Evaluating the Operational Efficiency and Cost Structures of Wide Row Sugarcane Production

Dr. Michael Deliberto, Mr. Brian Hilbun, Dr. Kenneth Gravois[1/], and Mr. Herman Waguespack[2/]
[1/]Louisiana State University Agricultural Center and [2/]American Sugar Cane League

In a bid to improve field efficiency and increase yields of raw sugar in Louisiana, researchers and cultivators have examined sugarcane row width as one potential area of accomplishing these goals. Growers have experimented with the cultivation of wide row (8' rows) in sugarcane production to reduce farm input costs and improve yields over traditional cultivation practices (6' rows). The potential input cost savings and increased net returns to the farming operation associated with wide row sugarcane production along with improved field efficiency can correspond to a reduction in cultivation cost.

However, the replacement strategy of combine harvester becomes pivotal in the grower's decision-making process of electing wide row adoption. Therefore, this research considers that for the representative farm studied, a harvester is scheduled to be replaced as the grower considers adopting eight-foot row width production. For a base yield of 7,500 pounds per acre, the additional amount of raw sugar produced per acre would have to be between 149 and 450 pounds per acre to offset the machinery costs associated with the adoption of wide row sugarcane production. When investment costs are compared to improved field efficiency and potential increases in raw sugar yield, this research suggests that positive economic gains can be realized from the investment of widened row width systems by as much as $29.68 per acre.

Based on conversations with industry experts and Louisiana sugarcane growers, information was assembled to provide a preliminary economic overview of the potential gains from eight foot row adoption in Louisiana. From the outset of our research, it was evident that any consideration of switching row width would necessitate a farm maintaining six foot row capability (for a certain period of time) while simultaneously incorporating eight-foot row production practices (along with eight foot row equipment). This would continue until all farm acreage had been converted over to eight foot row production.

Switching row configuration involves capital investment in equipment, either through customized modification of existing equipment or the purchase of new equipment and is subsequently accomplished via modification/purchase of tractors (axle width), modification of planting wagons and cultivator/row packers, and adjusting sprayer booms. Based on conversations with project cooperators, the planting method of sugarcane (e.g. whole stalk or billet) is one factor in determining the degree of the modification warranted and the associated costs requisite to facilitate conversion to wide row s.

Depending upon the planting method, existing whole stalk planters require either a slight axle modification (~$8,000) or a custom fabricated planter tailored specifically for billet planting systems (~$85,000). Common to both billet and whole stalk planting systems, tractor wheel spacers (hubs) would need to be added at an approximate cost of $1,000, fertilizer rigs would need to be widened subsequently requiring new coulters, hoses, and pumps ($1,500); drums used to pack the rows would need to be widened ($5,000); and folding spray rigs would also have to be widened ($1,500). For whole stalk planting systems, cooperators purchased a row opener/packer implement at an estimated cost of $30,000. These sugarcane grower cooperators estimated that their cultivation equipment investment ranged between $75,000 and $178,000. However, through conversations with sugar industry professionals, the acquisition of custom fabricated new equipment would be estimated to fall somewhere between $85,000 to $250,000. The largest conversion expense would be the purchase of an eight foot combine harvester. It is noted that modifications can be made to existing six foot combine harvesters, but

requirements for the specific conveyor guide extenders, shears, and frame adjustments needed in such a conversion are uncertain and highly variable. Through conversations with grower cooperators, this modification is estimated to total $90,000.

This information was provided from independent project cooperators and it should be borne in mind that costs amongst producers will vary and are partially correlated to that producer's ability to modify/convert existing equipment on-farm as opposed to having any conversions/modifications contracted off-farm. Assuming a straight-line amortization rate of 5.25 percent for these modifications/ conversions, additional per acre costs range from $19.36 to $56.96 per acre over a five-year schedule on a 1,000 acre representative farm with harvest through third stubble. A five-year amortization period was adopted to capture attendant costs over one growing cycle. Annualized investment costs are treated as fixed costs and are considered an additional cost outlay in addition to machine ownership costs.

With eight foot row production, it is hypothesized that there are certain efficiency gains in terms of both fuel and labor (variable cost) savings of approximately $5.00 per acre that could be realized by a sugarcane producer. This savings of $5.00 per acre is weighted to reflect the varying stages of production on a 1,000 acre representative sugarcane farm. When examining eight foot row field operations, assumptions as to labor and fuel savings were grouped by field activity (coupled with the number of field passes) and range anywhere, depending on the operation, from $2.40 to $4.80 per acre (unweighted). Each operation of sugarcane cultivation was referenced from Deliberto and Hilbun, 2020. The listing of field activities corresponds to standard production practices and engineering assumptions prevalent in the sugarcane industry in Louisiana. As no two farms are identical in their field activities, practices and field passes contained in Table 1 vary in terms of soil type, weather conditions throughout the production year, and the previous year's harvest time traffic field conditions.

Under these assumptions, the labor and fuel savings associated with non-harvest field operations nearly off-set the increased total costs incurred with buying an eight foot harvester. However, as annual use (in hours) are increased, total costs per hour would decrease as the larger eight foot machine is able to harvest 0.51 acres per hour more than the six foot machine. In our analysis, however, harvestable acres of sugarcane are held constant for both eight and six foot systems. Thus, the economic benefit in switching row configuration cannot solely be determined from the perspective of machine ownership due to the narrow gap between the cost per acre between both eight and six foot machines. Table 2.

Overall, when a producer is considering switching over to wide row sugarcane production the factors of potential cost savings, potential increased yields along with potential increases in capital costs should be considered. While one might be inclined to base their decision for or against wide row adoption upon one of the potentials listed above, it must be said that all potentials together should factor into a producer's decision making process. A summary of this research is presented is Table 3, those values that are positive/negative are to be viewed as a net positive/negative to a grower's bottom line (per acre).

The price of raw sugar received (cents per pound) also influences the breakeven amount of sugar warranted to cover the machinery amount that is outlaid in a non-revenue generating phase of the crop cycle. Increases in the price of sugar to the producer (50.8% grower share) can impact the pounds of sugar needed to offset a cost increase. Figure 3 incorporates potential efficiencies gained in eight foot row sugarcane production to a grower's net revenue (GNR). When these efficiencies are coupled with potential increases in yield that exceed 1.98% of our assumed base yield of 7,500 pound of raw sugar per acre (50.8% grower share), conversion would appear to be economically beneficent. Figure 1 assumes an $85,000 conversion investment coupled with a 1%, 3%, and 5% yield increase. Secondarily, at the upper bound of conversion cost ($250,000 investment), the representative farm would need increased yields upwards of 6% to approach economic beneficence under the same set of economic assumptions.

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Table 1. Labor and fuel costs savings associated with eight foot modification.

Crop Phase	Efficiency Gains (unweighted)	Efficiency Gains (weighted)
Fallow	$4.20	$0.84
Whole Stalk Hand Plant	$2.40	$0.09
Mechanical Plant	$2.40	$0.47
Plant Cane Field Operations	$3.60	$0.72
First Stubble	$4.80	$0.96
Second Stubble	$4.80	$0.96
Third Stubble	$4.80	$0.96
Total	$27.00	$5.00

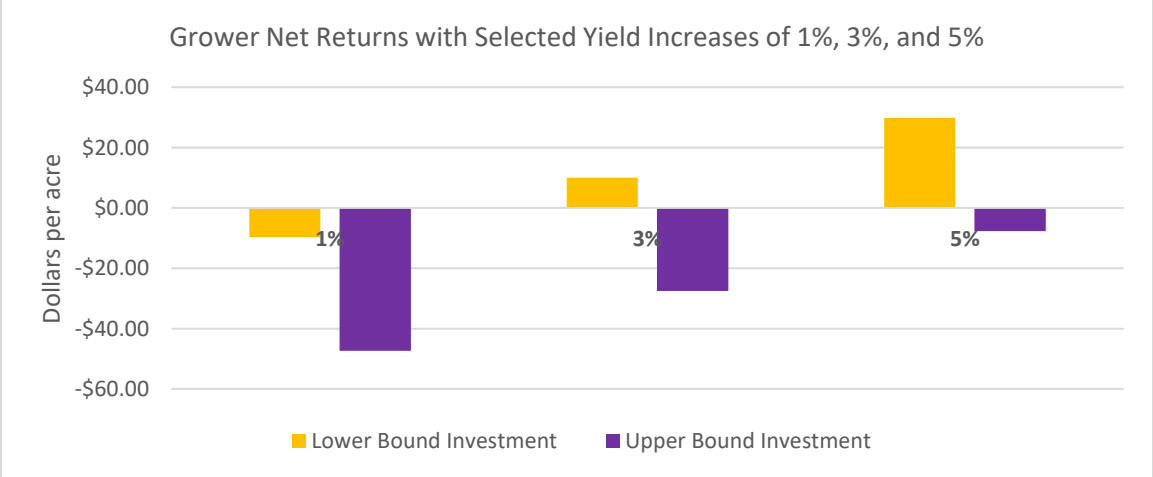
Table 2. Total per acre operating cost assumptions for six and 8 foot harvesters.

Parameter	6 Foot Harvester	8 Foot Harvester
Ownership Costs (per acre)	$40.36	$55.28
Operating Costs (per acre)	$74.23	$64.61
Total Costs (per acre)	$114.58	$119.89

Table 3. Summary of the potential cost savings and revenue from eight foot sugarcane production.

Production System	Field Cultivation Costs	Investment Amortization	Harvesting Ownership Cost	Harvester Operating Costs	Crop Revenue
8 Foot Rows	+$5.00	- $19.36 to - $56.96	-$14.93	+$9.62	+$9.91 to +$49.53

Figure 1. Potential per acre changes in GNR with eight foot row adoption across competing investment levels.



To access the full research report, please visit the LSU AgCenter's Sugarcane webpage at https://lsuagcenter.com/articles/page1594142357843.

Dr. Michael A. Deliberto can be contacted in the Department of Agricultural Economics and Agribusiness at (225) 578-7267 or by emailing mdeliberto@agcenter.lsu.edu.