The effect of changing from a monoclonal to a multi-clone farming system (mixing sugarcane varieties at planting) 2016 update

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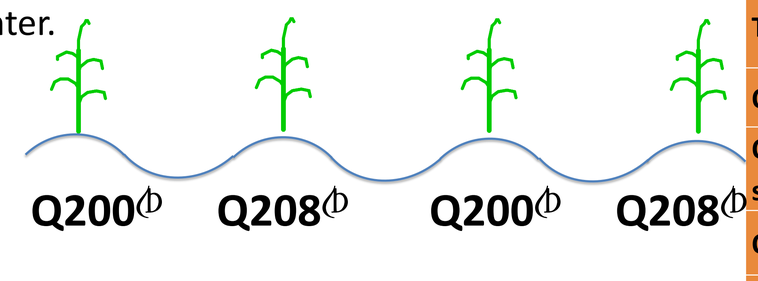
Aim: A series of four replicated experiments were conducted to determine the effect on sugar yield and profitability from establishing crops with more than one sugarcane variety.

Experiment 1: Sugarcane varieties Q190Φ and Q241Φ were planted in pure and mixed plots on 1.8m dual rows. The mixed plots were established by either planting alternate rows with a different variety or by planting the two varieties side by side within the one dual row using a whole-stalk dual-row double-disc cane planter.

Experiment 2: Sugarcane varieties Q200Φ and Q208Φ were planted in pure and mixed plots on 1.5m rows. The mixed plots were established by planting alternate rows with a different variety.

Experiment 3: Sugarcane varieties Q200Φ, Q208Φ and KQ228Φ were planted in pure and mixed plots on 1.6m rows. The mixed plots were established by planting alternate rows with a different variety.

Experiment 4: This is a repeat planting of Experiment 1 established in a different cane field. Sugarcane varieties Q190Φ and Q241Φ were planted in pure and mixed plots on 1.8m dual rows. The mixed plots were established by either planting alternate rows with a different variety or by planting the two varieties side by side within the one dual row using a whole-stalk dual-row double-disc cane planter.



Results : For all but the second ratoon in experiment four there was no significant differences between pure and mixed treatments for yield components (only sugar yield has been presented) and net revenue.

Planting alternate rows of Q190Φ and Q241Φproduced a significantly higher yield and net revenue than a pure stand of Q241Φ in the 2nd ratoon of experiment four. Planting Q190Φ and Q241Φ together in dual rows also produced a significantly higher net revenue than a pure stand of Q241Φ in the 2nd ratoon of experiment four.

Discussion: A monoclonal farming system can leave the sugar industry exposed to significant yield and financial losses whenever a new pest or disease problem occurs. Changing from a monoclonal to a multi-clone farming system might be a useful strategy to reduce the speed of spread and the overall yield losses associated with new disease outbreaks. The outbreak of Orange Rust caused major losses to the Australian sugar industry when it affected Q124. If prior to the outbreak of Orange Rust growers had adopted a planting system where they only planted Q124 in every second row on their farms the losses may not have been as severe. The same could have applied to the outbreak of Smut.

By adopting a multi-clone farming system on wide rows it would be relatively easy to fallow only every alternate row if a new pest or disease affected one variety. The remaining row would benefit from the 'skip row' effect and the overall reduction in farm yield should not be as significant as is the case in the current monoclonal system.

The variety Q241Φ has caused significant milling problems due to unusual levels of long fibres. It may be the case that if Q241Φ was planted in a multi-clone farming system milling problems with this variety could be overcome.

Conclusions: Although limited, the data collected from these four experiments indicates that changing from a monoclonal farming system to a multi-clone system has no apparent negative affect on yield or profit. If a new pest or disease outbreak occurs, this system may bring significant benefits to the sugar industry. More research into this topic could reveal other benefits. This work builds on earlier research reported by Spaull et al, 2006; Cadet et el, 2006; Raman Kapur et el, 1989; Nazir et el, 1997 and Simpson et el, 2013.

Table 1. Plant and first-ratoon sugar yields and net revenue for experiment 1.

	Plant		1st Ratoon	
Treatment	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**
Q190Φ	9.9 A	1493 A	13.4 A	2870 A
Q190Φ and Q241Φ mixed every second row	9.9 A	1523 A	12.3 A	2560 A
Q190Φ and Q241Φ mixed within each dual row	9.7 A	1499 A	12.5 A	2614 A
Q241Φ	9.2 A	1433 A	12.0 A	2515 A

Means in columns followed by the same letter are not significantly different. Revenue base on a sugar price of $400 per tonne.

Table 2. Plant crop sugar yields and net revenue for experiment 2.

Treatment	**Sugar (t/ha)**	**Net Revenue ($/ha)**
Q200Φ	14.2 A	3001 A
Q200Φ and Q208Φ mixed every second row	15.6 A	3416 A
Q208Φ	17.6 A	3768 A

Means in columns followed by the same letter are not significantly different. Sugar price $400.

Table 3. Plant ,1st , 2nd and 3rd ratoon sugar yields and net revenue for experiment 3.

	Plant		1st Ratoon		2nd Ratoon		3rd Ratoon	
Treatment	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**
Q200Φ	16.2 A	3711 A	13.1 AB	2954 AB	11.8 A	2549 A	7.9 B	1568 B
Q200Φ and Q208Φ mixed every second row	16.9 A	3802 A	14.0 A	3131 A	13.0 A	2727 A	9.9 AB	1972 AB
Q200Φ and KQ228Φ mixed every second row	15.6 A	3598 A	11.9 AB	2603 AB	10.7 A	2285 A	9.3 AB	1940 AB
Q208Φ	16.2 A	3686 A	14.3 A	3154 A	14.2 A	3066 A	12.4 A	2716 A
Q200Φ, Q208Φ and KQ228Φ mixed every third row	14.1 A	3250 A	12.3 AB	2740 AB	12.0 A	2629 A	9.3 AB	1942 AB
Q208Φ and KQ228Φ mixed every second row	14.8 A	3359 A	11.4 AB	2530 AB	12.2 A	2650 A	10.8 AB	2329 AB
KQ228Φ	13.8 A	3065 A	10.8 B	2407 B	12.3 A	2666 A	9.3 AB	2037 AB

Means in columns followed by the same letter are not significantly different. Sugar price $400.

Table 4. Plant, 1st and 2nd Ratoon sugar yields and net revenue for experiment 4.

	Plant		1st Ratoon		2nd Ratoon	
Treatment	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**	**Sugar (t/ha)**	**Net Revenue ($/ha)**
Q190Φ	14.0 A	2744 A	12.1 A	2349 A	12.1 AB	2606 AB
Q190Φ and Q241Φ mixed every second row	14.7 A	2851 A	14.6 A	2731 A	13.5 A	2856 A
Q190Φ and Q241Φ mixed within each dual row	13.2 A	2627 A	12.6 A	2300 A	12.9 AB	2778 A
Q241Φ	13.4 A	2547 A	15.3 A	2793 A	10.4 B	2199 B

Means in columns followed by the same letter are not significantly different. Sugar price $400.

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