



BUILDING A MULTI-YEAR ROTATION

Introduction

NuMan 5.0 gives users an option to create a rotation schedule to calculate the total phosphorus (P) removal over multi-crop and multi-year rotations. This information allows a planner to determine allowable phosphorus application rates for a given Transition Management Phase and Phosphorus Management Tool (PMT) score.

The rotation schedule function in *NuMan 5.0* should be used when...

- 1) A PMT risk assessment has been conducted for a field **and...**
- 2) The PMT score and Transition Management Phase allows phosphorus to be applied **and...**
- 3) The planned phosphorus application rate is greater than 1 year crop P-removal

Note: The maximum number of crops that may be entered and the number of years allowed in the rotation schedule is automatically determined by *NuMan Pro* based on the Transition Management Phase and the PMT score.

Maryland's Department of Agriculture's (MDA) PMT transition guide is available on the Help menu in *NuMan's* top tool bar if more clarification is needed.

Prior to building a rotation schedule,

- a Tier must be selected on the front page of *NuMan*,
- the crop and organic source for the year of the plan should be entered on the scenario page, and
- the PMT score must be determined.

Definitions of Rotation Schedule Functions

Definitions for the function buttons in the Rotation Schedule Window from left to right follow.

COMMAND	FUNCTION
Crop	opens <i>NuMan Pro</i> Crop Code list to allow selection of crops for the subsequent years of the rotation
Clear	removes the crop information in the current and subsequent years to allow for quicker editing of the rotation. This does not clear information from previous years.

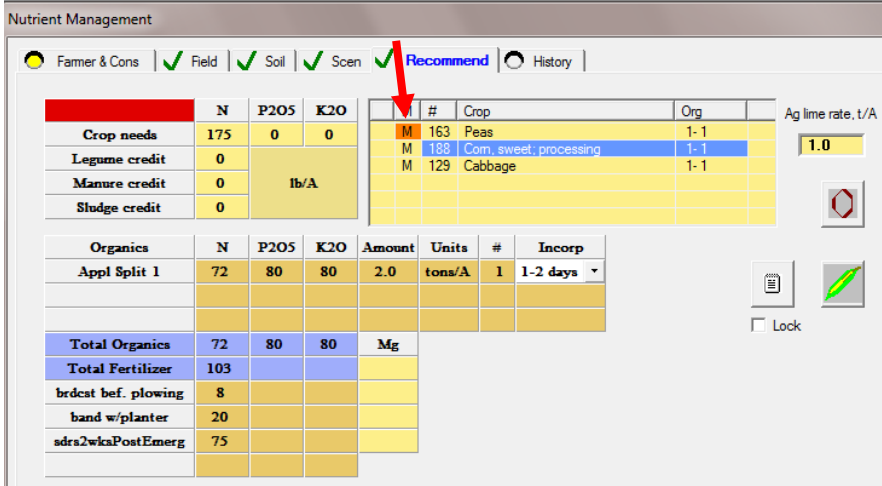
Delete	completely removes the rotation from the current field
OK	saves the data entered into the rotation up to that point and exits the rotation schedule window. The <i>NuMan Pro</i> file must also be saved to save the data permanently.
Lock	saves the values for the current year when moving to subsequent years. Allows the rotation schedule to be printed. Once the rotation is locked in year 1, it does not need to be re-selected in subsequent years.
Unlock	reverses the lock button in year 1 of the rotation so edits can be made. This function is disabled in subsequent years.
Comply	reduces the crops and/or years of the rotation to comply with MDA requirements if P loss risk increases during the rotation and user has applied additional P
Restore	reverses changes made to the rotation using the Comply and Clear buttons
Import	automatically creates the first year of the rotation by copying Scenario and PMT information into the Rotation Schedule Window

**PMT
Transition
Management
Phases**

PMT Score	TM1	TM2	PMT
Low	P crop removal for rotation of crops for three years (May be repeated each year a client is in TM1)	P crop removal for rotation of crops for three years (May be repeated each year a client is in TM2)	Total P applications related to crops anticipated to be planted in a 3-year period shall not exceed the amount of P removed by the planned crops for 3-year period
Medium	P crop removal for rotation of crops for three years (May be repeated each year a client is in TM1)	P crop removal for rotation of crops for two years (May be repeated each year a client is in TM2)	Expected crop P removal rate of up to two crops immediately following P application in the same cropping season.
High	P crop removal of up to two crops in the same growing season	50% P removal rate of up to two crops in the same growing season	No P-bearing materials may be applied

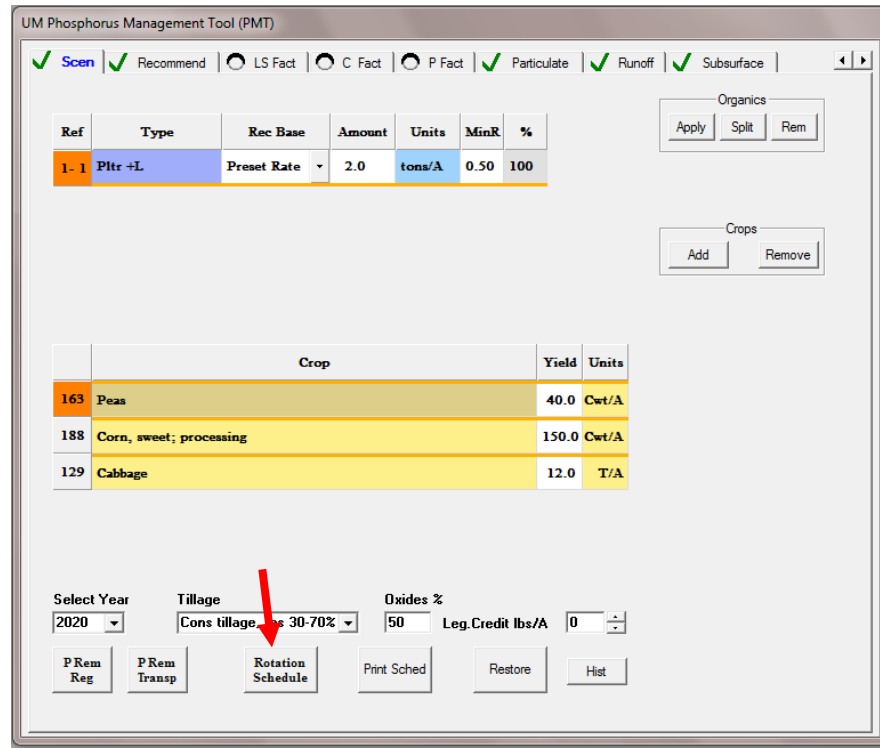
Creating a Rotation Schedule

If the PMT score and Transition Management Phase in the year for which the plan is being developed 1) allows phosphorus to be applied **and** 2) the planned phosphorus application rate is greater than 1 year crop removal, proceed to the steps below.

Step	Action																																																																																																
1	<p>Check on the Recommend page to make sure that all crops that will be grown in the current year are marked with an “M”. This is accomplished by right clicking in the “M” column beside the crop(s) (to remove an “M” mark, right click on it a second time).</p> <p>(This will include any P applications to these crops in the PMT calculation. Also mark with “M”, any crops that will remove P from the field in the current year – even if no P sources will be applied directly to those crops – so that their P removal will be accounted for in the rotation schedule).</p> <p>(If only a single crop will be grown that year it is not necessary to check “M”, it will be marked automatically when you import it into the rotation schedule).</p>																																																																																																
	 <p>The screenshot shows the 'Nutrient Management' software interface. The 'Recommend' tab is active, indicated by a red arrow. The interface includes several tables and controls:</p> <ul style="list-style-type: none"> Navigation: Farmer & Cons, Field, Soil, Scen, Recommend, History. Summary Table: <table border="1"> <thead> <tr> <th></th> <th>N</th> <th>P2O5</th> <th>K2O</th> </tr> </thead> <tbody> <tr> <td>Crop needs</td> <td>175</td> <td>0</td> <td>0</td> </tr> <tr> <td>Legume credit</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>Manure credit</td> <td>0</td> <td colspan="2">lb/A</td> </tr> <tr> <td>Sludge credit</td> <td>0</td> <td></td> <td></td> </tr> </tbody> </table> Crop List Table: <table border="1"> <thead> <tr> <th></th> <th>#</th> <th>Crop</th> <th>Org</th> <th>Ag lime rate, t/A</th> </tr> </thead> <tbody> <tr> <td>M</td> <td>163</td> <td>Peas</td> <td>1- 1</td> <td></td> </tr> <tr> <td>M</td> <td>188</td> <td>Corn, sweet, processing</td> <td>1- 1</td> <td>1.0</td> </tr> <tr> <td>M</td> <td>129</td> <td>Cabbage</td> <td>1- 1</td> <td></td> </tr> </tbody> </table> Organics Table: <table border="1"> <thead> <tr> <th>Organics</th> <th>N</th> <th>P2O5</th> <th>K2O</th> <th>Amount</th> <th>Units</th> <th>#</th> <th>Incorp</th> </tr> </thead> <tbody> <tr> <td>Appl Split 1</td> <td>72</td> <td>80</td> <td>80</td> <td>2.0</td> <td>tons/A</td> <td>1</td> <td>1-2 days</td> </tr> <tr> <td>Total Organics</td> <td>72</td> <td>80</td> <td>80</td> <td>Mg</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Fertilizer</td> <td>103</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>brdcast bef. plowing</td> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>band w/planter</td> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>sdrs2wkaPostEmerg</td> <td>75</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> Controls: A 'Lock' checkbox and a '1.0' input field are visible on the right side. 		N	P2O5	K2O	Crop needs	175	0	0	Legume credit	0			Manure credit	0	lb/A		Sludge credit	0				#	Crop	Org	Ag lime rate, t/A	M	163	Peas	1- 1		M	188	Corn, sweet, processing	1- 1	1.0	M	129	Cabbage	1- 1		Organics	N	P2O5	K2O	Amount	Units	#	Incorp	Appl Split 1	72	80	80	2.0	tons/A	1	1-2 days	Total Organics	72	80	80	Mg				Total Fertilizer	103							brdcast bef. plowing	8							band w/planter	20							sdrs2wkaPostEmerg	75						
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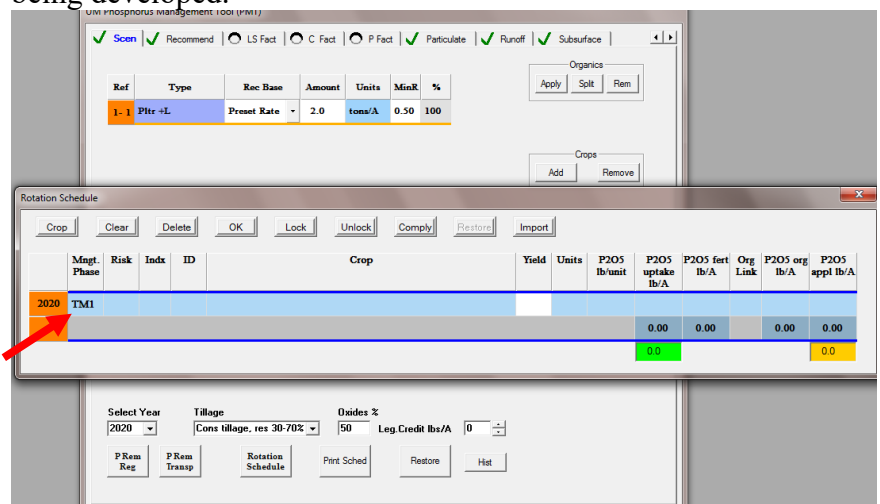
2

Return to the **Scenario** page and click on the **Rotation Schedule** button.



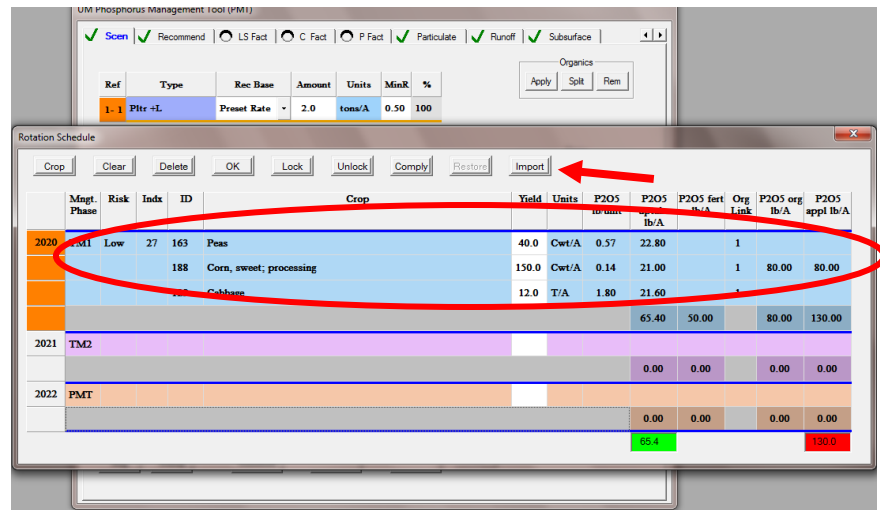
3

The rotation schedule window will open. The program will automatically determine the Transition Management Phase based on the Tier group entered previously and the year for which the plan is being developed.



4

Click on the **Import** button to automatically add the current year's crops to the rotation schedule.



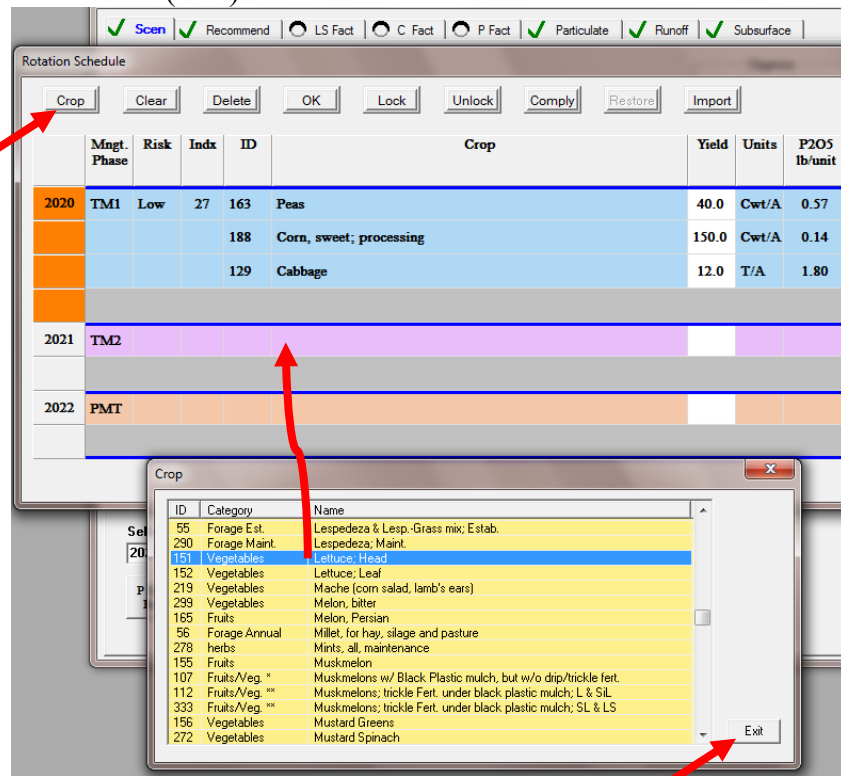
*(Note: if an organics application is part of a crop scenario, creating a rotation schedule will modify the crop scenarios shown on the **recommendation** page to create both organic and inorganic options for each crop - to allow for selective application of fertilizer or organic P to different crops in the rotation. Deleting a rotation schedule will restore the original scenarios shown on the recommendation page for that field).*

5

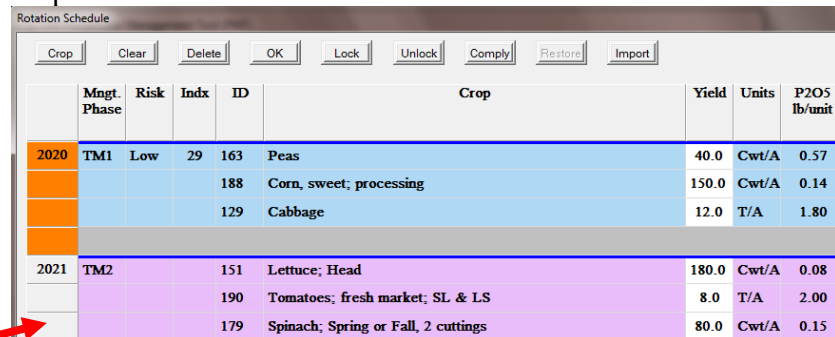
Click on the **Crop** button to add crops for the subsequent years of the rotation. When the crop list appears, add crops to the rotation by following the steps listed:

- 1) left click on the crop name in the list while continuing to hold the left mouse button down;
- 2) using the cursor, move the crop to the appropriate year in the rotation schedule; and
- 3) release the button.

The crop list window will stay open until you finish selecting crops and close it (Exit).



To remove a crop, left double-click, in the left most column for that crop:



6

Enter the yields for those crops added to determine the crop P removal for the rotation.

The P removal (labeled *uptake*) is displayed at the bottom of the rotation schedule and can be compared to the total P applied each year:

Year	Mngt. Phase	Risk	Indx	ID	Crop	Yield	Units	P2O5 lb/unit	P2O5 uptake lb/A	P2O5 fert lb/A	Org Link	P2O5 org lb/A	P2O5 appl lb/A
2020	TM1	Low	27	163	Peas	40.0	Cwt/A	0.57	22.80		1		
				188	Corn, sweet; processing	150.0	Cwt/A	0.14	21.00		1	80.00	80.00
				129	Cabbage	12.0	T/A	1.80	21.60		1		
							65.40			50.00		80.00	130.00
2021	TM2			151	Lettuce; Head	180.0	Cwt/A	0.08	14.22				
				191	Tomatoes; transplant; machine harvest; L & Sil.	18.0	T/A	2.00	36.00				
				179	Spinach; Spring or Fall, 2 cuttings	65.0	Cwt/A	0.15	9.75				
							59.97		0.00		0.00	0.00	
2022	PMT			163	Peas	40.0	Cwt/A	0.57	22.80				
				188	Corn, sweet; processing	150.0	Cwt/A	0.14	21.00				
				129	Cabbage	12.0	T/A	1.80	21.60				
							65.40		0.00		0.00	0.00	
									150.8			130.0	

7

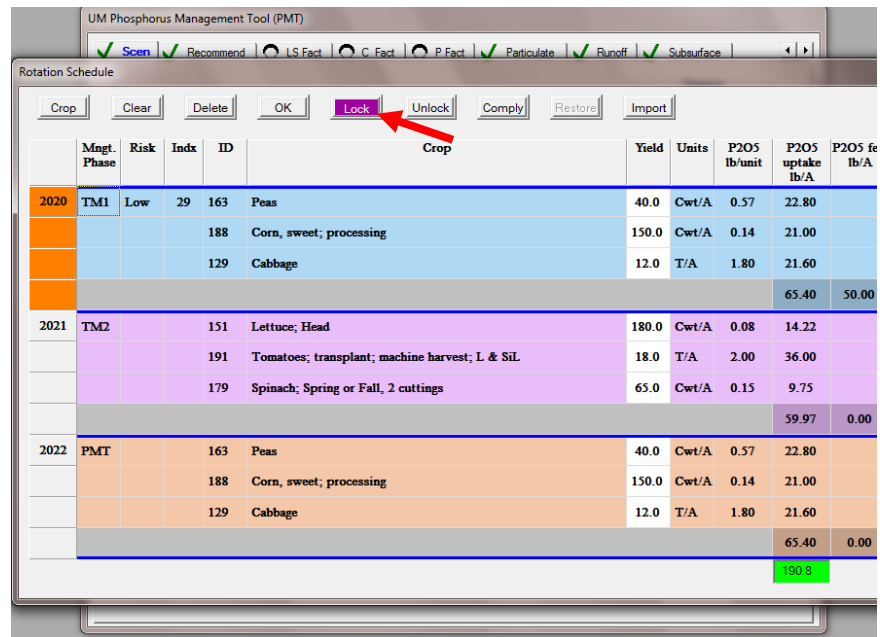
If the P application(s) in a given year exceeds the total allowed for the rotation, it will be indicated by the total application box for that year turning red.

Year	Mngt. Phase	Risk	Indx	ID	Crop	Yield	Units	P2O5 lb/unit	P2O5 uptake lb/A	P2O5 fert lb/A	Org Link	P2O5 org lb/A	P2O5 appl lb/A
2020	TM1	Low	29	163	Peas	40.0	Cwt/A	0.57	22.80		1		
				188	Corn, sweet; processing	150.0	Cwt/A	0.14	21.00		1	160.00	160.00
				129	Cabbage	12.0	T/A	1.80	21.60		1		
							65.40		50.00		160.00	210.00	
2021	TM2			151	Lettuce; Head	180.0	Cwt/A	0.08	14.22				
				191	Tomatoes; transplant; machine harvest; L & Sil.	18.0	T/A	2.00	36.00				
				179	Spinach; Spring or Fall, 2 cuttings	65.0	Cwt/A	0.15	9.75				
							59.97		0.00		0.00	0.00	
2022	PMT			163	Peas	40.0	Cwt/A	0.57	22.80				
				188	Corn, sweet; processing	1.0	Cwt/A	0.14	0.14				
				129	Cabbage	12.0	T/A	1.80	21.60				
							44.54		0.00		0.00	0.00	
									169.9		210.0		

8

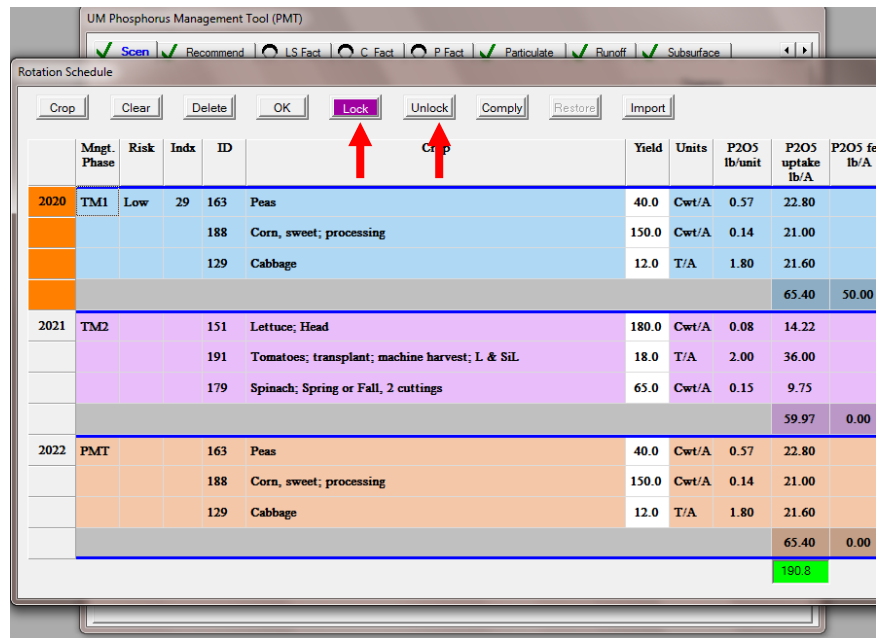
When an allowable rotation schedule has been chosen, click the **Lock** button.

- 1) This will preserve the rotation data for the current year when moving to subsequent years in the rotation.
- 2) It will also allow the user to print the rotation schedule as it appears on the screen.



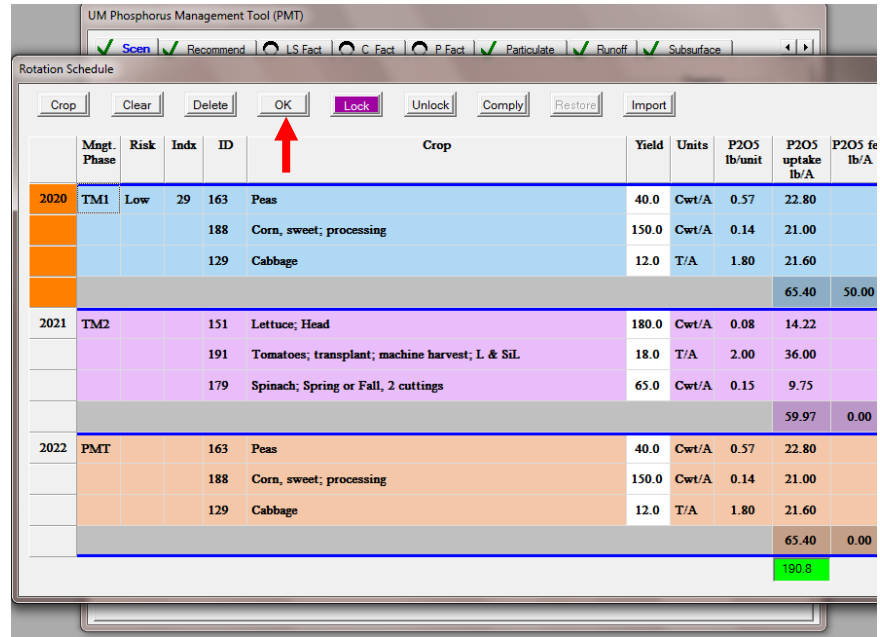
9

If the user wants to make changes to the rotation after locking it, they may click the **Unlock** button while still in the 1st year, make any desired edits, and then click the **Lock** button again.



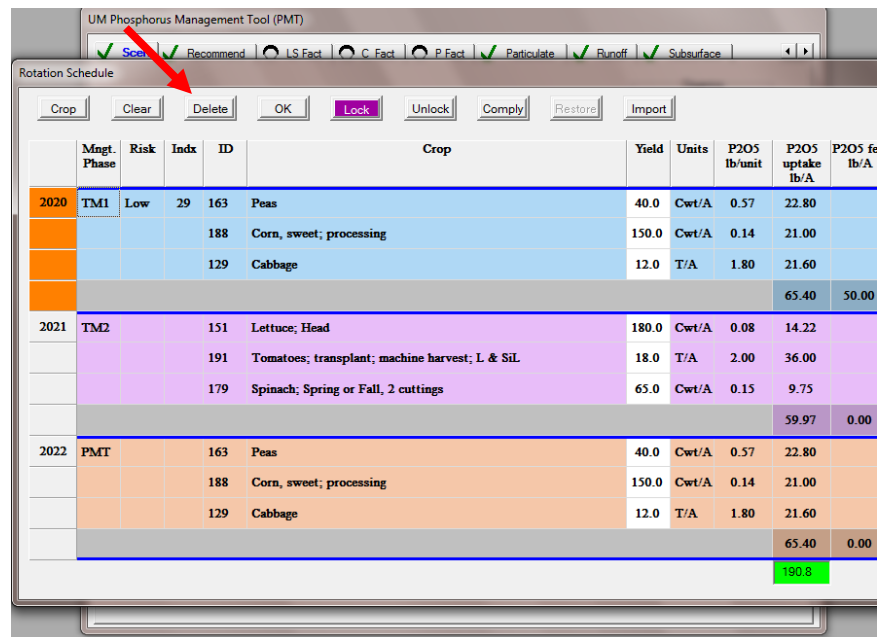
10

The rotation schedule may be saved for the current *NuMan Pro* session by clicking the **OK** button. To save it permanently, save the *NuMan Pro* file as well. (In subsequent years, the user may update the P loss risk assessment and return to the rotation schedule to determine if additional P may still be applied in the remaining years of the rotation).



11

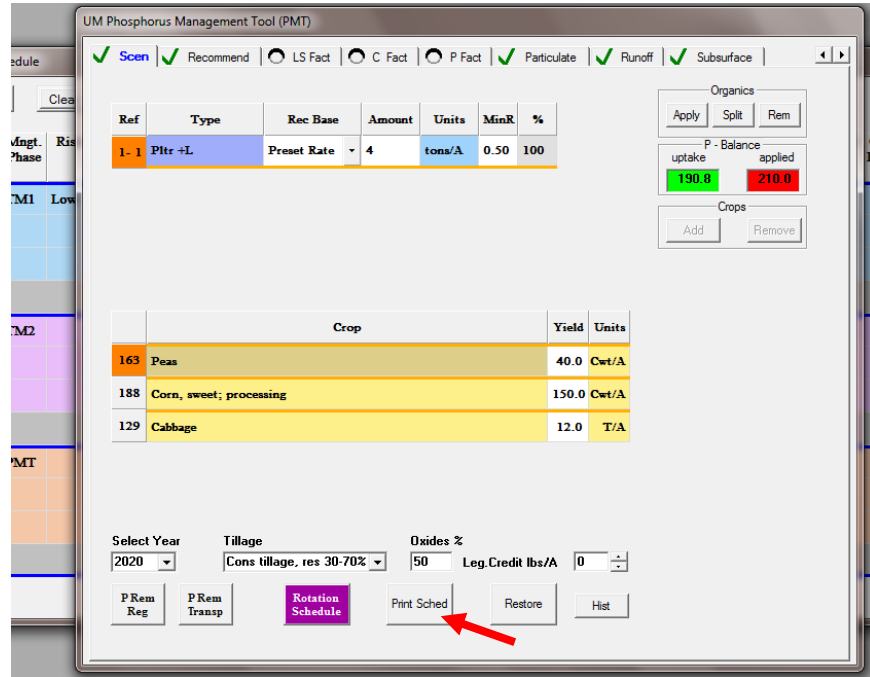
If the decision is made to remove a rotation from the current field, click the **Delete** button.



12

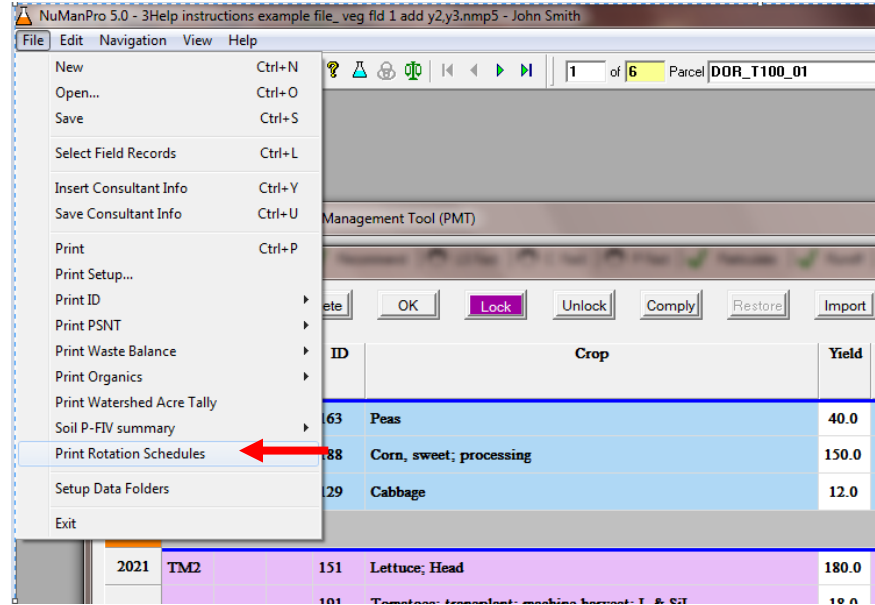
To print the rotation schedule for the current field, return to the Scenario page click on the **Print Sched** button.

Remember that printing a rotation schedule is allowed only after a rotation is locked (see step 8).



13

To print the rotation schedules for all fields for which one was developed, click on the **File** menu in the tool bar and chose **Print Rotation Schedules**. Remember that fields must be locked before printing is allowed.



14

Include the printout of the rotation schedule in the nutrient management plan.

November 26, 2018