

Vivonne Bay drainage trial

Background

Ironstone soils have a range of limitations to crop root exploration and as a result, water use and yield. Hard gravel and impermeable clay layers below the top 15 cm can cause seasonal perched water tables and waterlogging is the result.

Following consultation with the Island's Graingrowers' Association, a demonstration site was established on the Pontifex property at Vivonne Bay to test the ability of a range of drainage treatments to improve crop yields in soil prone to waterlogging.

What was done

Drainage Treatments

The raised beds, gravel slots and gravel mole treatments were installed in April 2007 with the conventional mole being added in April 2008.

TABLE 1

Drainage treatment details

Drainage treatment	Spacing (metres)	Depth (cm)
Raised bed	8	50
Gravel slot	8	50
Gravel mole	8	50
Conventional mole	8	30
Control	0	0

Wheat was sown at 2 kg/ha, with 10 inch row spacing in the first week of June across all treatments. The site was harvested on 14 December 2008 by doing replicated quadrant cuts in each treatment.

Water Monitoring

To monitor drainage over the growing season, a rainfall gauge was used to measure rainfall and data loggers on v-notch weirs were installed.

Results

Wheat yields

All treatments yielded more than the control in a year when waterlogging was very evident for a period of time in late winter. The raised bed treatment was almost double the yield of the control. The conventional mole was the lowest yielding of the treatments but still yielded almost 40% more than the control. The nature of the sodic clays in the area possibly resulted in the conventional moles collapsing to some degree during the season.

TABLE 2

Wheat yield with different Drainage treatments

Drainage treatment	Wheat yield (t/ha)
Raised bed	5.15
Gravel slot	4.14
Gravel mole	4.49
Conventional mole	3.87
Control	2.76

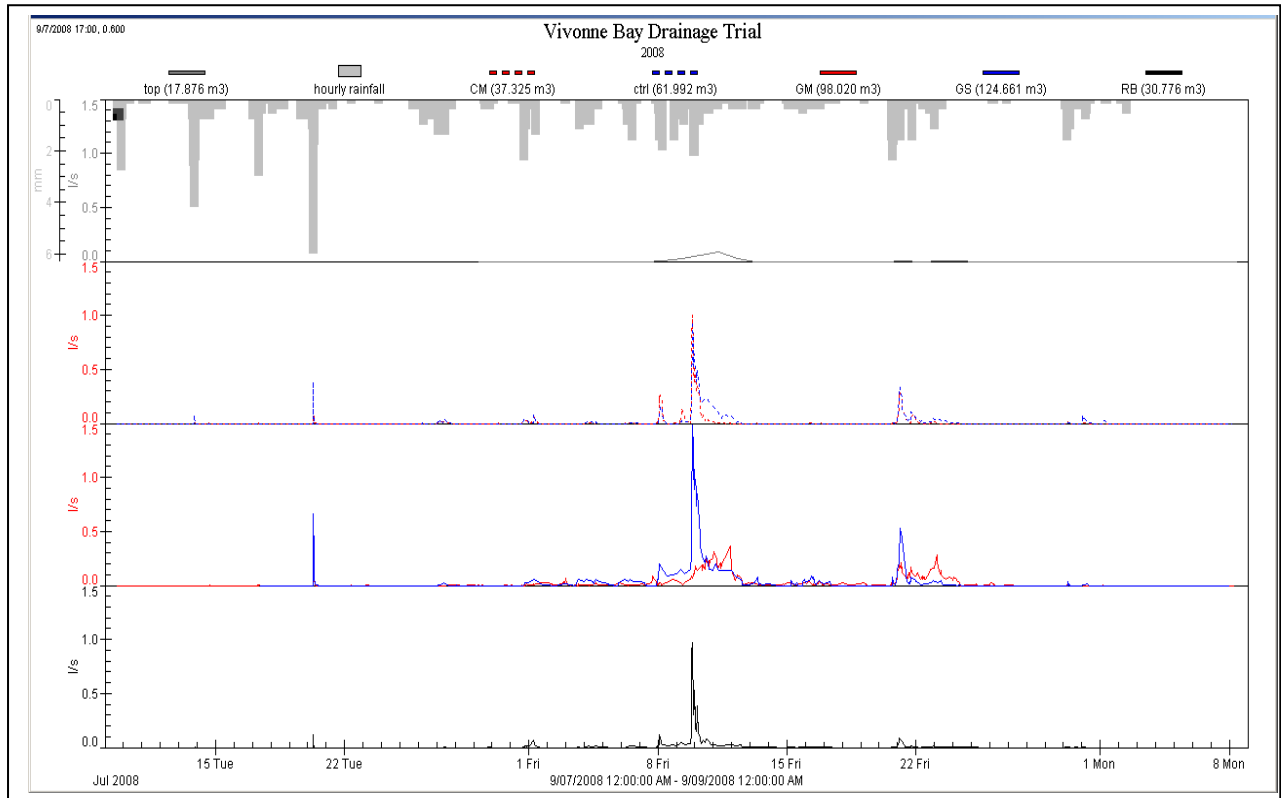
FIGURE 1

Data loggers and v-notch weirs used to measure water-flows



Water Monitoring

FIGURE 2
Rainfall versus run-off per treatment



Plotting rainfall against drainage per treatment (figure 2) shows that whilst there was considerable rainfall in July there was little actual run-off as the soil was still wetting up. Then in August, when there was about the same amount of rain as in July, a considerable amount of runoff/drainage occurred as the soil was saturated.

Actual volumes drained per plot in Table 3 shows the maximum drainage that flowed from the raised bed and the gravel moles. Due to the design layout and the flatness of the site, the reading for the gravel slot treatment was probably not a true reflection of the actual drainage that occurred.

Whilst the raised bed recorded the highest crop yield it did not drain the most water. This also occurred in 2007, indicating that the formation of the actual beds has an impact on yield in addition to the drainage impacts.

TABLE 3
Water drained with different drainage treatments

Drainage treatment	Water drained (kL)
Raised bed	30.8
Gravel slot	26.7
Gravel mole	36
Conventional mole	19.4
Control	24.7

What next?

In 2009, the delving treatment will be installed and work undertaken with the Spader. The site will be monitored again in the 2009 growing season.

Funding/Sponsors

- National Landcare Program through the Kangaroo Island Natural Resources Management Board
- Pontifex family

For further information contact

- Lyn Dohle on 8553 4999 BH or 8553 2487 AH or email dohle.lyn@saugov.sa.gov.au

Take Home Messages

- In a year where waterlogging caused yield penalties all treatments resulted in a yield increase compared to the control
- The raised beds increased yield by almost 200% followed by gravel moles, gravel slots and conventional moles
- On flat waterlogged land, raised beds provided the best yield result but they did have some management issues
- Gravel slots and gravel moles also worked extremely well but the slots were too expensive to install to consider for broadacre use. No commercial scale gravel mole is available at present
- Conventional moles are prone to collapse with Kangaroo Island's sodic clays