (lb/unit) -----		(lb/acre)	
	none						
	none						
	none						
	none						
	none						
	none						
	none						
	none						
	none						
	none						
	none						
<b>Total removal:</b>							

2. In the first blank under *Date*, enter **10/1999**, which is the date of the first corn harvest in the period we are considering. **Press Tab**.

Date	Crop	Yield
Oct-99	none	
	none	
	none	
	none	

3. In the drop down list under *Crop*, select **Corn (grain, bu)**.

Date	Crop	Yield
Oct-99	none none <b>Corn (grain, bu)</b> Soybeans Wheat	

**Note:** The drop-down list of crops is what we created in the previous chapter.

As soon as we select Corn (grain, bu), information is automatically entered under *Unit* and *Removal factors*.

Unit	Removal factors	
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	----- (lb/unit) -----	
bu	0.37	0.29

**Note:** PKalc is using the 0.37 lb P<sub>2</sub>O<sub>5</sub>/bu removal value we entered in the last chapter, rather than the default PPI value of 0.44 lb P<sub>2</sub>O<sub>5</sub>/bu.

4. Under *Yield*, type **117**, which is the corn yield on that date. **Press Tab.**

Date	Crop	Yield
Oct-99	Corn (grain, bu)	117
	none	
	none	
	none	

5. Enter the remaining soybean and corn grain yields for 2000-02 (p. 27).

Date	Crop	Yield
Oct-99	Corn (grain, bu)	117
Oct-00	Soybeans	36
Oct-01	Corn (grain, bu)	128
Oct-02	Soybeans	15
	none	
	none	

This completes our itemized list of nutrient removals during the time period we are considering.

6. **Click File | Save.**

Notice that PKalc calculates the amount of  $P_2O_5$  and  $K_2O$  removed per acre in the *Nutrients removed* column and provides a total at the bottom (131 lb  $P_2O_5$ /acre and 142 lb  $K_2O$ /acre).

Nutrients removed	
$P_2O_5$	$K_2O$
(lb/acre)	
43	34
29	50
47	37
12	21
131	142

7. Click the **Main** button in the upper left part of the form to return to the Main form.



## Evaluating Results

On the Main form, we find the net budget for both P and K in the row labeled *Est. net change*. This change is calculated by subtracting *Total removal* from *Total additions*.

**PKalc** MidAmerica Business

**Project:**  

**Period from:**  **to:**

**Comments:**  
 Phosphorus is being mined from the soil  
 Potassium is being mined from the soil

		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	102	0
<input type="button" value="Edit"/>	Total removal:	131	142
Est. net change:		➔	➔
		-29	-142

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Three categories of budgets exist:

1. If the estimated net change is positive, then P or K may be being built up in the soil (indicated under the *Comments* label).
2. If the estimated net change is negative, then P or K may be being mined from the soil.
3. If the estimated net change is zero, then P or K may be balanced.

**Note:** The estimated net change is an estimate only. Larger positive or negative numbers provide greater confidence that build up or mining situations exist. Smaller estimates carry less confidence. The amount of P/K removed per harvest unit of crops can vary widely, so cautious interpretations should be used.

## Printing Results

A one page printout of itemized and totaled lists of nutrient additions and removals can be printed by clicking the *Print Project* button on the Main page.

PKalc

MidAmerica Business

Project: Field01



Period from: Nov-98 to: Oct-02

### Additions

Date	Nutrient source	Source rate	Rate unit	Product analysis		Analysis unit	Nutrients added	
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
							----- (lb/acre) -----	
Nov-98	DAP	110 lb/acre		46	0	%	51.0	0.0
Nov-00	DAP	110 lb/acre		46	0	%	51.0	0.0
<b>Total additions:</b>							<b>102</b>	<b>0</b>

### Removals

Date	Crop	Yield	Unit	Removal factors		Nutrients removed	
				P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
						----- (lb/unit) -----	
						----- (lb/acre) -----	
Oct-99	Corn (grain, bu)	117 bu		0.37	0.29	43.0	34.0
Oct-00	Soybeans	36 bu		0.8	1.4	29.0	50.0
Oct-01	Corn (grain, bu)	128 bu		0.37	0.29	47.0	37.0
Oct-02	Soybeans	15 bu		0.8	1.4	12.0	21.0
<b>Total removal:</b>						<b>131</b>	<b>142</b>

### Balance

Comments:	Net	
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
----- (lb/acre) -----		
Phosphorus is being mined from the soil		
Potassium is being mined from the soil		
<b>Net change:</b>	<b>-29</b>	<b>-142</b>

Potash & Phosphate Institute ([www.ppi-ppic.org](http://www.ppi-ppic.org))

Removal coefficients may be printed out by clicking the *Print Crop List* button on the Main page.

**PKalc**

MidAmerica Business



**Removal Coefficients**

Crop	Removal coefficients*		Notes
	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
	----- (lb/unit) -----		
Alfalfa	15	60	dry matter basis
Corn (grain, bu)	0.37 (user)	0.29	
Soybeans	0.8	1.4	
Wheat	0.5	0.35	

\*All coefficients are those published by the Potash & Phosphate Institute (www.ppi-ppic.org) unless "user" is specified.

**Note:** The 0.37 lb  $P_2O_5$ /bu removal coefficient that we entered is tagged with *(user)* in the printout to denote that the user has entered his/her own coefficients rather than use the default PPI coefficients.

After results have been obtained and printouts filed, you can begin work on the next project. Be sure and save each Excel file under a unique name after you have completed it.

To easily clear your project, click *New Project* on the main page. This will erase all entries on the Additions and Removals form, but it will leave your custom crop and nutrient lists in place.

**PKalc** MidAmerica Business

**Project:**  

**Period from:**  **to:**

**Comments:**  
Phosphorus is being mined from the soil  
Potassium is being mined from the soil

		$P_2O_5$	$K_2O$
		----- (lb/acre) -----	
<input type="button" value="Edit"/>	Total additions:	102	0
<input type="button" value="Edit"/>	Total removal:	131	142
Est. net change:		-29	-142

Foundation for Agronomic Research: [www.ppi-far.org](http://www.ppi-far.org)  
Potash & Phosphate Institute / Potash & Phosphate Institute of Canada: [www.ppi-ppic.org](http://www.ppi-ppic.org)

You are now ready to begin exploring the possibilities of PKalc on your own.

If you have comments or questions about using PKalc, email [smurrell@ppi-far.org](mailto:smurrell@ppi-far.org) and use PKalc as the message subject.