Newsletter Volume 11, June 2015

CONSERVATION FARMERS INC.

The Yield Gap in the Northern Region

Over the last few years there has been increasing attention on bridging the yield gap. What is the yield gap, and how much potential is there for improvements in the northern region?

What is the Yield Gap?

Put simply the yield gap is the difference between the actual yield achieved and the water limited yield potential.

The actual yield is the yield achieved in commercial crops, while the water limited yield potential is the maximum yield of an adapted variety grown under rain fed conditions with best management practices to minimise growth limitations from nutrients, pest and diseases.

From a truly practical in-field perspective neither full potential yield nor water limited yield are likely to be attainable. As such, a more realistic goal is the exploitable yield. Observations in the southern region have shown that farm yields tend to plateau at around 80%. From this point it is suggested that further gains will become more difficult and less economically attractive. Critically important to bridging the yield gap is the cost benefit analysis associated with inputs and outputs.

To determine the exploitable yield we use the concept of relative yield. Relative yield is the actual yield divided by the water limited yield as a percentage.

Summary Terms and Calculations

Terms	Formula
Yg = Yield Gap	Yg = Yw-Ya
Ya = Actual Commercial Yield	
Yw = Water Limited Yield	
Y% = Relative Yield	Y% = Ya/Yw * 100

How the information is collated.

Actual yield is estimated from statistical data collated from sources such as the Australian Bureau of Agricultural and Resource Economics and Science (ABARES) and Australian Bureau of Statistics. The data is aggregated up from individual farms to statistical local areas (SLA), regions and climatic zones.

Water limited Yield is determined using cropping system models. The models consider daily weather data, soil characteristics (especially soil water holding capacity), soil water status at sowing and a specific best practice approach. The best practice approach includes sowing time, sowing rate/density, variety, and the dates and rates of nitrogen applications.

The data collated covers a 15 year period from the mid 1990's through until 2010. This time frame is long enough to represent climate variability but short enough to represent changes in technology and best practice.

What does the information show for the northern region?

The information collated can be found on the Yield Gap Australia Interactive website; www.yieldgapaustralia.com.au.

The data is depicted as maps which show the Yield Gap and the Relative Yield for each statistical local area over a number of years. Information can also be sourced at an agro ecological zone, regional or national level.

It is important to note that the information shows average yield data summarised for local areas and ecological zones using data sets collated at a national level.

Some local area examples are as follows;

		Actual Yield (t/ha)	Water Limited Yield (t/ha)	Yield Gap (t/ha)	Relative Yield (%)
SLA	Emerald	1.7	3.0	1.3	57
AEZ	Central Qld	1.5	2.8	1.3	54
	Taroom	1.1	3.3	2.1	35
	Tara	1.5	3.2	1.7	47
	Moree Plains	2.0	3.8	1.8	52
AEZ	NE NSW & SE Qld	1.9	3.9	2.0	49
Region	Northern	1.7	3.6	1.9	46

SLA: Statistical Local Area, AEZ: Agro Ecological Zone

What does it mean for Growers?

This data gives growers a really good look at a whole range of their neighbour's crops. Growers can more clearly see over the fence, they can investigate yields in their own local area or ecological zone. They can compare yields between regions and even at a national level.

A quick look suggests that northern grain producers are producing only about 46% of the

yield potential of the region and that there is more yield to be extracted from wheat crops. Similar trends have been seen in other regions, with Southern region at 52% and the west at 55%.

Because it is an interactive website growers can benchmark their farm performance with their neighbours, the average performance from a local, regional or even a national perspective.

Questions:

1. Soils can vary significantly across SLA and even paddocks. The program utilises APSoil and ASRIS maps to source soil information.
   - How comprehensive is this soil information for the northern region?

     We have lots of soil data for the Northern Region but we are using Australian Soil Classification soil classes as the distinguishing soil type. We have used up to three soil types per weather station to ensure that soil differences are captured.

     We are now looking at a sensitivity analysis for subsoil constraints to give up greater definitions, but that is one for a future upgrade.
   - How well do you believe the models and soil data sets account for this variability?

     We've done an analysis of the influence of soil type by AEZ and there are quite strong trends, especially in the northern region where stored water is so important.
2. Rainfall variability can be significant, especially in the northern region where patchy storms can result in full soil profiles at one location and no soil moisture in the neighbouring paddock.
   - How well are you able to account for this in the models?

     Only to the extent that we use every met station in the grain zone to map water limited yields. We use statistical techniques to interpolate between these stations.
   - Could this variability account for some of the yield gap?

     This would be one of the least important factors as we find that the relative yield gap is quite stable between seasons and this is much greater variability than between met stations in the same season.
3. If I enter my individual data how will this be utilised?

   If you enter your individual data in the "compare my farm" tool you will be able to benchmark your farm against the water limited yield potential and against your neighbours. This data is not kept by the website it is only seen by you and cannot be accessed by anyone else.

References:

Yield Gap Australia has been developed by CSIRO and the GRDC.
GRDC Project Code: CSA00042
www.yieldgapaustralia.com.au
Hochman et al (2012): Yield Gap Analysis: quantifying the yield gap between farmers' wheat yields and water limited yield potential. http://www.regional.org.au/au/asa/2012/soil-water-management/8040_hochmanz.htm
Zvi Hochman. David Gobbett, Heidi Horan, Di Prestwidge & Javier Navarro Garcia (2014): Bridging the yield gap – how much are we leaving behind? Environmentally achievable vs actual yields. GRDC Grains Research Update Goondiwindi, March 2014. http://grdc.com.au/Resources/Publications/2014/03/GRDC-Grains-Research-Update-Goondiwindi-March-2014#sthash.3FrkuXhk.dpuf