EVALUATIONS OF SKIP-ROW COTTON PRODUCTION ACROSS MULTIPLE YIELD ENVIRONMENTS

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Introduction

Low commodity prices, prior to 2003, and increasing production costs have spurred producers to consider production methods that either significantly enhance yields and quality or reduce production costs. A reduction in production costs, while maintaining yields, should ultimately lead to increased profits. One practice that receives sporadic interest as a method to reduce production costs is skip-row cotton. In this system not every row is planted, thus creating skips in an established pattern.

Past interest in this practice has been linked to farm bill legislation, in that this system allowed a producer to plant more acres to cotton. Current interest in skip-row relates strictly to reductions in production costs in an effort to increase the profit margin.

Potential economic advantages of skip-row planting include a reduction in “down the row” expenses such as seed, in-furrow insecticides and fungicides, starter fertilizers, and banded herbicides. Savings in field time associated with planting and harvesting with skip-row production may subsequently accrue since fewer actual acres are farmed. This may also lead to a reduction in some other “per acre” expenses such as scouting.

Seven trials were conducted across East Georgia from 2001 through 2003 to examine the impact of skip-row cotton on yield and profit compared to conventional planting. These trials were also designed to determine the yield relationship of skip-row yields to conventionally planted cotton in varying production environments.

Materials And Methods

Skip-Row Patterns and Data Collection
The skip-row patterns examined were 2x1, 4x1, 2x1 (modified) and 4x1 (modified). In a 2x1 or 4x1 pattern, two or four rows are planted for every full row skipped, respectively. The modified patterns utilize a 50-inch skip instead of a full row width. In all tests these patterns were compared to conventionally planted cotton. Experiments were arranged in a Randomized Complete Block Design and replicated 4 times. All plots were machine harvested and yields were then converted to pounds of lint per acre.

Economic Analysis
A “partial budget” economic analysis was utilized, thus only those costs that varied between the planting patterns were considered. Cotton was valued at 53.6 cents per

pound. Net Return (NR) was considered to be the treatment variable costs subtracted from the crop value. Input savings for skip-row calculated for these studies included seed, technology fees, and in-furrow insecticides. All other inputs were considered broadcast. Since total production costs were not included, NR was subsequently inflated.

If a skip-row pattern results in a wider area of land covered in each trip across the field, corresponding savings accrue. Therefore, tractor fuel and repairs, planting labor, picker fuel and repairs, and picker/buggy/module labor savings were included. For budgeting concerns it was assumed that 8-row planting equipment was used, and it was further assumed that 8 rows would be planted in each pass across the field, except with the 2x1 pattern. In this pattern it was calculated that only 6 rows were planted and 2 planter units were removed. It was assumed that 4-row harvesting equipment was utilized, and it was assumed that four rows of cotton were picked without operating a picker head in an unplanted row. The cost of planter and picker modification was not included in the budget. Table 1 lists the percent savings in "down the row" expenses and time savings in planting and harvesting. The production costs calculated from the partial budget analysis are listed in Table 2.

Data Analysis
All data were analyzed via linear regression. In these analyses the independent variable was conventional cotton yields, referred to as a "yield environment". Dependent variables were yields and NR of cotton planted in the skip-row patterns.

Results And Discussion

Production Costs
Of those analyzed, total savings for skip-row over conventional cotton were $18.20 and $31.23/A for the 4x1 and 2x1 patterns, respectively. The 4x1(modified) and 2x1(modified) patterns provided $6.34 and $12.08/A savings, respectively (Table 2).

Yield
Figures 1 through 4 illustrate the yield of the varying skip-row patterns in relation to the conventional cotton under different yield environments. The slope of the line representing the yields of conventionally planted cotton is 1. The yield slope of the skip-row patterns were then compared to 1. If the slope of the line representing the various skip-row yields is equal to 1 this indicates that the yield of the skip-row pattern was similar to that of conventional cotton across the various yield environments. If the slope is less than 1 this indicates that skip-row yields decline compared to conventional cotton as the yield environment becomes more productive. A slope greater than 1 would indicate that skip-row yields increase in comparison to conventional cotton in more productive environments.

All equations representing skip-row yields had slopes less than 1 indicating that skip-row tended to yield less than conventional cotton under more productive conditions.

However, the only significant difference was noted for the 2x1 pattern, which yielded less than conventional cotton under all yield environments (Fig. 1).

The lines representing the yield equations for skip-row and conventionally planted cotton begin to merge in less productive yield environments. This data indicates that skip-row patterns begin to approximate conventional yields under these less productive conditions. In addition, it was observed the modified skip patterns more closely approximated the conventional yields in all yield environments (Figs. 3 and 4).

Collectively this data can be used to calculate expected yields from the various skip-row patterns on a given farm. This data can then be used to help a producer to determine if, with their projected savings from skip-row, this system would be more profitable than conventional cotton.

Net Returns

Figures 5 though 8 illustrate the relationship of skip-row NR to conventionally planted cotton. The slope of the equation representing the NR of conventionally planted cotton is 0.536, the assumed price per pound of lint. The NR slope of the skip-row patterns were then compared to 0.536. If the slope of the line representing the skip-row NR is equal to 0.536 this indicates that the yield of the skip-row pattern was similar to that of conventional cotton across the various yield environments. If the slope is less than 0.536 this indicates that skip-row NR was reduced compared to conventional cotton as the yield environment becomes more productive. A slope greater than 0.536 indicates that the skip-row NR was greater than conventional cotton in more productive environments.

The slope representing the 2x1 pattern was significantly different from 0.536, indicating a NR relationship between the 2x1 pattern and conventionally planted cotton that is not consistent across yield environments (Fig. 5). The lines representing the NR equations for the 2x1 skip-row and conventionally planted cotton cross in a yield environment of approximately 620 lbs/A. Thus, it can be deduced that in yield environments less than approximately 620 lbs/A the 2x1 pattern will have a greater NR than conventional cotton. The opposite is true for yield environments greater than 620 lbs/A. No significant differences were observed for any of the other skip-row patterns.

Conclusions

Collectively, these data indicate that overall production costs can be reduced with skip-row cotton in East Georgia, however, there is a yield sacrifice with skip-row production, which is exacerbated in higher yielding environments. In these environments yield reductions incurred were too great to be overcome with the savings analyzed in these experiments. In lower yielding environments, there appears to be the potential to increase profits with the 2x1 pattern. In these studies a maximum of $31.23/A was saved with this pattern. This calculated figure does not include any fixed costs, and only a conservative estimate of direct cost savings. In a 3-yr study in Mississippi, an average of $66.36 in direct costs and $18.75 in fixed costs were saved with a 2x1

pattern (Parvin et al., 2002). If more savings are accrued the yield environment below which skip-row cotton becomes more profitable will increase. However, as the price of cotton increases the yield environment in which skip-row becomes profitable decreases.

References

Parvin, D.W., J.W. Burkhalter, F.T. Cooke, and S.W. Martin. 2002. Three years experience with skip-row cotton production in Mississippi, 1999-2001. Proceedings of Beltwide Cotton Production Conference, Atlanta, GA.

Table 1. Skip-row planting and harvesting widths and percent "down-the-row" and time savings compared to conventional 38-inch row spacing.

	Planting 8 rows			Harvesting 4 rows	
	Width	"Down the Row" Savings[1]	Time Savings	Width	Time Savings
	in.	%	%	in.	%
Conv.	304	0	0	152	0
2x1	342	33.3	12.5	228	50.0
4x1	380	20.0	25.0	190	25.0
2x1 (mod.)	352	13.6	15.8	176	15.8
4x1 (mod.)	328	7.3	7.9	164	7.9

[1] "Down the row" savings include seed, technology fees, and infurrow insecticides.

Table 2. Partial budget production costs for various skip-row patterns and conventionally planted cotton on 38-inch rows.

	Input Costs			
	Seed and Technology Fee	Planting[1] and Labor	Harvest[1] and Labor	Total
Conv.	$60.77	$2.91	$21.27	$84.95
2x1	$40.54	$2.54	$10.64	$53.72
4x1	$48.62	$2.18	$15.95	$66.75
2x1 (mod.)	$52.51	$2.45	$17.91	$72.87
4x1 (mod.)	$56.33	$2.68	$19.59	$78.61

[1] Includes equipment, fuel, and repairs.

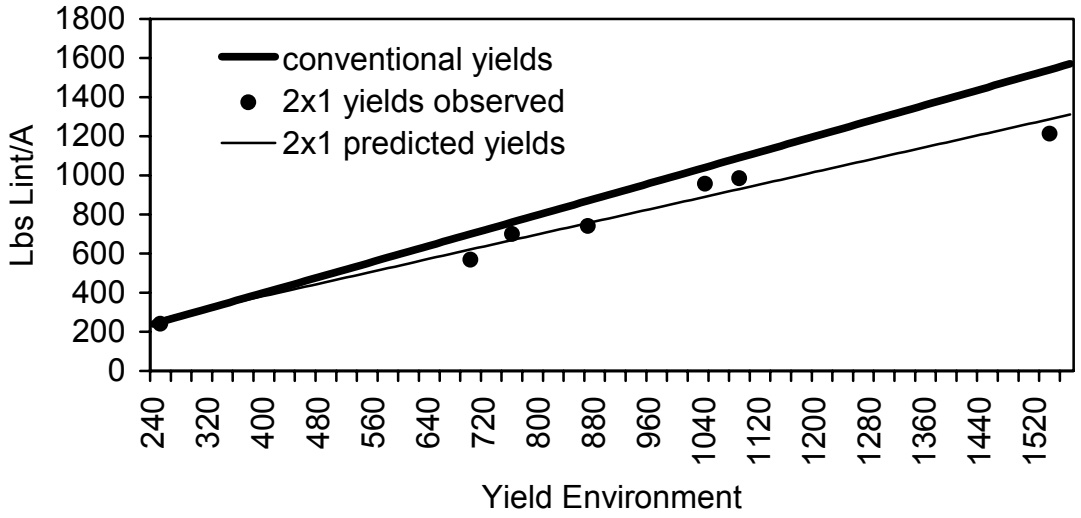

Figure 1. Linear regression of 2x1 skip-row lint yields across multiple yield environments. 2x1 yields=65.72+0.79x. R^2=0.9710. p(slope=1), 0.0197.

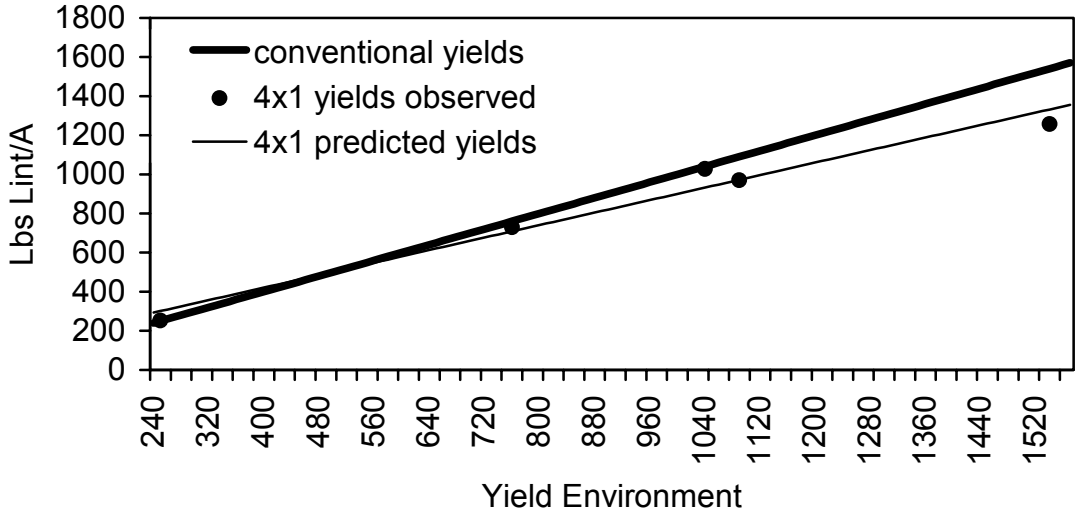

Figure 2. Linear regression of 4x1 skip-row lint yields across multiple yield environments. 4x1 yields=101.15+0.80x. R^2=0.9696. p(slope=1), 0.0912.

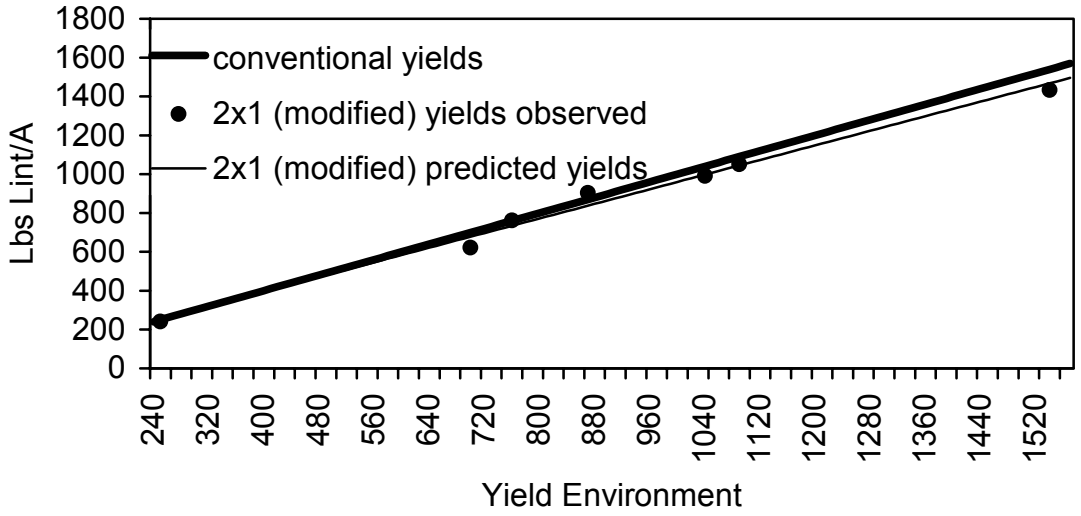

Figure 3. Linear regression of 2x1 (modified) skip-row lint yields across multiple yield environments. 2x1 (modified) yields=19.72+0.94x. R^2=0.9892. p(slope=1), 0.2332.

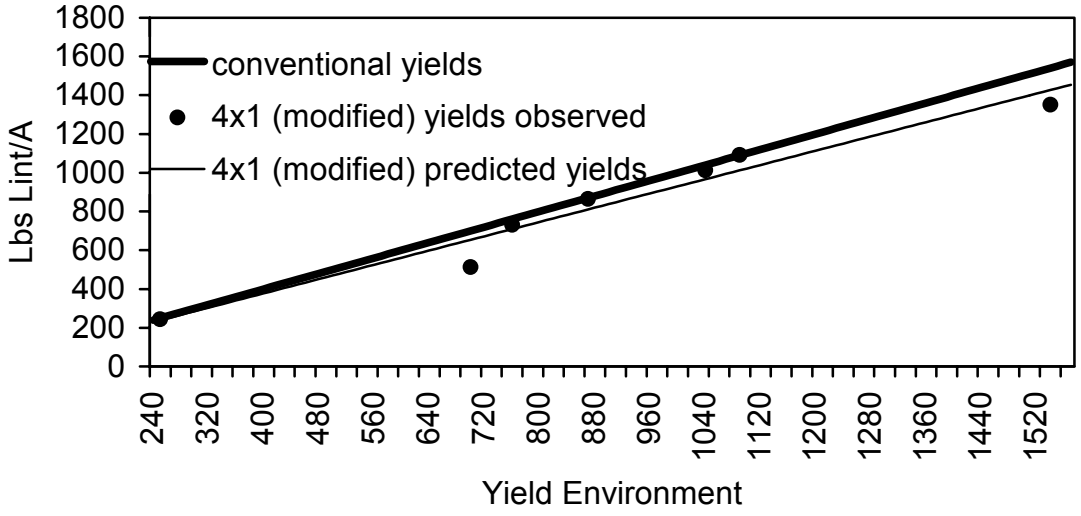

Figure 4. Linear regression of 4x1(modified) skip-row lint yields across multiple yield environments. 4x1 (modified) yields=9.62+0.92x. R^2=0.9554. p(slope=1), 0.4104.

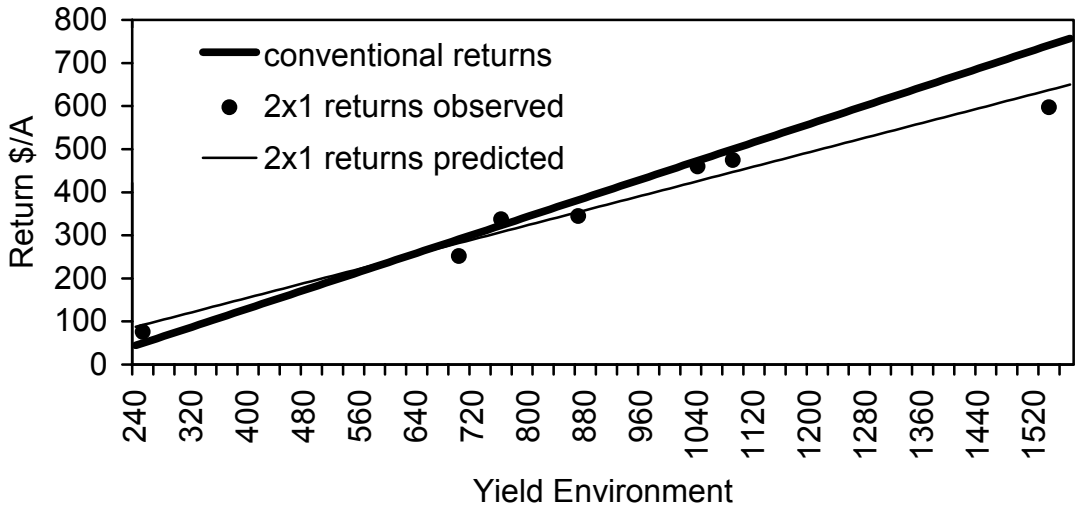

Figure 5. Linear regression of 2x1 skip-row NR across multiple yield environments.2x1 NR=-13.83+0.42x. R^2=0.9672. p(slope=0.536), 0.0225.

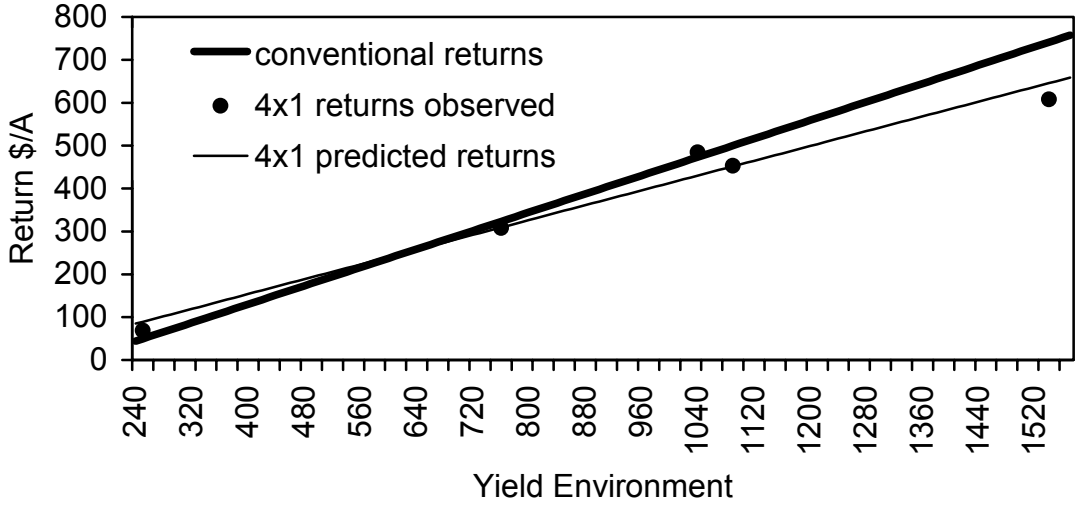

Figure 6. Linear regression of 4x1 skip-row NR across multiple yield environments. 4x1 NR=-18.65+0.43x. R^2=0.9705. p(slope=0.536), 0.0951

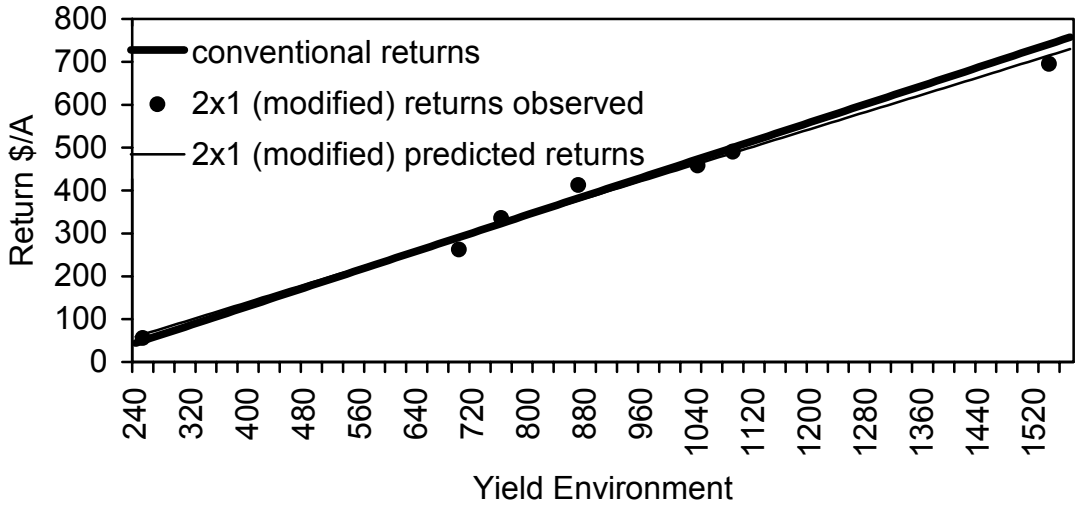

Figure 7. Linear regression of 2x1(modified) skip-row NR across multiple yield environments. 2x1 (modified) NR=-61.74+0.50x. R^2=0.9891. p(slope=0.536), 0.2311.

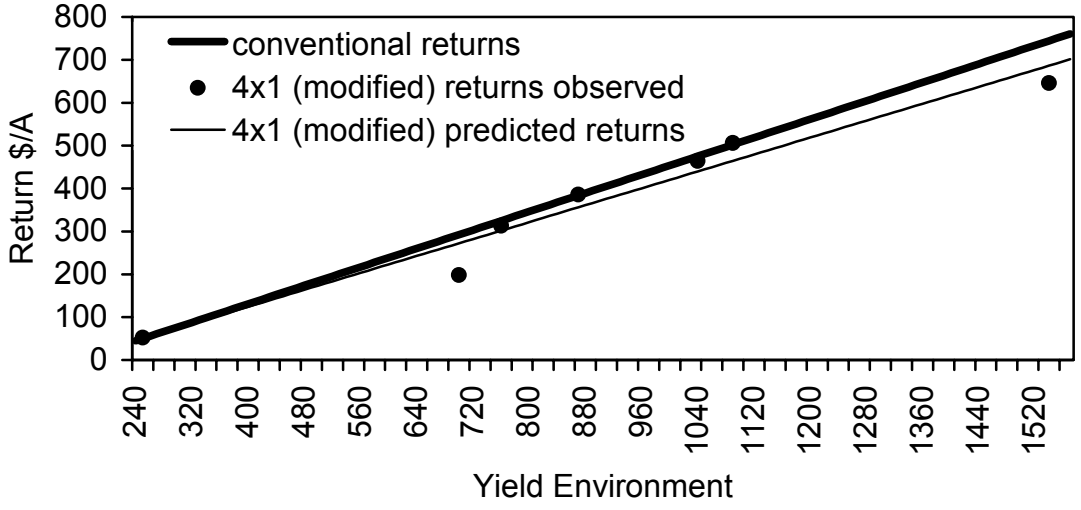

Figure 8. Linear regression of 4x1(modified) skip-row NR across multiple yield environments. 4x1 (modified) NR=-72.85+0.49x. R^2=0.9558. p(slope=0.536), 0.4053.