**BUREAU OF SUGAR EXPERIMENT STATIONS**

**QUEENSLAND, AUSTRALIA**

# FINAL REPORT – SRDC PROJECT BS63S

# FARMING SYSTEMS FOR GREEN CANE TRASH BLANKETS IN COOL WET CONDITIONS

**by**

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**SD98010**

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**SUMMARY**

The three year project to evaluate different farming systems for green cane trash blanketing in cool wet conditions was directed at:

- Evaluating the effect of different trash management practices on crop growth.
- Evaluating improved drainage as a means of reducing any negative effect of trash blanketing.

Trials were established at Childers and Rocky Point on relatively poorly drained soil types to compare full trash blanketing with trash raking off the cane row and bare cultivation; and, to determine any benefits from hilling-up or mole drainage in trash blanketed blocks. The trial sites were land planed at Rocky Point to improve surface drainage but this was not possible at Childers. The Rocky Point sites were dryland and the Childers sites received supplementary irrigation.

In the trash management trials early crop shoot counts were restricted by trash blanketing with raking of trash giving intermediate shoot counts between bare cultivation and trash blanketing. For later harvests (September and October) there was little reduction in early shoot counts. In all crops at Rocky Point and two of the three ratoons at Childers final stalk counts were similar in all trash management treatments.

Canopy measurements in the first ratoon crop at Childers and first and second ratoon crops at Rocky Point showed similar canopy development in all trash management treatments at 90-175 days after harvest. In the second ratoon crop at Rocky Point there was a significant variety x treatment interaction in canopy development with Q141 performing best under a full trash blanket.

Trash cover after harvest in the two trash management trials was found to range from 5.4 to 11.1 t dry matter/ha, depending on crop size. Smaller crops were found to produce insufficient cover to suppress weed growth.

There was no significant effect of trash retention after harvest on soil organic matter levels or other soil parameters over the term of the two trash management trials. However, there was a significant increase in soil bulk density in trash blanketed plots on the solodic soil at Childers, but not the heavy cracking clay at Rocky Point.

Soil temperature measurements under the trash blanket early in ratoon growth confirmed a depression in soil temperature of approximately 1°C at Childers and 2-3.5°C at Rocky Point compared to bare cultivation. Where trash was raked off the stool there was no depression in temperatures. The early depression in soil temperatures explains the slower ratooning in the trash blanketed plots. As the crop canopy developed the temperature differential decreased until there was no effect of trash at full canopy.

Soil moisture levels in the row followed the order trash blanket = trash raked > bare cultivated; while in the interspace the order was trash raked > trash blanket > bare cultivated.

Yields at Childers under a supplementary irrigation regime followed the order trash blanket > raked > burnt cultivated except for the first ratoon crop where bare cultivation gave the highest yield. In the Rocky Point trial which was unirrigated yields followed the order trash blanket > raked > burnt cultivated in all ratoon crops despite a range of effective rainfall levels in the different ratoon crops. This indicates that trash blanketing alone did not depress yields at these sites despite an early depression in shoot growth. Raking of trash from the cane row did not give any final yield benefit. Since all treatments were cut green, in practice higher cane losses with green cane harvesting may negate at least some of the yield benefits from better soil moisture levels under the trash blanket compared to a burnt cane harvest with cultivation.

Also during the course of these trials while two of the three harvests were early season at Childers (June) and one of three harvests at Rocky Point there was no waterlogging after harvest and this may have favoured the trash blanket treatments.

In the drainage treatment x variety trials there was evidence of lower soil moisture levels in the cane row with hilling up compared to flat culture and this was reflected in a small but non-significant yield benefit at both Rocky Point and Childers. Similarly, there was a small but not significant benefit from mole drainage at Childers in the first ratoon crop.

Despite these small effects the trials provided no clear evidence of benefits from improved drainage in trash blanketed blocks under the trial conditions. This may have been due to relatively dry conditions and the absence of severe waterlogging in both trials.

## 1.0 BACKGROUND

Burning of sugarcane prior to harvest is traditional in the Australian sugar industry. In the last 15 years green cane harvesting has expanded to reach 75% in north Queensland and 34% in Queensland in 1990. In 1990 south Queensland was harvesting only 17.5% of the crop green. Green cane harvesting has several advantages over the traditional practices. These include more flexibility in harvest time if wet weather intervenes, improved soil moisture storage in the early crop growth stages after harvest, reduced soil erosion due to the protection from the trash blanket, and excellent weed control.

Green cane harvesting does not suit all environments. Growers have experimented with the practice in south Queensland and have been successful in mid to late season harvests on well drained soils. It has been less successful following early season harvests when conditions are usually cold and occasionally wet following harvest, or in poorly drained soil types.

The unsuitability of some current varieties for green cane trash blanketing in cool wet conditions is an important issue. It will be more important if burning of cane in urban areas, such as around Nambour and Rocky Point, becomes an environmental issue in the community. Practices to enable green cane harvesting on all soil types will be required to maintain viability of mills located in or close to urban areas.

This project aims to identify agronomic practices and cane varieties, which will enhance green cane trash blanket performance in cool wet conditions.

## 2.0 OBJECTIVES

- To determine the factors which affect ratooning under green cane trash blankets in cool wet conditions in south Queensland.
- To identify and demonstrate the cultural practices which minimise these factors.
- To extend the adoption of green cane harvesting in areas where this practice is considered appropriate.

## 3.0 METHODOLOGY

In meeting the first objective the following factors were investigated as potential limitations to ratooning: soil moisture, soil temperature and cane variety. Hilling-up, raking of trash from the cane row, mole drainage or ripping and land planing were investigated as potential practices for improving ratooning under trash blanketing.

### 3.1 Trash management x variety

Two trials were established at Childers and Rocky Point, respectively, to evaluate the impact of trash management practices on ratooning and yield of selected major varieties. Both trials were located on poorly drained soil – a solodic at Childers and a gilgaed acid clay at Rocky Point. The trials were established in spring 1991 and following harvest of the plant crop three trash management practices were established: burnt cane cultivation, green cane trash blanket with trash raked off the cane row, and an undisturbed trash blanket. All treatments were harvested green and in the burnt cane cultivated plots trash was subsequently raked around the edges and burnt (Figure 1). Varieties for the respective locations are given in Table 1.

**Figure 1 – Establishment of trash blanket treatments at Rocky Point**

**TABLE 1**
**Varieties planted at Childers and Rocky Point in trash management trial**

| Childers | Rocky Point |
|---|---|
| CP51-21 | CP44-101 |
| Q137 | Q110 |
| Q141 | Q116 |
| Q146 | Q141 |

At the Rocky Point site all treatments were hilled-up in the plant crop.

Trash management treatments were applied after harvest of the plant crop and continued through to harvest of the third ratoon crop. Dataloggers were installed to record soil temperature at 150 mm with thermistors and soil moisture at 150 and 450 mm using gypsum blocks. Neutron probe tubes were also installed in the Rocky Point trial.

Third leaf samples were taken each year in April for comparison of nitrogen uptake between treatments. Progressive stalk counts were recorded for each ratoon crop in the three treatments. Trash weights were also recorded for each cane variety. Canopy development was measured in the first and second ratoon crop at Rocky Point. Yields and ccs were determined at each ratoon harvest. Harvest and planting dates for the trash management and drainage trials are given in Table 2.

**TABLE 2**
**Planting and harvest dates for trials at Childers and Rocky Point**

| Crop Class | Trash management trials | | Drainage trials | |
|---|---|---|---|---|
| | Childers | Rocky Point | Childers | Rocky Point |
| Planting | 17-18/9/91 | 11/91 | 17-18/9/91 | 13-14/8/92 |
| P harvest | 7/10/92 | 14/9/92 | 7/10/92 | 5-8/10/93 |
| 1R harvest | 22-23/7/93 | 5-8/10/93 | 22-23/7/93 | 25/7/94 |
| 2R harvest | 7-8/7/94 | 25/7/94 | 7-8/7/94 | 23-26/10/95 |
| 3R harvest | 5-6/7/95 | 23-26/10/95 | 5-6/7/95 | |

After the final harvest soil samples were taken from 0-100 mm and 100-250 mm in each treatment for full chemical analysis and measurement of bulk density.

### 3.2 Drainage treatments x variety

A further two trials were established at Childers and Rocky Point in 1991 and 1992, respectively, to determine the effect of drainage treatments on ratooning and yield of selected major varieties. Varieties were as indicated in Table 1 with the exception of Q125 replacing Q110 in the Rocky Point trial.

Treatments included hilling-up with and without mole drainage or ripping and normal filling in of the cane row with or without mole drainage or ripping. The Rocky Point trial was land planed prior to planting and mole drains were drawn from an open drain at the lower end of the trial block. A subsurface cross-drain was installed in the Childers block

to intercept the mole drains with the underground pipe leading to a drainage sump. After the first ratoon crop mole drainage was supplemented by deep ripping in both trials using parabolic tines.

Soil moistures were recorded on the Childers trial using neutron probe tubes and in the Rocky Point trial using a datalogger and gypsum blocks installed at 150 and 450 mm depths.

Yields and ccs were recorded at harvest for first, second and third ratoon crops at Childers and first and second ratoon crops at Rocky Point.

## 4.0 RESULTS AND DISCUSSION

### 4.1 Trash management x variety

#### 4.1.1 Growth monitoring – stalk counts

Progressive stalk counts for Childers and Rocky Point over the course of the trials are summarised in Tables 3 and 4, respectively.

**TABLE 3**
**Stalk counts for Childers trial in first, second and third ratoon crops for three trash management options versus days after harvest**

| | Stalks/$m^2$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ratoon** | **1R** | | **2R** | | | | **3R** | | | | |
| **Days** | **55** | **89** | **39** | **52** | **95** | **143** | **49** | **67** | **80** | **102** | **279** |
| Treatment* | | | | | | | | | | | |
| 1 | 9.3 | 13.6 | 7.1 | 8.3 | 10.2 | 11.0 | 5.2 | 5.4 | 6.4 | 9.0 | 5.3 |
| 2 | 10.2 | 13.5 | 6.8 | 8.6 | 10.5 | 11.3 | 3.8 | 5.6 | 6.3 | 9.4 | 6.5 |
| 3 | 9.5 | 12.9 | 4.2 | 5.1 | 7.5 | 8.8 | 2.5 | 3.5 | 4.5 | 6.0 | 6.7 |
| lsd 5% | 0.5 | 0.7 | 1.0 | 0.8 | 1.9 | 3.2 | 1.0 | 1.2 | 1.4 | 1.6 | 0.6 |
| | | | | | | | | | | | |
| Variety** | | | | | | | | | | | |
| 1 | 9.7 | 12.8 | 4.4 | - | 8.6 | 10.1 | 4.1 | 4.5 | 5.9 | 9.2 | 6.4 |
| 2 | 10.1 | 14.1 | 6.7 | - | 7.3 | 8.7 | 2.8 | 2.2 | 2.3 | 2.9 | 3.2 |
| 3 | 9.0 | 13.1 | 6.5 | - | 12.3 | 11.3 | 3.3 | 5.2 | 6.1 | 9.5 | 7.6 |
| 4 | 9.9 | 13.3 | 6.6 | - | 9.6 | 11.2 | 5.2 | 7.3 | 8.7 | 11.0 | 7.7 |
| lsd 5% | 0.6 | 0.8 | 1.7 | - | 1.6 | 1.9 | 0.9 | 0.8 | 1.4 | 1.1 | 1.2 |

* Treatment 1 = bare cultivated
Treatment 2 = trash raked off row
Treatment 3 = full trash blanket

** Variety 1 = CP51-21
Variety 2 = Q137
Variety 3 = Q141
Variety 4 = Q146

In the Childers trial early shoot counts were significantly higher in the burnt and raked plots than in the full trash blanket in two of the three ratoon crops. The exception was the first ratoon crop where the previous plant crop was harvested approximately 3 months later than the first and second ratoons. In two of the three years the trash blanket plots had

caught up to the burnt and raked plots at the time of the final count. There was no significant variety x treatment interaction in any year but Q137 reacted badly to the early harvest in 1994 and produced very low stalk numbers in all treatments.

The Rocky Point trial showed similar trends to the Childers trial with little early depression in shoot counts for late harvests (September and October) before first and second ratoon crops; and a significant depression in shoot counts after a July harvest prior to the third ratoon crop. In all ratoons the trash blanket counts were similar to burnt and raked treatments at the last shoot count. There was no significant variety x treatment interaction in the Rocky Point trial and the variety Q110 produced the highest shoot counts throughout the trial.

**TABLE 4**
**Stalk counts for Rocky Point trial in first, second and third ratoon crops for three trash management options versus days after harvest**

| | Stalks/$m^2$ | | | | | | |
|---|---|---|---|---|---|---|---|
| **Ratoon** | **1R** | | **2R** | | **3R** | | |
| **Days** | **45** | **116** | **68** | **124** | **46** | **66** | **177** |
| Treatment* | | | | | | | |
| 1 | 12.2 | 15.6 | 16.7 | 15.8 | 6.0 | 7.3 | 13.4 |
| 2 | 11.9 | 16.3 | 17.4 | 16.6 | 5.2 | 7.2 | 15.4 |
| 3 | 10.9 | 17.1 | 16.7 | 16.5 | 1.5 | 3.2 | 14.6 |
| lsd 5% | 0.5 | 1.0 | 1.9 | 0.8 | 0.7 | 0.7 | 0.7 |
| | | | | | | | |
| Variety** | | | | | | | |
| 1 | 12.0 | 16.4 | 15.5 | 14.5 | 4.2 | 5.9 | 11.9 |
| 2 | 14.9 | 17.5 | 20.7 | 19.3 | 4.4 | 6.9 | 17.6 |
| 3 | 9.4 | 16.2 | 15.8 | 15.5 | 5.7 | 6.8 | 16.7 |
| 4 | 10.3 | 15.3 | 15.7 | 15.9 | 2.6 | 4.1 | 11.9 |
| lsd 5% | 0.9 | 1.1 | 0.8 | 0.8 | 0.7 | 0.6 | 1.1 |

* Treatment 1 = bare cultivated
Treatment 2 = trash raked off row
Treatment 3 = full trash blanket

** Variety 1 = CP44-101
Variety 2 = Q110
Variety 3 = Q116
Variety 4 = Q141

The pattern of higher early shoot counts following raking of trash off the cane row or burning of the trash blanket in these trials is similar to that found in early trials conducted in north Queensland (Ridge *et al.*, 1979). In these trials also shoot counts were similar later in crop development and there was no effect of trash blanketing on final yield.

### 4.1.2 Growth monitoring – canopy development

Canopy development was estimated in the first ratoon crop only at Childers and in both first and second ratoons at Rocky Point by measuring light interception by the canopy using a linear sensor.

Results of canopy measurements for Childers and Rocky Point are given in Tables 5, 6 and 7, respectively.

**TABLE 5**
**Canopy closure % in first ratoon crop at Childers after 90 days for varieties and trash blanket treatments**

| Variety | Treatment | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | Mean |
| CP51-21 | 59.4 | 62.4 | 59.1 | 60.3 |
| Q137 | 68.6 | 69.9 | 66.6 | 68.4 |
| Q141 | 56.3 | 53.8 | 61.9 | 57.3 |
| Q146 | 66.5 | 69.5 | 71.8 | 69.3 |
| **Mean** | **62.7** | **63.9** | **64.9** | |

**TABLE 6**
**Canopy closure % in first and second ratoon crops at Rocky Point for different trash blanket treatments**

| Time | Treatment | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| First Ratoon | | | |
| 112 days | 69.6 | 70.1 | 69.9 |
| 175 days | 80.9 | 82.2 | 83.7 |
| Second Ratoon | | | |
| 138 days | 75.8 | 76.7 | 79.1 |

**TABLE 7**
**Variety canopy development in first and second ratoon crops at Rocky Point**

| Time | Variety | | | |
|---|---|---|---|---|
| | CP44-101 | Q110 | Q116 | Q141 |
| First ratoon | | | | |
| 112 days | 74.3 | 67.2 | 72.7 | 65.2 |
| 175 days | 85.1 | 78.6 | 79.6 | 85.8 |
| Second ratoon | | | | |
| 138 days | 90.9 | 79.2 | 73.7 | 65.1 |

Canopy development at both sites showed no significant treatment effects although the general order was trash blanket > trash raked > trash burnt. There were no significant varietal effects in the first ratoon crop but in the second ratoon at Rocky Point there were significant differences between varieties following the order CP44-101 > Q110 > Q116 >

Q141. There was also a significant variety x treatment effect with Q141 performing best under trash blanketing.

### 4.1.3 Trash cover measurements

Trash blanket measurements were carried out after harvest of the second ratoon crop in 1994 at both sites. Trash weights in relation to variety and crop size are given in Table 8.

**TABLE 8**
**Trash blanket weights for different varieties and crop sizes at Rocky Point and Childers**

| Crop size t/ha | Variety | Fresh weight t/ha | Dry weight t/ha |
|---|---|---|---|
| 116.8 | Q141 | 15.8 | 11.1 |
| 108.8 | Q116 | 14.6 | 10.2 |
| 98.8 | Q110 | 15.2 | 10.6 |
| 91.7 | CP44-101 | 12.3 | 8.6 |
| 64.2 | Q141 | 9.6 | 6.3 |
| 47.6 | CP51-21 | 8.3 | 6.1 |
| 47.0 | Q146 | 11.3 | 7.8 |
| 38.5 | Q137 | 8.0 | 5.4 |

Trash cover was broadly related to crop size and this has implications for successful trash blanket management. Smaller crops are less likely to provide an effective ground cover for weed control and excessive cover from large crops may restrict ratoon growth.

### 4.1.4 Third leaf nitrogen levels

The third leaf nitrogen figures are relatively low for Childers in both crops sampled and are low for the first ratoon at Rocky Point. There were no significant treatment effects on nitrogen levels except for the third ratoon at Rocky Point where trash blanket levels were significantly lower than for the burnt cane treatment. In general the third leaf analyses suggest that effective nitrogen uptake was below optimum in all crops except the third ratoon at Rocky Point and this may have been due to some losses with fertiliser placed by stool splitting.

**TABLE 9**
**Third leaf nitrogen levels at Childers and Rocky Point in first and third ratoon crops in 1993 and 1995**

| | Third leaf N% | | | |
|---|---|---|---|---|
| | Childers | | Rocky Point | |
| | 1R | 3R | 1R | 3R |
| **Treatment** | | | | |
| 1 | 1.58 | 1.35 | 1.47 | 1.98 |
| 2 | 1.56 | 1.31 | 1.49 | 1.93 |
| 3 | 1.59 | 1.36 | 1.49 | 1.90 |
| **Variety** | | | | |
| 1 | 1.68 | 1.29 | 1.45 | 1.92 |
| 2 | 1.57 | 1.49 | 1.53 | 2.00 |
| 3 | 1.50 | 1.37 | 1.49 | 1.85 |
| 4 | 1.56 | 1.21 | 1.46 | 1.99 |

### 4.1.5 Final soil analyses

Final soil analysis values for the different trash blanket treatments are given in Table 10. These indicate generally higher analyses for the surface 0-100 mm compared to the 100-250 mm zone but no consistent trend in any characteristic corresponding to trash blanket treatments. This is most notable for organic carbon analysis which were expected to be higher in the trash blanket treatments. The reason for the lack of build up of organic matter levels under trash blanketing is uncertain. While the trash blanket did not break down completely in any one year it was expected that some residue would have accumulated over the three ratoon crops.

### 4.1.6 Final soil bulk density

Final soil bulk density figures for the centre of the interspace in the blanket management treatments are summarised in Table 11.

At Childers in the solodic soil bulk density of both the 0-100 mm and 100-250 mm layers was significantly higher in the trash raked and trash blanket treatments than in the burnt cultivated treatment. There was no difference between treatments at Rocky Point on a heavy cracking clay soil.

**TABLE 10**
**Final soil chemical analysis for Childers and Rocky Point trials for different trash management practices and sampling depths**

| Trial/ treatment | Org C% | Total N% | $NH_4$-N mg/kg | pH | Ca me% | Mg me% | P mg\kg | S mg/kg |
|---|---|---|---|---|---|---|---|---|
| **Childers** | | | | | | | | |
| T1 | 1.00 | 0.053 | 0.55 | 6.16 | 3.55 | 1.24 | 81.7 | 5.69 |
| T2 | 1.17 | 0.058 | 1.03 | 6.04 | 3.43 | 1.36 | 72.6 | 9.44 |
| T3 | 0.95 | 0.046 | 0.71 | 6.11 | 3.48 | 1.12 | 83.9 | 5.94 |
| lsd 5% | 0.09 | 0.006 | 0.67 | 0.09 | 0.37 | 0.13 | 6.7 | 1.71 |
| D1 | 1.20 | 0.060 | 1.16 | 6.15 | 4.04 | 1.53 | 85.1 | 5.46 |
| D2 | 0.88 | 0.045 | 0.37 | 6.06 | 2.93 | 0.95 | 73.7 | 8.58 |
| lsd 5% | 0.07 | 0.005 | 0.55 | 0.08 | 0.30 | 0.10 | 5.4 | 1.40 |
| **Rocky Point** | | | | | | | | |
| T1 | 3.42 | 0.288 | 9.52 | 5.19 | 4.64 | 6.53 | 82.9 | 65.5 |
| T2 | 3.06 | 0.256 | 8.06 | 5.41 | 5.51 | 7.00 | 63.2 | 36.3 |
| T3 | 3.15 | 0.281 | 10.56 | 5.33 | 4.83 | 6.90 | 72.3 | 39.8 |
| lsd 5% | 0.27 | 0.014 | 2.00 | 0.10 | 0.22 | 0.21 | 13.5 | 16.1 |
| D1 | 3.63 | 0.298 | 10.86 | 5.38 | 5.30 | 6.69 | 89.9 | 42.7 |
| D2 | 2.78 | 0.252 | 7.89 | 5.24 | 4.69 | 6.93 | 55.7 | 51.7 |
| lsd 5% | 0.22 | 0.011 | 1.64 | 0.09 | 0.18 | 0.17 | 11.0 | 13.1 |

**TABLE 11**
**Final soil bulk densities for the centre of the interspace in the three treatments at Childers and Rocky Point**

| Treatment | Bulk density $t/m^3$ | |
|---|---|---|
| | 0-100 mm | 100-250 mm |
| **Childers** | | |
| T1 | 1.50 | 1.66 |
| T2 | 1.65 | 1.76 |
| T3 | 1.57 | 1.73 |
| **Rocky Point** | | |
| T1 | 1.11 | 1.42 |
| T2 | 1.02 | 1.43 |
| T3 | 1.12 | 1.35 |

### 4.1.7 Soil temperatures

Soil temperature measurements at both sites indicate a depression in soil temperature at 150 mm early in crop growth under a full trash blanket compared to raking or burning of trash. In September 1994 this was approximately 1°C at Childers (Figure 2) and 2-3.5°C at Rocky Point (Figure 3). Diurnal fluctuations in temperature at Childers and Rocky Point are shown in Figures 4 and 5, respectively. These show much larger daily fluctuations in bare and raked plots than under the full trash blanket. Fluctuations were also greater at Childers than at Rocky Point. In April 1994 there was little difference in

daily average temperatures between trash management treatments at Rocky Point (Figure 6) and a small diurnal fluctuation in soil temperatures (Figure 7).

The depressed temperatures early explain the slower early growth in trash blanket plots compared to raked and bare cultivated plots and similar temperatures for all treatments later mean that trash blanket plots recover from the early setback.

### 4.1.8 Soil moisture

Estimates of effective rainfall for Childers and Rocky Point during the trial period are given in Tables 12 and 13, respectively. Estimated irrigation for the Childers site is also given in Table 12.

**TABLE 12**
**Effective rainfall and irrigation at Childers for 1R, 2R and 3R crops in 1992/1993, 1993/1994 and 1994/1995**

| Year | Crop | Effective rainfall (mm) | Irrigation (mm) | Age of crop at harvest |
|---|---|---|---|---|
| 1992/1993 | 1R | 579.0 | 400 | 9.5 months |
| 1993/1994 | 2R | 862.9 | 250 | 11.5 months |
| 1994/1995 | 3R | 572.6 | 350 | 12.0 months |

**TABLE 13**
**Effective rainfall at Rocky Point for 1R, 2R and 3R crops in 1992/1993, 1993/1994 and 1994/1995**

| Year | Crop | Effective rainfall (mm) | Age of crop at harvest |
|---|---|---|---|
| 1992/1993 | 1R | 875.4 | 12.5 months |
| 1993/1994 | 2R | 717.0 | 9.5 months |
| 1994/1995 | 3R | 565.8 | 15.0 months |

* 1993/1994 better rainfall distribution in the peak growing period December-March inclusive

Neutron probe readings in the Rocky Point trash management trial and datalogger readings in the Childers trash management trial showed the following trends:

- In row soil moistures followed the order trash blanket = trash raked > bare cultivated
- Interspace soil moistures followed the order trash raked > trash blanket > bare cultivated

The interval between reading dates was too long to obtain an estimate of available soil moisture in the different treatments.

### 4.1.9 Harvest yields

Harvest yields for the first to third ratoon crops at Childers and Rocky Point are summarised in Tables 14 and 15.

**TABLE 14**
**Cane yield, ccs and sugar yield for Childers trial in first, second and third ratoon crops**

| | Cane yield t/ha | | | | CCS | | | | Sugar yield t/ha | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1R | 2R | 3R | Mean | 1R | 2R | 3R | Mean | 1R | 2R | 3R | Mean |
| **T'ment*** | | | | | | | | | | | | |
| 1 | 92.3 | 53.3 | 54.7 | 66.8 | 15.10 | 15.72 | 13.28 | 14.78 | 13.90 | 8.40 | 7.31 | 9.87 |
| 2 | 86.3 | 61.8 | 56.2 | 68.1 | 15.11 | 15.48 | 12.86 | 14.65 | 13.02 | 9.62 | 7.29 | 9.98 |
| 3 | 89.5 | 64.6 | 64.9 | 73.0 | 15.07 | 15.37 | 13.49 | 14.72 | 13.45 | 9.97 | 8.81 | 10.74 |
| lsd 5% | 2.7 | 5.9 | 6.7 | | 0.23 | 0.50 | 0.68 | | 0.46 | 0.92 | 0.99 | |
| **Variety **** | | | | | | | | | | | | |
| 1 | 76.3 | 57.7 | 55.6 | 63.2 | 15.69 | 15.80 | 13.95 | 15.22 | 11.96 | 9.13 | 7.76 | 9.62 |
| 2 | 91.7 | 46.7 | 31.4 | 56.6 | 14.26 | 14.66 | 12.27 | 13.99 | 13.09 | 6.86 | 3.81 | 7.92 |
| 3 | 95.6 | 78.1 | 77.9 | 83.9 | 15.43 | 15.76 | 13.41 | 14.90 | 14.75 | 12.28 | 10.46 | 12.50 |
| 4 | 93.7 | 57.1 | 69.5 | 73.4 | 14.99 | 15.86 | 13.21 | 14.64 | 14.03 | 9.05 | 9.18 | 10.75 |
| lsd 5% | 6.3 | 8.1 | 9.2 | | 0.25 | 0.68 | 1.20 | | 1.04 | 1.27 | 1.35 | |

* Treatment 1 = burnt, cultivated
Treatment 2 = trash raked off row
Treatment 3 = trash blanket

** Variety 1 = CP51-21
Variety 2 = Q137
Variety 3 = Q141
Variety 4 = Q146

**TABLE 15**
**Cane yield, ccs and sugar yield for the Rocky Point trial in first, second and third ratoon crops**

| | Cane yield t/ha | | | | CCS | | | | Sugar yield t/ha | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1R | 2R | 3R | Mean | 1R | 2R | 3R | Mean | 1R | 2R | 3R | Mean |
| **T'ment *** | | | | | | | | | | | | |
| 1 | 72.0 | 98.9 | 50.7 | 73.9 | 13.36 | 8.96 | 13.69 | 11.43 | 9.62 | 8.84 | 6.89 | 8.45 |
| 2 | 79.6 | 106.3 | 52.2 | 79.4 | 13.45 | 8.89 | 13.82 | 11.50 | 10.72 | 9.45 | 7.22 | 9.13 |
| 3 | 87.6 | 106.9 | 56.0 | 83.5 | 13.27 | 8.78 | 13.60 | 11.44 | 11.64 | 9.40 | 7.60 | 9.55 |
| lsd 5% | 1.7 | 4.9 | 2.0 | | 0.39 | 0.47 | 0.32 | | 0.41 | 0.65 | 0.31 | |
| **Variety **** | | | | | | | | | | | | |
| 1 | 76.1 | 91.7 | 52.6 | 73.5 | 13.31 | 8.68 | 13.92 | 11.51 | 10.11 | 7.96 | 7.32 | 8.46 |
| 2 | 84.0 | 98.8 | 51.6 | 78.1 | 12.78 | 9.47 | 13.34 | 11.54 | 10.76 | 9.38 | 6.88 | 9.01 |
| 3 | 79.3 | 108.8 | 57.2 | 81.8 | 12.91 | 8.12 | 12.64 | 10.72 | 10.26 | 8.80 | 7.24 | 8.77 |
| 4 | 79.6 | 116.8 | 50.3 | 82.2 | 14.45 | 9.24 | 14.91 | 12.07 | 11.50 | 10.77 | 7.49 | 9.92 |
| lsd 5% | 2.3 | 5.6 | 3.0 | | 0.66 | 0.64 | 0.43 | | 0.57 | 0.86 | 0.35 | |

* Treatment 1 = burnt, cultivated
Treatment 2 = trash raked off row
Treatment 3 = trash blanket

** Variety 1 = CP44-101
Variety 2 = Q110
Variety 3 = Q116
Variety 4 = Q141

Yields at Childers generally followed the order trash blanket > raked > burnt cultivated except in the first ratoon crop where the burnt cultivated yield was highest. The full trash blanket plots gave significantly higher yields than the burnt cultivated plots in both the second and third ratoon crops. A similar trend was evident in sugar yields. These results were obtained despite a moderate level of supplementary irrigation and the relatively high effective rainfall in the second ratoon crop. Yields overall suffered from the relatively poor drainage at this site. There was no interaction between variety and treatment in any year and no apparent advantage from trash raking despite higher initial shoot counts.

At Rocky Point yields showed a consistent trend over first to third ratoon crops in the order trash blanket > raked > burnt cultivated. Differences reached significance between trash blanketing and burnt cultivation in all three crops despite harvest of the second ratoon crop in July. The yield advantage occurred over a range of soil moisture conditions from relatively wet in the first crop to extremely dry in the third ratoon crop.

Since all treatments were cut green, in practice some of this difference may be negated by additional cane loss with green cane harvesting compared to burnt cane harvesting.

There was a significant variety x treatment interaction for cane yield, ccs and sugar yield in the third ratoon crop. The variety x treatment interaction was close to statistical significance in the first ratoon crop.

Q141 clearly produced the highest sugar yields at both sites and performed well with a full trash blanket.

The good yield performance of the full trash blanketed plots at both sites despite June harvesting in two of three years at Childers and one of three years at Rocky Point may have been due to the lack of waterlogging after harvest and in a wet year there may be some suppression of growth.

## 4.2 Drainage treatments x variety

### 4.2.1 Soil moistures

Monitoring of soil moistures in the drainage trial at Rocky Point at depths of 150 mm and 450 mm using gypsum blocks showed no significant effect of mole drains in reducing soil moisture levels, but a significant effect of hilling-up on the differential between moistures in the row and interspace (Table 16).

**TABLE 16**
**Typical soil moisture tensions as indicated by gypsum blocks in the drainage trial at Rocky Point**

| Treatment | Soil moisture tension bars |
|---|---|
| Hilled (differential row/interspace) | 1.97 |
| Non-hilled (differential row/interspace) | 0.68 |
| Mole drained (mean for season) | 2.36 |
| No mole drains (mean for season) | 3.08 |

In the Childers drainage trial where soil moisture was monitored with a neutron probe there was no significant difference in moisture levels between mole drained and undrained plots or between hilled and non-hilled treatments.

### 4.2.2 Harvest yields

Harvest yields for the drainage trials at Childers and Rocky Point are summarised in Tables 17 and 18, respectively.

**TABLE 17**
**Cane yield, ccs and sugar yield for the Childers drainage trial in plant, first, second and third ratoon crops**

| | Cane yield t/ha | | | | | CCS | | | | Sugar yield t/ha | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | 1R | 2R | 3R | Mean | P | 1R | 2R | 3R | P | 1R | 2R | 3R | Mean |
| **T'ment *** | | | | | | | | | | | | | | |
| 1 | 57.0 | 75.6 | 53.3 | 56.6 | 60.6 | - | - | 16.19 | 12.28 | - | - | 8.56 | 7.08 | 7.82 |
| 2 | 56.0 | 80.2 | 58.0 | 56.2 | 62.6 | - | - | 15.76 | 12.11 | - | - | 9.08 | 6.94 | 8.01 |
| 3 | 64.7 | 75.8 | 45.0 | 59.8 | 61.3 | - | - | 16.11 | 12.28 | - | - | 7.20 | 7.44 | 7.32 |
| 4 | 68.0 | 78.9 | 48.4 | 55.6 | 62.7 | - | - | 16.02 | 12.56 | - | - | 7.65 | 7.14 | 7.40 |
| lsd 5% | | 9.2 | 7.8 | 13.6 | | | | 0.53 | 0.78 | | | 1.09 | 1.62 | |
| **Variety **** | | | | | | | | | | | | | | |
| 1 | 56.9 | 66.8 | 58.4 | 72.1 | 63.6 | - | - | 16.77 | 13.66 | - | - | 9.68 | 9.80 | 9.74 |
| 2 | 50.0 | 77.7 | 35.6 | 23.2 | 46.6 | - | - | 15.42 | 11.07 | - | - | 5.42 | 2.54 | 3.98 |
| 3 | 69.1 | 79.6 | 55.1 | 61.0 | 66.2 | - | - | 15.94 | 12.16 | - | - | 8.64 | 7.40 | 8.02 |
| 4 | 68.8 | 86.4 | 55.6 | 71.8 | 70.7 | - | - | 15.93 | 12.33 | - | - | 8.75 | 8.86 | 8.81 |
| lsd 5% | | 6.2 | 5.8 | 8.2 | | | | 0.40 | 0.75 | | | 0.89 | 1.01 | |

* Treatment 1 = moles
Treatment 2 = moles plus hilling
Treatment 3 = no moles
Treatment 4 = no moles plus hilling

** Variety 1 = CP51-21
Variety 2 = Q137
Variety 3 = Q141
Variety 4 = Q146

There were no large effects from the two drainage treatments, hilling-up and mole drainage at either site.

At Childers there was a significant benefit in cane and sugar yield from mole drainage in the second ratoon crop but no effect in the first and third ratoon. There was a small but non-significant cane yield benefit from hilling-up in the first and second ratoon crops of approximately 4 t/ha or 6%.

In the Rocky Point trial there was no apparent benefit from mole drainage but hilling up produced a small but non-significant cane and sugar yield benefit overall. This was approximately 4% and 2% respectively.

The lack of a clear response to drainage treatments in these trials may have been due to the absence of severe waterlogging, particularly early in the season when soil temperatures were less favourable for ratooning.

**TABLE 18**
**Cane yield, ccs and sugar yield for the Rocky Point drainage trial in first and second ratoon crops**

| | Cane yield t/ha | | | CCS | | Sugar yield t/ha | | |
|---|---|---|---|---|---|---|---|---|
| | 1R | 2R | Mean | 1R | 2R | 1R | 2R | Mean |
| **Treatment*** | | | | | | | | |
| 1 | 109.0 | 63.0 | 86.0 | 9.20 | 13.47 | 9.99 | 8.43 | 9.21 |
| 2 | 113.9 | 63.6 | 88.8 | 9.01 | 13.57 | 10.23 | 8.58 | 9.41 |
| 3 | 107.6 | 66.1 | 86.9 | 9.07 | 13.74 | 9.76 | 9.02 | 9.39 |
| 4 | 113.1 | 68.7 | 90.9 | 8.97 | 13.28 | 10.11 | 9.04 | 9.58 |
| lsd 5% | 10.4 | 3.7 | | 0.43 | 0.78 | 0.80 | 0.93 | |
| **Variety**** | | | | | | | | |
| 1 | 108.2 | 74.7 | 91.5 | 8.23 | 13.20 | 8.90 | 9.77 | 9.34 |
| 2 | 122.9 | 67.3 | 95.1 | 8.65 | 12.31 | 10.63 | 8.27 | 9.45 |
| 3 | 120.8 | 62.7 | 91.8 | 9.56 | 13.99 | 11.55 | 8.78 | 10.17 |
| 4 | 91.6 | 56.6 | 74.1 | 9.80 | 14.56 | 8.98 | 8.24 | 8.61 |
| lsd 5% | 5.5 | 3.5 | | 0.41 | 0.95 | 0.60 | 0.40 | |

* Treatment 1 = moles
Treatment 2 = moles plus hilling
Treatment 3 = no moles
Treatment 4 = no moles plus hilling

** Variety 1 = Q125
Variety 2 = Q116
Variety 3 = Q141
Variety 4 = CP44-101

## 5.0 DIFFICULTIES ENCOUNTERED DURING PROJECT

There were several difficulties encountered during the project the main one being the lack of wet conditions at ratooning to allow testing of ratooning after early harvesting under cold, wet conditions. At Rocky Point the late planting of the trial coupled with dry conditions created difficulties in arranging early harvest of the trial in subsequent ratoons.

Because both trial sites were relatively remote from Bundaberg full readings for soil temperature and soil moisture were not obtained due to unreliability of the dataloggers with infrequent downloading of data.

At the Childers site there was also partial loss of the trash blanket in the first ratoon crop due to a runaway fire on the trial farm. This may have had some impact on treatment effects in the second ratoon.

## 6.0 RECOMMENDATION FOR FURTHER RESEARCH

While these trials showed no suppression of ratoon yields from early season trash blanketing on two poorly drained soils there is a need for testing under waterlogged conditions and under a heavier trash blanket from high yielding crops. Current trials in northern New South Wales should meet these requirements.

## 7.0 APPLICATION OF RESULTS TO THE INDUSTRY

The results of these trials indicate that there is no impediment to trash blanketing in the Bundaberg-Rocky Point region in most years provided block drainage is satisfactory. Because of the heavier trash blanket produced by larger crops it is desirable to rake trash off the row following early season harvests to promote faster ratooning. This does not appear to be necessary for moderate crop yields up to 115 t/ha. In dry conditions it is likely that there will be a yield benefit from trash blanketing, but it is uncertain whether there will be any yield loss if there are unseasonal wet conditions during early harvests.

## 8.0 PUBLICATIONS ARISING

There have been no publications from the project to date.

## 9.0 REFERENCES

Ridge, D R, Hurney, A P, and Chandler, K J (1979) Trash disposal after green cane harvesting. Proc. Aust. Soc. Sugar Cane Technol., 1, 89-93.

## 10.0 ACKNOWLEDGMENTS

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**SRDC FINAL REPORT - BS63S - FARMING SYSTEMS FOR GREEN CANE TRASH BLANKETS IN COOL WET CONDITIONS**

**BY**

**D R RIDGE**

**SENT TO:**

**AS PER ATTACHED LIST**

**BY CHRIS**
**21 AUGUST 1998**

**Fig. 3 Daily temperature readings during September 1994 in trash management trial at Rocky Point**

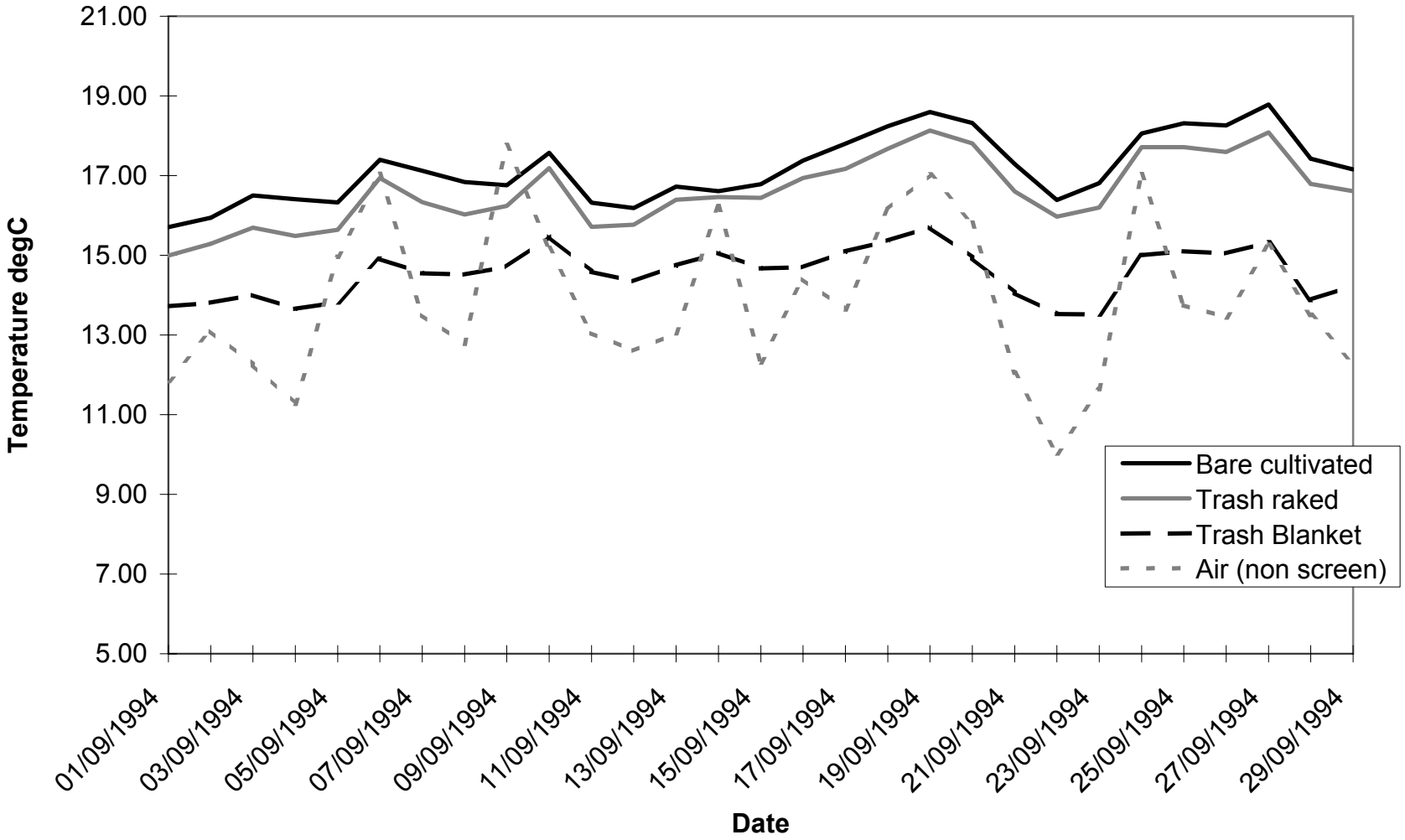

**Fig. 4 Average diurnal temperature fluctuations during September 1994 in trash management trial at Childers.**

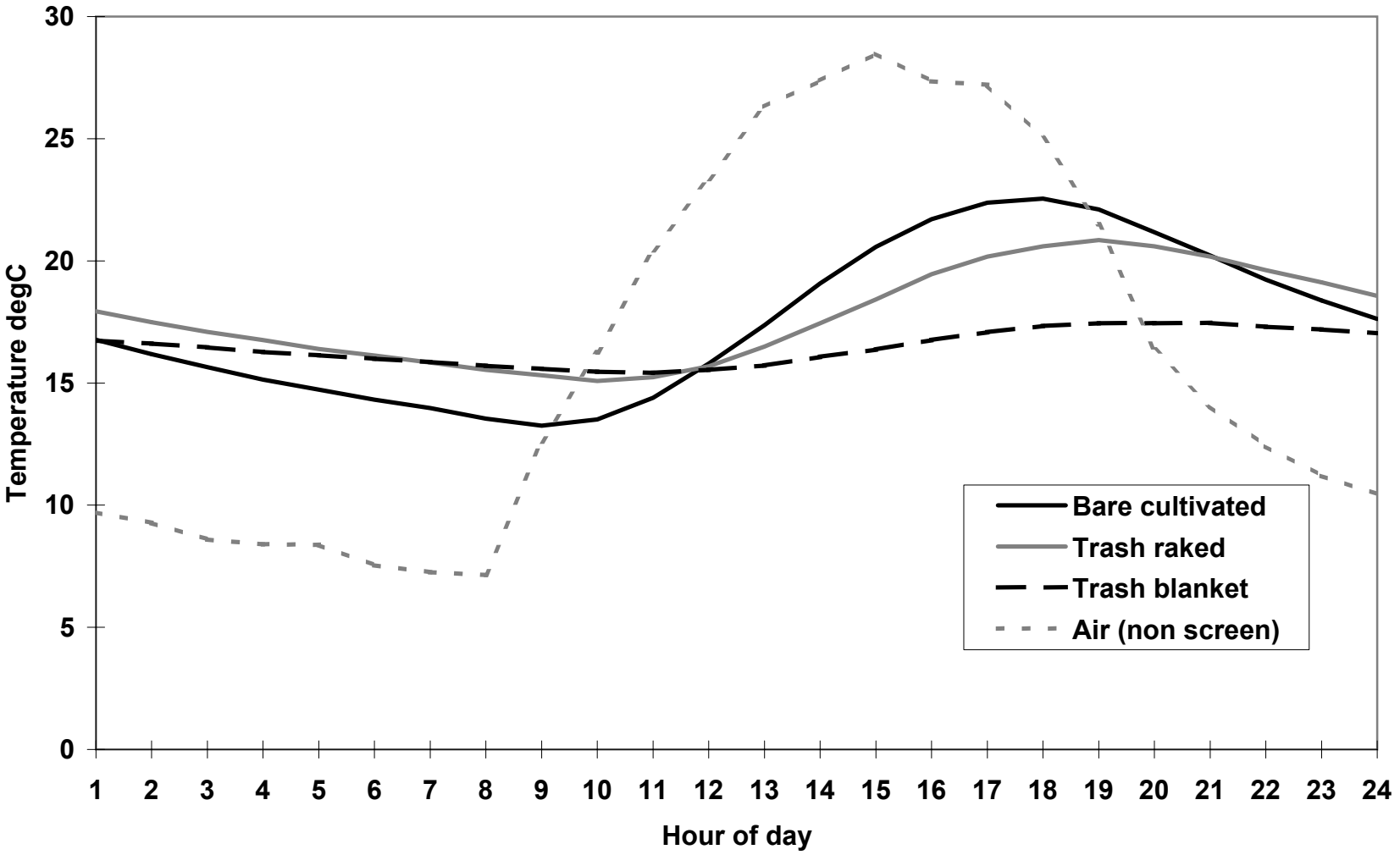

**Fig. 5 Average diurnal temperature fluctuations during September 1994 in trash management trial at Rocky Point.**