MALLEE CATCHMENT
TECHNICAL BULLETIN

Technical Bulletin #31

Managing production risk at Sea Lake and Waitchie

Above: Ground cover photos were taken at both the Sea Lake and Waitchie sites to determine the percentage of ground cover and the soil erosion risk. Photo: BCG.

This technical bulletin summarises research undertaken at the Sea Lake and Waitchie Landcare delivery sites to reduce production risk and better understand seasonal climate risk in 2011.

Background

Landcare delivery sites were established prior to the 2005 cropping season to provide research, development and extension opportunities in the northern, western, central and eastern Mallee. This project built on the information gained over the last five years and delivered real time information to local farmers during the 2011 cropping season for two paddocks at Sea Lake and Waitchie. This project aimed to increase landholder understanding of production risk by focussing on zone management within a paddock, in light of a variable and changing climate, and to reduce the impact of non-stable soils and declining soil health by adopting sustainable dryland farming practices.

At a glance

- Two focus paddocks, one at Sea Lake and one at Waitchie, were managed according to production zones;
- Separating paddocks into production zones and managing those zones appropriately increased production in productive zones and reduced losses where land capability was poor;
- Measurements were taken at each paddock for soil moisture, nitrogen, electrical conductivity and chloride, for use in YieldProphet® simulations at key growth stages during the year;
- Utilising existing Landcare networks was an effective way to disseminate new information and generate discussion among local growers.

mallee
catchment management authority

Yield Prophet® was used at critical decision times during the season to highlight each paddock's production zone:

- available soil water;
- nitrogen status of the crop and risk of additional nitrogen (N) fertiliser applications; and
- production risk (as assessed by soil water status and seasonal rainfall forecasts).

Method

Paddock zoning

In consultation with paddock owners, two previously electromagnetically surveyed (EM) paddocks, one at Sea Lake and one at Waitchie, were selected for this study.

Zones were identifed based on the EM map and the owner's experience of yield in the paddock.

Soil measurements

Each paddock was soil sampled separately to 130cm depth on 23 March (Sea Lake) and 22 March (Waitchie). Six soil cores were taken at depth intervals of 0-10cm 10-40cm, 40-70cm 70-100cm and 100-130cm.

The samples were analysed for available nitrogen (N), Colwell phosphorus (P), phosphorus buffering index (PBI), organic carbon (OC), electrical conductivity (EC), chloride (Cl) and soil water.

Results were used for Yield Prophet® simulations at key growth stages during the year to work out potential yield and assess the risk of applying nitrogen fertiliser during the season for each zone. Yield probabilities, soil moisture and nitrogen were measured and simulated at the end of the year.

Seasonal climate

Seasonal weather and climate forecasts were summarised to create awareness and increase knowledge of key climate drivers and trends. Cumulative and monthly growing season rainfall deciles and temperature figures were compiled for Sea Lake and Waitchie and/or the nearest weather station.

Production risk

Yield data was obtained from growers and compared with Yield Prophet® simulations. The outcomes were communicated to local farmers via newsletters on production risk per group (two groups), group meetings and crop walks.

Climate

Rainfall

Annual and growing season rainfall (GSR) was obtained for Sea Lake and Ultima (near Waitchie) for 2011. Annual rainfall was within the wettest 10% of years on record but GSR was within the lowest 20% of historical rainfall years.

Temperature

Swan Hill temperature was the nearest long term data set for both Sea Lake and Waitchie. Measurements showed that annual maximum temperature was 3.6°C cooler but minimum temperatures were 1.6°C warmer than average. Therefore, the annual temperature was 2°C below average. In contrast, growing season temperature was 3.6°C above average. August and October were the warmest growing season months as temperatures of 2.6°C and 1.9°C above average were recorded.

Seasonal climate

La Niña and Indian Ocean Dipole positive (IOD+ve) events

The La Niña that occurred during the 2010/11 summer was the strongest on record and resulted in record rainfall for the Mallee region. Resultant of this rainfall was a full soil moisture profile leading into the 2011 cropping season.

Above: Wheat crops in the Mallee.
Photos: Mallee CMA.

During September 2011, a consecutive La Niña developed but much weaker than the previous one earlier in the year. This La Niña did not impact on growing season rainfall, which was only decile 2 for the Sea Lake and Waitchie areas.

IOD +ve event, (warm water in the eastern Indian Ocean, combined with cool water in the western Indian Ocean) also occurred in September. A La Niña combined with an IOD+ve is not common as La Niña's are often associated with increased rainfall, while IOD+ve events can be associated with reduced rainfall. It is possible these events cancelled each other out to ensure that spring rainfall was close to average for the Mallee.

Seasonal climate outlooks

Model forecasts suggested temperature and rainfall outlooks to be close to average for the majority of the growing season. Central Pacific Ocean temperatures were forecast to be neutral to slightly cool for the spring period. This suggests that the models did recognise an average to weak La Niña trend that did occur.

Sea Lake

Paddock zoning

Three zones were identified for the Sea Lake paddock (Figure 1). Results for soil measurements prior to sowing showed that the Colwell P levels exceeded the critical Colwell P, which means phosphorus nutrition was adequate.

Sulphur levels were low (<6ppm) in the topsoil but at higher levels in the subsoil for zones 2 and 3. It was only for zone 1 where sulphur levels throughout the profile were low.

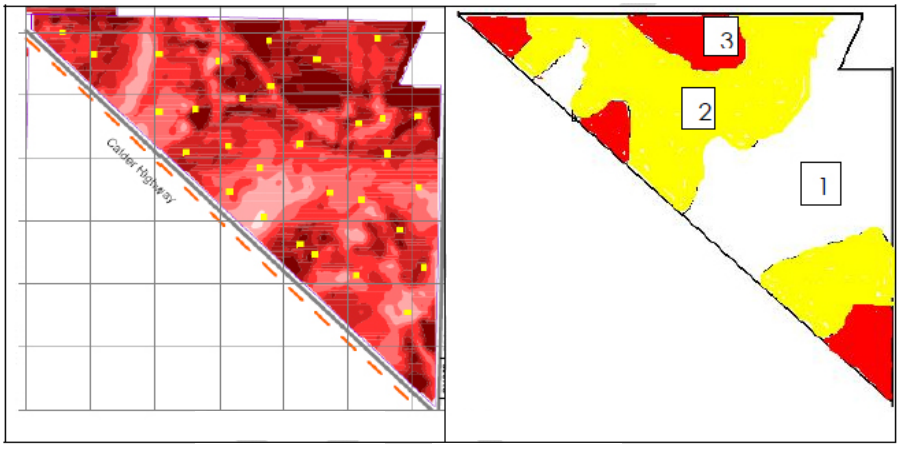

Figure 1. Sea Lake 2011 site maps showing: Left: EM survey map [dark red= highest EC; lighter red= lower EC]. Right: Paddock zones (1= high production zone; 2= lower production zone; 3= lowest production zone)

Site establishment

The site was sown with Hindmarsh barley on April 26, 2011 and Urea was applied during seeding (Table 1). Seeding and fertiliser were managed according to each zone's production capability.

Yield Prophet®

Initial Yield Prophet® simulation runs indicated a high yield potential of between 2 and 5 t/ha depending on seasonal outcome. The optimum time to use Yield Prophet® for yield estimation and nitrogen fertiliser requirement is at mid to late tillering, or if the season is very favourable even as late as second node stage.
The yield map (Figure 2) suggested that low EC and medium EC zones yielded similarly, ranging between 3.5 to 3.9t/ha, while the high EC zone yielded 2.9-3.0 t/ha. These yields were above long term barley average yields.

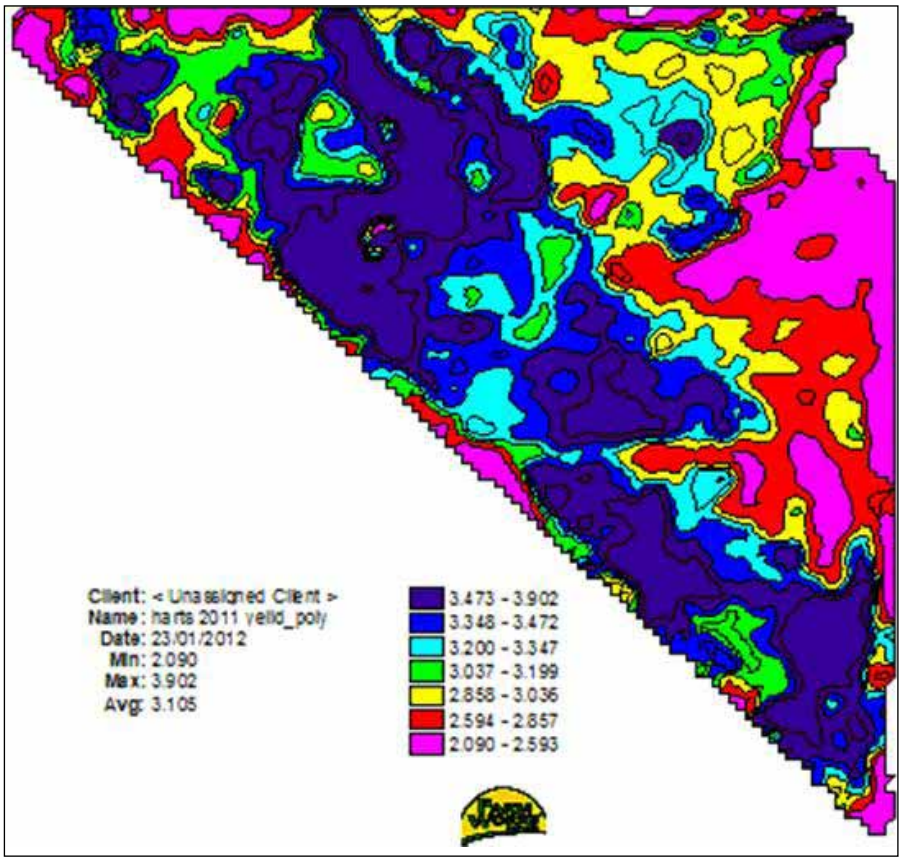

Figure 2. Sea Lake 2011 yield map.

When actual yields were compared with Yield Prophet® simulations, the medium EC zone simulation and actual yield was the same. However, the actual yield for the low EC zone was about 1 t/ha less than the simulated yield, while the high EC zone yield simulation was about 1 t/ha greater than what actually occurred.

Table 2. Dates for growth stages for Hindmarsh barley sown 26 April, 2011 at Sea Lake.

GS15	GS30	GS37	GS45	GS65	GS75
Five leaf	End of tillering	Flag leaf showing	Mid booting	Mid flowering	Grain fill
June 6	July 12	July 28	Aug 3	Aug 14	Sep 5

Table 1. Sea Lake 2011 paddock inputs.

	Zone 1	Zone 2	Zone 3
Seed rate kg/ha	52	50	40
Urea at seeding kg N/ha	33	22	22
Top dress 1 June SOA kg N/ha			20
Top dress 1 July urea kg N/ha	23	23	23

Waitchie

Paddock zoning

Two zones were identified but were managed the same for seed and fertiliser at sowing (Figure 3a and 3b).

Results for soil measurement prior to sowing showed for each zone, the Colwell P level exceeded the Critical Colwell P which means phosphorus nutrition was adequate.

Sulphur levels were low (<6ppm) in the topsoil but at much higher levels in the subsoil for both zones. Sulphur nutrition should be adequate in both zones.

Site establishment

The site was sown with Hindmarsh Barley on April 28, 2011, seed and fertilisers were applied at the same rate for both zones.

Yield Prophet®

Actual yield and Yield Prophet® simulations were both approximately 2.3t/ha for the high production zone. The grower observed that the crop was affected by frost damage.

Table 3. Waitchie 2011 paddock inputs.

	Zone high	Zone low
Seed rate kg/ha	50	50
Granulock Zn1% at seeding kg N/ha	5	5

Table 4. Dates for growth stages for Hindmarsh barley sown 28 April 2011 at Waitchie.

GS15	GS30	GS37	GS45	GS65	GS75
Five leaf	End of tillering	Flag leaf showing	Mid booting	Mid flowering	Grain fill
June 10	July 17	Aug 1	Aug 7	Aug 18	Sep 9

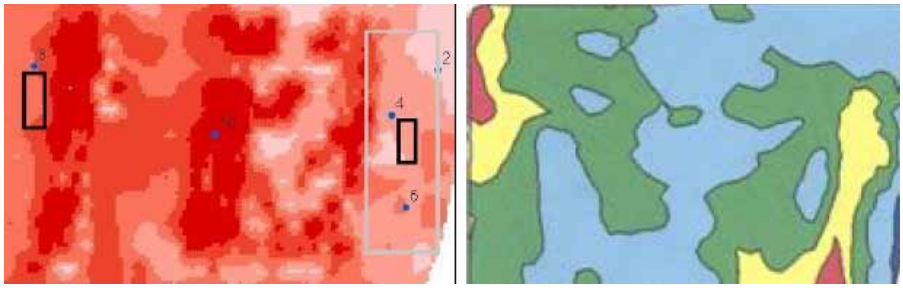

Figure 3. Waitchie 2011 site maps showing: Left (3a): EM survey map (dark reds – high EC; lighter red – lower EC). Right (3b): Yield map from when the paddock was in barley (2005). Light blue 3t/ha; Green 2.5 t/ha; Yellow 2.0 t/ha; Red less than 1.5 t/ha.

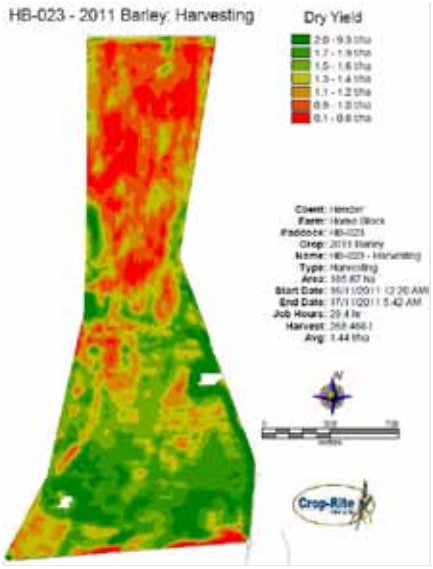

Figure 4: Waitchie Yield map for the 2011 season.

Implications of the findings

Managing paddocks according to production zones can improve land capability and gain higher production in appropriate areas, while minimising inputs where production capability is low.

Yield Prophet® simulations are an effective means for growers and their advisors to generate discussion and support or question intuition.

Utilising existing group networks is an effective way to disseminate and discuss new technology and information.

Further information

The information for this bulletin has been taken from 'Managing production risk at Sea Lake and Waitchie' final report. Copies of this report can be downloaded from the Mallee Catchment Management Authority (CMA) website **www.malleecma.vic.gov.au**

Acknowledgements

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Project Partners

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