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THE ECONOMIC IMPACT OF A COTTON PICKER WITH AN ONBOARD MODULE BUILDER

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Abstract

Partial analysis indicates that a cotton picker with an onboard module builder will result in a reduction of harvesting costs of 11 to 38 percent depending on the number of module builders and boll buggies replaced. Impacts at the farm level will be much larger and will require whole farm or systems analysis.

Introduction

The number of cotton acres on a cotton farm is limited by the growers' capacity to harvest in a timely manner. Cotton harvest is the most costly component of the cotton production system. Annual costs of production publications provided by the Department of Agricultural Economics at Mississippi State University estimate harvest to be 24 percent of the cost of producing cotton (excluding ginning) [Delta Planning Budgets, p. 45].

Producers have been adjusting to the declining relative profitability of cotton and Monsanto's herbicide tolerant technology by reducing the number of "trips-over-the-field" required to produce cotton. Seventy seven percent of Mississippi's 2003 crop was planted to a herbicide-tolerant variety [Mississippi Agricultural Statistics Service]. On many farms, cotton harvest requires more tractors, tractor operators, and support labor than are necessary at any other period of the production system. A cotton picker with an onboard module builder (PwOBMB) reduces per acre harvest cost and has the potential to allow the producer to make other labor and machinery adjustments that will result in additional savings.

A PwOBMD will not require module builders (MB) or boll buggies (BB) or the tractors that support them during the harvest period. If these tractors are not needed at other times during the production cycle, the grower will be able to produce the same or more acres of cotton with fewer tractors and fewer permanent laborers. The purpose of this report is to update an earlier publication by Parvin.

Method

The Mississippi State University Budget Generator (Laughlin and Spurlock), a widely accepted computer algorithm which standardized many accounting calculations, etc. was employed to produce per acre harvesting budget tables for the current technology (6-row picker supported with MB and BB) and the new technology (PwOBMD). Growers with 6-row harvesting systems were contacted to obtain an estimate of the number of module builders and boll buggies required for cotton harvesting systems based on one, two, and three pickers.

Data

Table 1 lists the major data items employed in this report. Labor was priced at two levels: Operator labor (picker and tractor drivers), $9.02 per hour; support labor (one for each picker and module builder), $6.44 per hour. Diesel fuel price was set at $0.95 per gallon.

Assumptions

It was assumed that the new technology would not significantly alter the cost of hauling (seedcotton to the gin) or ginning. Once over harvest (no scrapping) was assumed for purposes of this report.

Results

Table 2 provides an estimate of the cost of cotton harvest with the current technology (one picker, one module builder, and one boll buggy) versus the cost associated with the new technology (PwOBMB). The per acre cost of the new picker is $52.25 or $10.30 more than the current picker. The BB and MB cost ($7.63 + $9.19) $16.82 per acre. The new technology is $16.82 - $10.30, or $6.52 less expensive per acre than the picker supported by one MB and one BB. Therefore, the direct impact of the PwOBMB is a function of the number of MB's and BB's replaced. That information is provided in Table 3 for one to three pickers and three yield levels. Growers tend to add additional MB's before adding additional BB's.

Table 4 summarizes the savings in harvesting costs associated with the new technology. The savings range from 11.09 to 38.37 percent or $6.52 to $32.53 per acre, depending upon the number of MB's and BB's replaced per picker. The saving in harvesting costs associated with system 9 is $45.57 per acre or 22.53 percent. Table 5 reports similar information in terms of direct cost. Savings in direct cost vary from 16.28 to 44.84 percent.

Case Studies

Two experienced producers with knowledge of how a 6-row PwOBMB might impact their harvesting operations provided the following information:

Producer 1 has 12 4-row pickers supported by 12 MB's and 12 BB's, requiring 36 operator laborers and 24 support laborers. He expects to harvest the same acreage with six 6-row PwOBMB, requiring six operator laborers and six support laborers.

Producer 2 has four 6-row pickers supported by trailers and two tractors for mechanical "stompers". The system requires six operator laborers and eight support laborers. He expects to harvest the same acreage with three 6-row PwOBMB, requiring three operator laborers and three support laborers.

Limitations

Per acre budgeting or partial analysis is limited by many assumptions that are assumed to be unchanged relative to the treatments (current versus new technology in this case) under investigation. Parameters such as the number of tractors per farm, annual hours or use per tractor, etc. are fixed within the budget generator algorithm. Table 6 begins to address these limitations. A PwOBMB may allow producers to reduce the number of tractors per farm and number of permanent laborers per farm. These impacts are not included in Tables 4 or 5. For example, on a high-yielding three-picker farm with nine tractors in use at harvest and 12 operator laborers (system 9), the key question is how many tractors are needed outside the harvesting period. If five tractors are needed except for the harvesting period, four tractors and four tractor drivers can be completely eliminated from the farm. Additionally, during the harvest season the number of support laborers can be reduced by 63 percent, from eight to three, and two of the remaining operator laborers (tractor drivers) will be underemployed during the harvest period. Improvements in overall efficiency of this type will require a systems or holistic whole farm approach to research.

References

Delta 2003 Planning Budgets. 2002. Budget Report 2002-010, Department of Agricultural Economics, Mississippi State University.

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Table 1. Powered and towed equipment parameters and estimated cost per acre, selected items, 2003.

Item	Size	Life Yr	Annual Use hr	Price $	Repair Cost %	Salvage Value %	Fuel Cons. g/hr	Perf. Rate hr/a	Direct Cost $/a	Fixed Cost $/a
Tractor	190 hp	14	600	107,342	60	20	9.77	.133	2.26	2.29
Picker	6R-40	10	200	275,000	80	10	16.73	.133	16.74	23.15
PwOBMB	6R-40	10	200	350,000	80	10	16.73	.133	20.73	29.46
BB	4 bale	10	200	16,000	50	10	-	.133	0.53	1.35
MB	32'	10	200	20,000	50	10	-	.133	0.73	1.85

Table 2. Estimated cost per acre, cotton harvest, current versus new technology, Mississippi 2003.

Operation	Size	Perf. Rate	Power Unit Cost		Equipment Cost		-- Labor --		Total Cost
			Direct	Fixed	Direct	Fixed	Hours	Cost	
			----- Current Technology -----						
Picker	6R	0.133	16.74	23.15	-	-	0.26	2.06	41.95
MB	32'	0.133	2.26	2.29	0.73	1.85	0.26	2.06	9.19
BB	4 bale	0.133	2.26	2.29	0.53	1.35	0.13	1.20	7.63
Sum									58.77
			----- New Technology -----						
PwOBMB	6R	0.133	20.73	29.46	-	-	0.26	2.06	52.25
Sum									52.25
Diff									6.52

Table 3. Number of 6-row cotton pickers, module builders (MB) and boll buggies (BB) [Current Technology] and number of cotton pickers with onboard module builder (PwOBMB) [New Technology], 9 harvesting systems [3 farm sizes (acres of cotton) and 3 yield levels (lbs. of lint per acre)].

System	Acres	Yield	Current Technology			New Technology		
			Pickers	MB	BB	PwOBMB	MB	BB
1	1,500	800	1	1	1	1	0	0
2		1,000	1	2	1	1	0	0
3		1,200	1	3	2	1	0	0
4	3,000	800	2	2	2	2	0	0
5		1,000	2	3	2	2	0	0
6		1,200	2	4	3	2	0	0
7	4,500	800	3	3	3	3	0	0
8		1,000	3	4	3	3	0	0
9		1,200	3	5	4	3	0	0

Table 4. Total costs and total cost per pound of lint comparisons, current cotton harvest technology versus new technology, 9 harvesting systems (3 farm sizes and 3 yield levels).

Systems	Acres	Yield	Current Technology		New Technology		Diff.	Savings
			$	¢/lb.	$	¢/lb.	¢/lb.	%
1	1,500	800	58.77	7.346	52.25	6.531	0.815	11.09
2		1,000	67.96	6.796	52.25	5.225	1.571	23.12
3		1,200	84.78	7.065	52.25	4.354	2.711	38.37
4	3,000	800	117.54	7.346	104.50	6.531	0.815	11.09
5		1,000	126.73	6.337	104.50	5.225	1.112	17.54
6		1,200	143.55	5.981	104.50	4.354	1.627	27.20
7	4,500	800	176.31	7.346	156.75	6.531	0.815	11.09
8		1,000	185.50	6.183	156.75	5.225	0.958	15.49
9		1,200	202.32	5.620	156.75	4.354	1.266	22.53

Table 5. Direct costs and direct cost per pound of lint comparisons, current cotton harvest technology versus new technology, 9 harvesting systems (3 farm sizes and 3 yield levels).

Systems	Acres	Yield	Current Technology		New Technology		Diff.	Savings
			$	¢/lb.	$	¢/lb.	¢/lb.	%
1	1,500	800	27.22	3.403	22.79	2.849	0.554	16.28
2		1,000	32.27	3.227	22.79	2.279	0.948	29.38
3		1,200	41.31	3.443	22.79	1.899	1.544	44.84
4	3,000	800	54.44	3.403	45.58	2.849	0.554	16.28
5		1,000	59.49	2.975	45.58	2.279	0.719	24.17
6		1,200	68.53	2.855	45.58	1.899	0.956	33.49
7	4,500	800	81.66	3.403	68.37	2.849	0.554	16.28
8		1,000	86.71	2.890	68.37	2.279	0.611	21.14
9		1,200	95.75	2.660	68.37	1.899	0.761	28.61

Table 6. Number of tractors, operator laborers and support laborers, current cotton harvest technology and new technology, 9 harvesting systems (3 farm sizes and 3 yield levels).

			Current Technology			New Technology		
				Laborers			Laborers	
System	Acres	Yield	Tractors	Operator	Support	Tractors	Operator	Support
1	1,500	800	2	3	2	0	1	1
2		1,000	3	4	3	0	1	1
3		1,200	5	6	4	0	1	1
4	3,000	800	4	6	4	0	2	2
5		1,000	5	7	5	0	2	2
6		1,200	7	9	6	0	2	2
7	4,500	800	6	9	6	0	3	3
8		1,000	7	10	7	0	3	3
9		1,200	9	12	8	0	3	3