

SRA Grower Group Innovation Project Final Report



Sugar Research
Australia

Research Funding Unit

SRA project number:	GGP046
SRA project title:	Investigate skip row configuration in sugar cane
Group name:	Blackburn Harvesting Group
Contact person(s): Name(s) Phone number Address Email address	Mr Lee Blackburn 1056 Marian Road, North Eton 4741 Ph. 49541525, Mob. 0405 140322 blacky@easynet.com.au
Due date for final report	1/7/2013

Sugar Research Australia Ltd
ABN 16 163 670 068

Head Office
50 Meiers Road
Indooroopilly QLD 4068
Australia

Postal Address
PO Box 86
Indooroopilly QLD 4068
Australia

Tel +61 7 3331 3333
Fax +61 7 3871 0383
Email sra@sugarresearch.com.au
Web sugarresearch.com.au

Executive Summary:

The aim of the project was to compare a double skip row sugarcane system with conventional solid plant on 1.8 m row spacing. Comparisons were made of productivity, profitability and water relationships. The skip row area was designated to grow crops which are usually cultivated over a traditional sugarcane fallow period. Ideally these skip area crops would provide break-crop soil health advantages but would also be harvested to contribute to income. One objective of this project was to evaluate different break crop alternatives to see which may be more suited to this situation. Results from this project show that the double skip row cane averaged about 70 % of the conventional cane yield, sugar yield and dollars returned per hectare. This excludes the data from the exceptionally wet 2010/11 summer which was in the wettest 5% of all years. Above-average rainfall years during the course of this trial negatively impacted on sugarcane and skip area crops. Only two skip row area crops were sown and that was to peanuts in August 2009 and November 2011. Again wet weather prevented harvest of these crops. The profitability of the double skip row system is under-estimated because costs were incurred to establish and manage the peanuts but no income was received. The group had hoped to evaluate soybean, sugar beet and possibly corn, but unfavourable seasons prevented this from happening.

Soil moisture comparisons between solid plant and skip were made using an Enviroscan. Particularly wet seasons complicated matters; for example, by producing a shallow water table at times during the summer. It was evident that the skip cane had a greater soil water resource to exploit. With regard to the skip's effect on runoff water quality, the site flooded several times each year which made it impossible to calculate total runoff, sediment, nutrient and herbicide load during the season. There was no clear and consistent evidence that the skip was any worse or better than the solid row configuration in terms of runoff water quality. However given that cane occupied approximately 50% of the area, it is logical to expect a major reduction in potential nutrient/herbicide losses (depending on skip crop inputs).

Significant harvesting savings are possible with the skip, as time required to harvest the crop was lower (at least 30% less) than the conventional row configuration. Farmers have commented that the skip may have a role in short rows which occur towards the corners of irregular-shaped blocks. The grower group recommends that this trial be continued into the next crop cycle to determine the skip area effect on cane production. The next cane crop will be planted into the old skip areas. A profile of soil biology in the skip versus cane areas will be determined before the next crop cycle. Currently, double skip row cane is not a commercially viable option for farmers.

Background:

A study tour to the grain industry, where skip row systems are utilised, inspired skip experimentation in the Australian sugar industry. Locally, John Hughes (QDAFF, Mackay) conducted one skip trial which highlighted the potential of this system to reduce inputs and yet produce 80% of the yield when compared to the current system. Our industry is facing increasing environmental scrutiny, and the skip system has the potential to greatly reduce

fertiliser & herbicide inputs. This saving in conjunction with improved harvesting efficiency also reduces costs of production. Skip row planting isn't a unique concept but it has not been thoroughly tested in the sugar industry. This trial aims to evaluate the system from a financial and environmental perspective.

Objectives:

This project aims to compare a double skip row system with the 'conventional' solid planting on a 1.8 m row spacing according to the following criteria:

- 1) productivity (tonnes cane & tonnes sugar per hectare)
- 2) gross margin
- 3) water relationships
- Plus
- 4) investigate different break crop options that are suitable in the skip row area

Methodology:

The trial site was selected due to its uniform soil type and the ability to apply irrigation with a centre pivot. The soil type is a duplex; sandy clay loam over a medium clay (Marian soil). Duplex soils represent approximately 28 % of the district. Under 'normal' seasons, the block does not suffer flooding. It has a 0.4% slope draining to the north. Variety Q208^(b) was selected because it's the best adapted cane for the district and low pachymetra levels exist in the soil (Q208^(b) has an intermediate pachymetra rating). The selection of peanuts as the break crop was determined due to its potentially attractive returns, legume benefits and harvesting equipment accessibility. 'Walter' variety of peanuts was selected because of suitable traits for our conditions and the possibility of it becoming commercial in the central region.

The cane and peanuts were planted in 2009 (Table 1).

Table 1 – Details regarding the establishment of the skip row trial on farm 3120, block 2-2

Details	sugarcane	skip crop
pre-plant cultivation	offset x 1, rip x 2 & hoe x 1	
planting date	15/08/2009	27/08/2009
variety	Q208	Peanut-Walter
planting rate	8.5 t/ha	175 kg/ha
planter type	billet, 400mm wide chute	Monsen direct drill
row configuration	1.8 m single	4 x 0.9 m rows per skip area

The trial incorporated two replications of the 1.8 m single row continuous plant (T3) and the 1.8 m double-skip row treatments (T5) (Figure 1). Both treatments received Six Easy Steps

(6ES) nutrient regime. Knockdown herbicides were mainly used for weed control in both treatments although occasional use of non-PS2 residuals did occur in some years. Within this trial were three other treatments which were part of another project and are not reported in this document.

A skip treatment consists of two cane rows on 1.8 m spacing followed by two missed rows which is the skip area planted to peanuts in 2009 (Figure 1). This configuration is repeated three times for each plot. Trial layout is shown in Figures 2 and 3.

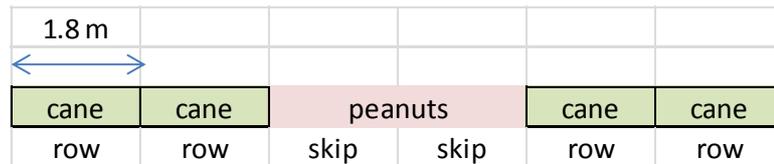


Figure 1 – Skip row treatment (T5) configuration

No skip area planting opportunity occurred in 2010 due to wet conditions. In November 2011 peanuts were again planted but wet weather caused their abandonment.

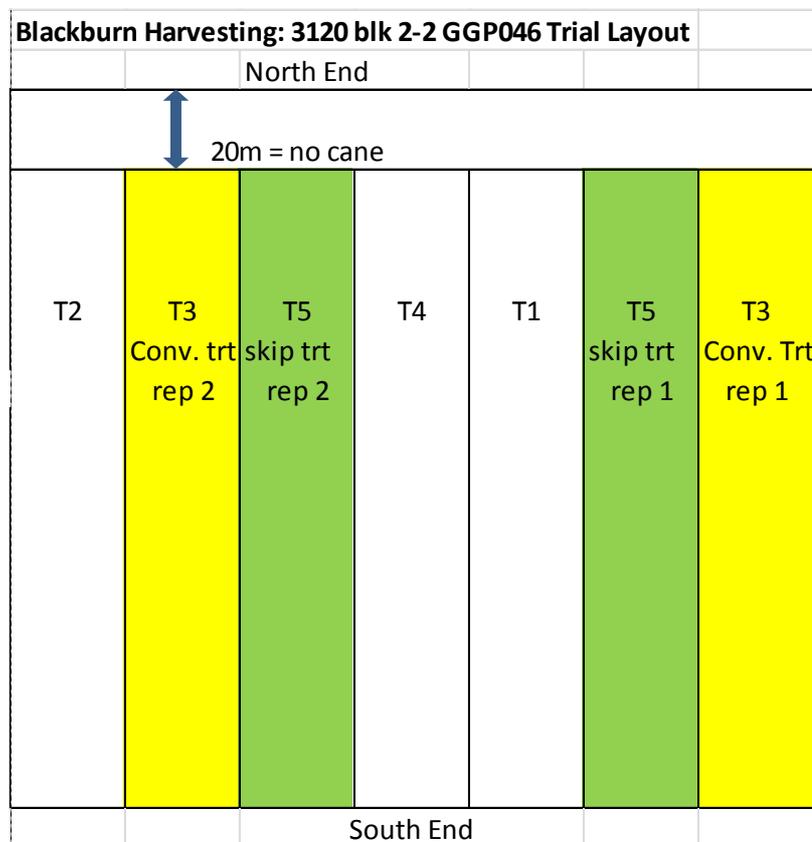


Figure 2 – Trial layout: note that only T5 (skip) and T3 (continuous) are part of this project



Figure 3 – Aerial image of the trial site clearly showing the two skip row treatment replicates

Water relationships were monitored in one of the replicates by DERM working in partnership with Reef Catchments as part of the Paddock to Reef project. The aim was to look at the effect of different management practices on water quality coming off the paddock. Runoff, sediment load, nitrogen, phosphorus and herbicides were monitored. Soil moisture was measured through time via Enviroscans placed in one skip replicate and one of the other 1.8 m single row treatments. Rainfall was also automatically recorded at the site. Irrigation was applied via a centre pivot as required during each season.

Harvesting was carried out each year using commercial equipment. Bin numbers were recorded from each plot and cane yield and PRS measured at the mill.

Results and Outputs:

Results from this project show that the double skip row cane averaged about 70 % of the conventional cane yield, sugar yield and dollars returned per hectare (Table 1). This excludes the data from the exceptionally wet 2010/11 summer which was in the wettest 5% of all

years. Above-average rainfall years during the course of this trial (Figure 4) negatively impacted on sugarcane and skip area crops.

Costs were incurred to grow the skip crop (e.g. \$400/ha spent in 2009/10 crop on the peanut crop establishment) but no skip crops were harvested during the life of the trial due to wet weather. The peanut yield was estimated at 2.7 t/ha in 2009/10 by a Farmacist consultant but this was never realised.

One positive observation regarding the skip treatment cane crop was the relatively short time required to commercially harvest. Using a stop watch during the 2012 harvest, it was determined that the time taken to harvest the skip treatment cane decreased by at least 30 % (i.e. on a same total area basis).

Table 1 – Production and net return from conventional single rows versus double skip

T3 1.8 m single rows	Plant 2010	1R 2011	2R 2012	3R 2013	4 Year Average
TC/ha	127.2	41	83	113	91.1
PRS	11.75	13.44	15.57	16.22	14.25
TS/ha	14.95	5.51	12.92	18.33	12.97
Net Return* (\$/ha)	2051	838	2586	3929	2351
T5 1.8 m double skip					
TC/ha	92.8	21.2	59	82	63.8
PRS	11.03	12.62	15.63	15.63	13.73
TS/ha	10.24	2.68	9.22	12.82	8.75
Net Return* (\$/ha)	1198	428	1666	3011	1576

* Costs exclude cultivation, irrigation, fertiliser other than nitrogen and fixed costs other than harvesting

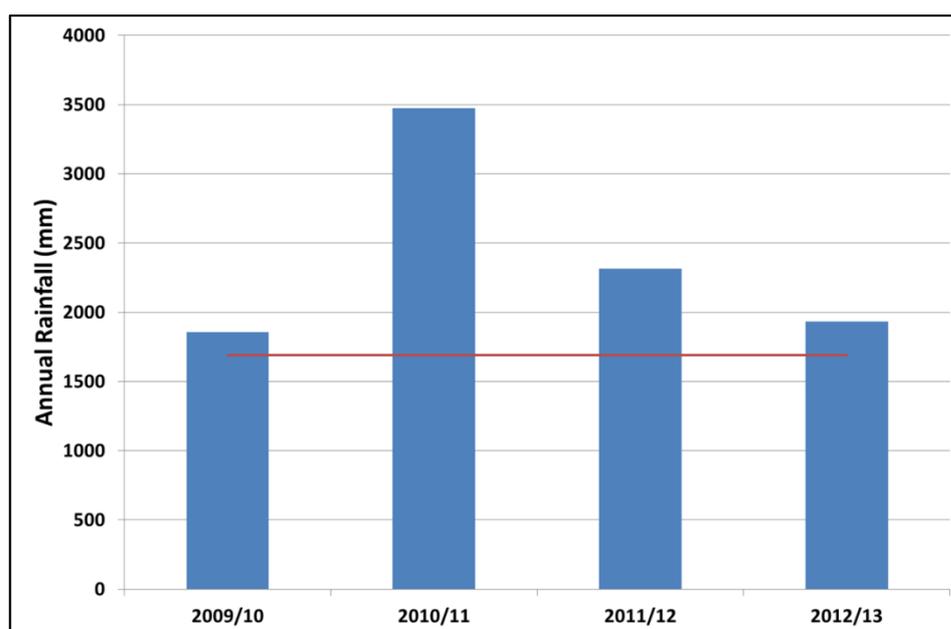


Figure 4 – Trial site annual rainfall (blue bars) and long-term average annual rainfall (red horizontal line)

The site flooded several times each year which made it impossible to calculate total runoff, sediment, nutrient and herbicide load during the season.

There was no clear and consistent evidence that the skip was any worse or better than the solid row configuration with respect to water quality of runoff. However given that cane occupied approximately 50% of the area, it's logical to expect a major reduction in potential nutrient/herbicide losses (depending on skip crop inputs).

With regard to water use comparisons between the two treatments, the particularly wet seasons complicated matters. For example, a shallow water table existed at times during the summer. Rainfall recorded at the site between 1/9/2010 and 30/4/2011 was 3243 mm which was in excess of the long term average of 1468 mm for this same period. It was evident that the skip cane had a greater soil resource to exploit and it never dried the soil out to the same extent as the solid 1.8 m treatment (Figure 5, T2). It's important to note that the skip area did not contain an active crop but did have weeds including nutgrass. After rainfall the skip treatment appeared to hold more moisture than the conventional (Figure 5).

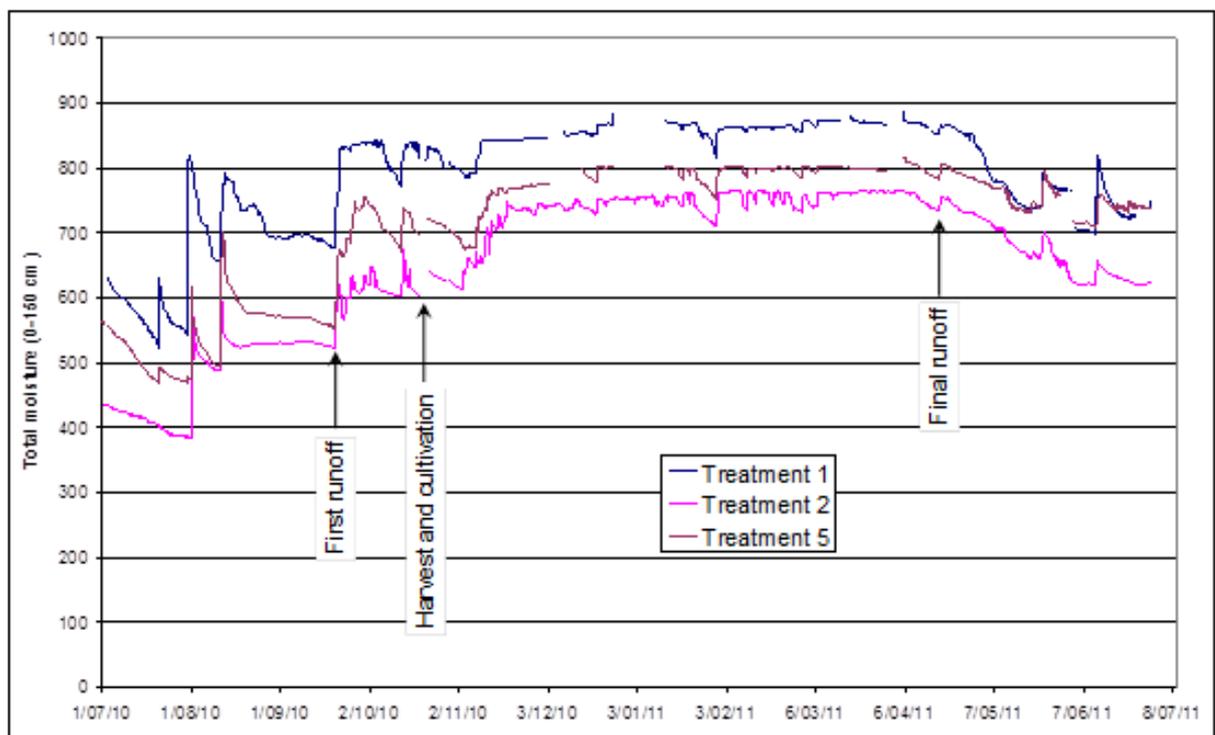


Figure 5 – Enviroscan output of total moisture in the soil profile (0-150 cm) for 2010/11. (Treatment 2 is 1.8 m single rows and Treatment 5 is double skip)

One of the objectives of this project was to evaluate different skip area crop options. Unfortunately the run of wet seasons hampered this goal, limiting planting opportunities. The group had planned to try soybean and corn but this never eventuated. The only crop planted was peanuts. In 2009/10 the peanuts got off to a good start and appeared to handle the situation (competition from adjacent cane rows) well. Peanuts are a high input and

expensive crop to grow and harvest. Growers wishing to experiment with double skip are better off planting soybean or possibly a short term legume pasture species (providing it does not pose an eradication problem at the end of the crop cycle).

Intellectual Property and Confidentiality:

Not applicable.

Capacity Building:

During the life of this project the group worked with a range of researchers (DERM, DAFF, BSES/SRA), extension officers (MAPS, Grower Group Services, DAFF), government representatives (SRDC, Reef Catchments) and private consultants (Farmacist). This interaction was useful to the group members because it exposed them to scientific reasoning, experimental procedures, a range of monitoring equipment, analysis and presentation of data, information sharing and public speaking. This experience has improved the group members' understanding of the correct methods of evaluation of different farming practices and treatments. Consequently, various new projects/trials have been established on farm (with collaboration from industry service providers) to investigate issues which are affecting the growth of sugarcane and its productivity/profitability in the region.

Environmental and Social Impacts:

From an environmental perspective, the double skip row treatment has the potential to reduce the amount of nutrient and pesticide loss from the sugarcane crop because it only occupies 50% of the normal area. Unfortunately, due to regular flooding of the bottom end of the trial (where flumes were located), little useful data was actually recorded. However, data collected from initial runoff events showed that the skip treatment was no better or worse than the conventional treatment in terms of water quality. It is important to note that the skip area crop inputs are also subject to potential off-site movement. Peanuts had fertiliser, herbicide and fungicides applied. Using a legume which can efficiently fix nitrogen eliminates or greatly reduces the need for inorganic nitrogen fertiliser input and hence reduces potential nitrogen loss. Regarding social impacts of the double skip treatment, it requires a decent level of skill to manage break crops in this system, particularly if they are taken to harvest. One significant benefit of the system is the speed of harvest, which obviously saves time, labour and costs.

Outcomes:

This project has demonstrated that the double skip system can provide approximately 70% of the yield and financial returns of a conventional 1.8 m solid plant. This is conservative because no return was provided by the skip area crop, even though costs of establishment had been incurred. Unfortunately the wetter-than-average seasons dominated the life of this trial. This prevented the group from investigating other skip area crop options.

Also, at this point in time we do not know what soil health benefits the skip areas will impart upon the next cane crop. If there is a yield increase, will it only be confined to the plant cane? Maybe the benefit could have been greater if we had been able to grow a skip area crop each year? The grower group recommends that this trial be continued into the next crop cycle to determine the skip area effect on cane production. A profile of soil biology in the skip versus cane areas will be determined before the next crop cycle.

Communication and Adoption of Outputs:

The following is a list of the field walks held at the trial site:

- BSES Extension Officers group tour: approximately 12 individuals
- Government ministers and industry leaders: The Hon Tony Burke MP (Federal Environment Minister), Ms Kirsten Livermore, Tim Mulherin & Kate Jones (State Environment Minister)
- 2011 ASSCT Agriculture Tour: approximately 70 people (farmers/industry personnel)
- Agricultural students from Papua New Guinea: 12 students
- Catalyst Growers & WWF: 45 growers and industry personnel associated with the Catalyst project and four people from WWF
- Brazilian Growers tour: 12 growers from Brazil
- RABO Bank managers tour: 5 Australian and some overseas managers
- Bonsucro group: approximately 12 attendees
- Proserpine farmers delegation: 10 growers looking to trial the skip concept

Other Communication Activities (Trial results and progress reported):

- * MAPS/SRA Trial Information Day (2011-2014): attended by most service providers in the Central District
- * MAPS grower shed meeting booklet: 600 copies produced and information presented to approximately 40 % of Mackay growers each year between 2011 and 2014
- * GIVE conference presentation in Innisfail 2014

SRDC/SRA has been acknowledged for their financial and technical input at field walks, presentations and in any printed documents.

As a result of trial learnings, two members in the project group have planted an area of skip rows on their farms. Large areas have not been planted because of concern over low production if very wet seasons are experienced. Members of OCPS (O'Connell Catchment Precision Services) farmer group in Proserpine have been experimenting with single skip row cane in recent history.

Recommendations:

The grower group has the following recommendations:

1. A profile of soil biology in the skip versus cane areas should be determined before the next crop cycle (i.e. soil sampling and identification and ratio of beneficial and negative organisms)
2. Continue the trial into the next crop cycle to determine the skip area effect on cane production. (cane to be planted into the skip areas)
3. Encourage other growers to trial the system (including the collection of agronomic, productivity and financial data) on a small scale in short rows that are found towards the corners of irregular-shaped blocks. Currently it is not a sound economic recommendation to promote the double skip row system as a commercial option for growers.

Acknowledgements:

We are grateful to SRDC (now SRA) & Grower Group Services for financial and technical support. We also thank the following people and organisations for their assistance: John Hughes (QDAFF), John Agnew (MAPS), Ken Rohde (QDAFF) and Reef Catchments.

Photos:

1. Peanuts planted in the double skip row area (2009)



2. Harvesting cane in the double skip row treatment



3. A flume in front of the skip row treatment: Flooding of the site meant measuring water quality was difficult!



4. Bonsucro field visit



5. Industry representatives and Minister for Environment Kate Jones visit trial site.

