

**Long-term P & K Fertility for West Texas Peanut-Cotton Cropping System
Gaines and Dawson County, Texas
Year 4—2004 & Four-Year Summary**

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OBJECTIVE:

This report continues the project initiated in 2001. Response to P and K fertilizer in peanut is often difficult to measure. Soil tests in West Texas report high K, and P is often high as well. One- and two-year fertility projects addressing P and K in peanuts will not provide adequate results. A long-term fertility project was needed whereby peanut, as well as its rotational crop (cotton), is fertilized at a range of nutrient levels, each of which is retained on the same land area over time. Results will assist producers in examining the economic value of P and K for peanut and cotton in a three-year rotation.

The objective of this proposal is to continue the two long-term P&K fertility sites (AGCARES, Lamesa, TX; Western Peanut Growers facility, Gaines Co., TX) to gauge long-term impact and optimum levels of different P and K fertilizer regimes in a three-year peanut-cotton rotation.

METHODS AND PROCEDURES:

Peanuts

	<u>Gaines County</u>	<u>Dawson County</u>
Soil Type:	Brownfield loamy sand	Amarillo fine sandy loam
Peanut variety:	Flavor Runner 458	Flavor Runner 458
Planting:	April 28, 2004, on 36" rows	April 29, 2004 on 40" rows
Previous Crop:	Cotton (2 years)	Cotton (2 years)
Seeding Rate:	~5.5 seeds per row foot	~5.7 seeds per row foot
Plot Set-up:	RCBD, four reps for each of 6 treatments	Same
Harvest Area:	2 rows X 33'	4 rows X 33'
Inoculant:	Nitragin Lift liquid, 1X	Nitragin Soil Implant granular, 1X
N Fertilizer:	~50 lbs. N/A applied with pivot	~40 lbs. N/A
Herbicide:	Sonolan	Prowl
Insecticide:	None	None
Rainfall:	~14" during the growing season	15" during growing season
Irrigation level:	~14"	13"
Date Dug:	October 22, 2004	October 12, 2004
Date Harvested:	November 18, 2004	November 11, 2004

Cotton

	<u>Gaines County</u>	<u>Dawson County</u>
Soil Type:	Brownfield loamy sand	Amarillo fine sandy loam
Cotton variety:	Paymaster 2326 RR	Paymaster 2326RR/BG
Planting:	May 10, 2004, on 36" rows	May 6, 2004 on 40" rows
Previous Crop:	Set 1, cotton; set 2, peanuts	Set 1 (UNR), cotton; set 2, peanuts
Seeding Rate:	~16 lbs./A	North pie, 15 lbs./A South pie, 8 lbs./A
Plot Set-up:	RCBD, four reps for each of 6 treatments	Same
Harvest Area:	2 rows X 33' (stripper)	2 rows X 30' (stripper)
N Fertilizer:	60 lbs. N/A	~60 lbs. N/A
Herbicide:	Prowl, 1.5 pt./A	Treflan, 1.5 pt/A
Rainfall:	~14" during the growing season	15" during growing season
Irrigation level:	~12"	North pie, 13" South pie, dryland
Date Harvested:	November 27, 2004	November 10 (dryland) & 15, 2004

Each individual plot was marked and the position recorded with a GPS unit so we can come back on the same location in 2004. Soil samples were collected from 0-12" depth.

Texas A&M soil tests on the peanut ground indicated WPG indicated average 23 ppm P (moderate) and potassium, 270 ppm K (high); at AGCARES 26 ppm P (moderate), and potassium, 255 K (high). Slight trends were observed reflecting application (or lack thereof) of P and K in 2003.

Fertilizer application for P used 10-34-0 applied with rolling coulters leading a knife rig, banded 4" deep. Equivalent amounts of N were applied to each plot to ensure that all plots received the same amount of N. Potash application for K used 0-0-60, which also was incorporated into the surface.

Due to irrigation limitations, the south pie at AGCARES was not irrigated in 2004, but it received the same levels of fertility.

RESULTS AND DISCUSSION:

Peanut

There was no significant yield response to K or P at either location in this fourth year of fertilizer application. Yields at WPG were fair at ~4300 lbs./A. and 5,200 lbs./A at AGCARES. Although we believe that as this study continues for up to six years that crop response may begin to respond to residual fertility, we have not seen consistent evidence of it yet. It is possible that with soil K levels already high that addition of more K could interfere with calcium uptake. This information should be valuable in helping West Texas peanut and cotton farmers gauge the value of their particular approach to fertilizer use.

Although in Gaines Co. in 2003 we saw evidence of yield response to added P that was not evident in 2004. Earlier evidence suggested that cotton is responding to P applications the preceding year in peanut, but then again, yield response could be to long-term P applications whereas some treatments receive no P.

Table 1: Peanut yield response to P and K at Western Peanut Growers, 2004 (fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Peanut Yield (lbs./A)^
1	0	0	4153
2	30	0	4477
3	60	0	4400
4	0	80	4451
5	30	80	4307
6	60	80	4345
Trial average			4355
P-Value:	0.9568	0.9243	NS
P-Value interaction (P2O5 X K2O): 0.7470			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			12.5%

Table 2: Peanut yield response to P and K at AGCARES, 2004 (fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Peanut Yield (lbs./A)^
1	0	0	5177
2	30	0	5549
3	60	0	5458
4	0	80	5215
5	30	80	5243
6	60	80	5138
Trial average			5297
P-Value:	0.7348	0.3561	NS
P-Value interaction (P2O5 X K2O): 0.7276			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			8.9%

Cotton

We observed no yield response to K or P in 2004 for cotton at either location (Tables 3-4, WPG; Tables 5-6, AGCARES). A slight response to K in cotton after peanut had been observed at WPG in 2003. With high soil test levels of residual fertility for K this any response is not expected. Potassium response is often seen not in the crop the year it was applied but in the subsequent crop, but we have not observed this in this trial.

Table 3: Cotton yield response to P and K at Western Peanut Growers, 2004 (northwest pie, cotton after peanut after cotton, fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Lint Yield (lbs./A)^
1	0	0	1201
2	30	0	1390
3	60	0	1403
4	0	80	1355
5	30	80	1308
6	60	80	1425
Trial average			1347
P-Value:	0.1077	0.5475	NS
P-Value interaction (P2O5 X K2O): 0.1980			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			9.8%

Table 4: Cotton yield response to P and K at Western Peanut Growers, 2004 (north pie, cotton after cotton after peanut, fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Lint Yield (lbs./A)^
1	0	0	1036
2	30	0	1068
3	60	0	1115
4	0	80	1020
5	30	80	1077
6	60	80	1079
Trial average			1066
P-Value:	0.9132	0.9181	NS
P-Value interaction (P2O5 X K2O): 0.9921			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			25.1%

Table 5: Dryland cotton yield response to P and K at AGCARES, 2004 (south pie, cotton after peanut after cotton, fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Lint Yield (lbs./A)^
1	0	0	674
2	30	0	644
3	60	0	626
4	0	80	623
5	30	80	623
6	60	80	647
Trial average			639
P-Value:	0.8110	0.4044	NS
P-Value interaction (P2O5 X K2O): 0.0.3542			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			

Table 6: Cotton yield response to P and K at AGCARES, 2004 (north pie, cotton after cotton after peanut, fourth year of long-term same site study).

Treatment	P2O5 (lbs./A)	K2O (lbs./A)	Lint Yield (lbs./A)^
1	0	0	1203
2	30	0	1214
3	60	0	1198
4	0	80	1168
5	30	80	1216
6	60	80	1168
Trial average			1192
P-Value:	0.6346	0.4501	NS
P-Value interaction (P2O5 X K2O): 0.8744			
Least significant difference (LSD), 0.10			
Trial coefficient of variation (CV)			

A four-year summary is included for field yield trial results for peanut and cotton treated with long-term P & K fertilizer (Table 7). After four years little effect has been observed for response to either nutrient.

Table 7. Summary of long-term P and K applications to peanut and cotton in a three-year rotation (Gaines and Dawson Counties, Texas, 2001-2004).

Nutrient	Location	2001	2002	2003	2004
Phosphorus	WPG--Peanut	NS	NS (T)	**	NS
	AGCARES--Peanut	NS	NS	NS	NS
	WPG--Cotton after peanut after cotton	NS	**	NS	NS (T)
	WPG--Cotton after cotton after peanut	NS	**	NS	NS
	AGCARES--Cotton after peanut after cotton	NS	NS (T)	NS	NS
	AGCARES--Cotton after cotton after peanut	NS	NS	NS	NS
Potassium					
Potassium	WPG-Peanut	NS	NS	NS	NS
	AGCARES-Peanut	NS	NS	NS	NS
	WPG--Cotton after peanut after cotton	NS	NS	*	NS
	WPG--Cotton after cotton after peanut	NS	NS	NS	NS
	AGCARES--Cotton after peanut after cotton	NS	NS	NS	NS
	AGCARES--Cotton after cotton after peanut	NS	NS	NS	NS

NS, not significant at $\alpha = 0.10$

NS (T), not significant at $\alpha 0.10$, though upward trend noted in crop response to nutrient

*, significant at $\alpha = 0.10$

**, significant at $\alpha = 0.05$