Sugar Research Australia

Case Study

Comparison between commercial farming systems in the Southern Region

Introduction

The findings of the Yield Decline Joint Venture demonstrated positive benefits in the modern farming system, which were: lower input costs, increased yields in ratoons, improved soil structure and biology, and a more sustainable system.

A number of growers have adopted the system of wider row spacings to match their machinery operations with guidance systems, introduced legume rotations, improved irrigation systems, and are monitoring crop performance to take advantage of these benefits.

There are a number of growers undecided if there are benefits to making the change. Therefore to assist growers, this case study's objective is to review and assess three commercial farming operations utilising different row spacings and systems.

The review focuses on the advantages and disadvantages of agronomic practices and economics of the operations. The three farms were selected in the Southern Region that have been in production for at least two crop cycles (10 years).

Criteria for selection of systems:

1. Similar marginal soil types
2. Irrigation capacity to apply a minimum of at least 4ML/ha
3. Large operators to insure timeliness of operation could take place
4. Ideally a legume rotation
5. Three different row spacings – 1.5m single row, 1.8m single row and 2m dual rows.

With the group of growers formed, there was discussion within the group around the challenge with assessing individual farming operations as each management style is unique. There is also the variance in growing areas and climate conditions as well as the way farm operations are conducted.

Therefore to overcome this challenge, we have presented their specific farm figures, as well as a mock generic farm model, where by the group decided what inputs and outputs would be the most likely outcome.

Agronomic benefits between systems

Each grower was interviewed to discuss the advantages and disadvantages that they had identified with their system since inception.

Table 1: Agronomic benefits identified between different systems.

Row spacing	Increase in soil biology	Reduced stool damage during wet conditions	Reduced compaction	Increased water efficiency with reduced compaction	Reduced farm machinery operations	Reduced weed pressure with canopy cover
1.5m single row	X	X	X	X	X	✓
1.8m single row	✓	✓	✓	✓	✓	X
2m dual row	✓	✓	✓	✓	✓	✓

As can be seen in Table 1, there are numerous benefits with both the 1.8m single and 2m dual row systems compared to the 1.5m single system. What was very noticeable in the discussion was those who have implemented the wider row spacing have reduced stool damage and compaction with increased water infiltration and biological activity in the soil (earthworm activity and friable soil structure), which they believe has led to sustainable yields in the ratoon crops and extend the ratoon crop to allow more ratoons. Farm machinery operations are significantly reduced with both wider row spacings, which reflects positively in the soil biology and reduced input costs, which can be seen in the economics below. It was felt that weed control is an issue in the 1.8m system, however the grower successfully controls weeds with an effective weed control program.

Transition to a wider row spacing

One disadvantage to the 2m dual row system is the modification to front end of a harvester to accommodate the wider row spacing, which comes at an estimated cost of $50,000. The 1.8m system modifications would require adjustment to cultivation equipment and an extension to the elevator on the harvester.

Above: Young ratoons 2m dual row.

Above: Young ratoons 1.8m single row.

Above: Young ratoons 1.5m single row.

Economics

Table 2: Individual farm gross margins.

Operation	1.5 meter (P+3R)		1.8 meter (P+4R)		2.0 meter dual (P+4R)	
	# Operations	Total $/ha	# Operations	Total $/ha	# Operations	Total $/ha
Fallow	**Soybeans**		**Bare fallow**		**Soybeans**	
Land preparation	2	238	2	145	4	310
Planting	1	210	0	0	1	100
Fertiliser	1	95	0	0	1	665
Irrigation (Supplementary)	0	0	0	0	3ML	300
Pesticides	2	110	2	96	8	257
Harvesting	1	220	0	0	1	200
Total costs ($/ha)		873		241		1,832
Plant cane						
Cultivation/land preparation	7	778	5	662	1	95
Planting	1	1,120	1	743	1	750
Pesticides	2	375	3	493	2	401
Fertiliser	1	515	2	1,550	1	340
Irrigation (Supplementary)	4ML	867	8ML	600	4ML	405
Harvesting#	1	1,000	1	923	1	748
Total costs ($/ha)		4,655		4,971		2,728
Ratoon cane						
Cultivation	1	30	0	0	0	0
Pesticides	2	158	1	67	1	50
Fertiliser	1	420	2	847	1	335
Irrigation (Supplementary)	4ML	867	6ML	450	4ML	405
Harvesting#	1	728	1	611	1	603
Total costs ($/ha)		2,203		1,975		1,393
Outputs						
Soybean yield		3		0		3
Value/T soybeans		550		0		690
Plant yield (T/ha)		130		130		110
Ratoon yield (T/ha)		91		86		90
Value/T cane		45		45		45
Average cost ($/ha)		2,816		2,474		1,616
Average yield (t/ha)		101		95		94
Average cost ($/t)		$27.95		$26.10		$17.19
Soybean/bare fallow gross margin/ha		$777		-$241		$445
Average gross margin/ha		$1,718		$1,692		$2,570

 # Estimate of harvest costs in the 1.8m & 2m row spacings have been reduced due to field efficiencies

As previously described, there are significant differences between the individual farming operations. It should be noted that the 1.8m farm does not grow legumes in the fallow, however does apply cow manure as a soil ameliorant hence the deficit in the fallow gross margins (return on investment). There is variability in yields and this is due to a number of factors including climate, soil type, number of ratoons etc. An interesting point to note is that the input costs in the 2m system are significantly less than both the 1.5 and 1.8m system. An argument could be raised that the input cost are higher in a legume fallow, however the counter argument is that they are off-set with the income from the soybean income producing a positive gross margin. This produces a higher gross margin for both the plant and ratoon crops.

To try and reduce the variables when comparing costs, a mock generic farm was modelled. The legume crop is a green crop of soybeans desiccated prior to planting. Operation costs were standardised however the number of operations varied according to the row spacing system. Plant and three ratoons were used for all three systems however, it was felt that the 1.8m and 2m systems could be extended to 4 ratoons because of reduced compaction. Once again the results show lower input costs in both the 1.8m and 2m systems provide higher gross margins than the 1.5m system in the generic farm model.

Table 3: Generic farm gross margins.

Operation	Cost	1.5 meter (P+3R)		1.8 meter (P+3R)		2.0 meter dual (P+3R)	
	$/ha or $/ML	# Operations	Total $/ha	# Operations	Total $/ha	# Operations	Total $/ha
Fallow (green crop of soybeans)							
Land preparation	110	6	660	3	330	3	330
Seed	100	1	100	1	100	1	100
Spray weed control	80	1	80	1	80	1	80
Total costs ($/ha)			840		510		510
Plant cane							
Fallow preparation	110	2	220	1	110	1	110
Planting	1,300	1	1,300	1	1,300	1	1,300
Cultivation	65	3	195	3	195	1	65
Spray weed control	80	2	160	3	240	2	160
Fertiliser	450	1	450	1	450	1	450
Irrigation (Supplementary)	200	4	800	4	800	4	800
Harvesting#		1	975	1	923	1	905
Total costs ($/ha)			4,100		4,018		3,790
Ratoon cane							
Fertiliser	450	1	450	1	450	1	450
Spray weed control	50	1	50	1	50	1	50
Irrigation (Supplementary)	200	4	800	4	800	4	800
Harvesting#		1	638	1	604	1	603
Total costs ($/ha)			1,938		1,904		1,903
Outputs							
PC yield (T/ha)			130		130		135
Ratoon yield (T/ha)			85		85		90
Value/T cane			45		45		45
Average cost ($/ha)*			2,688		2,560		2,502
Average yield (t/ha)			96		96		101
Average cost ($/t)			$27.93		$26.59		$24.71
Average gross margin/ha			$1,853		$1,899		$2,182

 # Estimate of harvest costs in the 1.8m & 2m row spacings have been reduced due to field efficiencies

** Includes fallow costs*

Conclusion

As agriculture progresses into the future, there is a greater requirement to implement sustainable systems that are productive and profitable. By evaluating the three commercial farming systems it can be noted that wider row spacings with legume rotations do demonstrate agronomic benefits, with reduced compaction, stool damage increased water infiltration and soil biology. From an economic point, input costs are reduced and yields maintained. What is important from a business perspective is that the return on investment over the crop cycle is significantly higher in the modern farming systems.