# Managing 2010 Using Yield Prophet

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Welcome to the first Yield Prophet report for 2010. This is the first of a series of reports that form part of a Liebe Group project aiming to increase water use efficiency and optimise input costs to assist with creating sustainable farms given a changing climate.

This aspect of the project will be examining the most effective way for growers to utilise Yield Prophet. A series of Water Use Efficiency Workshops will be conducted over the next 2 years, to assist in achieving this aim which will complement these reports produced through the growing season.

Yield Prophet is a web based interface for the agricultural production simulation model (APSIM). It uses real-time information from the paddock to simulate how the crop is growing, and because it is based on historical rainfall records, how it may yield. This provides an accurate forecast (if everything is set up well) of the chance of achieving a certain yield at any point in time during the season. From this we can match inputs to these yield potentials.

For dryland cropping systems we know rainfall and soil have the greatest influence on crop performance. Success with Yield Prophet requires accurately characterising the soil, particularly how it holds and releases water to the crop.

The yield forecasts generated by the model consider only rainfall, temperature and nitrogen as the only variables. All other limitations such as nutrient deficiencies, weeds, disease, frosts etc need further consideration and interpretation.

When reading these reports remember that they are specific to a site and that the information provided is generic in nature. Moving forward with the project, it is proposed to work with a greater range of sites to provide a more accurate picture for Liebe growers.
This report is the first of a series that will come through the season as we monitor three sites with different soil types.

- Deep Yellow Sand at the Long Term Research Site at Stuart McAlpine's, West Buntine.
- Red Loam at the Practice for Profit site at Rob Nankivell's, East Maya.
- Loamy Clay at Ian Hyde's, Dalwallinu.

Yield Prophet contains a tremendous amount of information which is interesting to explore. You will find that much of the knowledge that drives the model will be valuable for your understanding of how crops grow. (We aim to extract some of this information at the first Water Use Efficiency Workshop on the 22nd July during the Beer and Burger night). For now, we are going to consider the more basic output of the model with some consideration of what you might do with these crops. Over time we will cover the important aspects of the model.

This has so far been a difficult season and these reports were relevant on the 7th July, but a lot may have changed by the time you read this. This report is indicative of how the season was tracking at this time and there for the information provide is general in nature. These reports will be produced frequently throughout the season to provide up to date information to assist with decision making.

## SITE DESCRIPTION

**PROPERTY:** Liebe Group Long Term Research Site, West Buntine.

Stuart and Leanne McAlpine, West Buntine.

**SOIL TYPE:** Deep Yellow Sand

**ROTATIONS:**
2009 = Lupins
2008 = Wheat
2007 = Wheat

**VARIETY:** Magenta

**SOWING DATE:** 28/5/2010

**RAINFALL(1/4/10 - 7/7/10):** 47mm

This report has been created with assistance from:

Department of Agriculture and Food

FARMANCO

# Sand at Stuart McAlpines (Long Term Research Site)

Figure 1 illustrates how the season is tracking. As you are all aware it is very dry. Currently in the driest 10% of years, a decile 1 year.

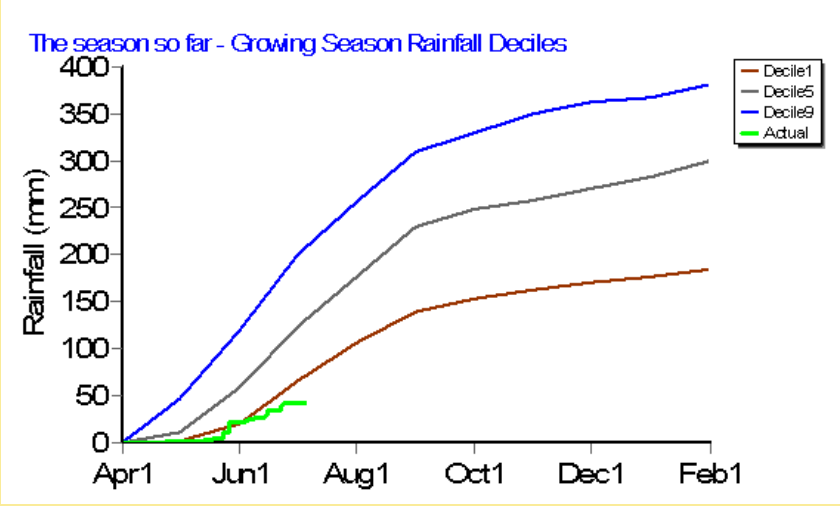


**Figure 1**: Buntine rainfall to the 5th July 2010.

The predicted grain yields for this site using the soil information and the historical record is presented in Figure 2.

The probabilities indicate the chance of achieving a particular yield, both with and without additional nitrogen. To interpret this graph consider the 80% probability as the 20% of lowest yielding years, the 50% as an average year, and 20% as the 20% of highest yielding years.

In this case we can see that until we consider we are in an average season (probability = 50%) we have no response to additional N.

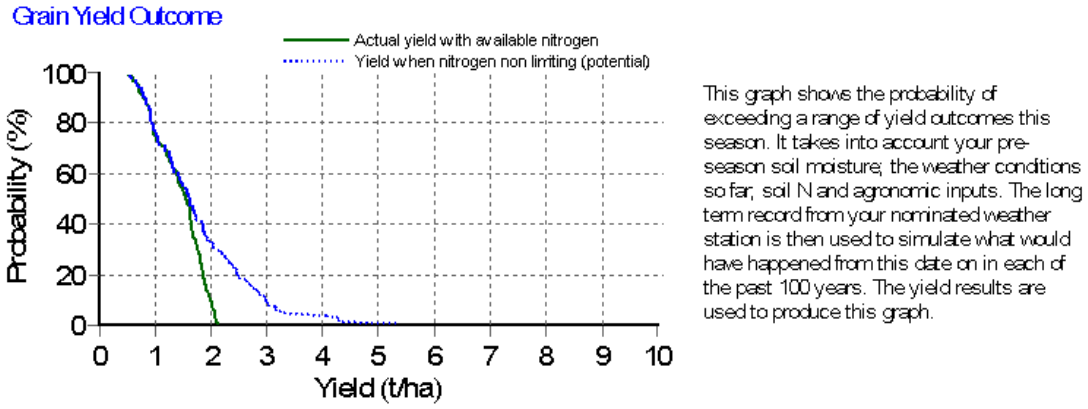


**Figure 2**: Predicted Grain Yield for a deep yellow sand at West Buntine.

Figure 3 is an important graph showing what is happening with the water in the soil. The soil characterisation has determined how big 'the bucket is' – how much water the soil can hold.

The PAWC, is the Plant Available Water Capacity (90mm). This is how much water the crop can access down at its final root depth (1194mm).

Plant Available Water (PAW) is currently 26mm, however the model has calculated the current root depth to be 572mm, so the crop is only able to access 18mm of this (current crop PAW). Given evaporation and transpiration will average ~1mm/day at this stage we have 18 days until we reach the wilting point.

**BEER & BURGER NIGHT**
Thursday 22nd July
Liebe Group
Main Trial Site
Nankivells Property
East Maya Road

3pm-5pm: Field Walk
5.15pm-6pm:
Yield Prophet Presentation
6pm-6.45: R&D Meeiting
6.45: Beer & Burgers

Contact:
Flora Danielzik
96642030

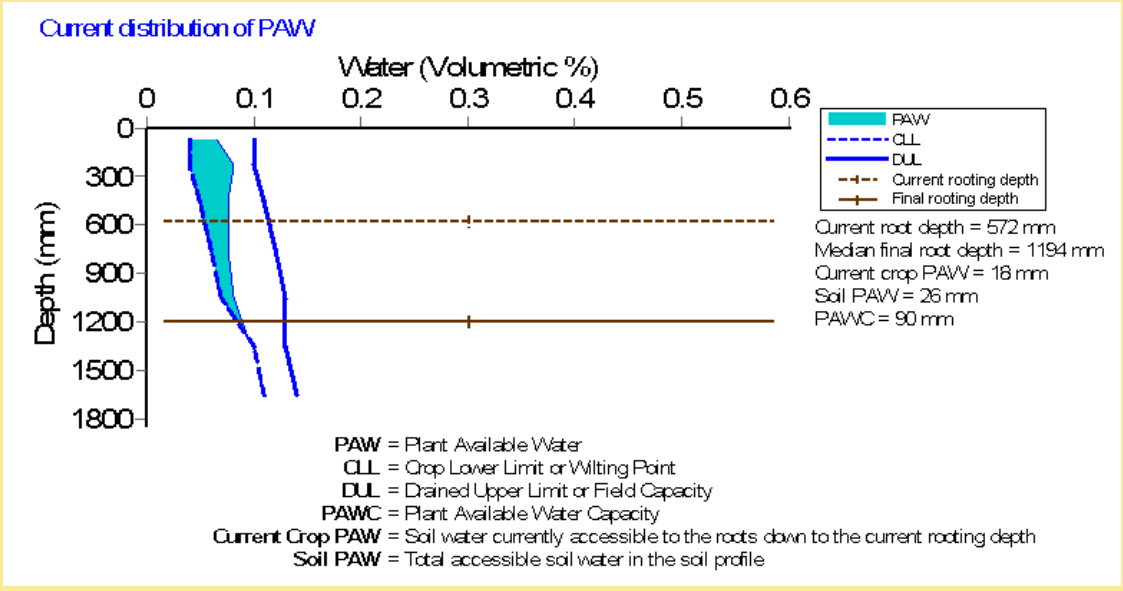


**Figure 3:** Distribution of plant available water of a deep yellow sand at West Buntine.

Figure 4 is the N budget for this site. Soil tests before seeding showed that 81 kg/ha of N was available. This is on the back of a good lupin stubble. N mineralised after the March rain has contributed to this. Mineralisation since 24th May is negative suggesting that there has been 10 kg/Ha of N made unavailable to plants. This is due to the slowed rate of mineralisation of organic matter in the cold and the utilisation of N by soil micro organisms. There has been 6 kg/ha of N applied at seeding. The plants have used 26 kg/ha to get to the 4-5 leaf stage. The efficiency of N utilisation is excellent, as is the case in dry conditions, and there has been no leaching or denitrification losses. There is still 52 kg/ha of N for the crop to grow onto.

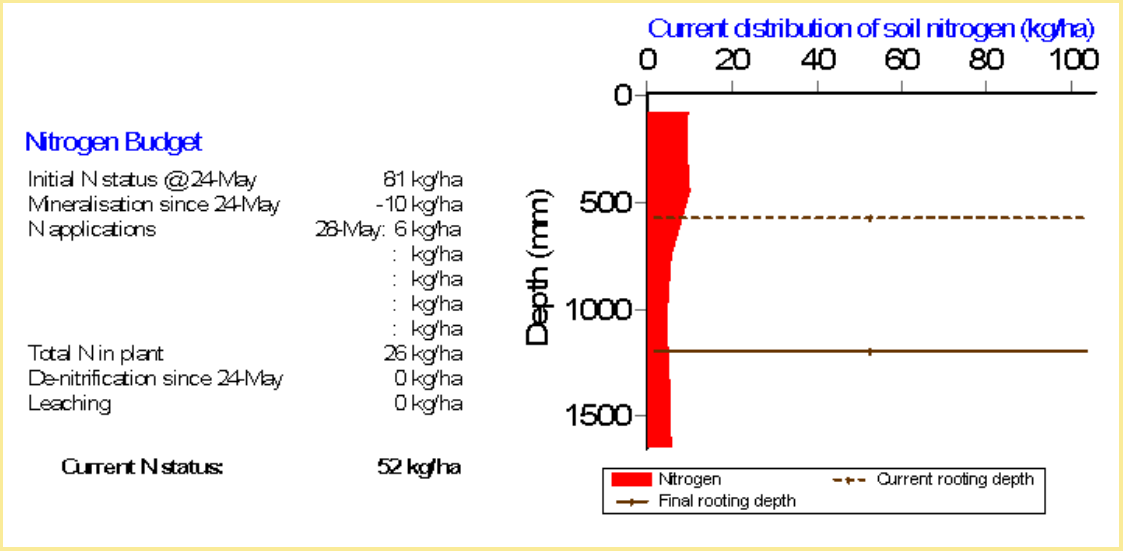


**Figure 4**: Nitrogen Budget of a deep yellow sand at West Buntine.

Managing N is one of the main benefits our farm managment will derive from this model. Using the information above, and by running different N application scenarios we can predict yield for a particular N regime. From this we can assess the risks and benefits of each N regime.
Scenario 1 is to add 0 kg /ha N;
Scenario 2 is to add 20 kg/ha N;
Scenario 3 is to add 40 kg/Ha N.
The graph shows that there is no yield response to applying extra N unless we think we are going to see average yields (probability :50%).

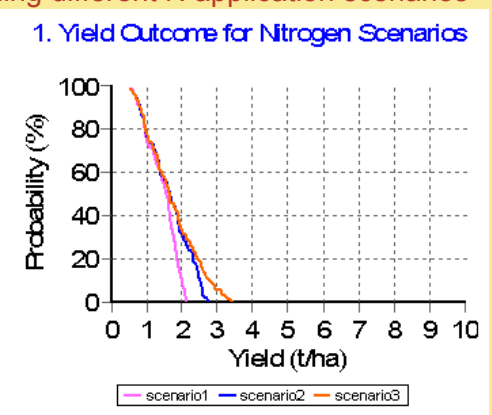


**Figure 5**: Potential Yield Outcomes for three different nitrogen scenarios at West Buntine.

## SITE DESCRIPTION

**PROPERTY:** Liebe Group Main Trial Site.

Rob Nankivell, East Maya.

**SOIL TYPE:** Red Loam

**ROTATIONS:**
2009 = Field Peas
2008 = Wheat
2007 = Wheat

**VARIETY:** Wyalkatchem

**SOWING DATE:** 1/6/2010

**RAINFALL TO DATE (SINCE 1ST APRIL):** 45mm

# Red Loam at Rob Nankivell's (Practice for Profit Site)

Two larger rainfall events have lifted this site to a decile 5 season (Figure 6). This highlights how influencial small amounts of rain can be to the decile rating early in the season. It also shows how patchy the rain has been!

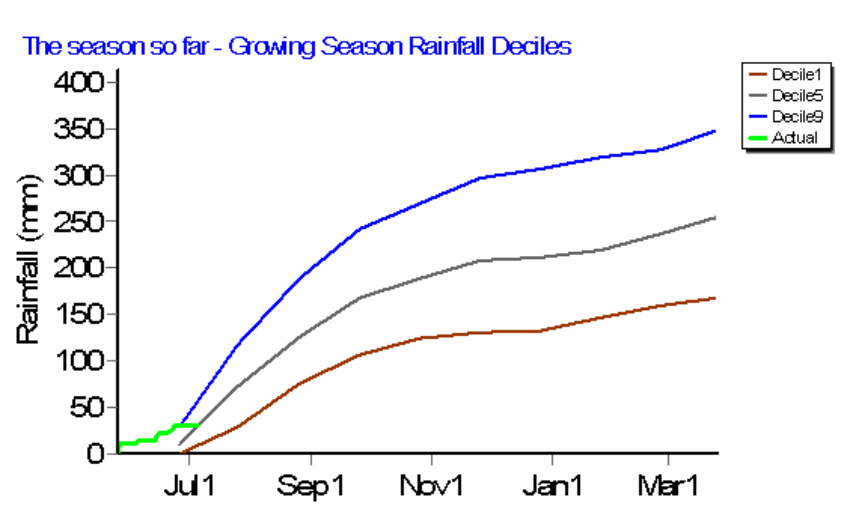


**Figure 6:** East Maya rainfall to the 5th July 2010.

The predicted grain yields in figure 7 suggest that the site is N reponsive and that a yield of 1.75 t/ha will be achieved if a decile 5 season continues, and N is added.

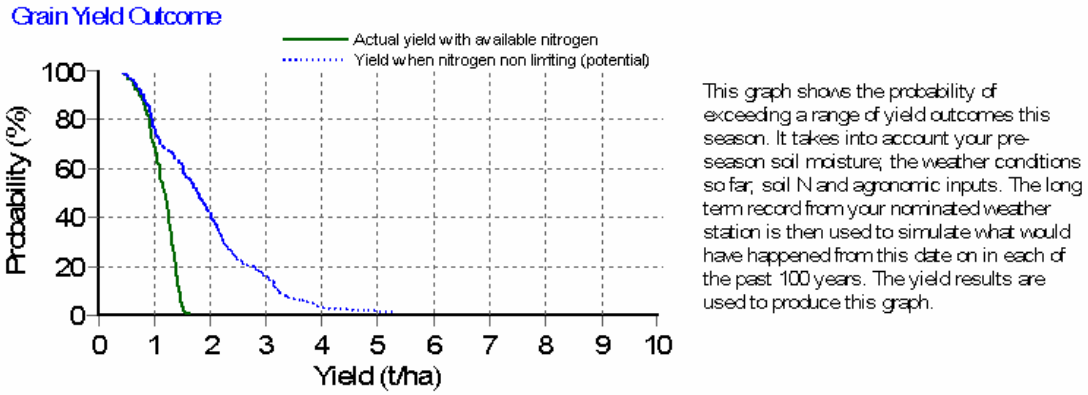


**Figure 7:** Potential grain yield outcome on a red loam at East Maya.

Figure 8 indicats roots have developed well and the crop has access to the same amount of soil water as the light land site at this point (Current PAW = 19mm). At the end of the season this shallower soil may run out of water and limit yield. The soil sampler was not able to sample below 600mm, so it is estimated that roots are not getting down there either. This site has 2/3rds of the plant water available capacity of the light land site (PAWC = 64mm).

## Disclaimer:

**Information in this report is of a general nature and any decisions should be made using information from a range of sources. No responsibility is taken for incorrect information printed.**

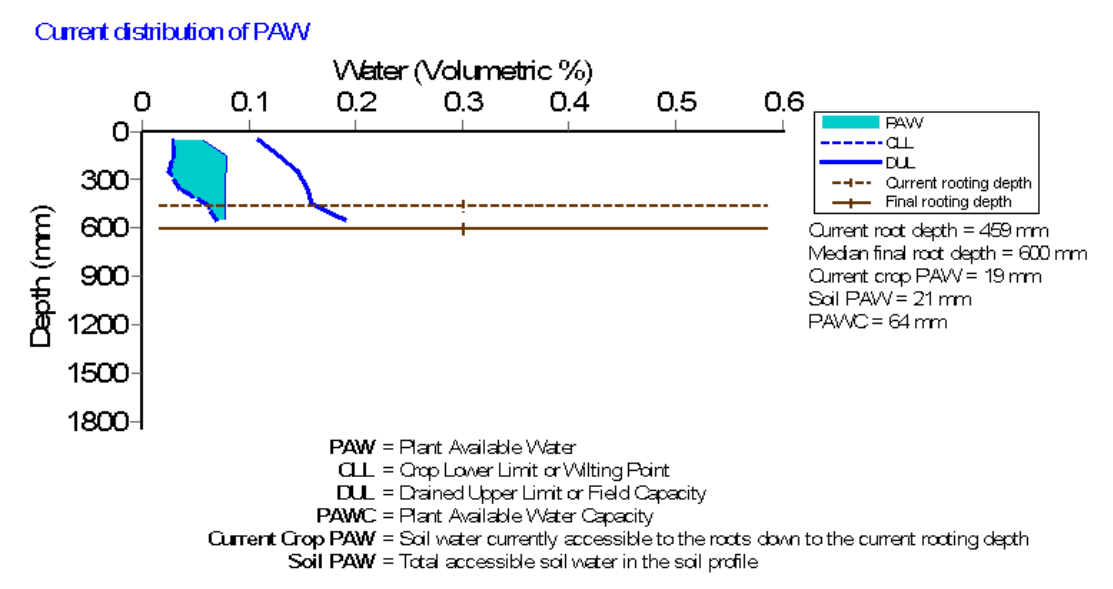


**Figure 8**: Distribution of Plant Available Water of a red loam at East Maya

Even though this is a field pea stubble, it was from a good yielding crop and there was little stubble residue after grazing. Subsequently the N levels started low. With the dry start there has been no leaching or denitrification losses, and less N has been tied up in this soil (-4 kg/ha) compared with the sand. The N supply will need to be topped up shortly to meet the growing crops requirement.

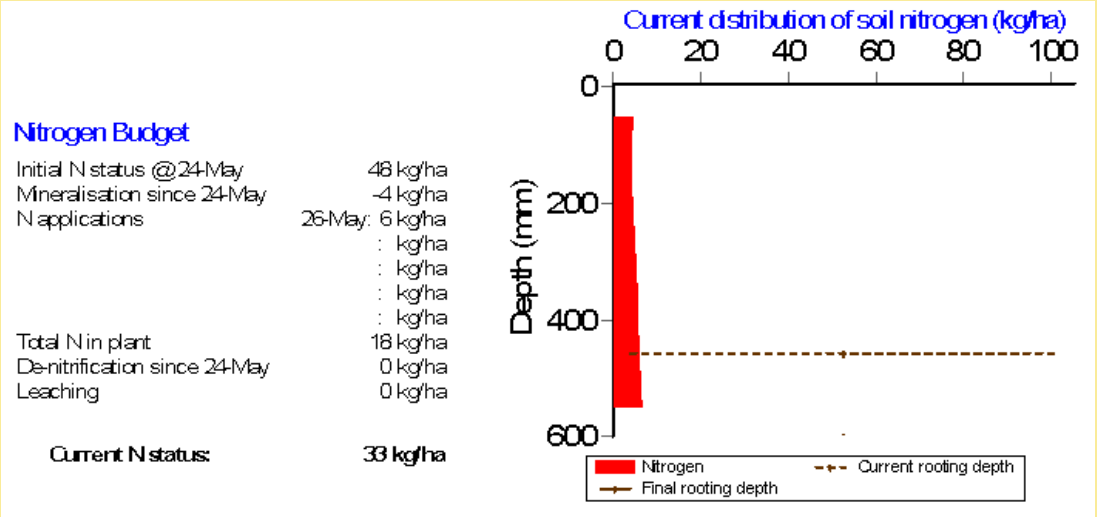


**Figure 9:** Nitrogen Budget of a red loam at East Maya.

The N scenarios as shown in figure 10, (0, 20, 40 kg/ha) indicate that 20 kg/ha of N is appropriate for a decile 5 season. This level of N keeps this crop at optimum yields up to the point where the season goes beyond decile 6. ie better than average. If the season were to improve any more than this then a further application may be considered. (eg another 20 kg/ha to cover for a decile 8 finish).

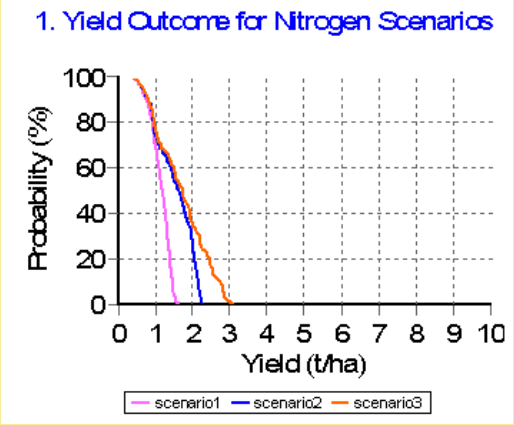


**Figure 10:** Potential yield outcomes for three different N scenarios on a red loam at East Maya.

## SITE DESCRIPTION

**PROPERTY:** Ian Hyde, Dalwallinu

**SOIL TYPE:** Loamy Clay

**ROTATIONS:** 2009 = Volunteer Medic Pasture

**VARIETY:** Bonnie Rock

**SOWING DATE:** 25/5/2010

**RAINFALL TO DATE (SINCE 1ST APRIL):** 39.8 mm

# Loamy Clay at Ian Hyde's

At this stage in the season this site is tracking at less than decile 1 (figure 11), which can be interpreted as a 90% probability of 0.5 t/ha. If the season can reach a decile 5 level the yield will be in the order of 1.5 t/ha. Given the information presented in Figure 12 this site is not going to require any additional N.

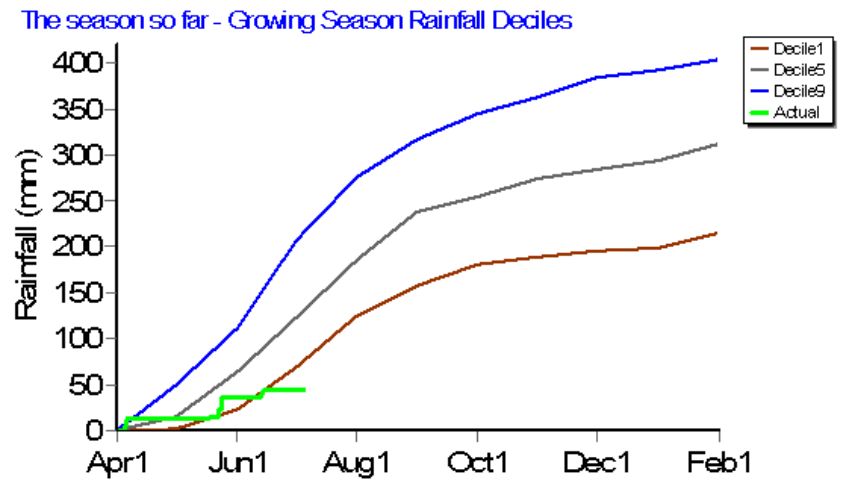


**Figure 11**: Dalwallinu rainfall at the 5th of July, 2010.

This soil has a higher Crop Lower Limit (CLL) than the other two soils indicating it has a higher percentage of clay, which is holding on to more water. It also has a higher Drained Upper Limit (DUL) allowing more water to be held in total. The bucket size here is 101mm. The roots have progressed well (537mm), however the soil is very dry and only 6mm of current crop Plant Available Water (PAW) is available. Given evaporation and plant use is going to average 0.8 mm/d over the next 10 days, we are going to be at the wilting point in 7 days if current conditions persist.

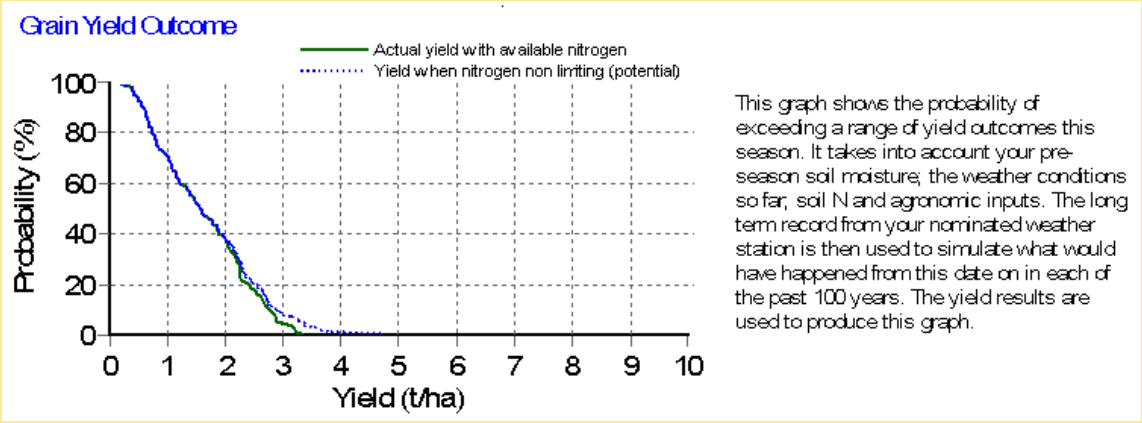


**Figure 12:** Predicted grain yield outcomes for a loamy clay at Dalwallinu.

**Acknowledgements:**
This project is supported by funding from the Grains Research & Development Corporation and the Australian Government Department of Agriculture, Fisheries and Forestry under the FarmReady initiative, part of Australia's Farming Future.

Support with yield prophet from Caroline Peek and Rob Grima, Department of Agriculture & Food, WA.

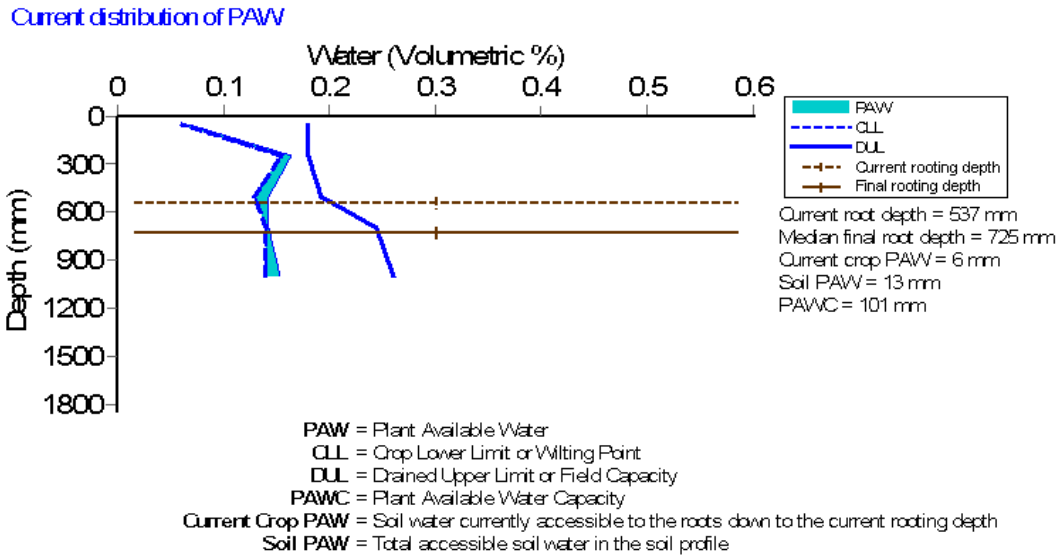


**Figure 13:** Current distribution of Plant Available Water of a loamy clay at Dalwallinu

This site has had a good medic history and which shows the initial N status of 153 kg/ha. The current distribution of soil nitrogen graph (Figure 14), shows how much N is in the system. It also shows how much N has moved beyond the root zone over time and is unavailable to the crop. (This has implications for acidification as well).

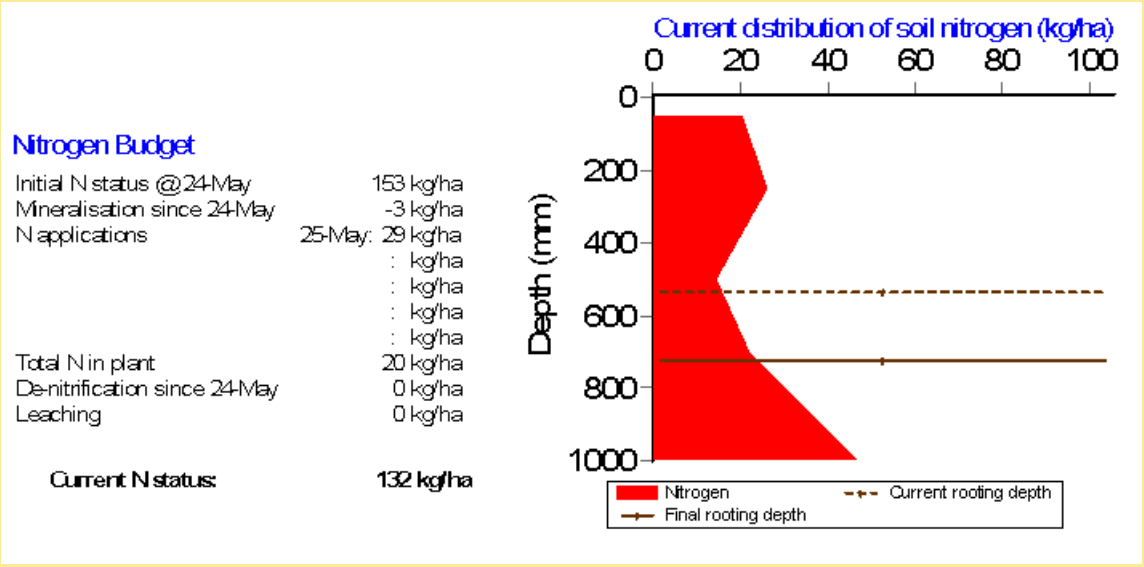


**Figure 14**: Current Distribution of Soil Nitrogen of a loamy clay at Dalwallinu.

N scenarios (0, 20, 40 kg/ha) shown in Figure 15 indicate there will be no response to applied N at this site.

We will follow this report with another in 2-3 weeks which considers other aspects of Yield Prophet. This will be interesting as the rain forcast for this weekend is going to change things Significantly and will provide an Interesting comparison for this report.

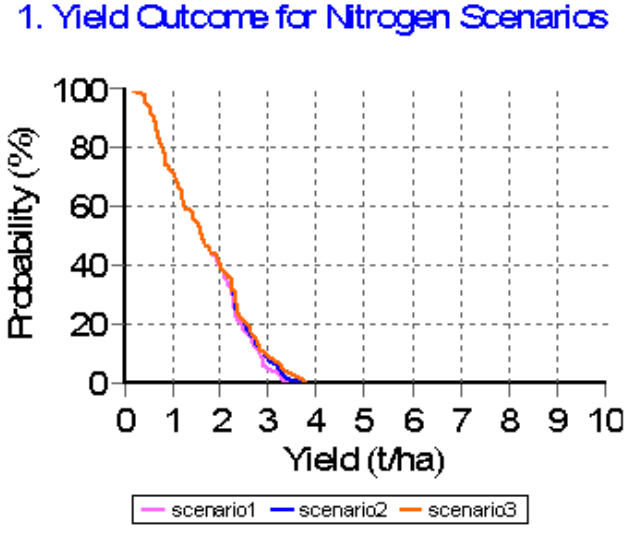


**Figure 15:** Potential yield outcomes for Three different N scenarios on a loamy clay at Dalwallinu.