Grains Research
UPDATE
NORTHERN REGION

GRDC
Grains Research & Development Corporation

How dependent are crops on stored soil water?

Modelling conducted by Dr David Freebairn and Brett Robinson from QDNR & W has once again highlighted the importance of stored water in northern farming systems. Using Emerald as an example, data shows that 82% and 26% of crop water supply comes from the fallow period for winter and summer crops respectively (Table 1), while fallow efficiency is about 23% for summer and winter fallows.

Figures 1 and 2 show patterns of average monthly rainfall, evaporation, transpiration, runoff and deep drainage for summer and winter crops. It is notable that evaporation is robbing water, even during the crop stage and that it accounts for 30-50% of rainfall in any one month. Draw down of soil water during crop growth highlights the importance of stored water, even for summer crops which are less dependent on this buffer, but

Table 1. Some water balance and derived indices for 3 sites for summer and winter crops

Location	Crop season	Annual rainfall (mm)	Fallow rainfall (mm)	In-crop rainfall (mm)	Fallow efficiency[1] (%)	Fallow dependency[2] (%)
Emerald	summer	644	288	356	22	26
Emerald	winter	644	538	106	25	82
Dalby	summer	641	260	381	26	27
Dalby	winter	641	453	188	24	62
Moree	summer	524	242	282	28	32
Moree	winter	524	315	208	18	36

[1] *Fallow efficiency, is defined as the (gain in soil water) / (fallow rain)%.*

[2] *Fallow dependency is defined as the (increase in fallow soil water) / (transpiration) %. In practice, this is the proportion of transpiration (water that goes through the crop) that comes from soil water stored in the fallow.*

Figure 1 Monthly water balance components for a summer crop at Emerald

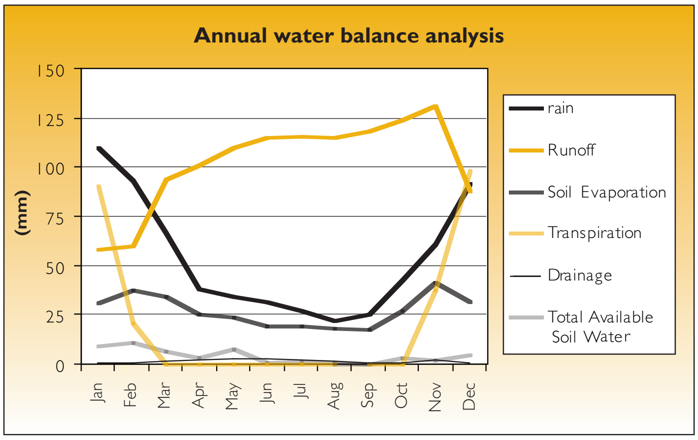
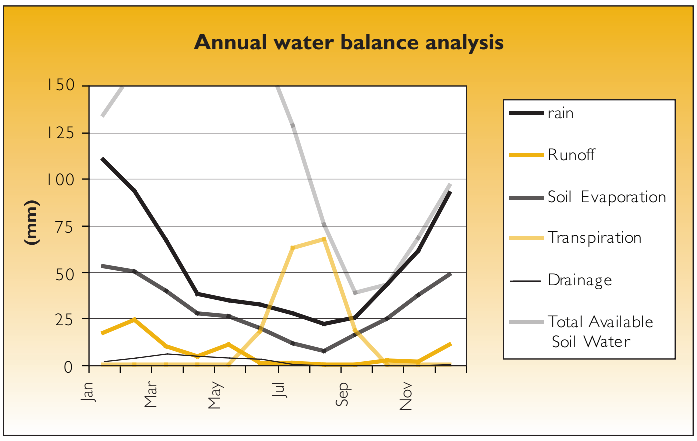


Figure 2 Monthly water balance components for a winter crop at Emerald



nevertheless require stored water for the many dry periods between rainfalls.

How can we manage better?

While these results seem intuitive, a few features stand out - for example, the less rain in-crop, the more dependence on stored water, with Emerald being the extreme case for winter crop-summer fallow sequences. Moree appears to be the breakpoint where both summer and winter crops are similarly dependent on stored water (32-36%). It stands to reason that as the importance of the fallow on crop performance increases, management of fallow periods and the ability to estimate starting soil water increases.

At Emerald, winter crops such as wheat are highly dependant on stored soil water at planting and therefore management of the preceding summer fallow to maximise water accumulation is critical. On the other hand, summer crops such as sorghum are less dependent on stored soil water at planting and more dependent on in-crop rain. Fallow management to maximise water accumulation is still important however. Therefore, summer 'opportunity' crops are more likely to be successful in the CQ environment than further south.

FURTHER INFORMATION:

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Rusts – be vigilant for swift response

Most cereal rusts – including stripe rust have a long latent period. The latent period is the time between when infection occurs and when disease symptoms become visible as pustules on the leaf. Typically this is around 2 weeks for stripe rust. With most foliar fungicides providing only 8-10 days kickback (ie they need to be sprayed within a week of infection occurring to work to their full potential), fungicides are generally far less effective when applied to crops where symptoms are already present. This explains why in sensitive varieties that exhibit disease symptoms when spraying, or in periods when inoculum loads are high, disease symptoms can sometimes still progress in the week or so after spraying with potentially devastating effects on crop yield.

The warmer conditions of early spring can see rapid rises in disease levels as temperatures favour more rapid cycling of the pathogen within infected plants. It is critical that at risk crops are identified and protected before they suffer significant infection. This requires farmers and agronomists to balance their use of foliar fungicides with the likely inoculum load for that season, varietal susceptibility, prior management such as seed treatments and in response to the economic outlook of the crop.

There are many variables to consider, but recent research by the Northern Grower Alliance, New South Wales DPI and the Queensland DPI&F has provided the data needed for informed decisions.

Much of the information from trials in the 2006 season and how this relates to fungicide management strategies were summarised in the March 2007 Updates. Update papers can be downloaded from the GRDC website. A more comprehensive document titled "Stripe rust – Understanding the disease in wheat can be downloaded from: http://www.agric.nsw.gov.au/reader/crops-pests-diseases.

According to NSWDPI cereal pathologist Steven Simpfendorfer, "the critical issue is timing". Early treatment is essential in susceptible varieties and situational awareness of how the disease is progressing in the region and surrounding areas, as well as frequent and thorough crop monitoring are critical to success. Our research in 2006 highlighted that delaying a foliar fungicide application by even four days can dramatically reduce the benefit of spraying," he said.

It is estimated that some 2.8 million ha of wheat will be sown in NSW in 2007. Moderate areas have also been sown early to dual purpose wheat varieties, particularly in the central and southern regions of NSW. Many of the dual purpose wheat varieties have only an intermediate level of resistance to stripe rust and appear to be involved in building up early season inoculum levels. Unmanaged, this could increase the inoculum load paced on main season varieties.

Main season varieties such as Ventura$^{\phi}$ and Ellison$^{\phi}$ which are resistant to the WA pathotype of stripe rust are proving popular with growers and have been widely sown in 2007. The concern here is the potential threat that a new pathotype of stripe rust, that was detected at only two sites in south-eastern Australia in 2006, may pose to wheat crops in 2007. The new pathotype has arisen from a mutation of the WA pathotype which has acquired virulence for the *Yr*17 gene which is the major line of defence in many popular wheat varieties grown in NSW, including Ellison, Marombi$^{\phi}$, Sunbri$^{\phi}$, Sunlin$^{\phi}$, Sunstate$^{\phi}$, Sunvale$^{\phi}$ and Ventura. The simple message is varieties with the *Yr*17 resistance gene will need to be carefully monitored during the 2007 growing season.

The drought will have limited the survival of rust on volunteer wheat over summer and reduced inoculum load. However, plenty of volunteer wheat still existed in many regions and rust spores can rapidly spread between regions during the season once it develops. The WA pathotype is likely to again be the dominant stripe rust pathotype in 2007 with the new *Yr*17 pathotype presenting a lessening risk to crops the further north they are in 2007.

The situation in mid June was that no stripe rust has been reported in NSW on volunteer wheat, early sown dual purpose wheat crops or main season varieties. However, wide plantings and a favourable season may see this situation change as we progress towards the end of winter and into spring.

FURTHER INFORMATION:

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Project code: DAN485

Word swap at WTO – implications for grains industry

Growers should be aware that a recent change to the World Trade Organisation's (WTO) regulations for grain exports signals significant changes for Australia's grains industry.

"Changing the requirement for grain exports from a declaration that a particular pest 'is not known to occur' to the new requirement to provide evidence that the pest 'is known not to occur' means taking new action to maintain our access to international markets," said Dr Sharyn Taylor, Program Manager at Plant Health Australia (PHA).

"The Australian grains industry needs to build on current inspection and surveillance activities to gather the scientific evidence required to support claims that our grain is free of pests and diseases," Dr Taylor said.

To ensure 'evidence of absence' for Australia's grains industry, PHA, in partnership with the Department of Agriculture and Food, WA (DAFWA), and the Grains Council of Australia, has initiated the Grains Industry Biosecurity Surveillance Program. Within this program, Mr Keith Devenish has been appointed by PHA and DAFWA as the first Grains Industry Biosecurity Officer.

The program aims to establish a network of grain growers and agronomists to collect and record crop inspection information as part of their usual crop surveillance activities, and report back several times during the growing season. Participants will receive training from PHA, with expressions of interest currently being sought for the first session planned for Perth in late August.

"The WTO change is good news for Australian grain growers. By ensuring that current surveillance and data collection efforts are coordinated and centrally recorded, the grains industry maintains its international markets, and any disputes can be quickly resolved. The current arrangements for rapid detection and response to any emergency plant pest incursion are also strengthened," Dr Taylor said.

FURTHER INFORMATION:

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Advice on guidance systems

The Central Queensland Sustainable Farming Systems project recently captured grower experiences with GPS guidance systems.

Key issues for growers considering purchasing GPS guidance were:

- **Identify needs before purchase.** If inter-row cultivating, planting adjacent to standing stubble or shield or band spraying, then a 2cm accurate system is likely to be needed. If the objective is just to minimise spray overlap, a 10cm or 25cm system may be appropriate.
- **Ensure the auto steer system is compatible** with existing machinery.
- **Repeatability** of the system is critical if a grower wants highly accurate, precision guidance. **Repeatability** is the long term accuracy that allows you to come back in two hours, two days, or two years. Some guidance dealers will quote **'pass to pass' accuracy**, which can mislead growers who want a long-term accurate and repeatable guidance system. **Pass to pass accuracy** is accurate if a following pass is performed within 15 minutes of a previous pass.
- **Dual frequency** (as opposed to single frequency) guidance systems, reduce satellite acquisition times during start-up and reacquisition following satellite drop out.
- **A good base station set-up and location** (for systems that need one) was vital for the system to operate to full potential. Issues include:
    - o An uninterrupted view of the sky from horizon to horizon,
    - o Located away from buildings that interrupt the GPS signal,
    - o A sturdy base to prevent wind movement.
- **Good customer service is vital.** Most growers will have teething problems – especially during set-up. Good backup is likely to be needed.
- **Try before you buy.** The offer of a shift in a neighbours spray rig is likely to make most happy to give you a test drive of their machine.

FURTHER INFORMATION:

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Project code: DAQ 00049

New legume inoculant formulations

Effective rhizobia nodulation is essential to maximise the yield and the amount of nitrogen fixed by a legume crop or pasture.

Speaking at recent GRDC Updates, Dr David Herridge from NSW DPI in Tamworth said "In soils with low levels of rhizobia, inoculation can result in a substantial increase in nodulation and yield. Yield increases of 50–150% are not uncommon in pulse crops."

The inoculation method has been to apply a peat-based inoculant as slurry to the seed just before sowing. Now, a more diverse range of inoculant products with a range of application options are available from several manufacturers. These include:

- Becker Underwood (NODULAID™ and NODULATOR® Granules) – Peat and liquid inoculants, applied as a slurry/powder/liquid to the seed or 'in furrow' to the soil and peat/clay granular inoculants, applied 'in furrow' to the soil
- New-Edge Microbials (EasyRhiz™) - Freeze-dried inoculants, made up as a liquid and applied to the seed or 'in furrow' to the soil
- ALOSCA Technologies (ALOSCA®) - Clay granular inoculants, applied 'in furrow' to the soil
- Brushmaster (Inoculeze™) – Peat inoculants, applied as a 'tea' extract to the seed just before sowing using an applicator
- Philom Bios Australia (N-Prove) – Will release a range of peat-based and granular inoculants in the 2008 season. These peat products can be applied as a slurry/powder/liquid to the seed or 'in furrow' to the soil.

"All the products mentioned incorporate the same strain of rhizobia for each of the legume groups, said Dr Herridge. This means, regardless of the brand bought, the strain will be one that has undergone rigorous trialling for efficacy and adaptation to Australian conditions by an independent body.

To improve information availability and farmer confidence in rhizobial inoculants, the GRDC is supporting the NSW DPI's Australian Legume Inoculants Research Unit (ALIRU) to assess inoculant quality at the point-of-sale and to report the results to farmers, advisers, resellers and manufacturers.

FURTHER INFORMATION:

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Project code DAN00097

Certified mungbean agronomy courses

Mungbean agronomy courses for agronomists and farmers run by Pulse Australia in association with the Queensland DPI&F, NSW DPI and the Australian Mungbean Association are planned for later in 2007.

Course locations and dates are:

Emerald: September 5th & 6th

Dalby: October 10th & 11th

Narrabri: October 17th & 18th.

Courses provide the technical knowledge and practical skills required to achieve more reliable and profitable mungbean production.

Topics covered include, variety and paddock selection, crop agronomy, nutrition, weed, disease and insect control, as well as harvest and marketing consideration. The cost is $475

FURTHER INFORMATION:

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Diary dates

Grains Research Updates – dates set for 2008

Dubbo – February 28 and 28th

Goondiwindi – March 5 and 6th

Detailed diary dates are located on the GRDC website