Four years and counting: an update on seasonal soil testing variation

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Introduction

Nutrient management based on recent soil tests is integral to economical and environmentally sound crop management. Based on historical information, soil test results vary between spring and fall sampling dates due to climate conditions during the growing season and at sampling time. Soil test-based phosphate (P) and potassium (K) recommendations offered for soybeans based on samples analyzed by the Mississippi State University Extension Service Soil Testing Laboratory (MSU ES STL) over a fifteen year period found, based on soil region, 10 to 61% of the soybean samples were medium or lower, thus triggering at least maintenance recommendations. Since fertilizer costs escalated in 2008, prices have been erratic which increases uncertainty about the need for nutrient purchases. More modern information on soil sampling timing is needed to optimize soil plant nutrient recommendations.

Methods

Eight georeferenced sites have been sampled monthly since April 2011 for soil test parameters and gravimetric moisture. The samples reported here ranges from 41 to 55 months due to occasional factors precluding collection. Standard analytical procedures for row crop samples of the MSU Extension Service Soil Testing Laboratory are used (available upon request). Time Series Analysis was used to determine trends using SAS Version 9.4.

Results

There is a sinusoidal variation of soil test phosphorus and potassium across seasons, and ranges significantly from the first samples taken in April, 2011. In the Mississippi State University Extension Service soil test recommendation system, P applications are recommended in the Very Low, Low, and Medium categories (<73). The potassium recommendations are indexed by soil Cation Exchange Capacity and crop, and will be featured elsewhere. Results indicate the current recommendation to sample soils at the same time of the year is applicable, and this work will reinforce current educational programs.

Table 1. Locations, soils, and initial data.

Soil	Texture	pH	STP[1]	STK[2]	CEC[3]	Organic Matter
			------- (mg kg^{-1}) -------		(cmolc kg-1)	(%)
Falkner, fine-silty, siliceous, active, thermic Aquic Paleudalf	Silt Loam	5.9	34	102	8.9	1.62
Atwood, fine-silty, mixed, semiactive, thermic Typic Paleudalf	Sandy Loam	6.8	42	34	12.5	1.81
Loring, fine-silty, mixed, active, thermic Oxyaquic Fragiudalf	Silt	7.0	75	30	8.3	1.61
Marietta, fine-loamy, siliceous, active, thermic Fluvaquentic Eutrudept	Loam	6.3	101	135	15.4	1.11
Bosket A, fine-loamy, mixed, active, thermic Mollic Hapludalf	Loamy Sand	6.7	45	149	8.9	0.71
Bosket B, fine-loamy, mixed, active, thermic Mollic Hapludalf	Sandy Loam	6.8	46	138	8.9	0.68
Brooksville, fine, smectitic, thermic Aquic Hapludert	Loam	5.9	36	191	22.3	1.91
Savannah, fine-loamy, siliceous, semiactive, thermic Typic Fragiudult	Sandy Loam	6.7	85	125	19.0	2.20

1 STP = Soil Test Phosphorus, Mississippi Soil Test

2 STK= Soil Test Potassium, Mississippi Soil Test

3 CEC = Cation Exchange Capacity

Figure 1. Trend analysis for soil test phosphorus as determined by the Mississippi Soil Test method for each soil from April, 2011 to October, 2015.

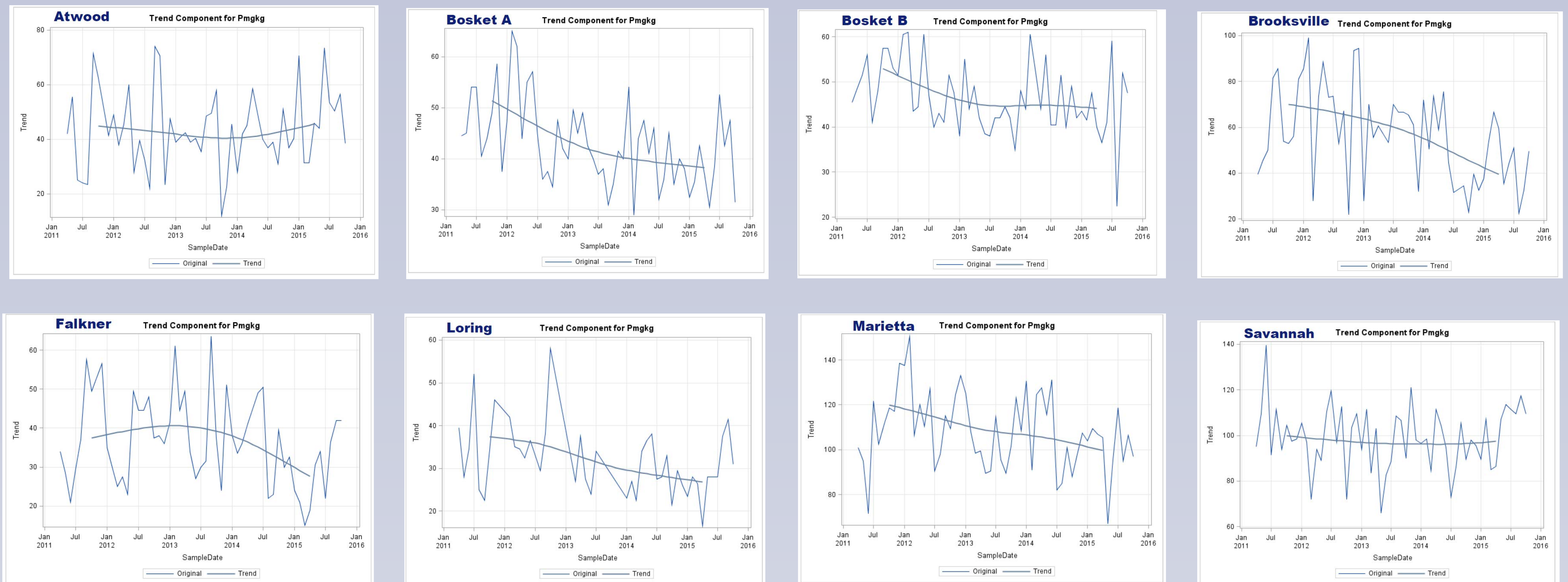
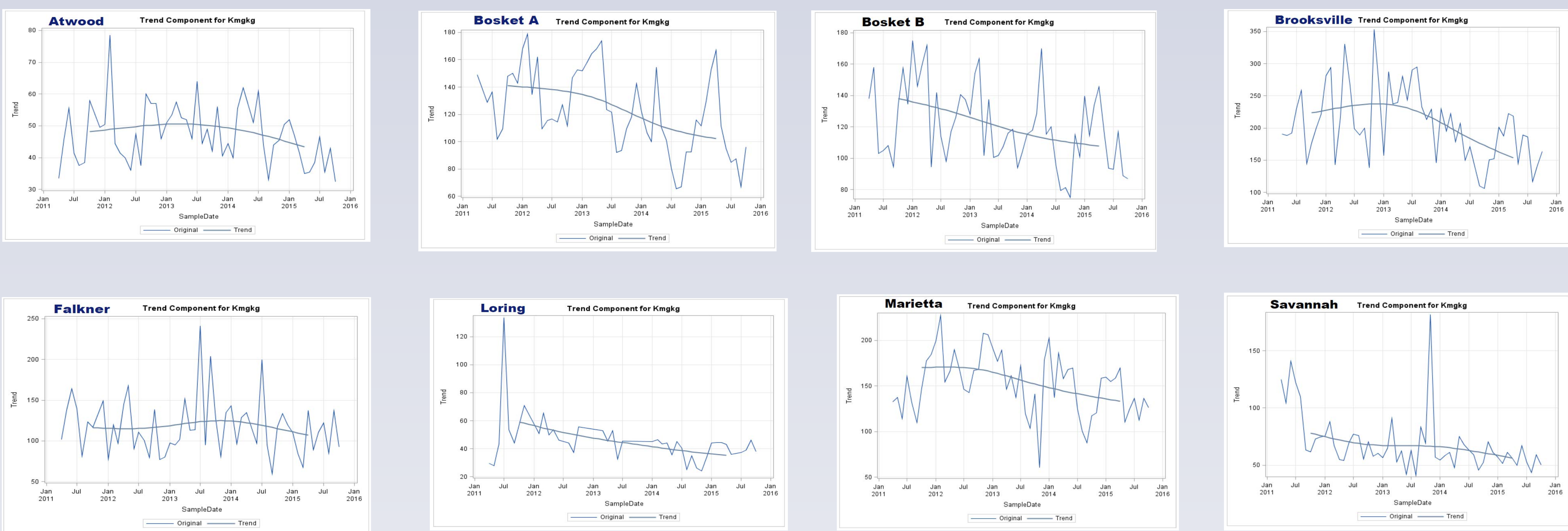


Figure 2. Trend analysis for soil test potassium as determined by the Mississippi Soil Test method for each soil from April, 2011 to October, 2015.



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