

TITLE:

Testing of Precision Agriculture Technologies in Irrigated Cotton at AG-CARES, Lamesa, Texas, 2000.

AUTHORS:

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METHODS AND PROCEDURES:

Experimental Design:	Randomized complete block with 3 replications
Plot size:	53 ft wide (16 40-inch rows) and > 500 ft long.
Experimental area:	27 ac
Soil type:	Amarillo sandy loam to sandy clay loam
Variety:	Paymaster Roundup® Ready 2326
Soil sampling:	Half-ac grid (Fig.1 and 2)
P fertilizer rate:	Blanket-rate of 30 lb P ₂ O ₅ /ac, Average Variable-rate of 38 lb P ₂ O ₅ /ac
Planting date:	May 10, 2000
Harvest date:	October 4, 2000
Irrigation:	LEPA on a 3.5 day schedule at 75% estimated cotton ET replacement

RESULTS

Cotton responded to P fertilizer in all three landscape positions of the precision agriculture site at AGCARES (Table 1 and 2). Historically, the greatest yields have been observed in the bottomslope where re-distribution of water and nutrients occurs. Variable-rate (VRT) and blanket-rate resulted in lint yields greater than zero-P in both sideslopes. In the bottomslope, only the variable-rate treatment affected lint yields. The south-facing sideslope had the lowest lint yields in 2000. This may be due to the greater amount of blowing observed there and to faster soil water evaporation. The Micro-Trak® yield data was less variable than the hand-picked lint data and only the machine data showed the P fertilizer response (Table 1 and 2).

Temik® was applied at planting at a rate of 5 lb/ac to the entire 27-ac area. Greater nematode numbers were observed in the bottomslope, and for this reason, the VRT strips of this area received an additional 5 lb/ac sidedress of Temik. However, yields in this area were not affected by Temik®.

Preliminary cost and returns economic analysis of the VRT technology is shown in Table 3. This analysis does not consider the greater cost of grid-soil sampling or of VRT equipment. The average P fertilizer rate applied in the VRT plots was 38 lb P₂O₅/ac, compared to 30 lb P₂O₅/ac in the blanket-rate plots. Although statistically there was no difference between the VRT-P and blanket-P treatments we did this analysis by calculating a “return to P fertilizer” for each. This preliminary analysis indicates that up to \$24/ac return of VRT-P is possible. Extra or variable-rate Temik was not economical.

Table 1. Micro-Trak® cotton lint yields (lb/ac) for variable-rate, blanket-rate and zero-rate P fertilizer application, Lamesa, TX, 2000.

Treatment	North-facing sideslope	Bottom-slope	South-facing sideslope	Mean
Variable-rate P fertilizer	536 a ¹	590 a ¹	485 a ¹	537 a ¹
Blanket-rate P fertilizer	540 a	544 b	479 a	521 a
Zero P fertilizer	493 b	521 b	434 b	483 b
Mean	523 a ²	552 a	466 b	

¹ Means in a column followed by similar letter are not different by pairwise comparisons, p>0.05

Table 2. Hand-picked cotton lint yields (lb/ac) for variable-rate, blanket-rate and zero-rate P fertilizer application, Lamesa, TX, 2000.

Treatment	North-facing sideslope	Bottom-slope	South-facing sideslope	Mean
Variable-rate P fertilizer	679 a ¹	759 a ¹	570 a ¹	670 a ¹
Blanket-rate P fertilizer	634 a	673 a	564 a	623 a
Zero P fertilizer	596 a	665 a	523 a	594 a
Mean	636 a ²	699 a	552 b	

¹ Means in a column followed by similar letter are not different by pairwise comparisons, p>0.05

Table 3. Input application rates and cost and returns of input applications, Lamesa, TX, 2000

	Avg rate of input (lb/ac)	Unit cost of input (\$/lb)	Cost of input (\$/ac)	VRT cost minus blanket-rate cost (\$/ac)	Benefit of VRT with income from \$0.60/lb cotton ^b
Treatments			<u>P fertilizer (lb P₂O₅/ac)</u>		
Variable-rate of input	38.4	0.31	11.90	2.60	23.83
Blanket-rate of input	30.0	0.31	9.30		
Zero rate	0	0.31	0		
			<u>Temik nematicide (lb/ac)</u>		
Variable-rate of input	6.3	3.25	20.48	-4.23	-4.23 ^a
Blanket-rate of input	5.0	3.25	16.25		
Sum of products				-1.30	19.60

^a Assumes no gain in yield

^b Does not consider capital costs of variable-rate application equipment or the greater cost of 0.5-ac grid soil sampling and laboratory analysis for the VRT treatments.

Fig. 1. Half-acre grid soil sampling locations and Mehlich-3 P, AGCARES, Lamesa, TX 2000

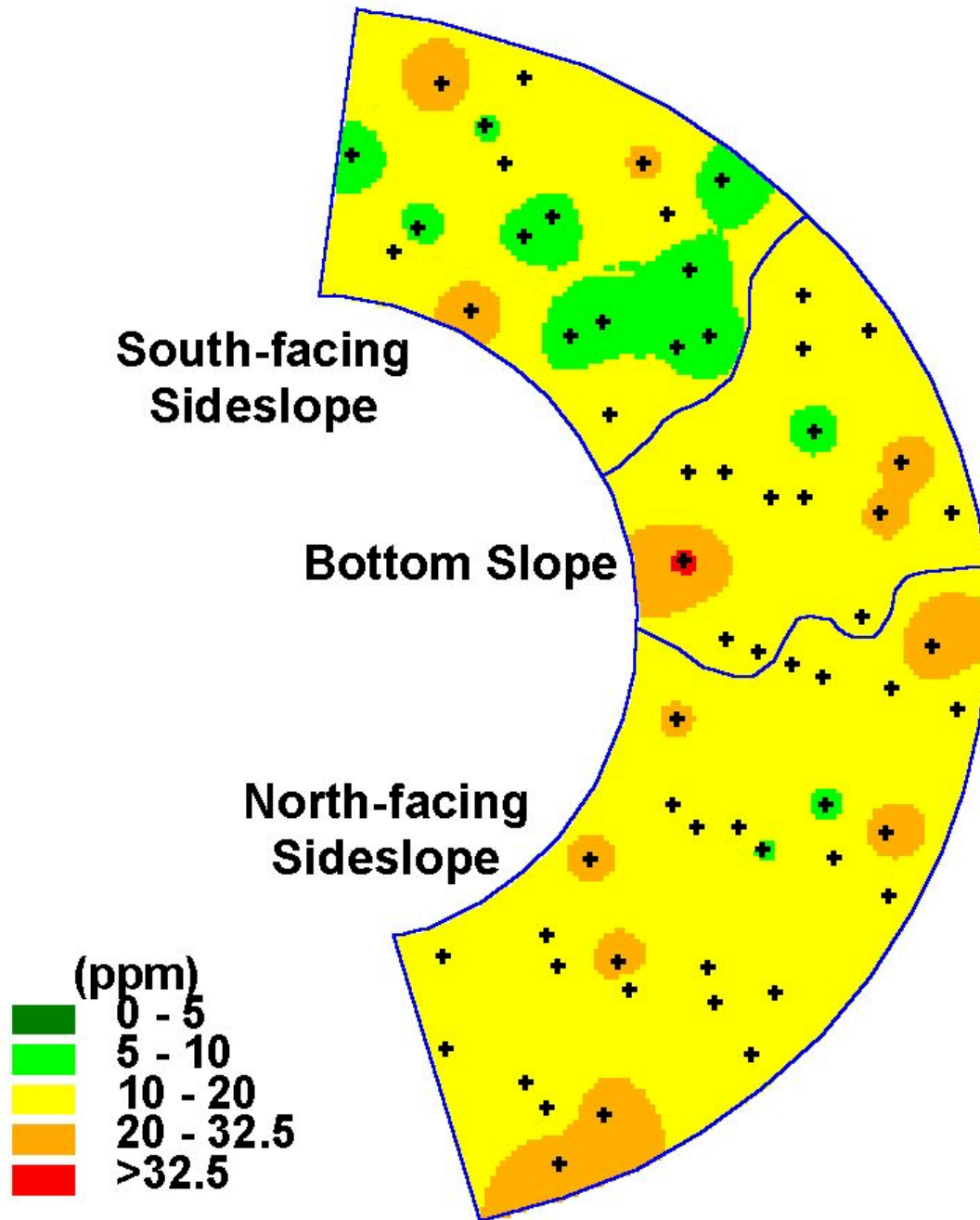


Fig. 2. Variable-rate inputs experimental layout and P fertilizer rates applied (V = VRT, B=blanket-rate, Z=xero-P), AGCARES, Lamesa, TX 2000

