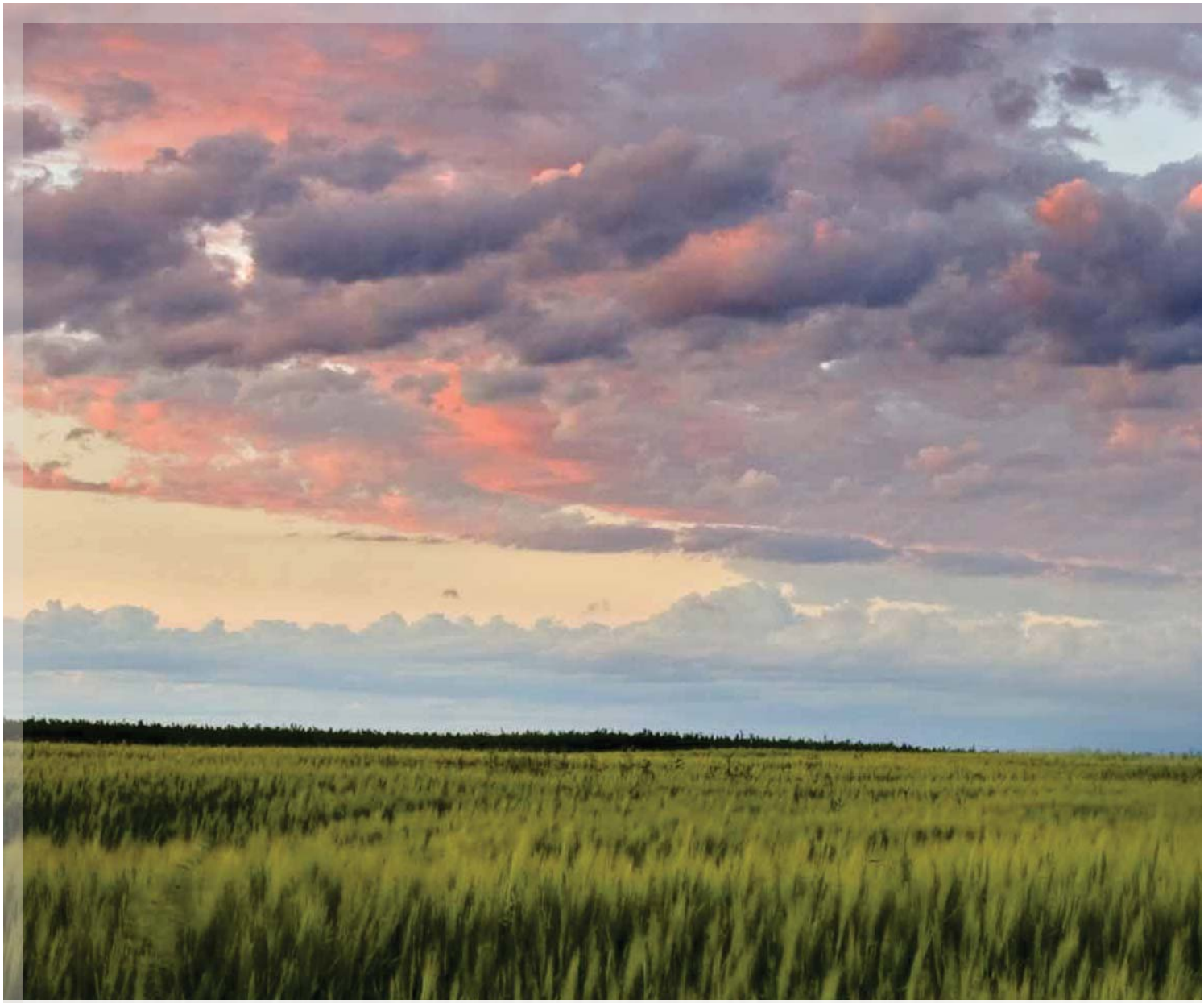

BALANCED CROP NUTRITION

Managing P Soil Test Values

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Soil testing is the best tool farmers have for determining and managing phosphorus (P) levels in their fields. Testing can confirm increases in soil test phosphorus (STP) resulting from application of P and also document how much crop removal has decreased STP.

Unfortunately, in the last decade or two, STP has declined in many areas of the Corn Belt. The steady decline is generally due to increasing yields, which remove greater levels of P from the soil, coupled with P application rates that often have fallen below crop nutrient removal rates (Table G). This trend is particularly evident for rented land when the renter chooses to mine P from the soil rather than apply fertilizer or manure P at a rate sufficient to maintain STP at an optimum level.

Building P soil test values

Since nutrients removed by the crop need to be replaced by fertilizer or manure P to maintain soil test P values, farmers often ask, "How much phosphate will it take to raise my STP value to the optimum level?" This is a difficult question to answer as the amount of P required depends on current and targeted STP levels, subsoil P level, depth of P_2O_5 incorporation and crop yields/nutrient removal during the time frame in which the STP is to be increased.

A common rule of thumb developed by University of Illinois researchers says 18 pounds P_2O_5 per acre will increase Bray P_1 by 1 ppm. In a 12-year Minnesota study during the '70s and '80s, with corn yields averaging 150 bu/acre, Bray P_1 STP was maintained at 20 ppm with an annual 50-pounds-P_2O_5-per-acre rate. STP increased 1 ppm per year when an additional 30 pounds P_2O_5 per acre were applied annually. Thus, given the many variables involved, annual soil testing is an excellent way to monitor changes in STP for each particular situation.

Recent research indicates high soil test P values may be necessary for economically successful corn and soybean production. A three-year study in Minnesota compared yields of corn and soybeans grown on low P-testing soil and very high P-testing soil. A 50-pounds-P_2O_5-per-acre rate was applied for corn each year followed by no additional P for soybeans the next year. All other inputs were similar across both STP regimes.

Table H shows the economic penalty (nearly $120 per acre per year) of low-testing compared to very-high-testing soils even when P fertilizer is applied. This illustrates further that managing soil phosphorus levels is critical as farmers attempt to maximize the return on their fertilizer dollar. Knowing the soil test P status of soils is especially important on rented or recently acquired acres. Simply said, high yields require high P uptake, which requires P to be available in the soil.

Maintaining high STP values gives growers the flexibility to skip P fertilization without sacrificing yield. Moreover, the risk of failing to maximize yield in exceptional years is reduced by maintaining STP at high levels. Less-than-high STP values can easily be yield limiting, resulting in potential yield being left in the field. Finally, high STP gives extra resource value to the land, providing better return on investment to both the landowner and renter.

Visit www.Back-to-Basics.net for more information on soil testing and managing phosphorus.

Table G.

Calculate P and K Removal rates

To calculate phosphorus (P) and potassium (K) removal rates in corn grain and soybean seed, multiply yield by estimated P and K removal constants.

CORN					
P Removal Rate	=	corn yield bu.	X	**.35**	(P_2O_5/bu. removal constant)
K Removal Rate	=	corn yield bu.	X	**.25**	(K_2O/bu. removal constant)
SOYBEAN					
P Removal Rate	=	soybean yield bu.	X	**.85**	(P_2O_5/bu. removal constant)
K Removal Rate	=	soybean yield bu.	X	**1.3**	(K_2O/bu. removal constant)

Source: G. Randall, University of Minnesota

Table H.

Soil Test P Impact on Yield, Economic Return

	LOW STP 7 PPM	VERY HIGH STP 25 PPM	YIELD DIFFERENCE	ECONOMIC BENEFIT PER ACRE FOR VERY HIGH STP
P_2O_5 prior to corn	50 lbs/A	50 lbs/A		
Corn yield 3-yr avg.	167 bu	193 bu	26 bu	$117 ($4.50/bu)
Soybean yield 3-yr avg.	39 bu	49 bu	10 bu	$97.50 ($9.75/bu)

Source: G. Randall, University of Minnesota