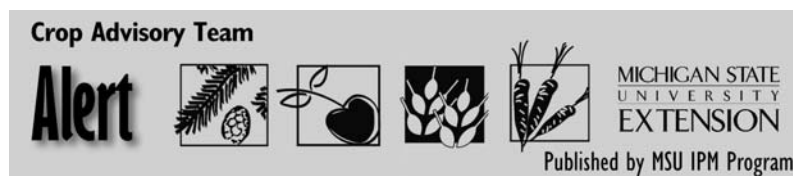


**Special Field Crop
CAT Alert edition:
Another look at
fertilizers**



Articles compiled by the [MSU Extension Field Crops Area of Expertise Team](http://www.ipm.msu.edu/fertilizer2009.htm) and Natalie Rector, issue coordinator. Visit <http://www.ipm.msu.edu/fertilizer2009.htm> to read the issue online.

Michigan State University recommendations for phosphorus and potassium

Pull out your soil tests and use the following information to assess phosphorus and potassium levels along with your 2009 crop plan to determine where fertilizer will benefit, and where you can save money on nutrients without sacrificing yield. The following charts will help to assess your current soil test levels, showing you where your test values are within the ranges, and help you decide how risky reducing fertilizer will be. For a complete listing, visit <http://www.emdc.msue.msu.edu/mainsearch.cfm> type E2904 in the inventory number box to search for Nutrient Recommendations for Field Crops in Michigan. Or click on the link for a complete [PDF copy](#).

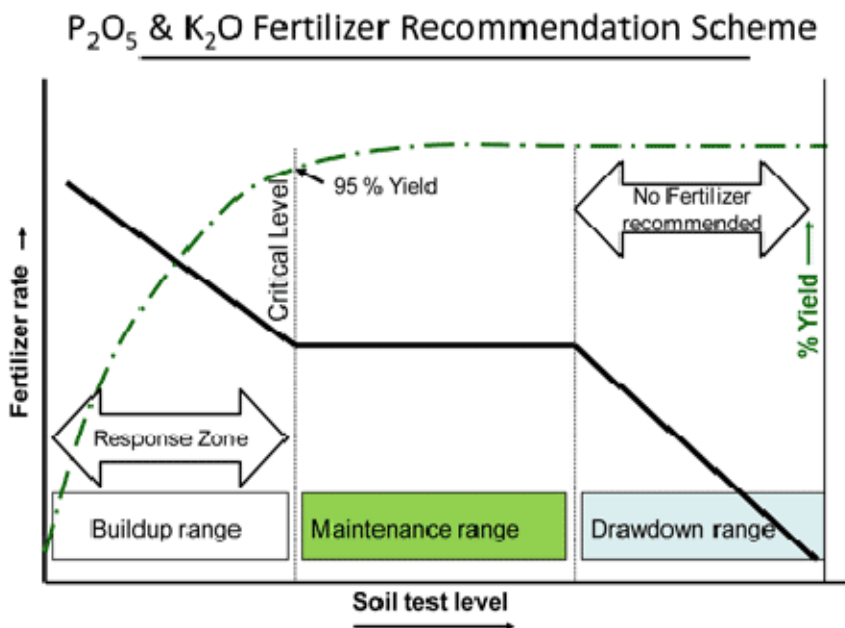
Phosphorus is always most efficient to band 2 X 2 at planting. The high price of potash may also encourage the use of banding to maximize the uptake efficiency of that nutrient as well. Maximum rates to band at 2 X 2 placement are in the following table.

Maximum fertilizer rates to band at 2 X 2 placement				
	Lbs. N per acre	Lbs. P₂O₅ per acre	Lbs. K₂O per acre	Max N + K₂O¹
Corn	40	100	100	100 (140)
Dry Beans	40	All recommended	60	100
Soybeans	-	100	80	80
Sugarbeets	40	100	80	80 (120)

¹Numbers in () are for clayey soils.

MSU’s recommendations for P₂O₅ and K₂O are based on the Buildup-Maintenance-Draw Down Model, shown below in Figure 1. The lower the level of available nutrients as indicated on a soil test, the greater the probability of a beneficial response to applied fertilizer. The critical level is the soil test level at which 95 percent of maximum yield is expected. This is usually near the maximum economic optimum return to fertilizer.

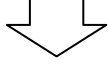

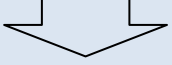
Figure 1.



For potassium, both the Cation Exchange Capacity (CEC) and the soil test value are taken into consideration to determine the critical value. See Chart 1a. When soil tests are below the critical level, yields will respond to applied nutrients, providing an economic return. Fertilizer recommendations are based on crop nutrient needs for the coming year and any additional nutrients required for building up the soil test values to above the critical level. Potash and phosphate recommendation guidelines are given in Charts 1a and 1b.

Potassium (K₂O) Recommendation Guidelines

Compare your soil test levels to the following information:

Chart 1a: Potassium (K)	K Soil test value in ppm (if reported in lbs./a K ÷2 = ppm)						
	Most Crops, Mineral Soils	Soil test levels less than 80 ppm K	CEC =4 85-115 ppm	CEC=6 90-120 ppm	CEC=8 95-125 ppm	CEC=10 100-130 Ppm	CEC=12 105-135 ppm
Fertilizer considerations based on price of fertilizer, willingness to pay and/or acceptance of yield risk	 Responsive range for added potash. 1) Fertilize at soil test recommended rates which will include build up rates. or 2) Fertilize at removal values (see table below) which will maintain soil test levels.	 1) Follow soil test recommendations. or 2) Fertilize at or below removal rates, knowing that soil test levels will decline but yields should not be impacted until soil tests drop below this range.				 1) Apply no fertilizer; draw off soil bank. Re-soil test every 1-3 years to monitor balance in soil bank. Or 2) if you must fertilize, apply at less than removal values see below:	

*see E-2904 for recommendations on organic soils.

Chart 1b.

Phosphorus (P₂O₅) Recommendation Guidelines

Compare your soil test levels to the following information:

Chart 1b: Phosphorus (P)	P soil test value in ppm (if reported in lbs./A P ÷2 = ppm)		
	Alfalfa & Wheat	0 to 25 ppm	25 ppm to 40 ppm
Corn, Soybeans & Sugar Beets	0 to 15 ppm	15 ppm to 30 ppm	30 ppm and above
Dry Beans	0 to 15 ppm	15 ppm to 40 ppm	40 ppm and above
Fertilizer considerations based on price of fertilizer, willingness to pay and/or acceptance of yield risk	1) Fertilize at soil test recommended rates which will include build rates. Or 2) Fertilize at removal values (see table below) which will maintain soil test levels.	1) Follow soil test recommendations. or 2) Fertilize at or below removal rates, knowing that soil test levels will decline but yields should not be impacted until soil tests drop below this range.	1) Apply no fertilizer; draw off soil bank. Re-soil test every 1-3 years to monitor balance in soil bank. Or 2) if you must fertilize, apply no more than removal values see below:

Above this critical level is a plateau range called the maintenance range. In this range, fertilizer recommendations are based on crop removal rates that will achieve economic production and maintain the soil test without expecting test levels to rise or fall. Since this is based on crop removal values, the fertilizer recommendation will vary depending on the crop grown and the yield potential (see Chart 2).

If soil test values are in the draw down range, no fertilizer will be needed. In this range, it is possible, profitable, and prudent to utilize the nutrients stored in the soil from past fertilizer and or manure applications. Additional resources are available at www.fieldcrop.msu.edu . Follow the link for a complete PDF copy of the [Nutrient Recommendations for Field Crops in Michigan](#), bulletin E2904.

Chart 2

Removal rates of K ₂ O and P ₂ O ₅ at various yield potentials			
Crop	Yield Potential	Estimated P ₂ O ₅ crop removal	Estimated K ₂ O crop removal
		Per acre, per year	Per acre, per yr.
Corn	100	37	27
	per bushel	125	34
		150	41
		200	54
Alfalfa	3	39	150
	per ton of dry hay equiv.	5	250
		7	350
Soybeans	30	24	42
	per bu.	40	56
		50	70
		60	84
Dry Beans	15	18	24
	per CWT	20	32
		25	40
		30	48
Sugar Beets	20	26	66
	per ton	25	83
		30	99
		35	116
Wheat	50	32	19
	per bu.	70	26
		90	33