Hyper Yielding Cereal Project

A FEED GRAIN INITIATIVE

FAR AUSTRALIA

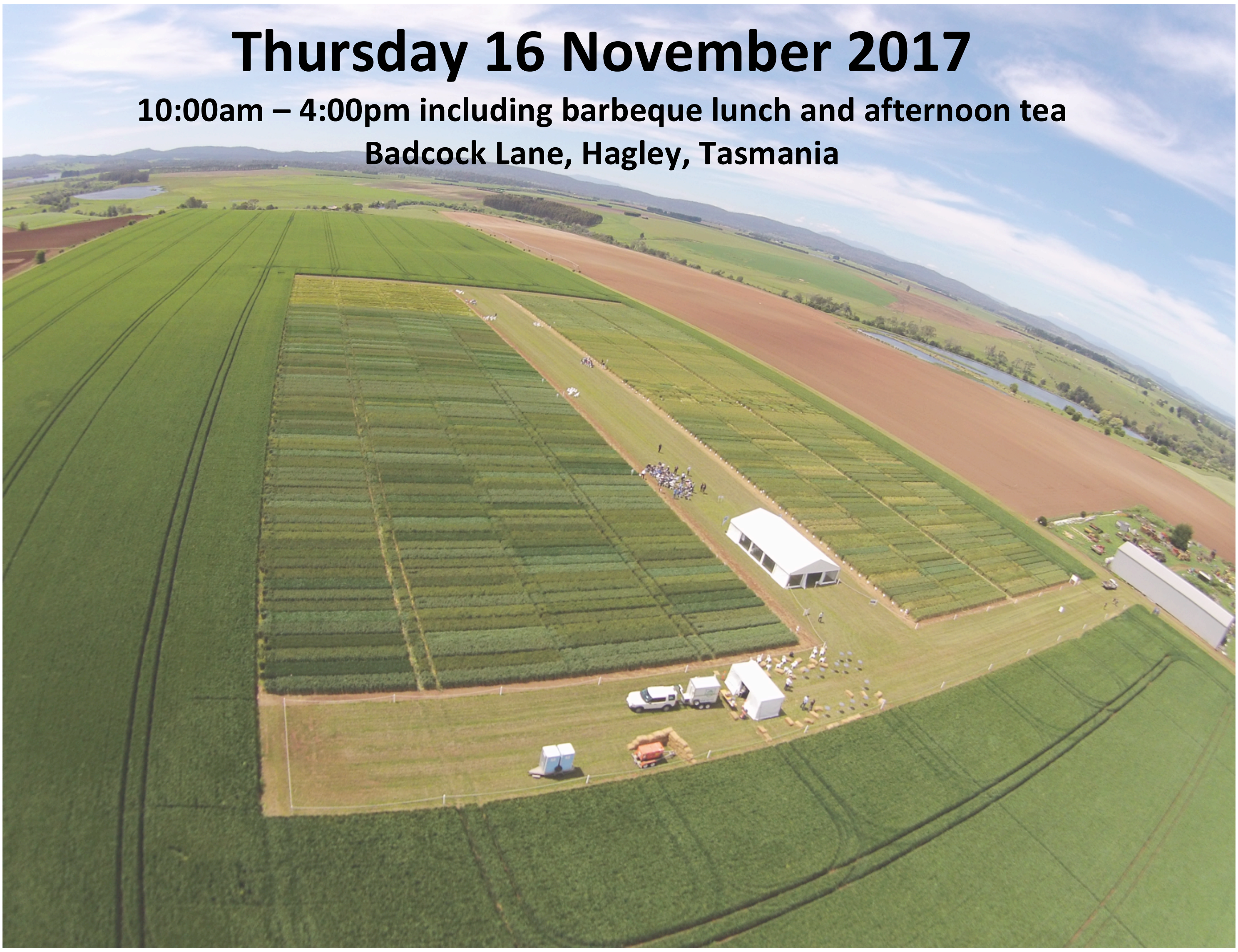
GRDC GRAINS RESEARCH & DEVELOPMENT CORPORATION

SFS

Thursday 16 November 2017

10:00am – 4:00pm including barbeque lunch and afternoon tea

Badcock Lane, Hagley, Tasmania



The project steering committee would like to thank the following event sponsor:

Roberts

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VISITOR INFORMATION

We trust that you will enjoy your day with us at the Hyper Yielding Cereal Project Field Day. Your health and safety is paramount, therefore whilst on the property we ask that you both read and follow this information notice.

HEALTH & SAFETY

- All visitors are requested to follow instructions from FAR and SFS staff at all times.
- All visitors to the site are requested to stay within the public areas and not to cross into any roped off areas.
- All visitors are requested to report any hazards noted directly to a member of FAR or SFS staff.

FARM BIOSECURITY

- Please be considerate of farm biosecurity. Please do not walk into farm crops without permission. Please consider whether footwear and/or clothing have previously been worn in crops suffering from soilborne or foliar diseases.

FIRST AID

- We have a number of First Aiders on site. Should you require any assistance, please ask a member of FAR or SFS staff.

LITTER

- Litter bins are located around the site for your use; we ask that you dispose of all litter considerately.

VEHICLES

- Vehicles will not be permitted outside of the designated car parking areas. Please ensure that your vehicle is parked within the designated area(s).

SMOKING

- There is no smoking permitted inside any marquee.

Thank you for your cooperation, enjoy your day.

WELCOME TO THE 2017 HYPER YIELDING CEREAL PROJECT FIELD DAY

On behalf of the steering committee, I am delighted to welcome you to the second Hyper Yielding Cereal Project Field Day. For those that attended last year welcome back, we are pleased to have attracted you back to the event, to those visiting for the first time it's great to have your interest in the project.

Led by the Foundation for Arable Research (FAR) Australia in collaboration with Southern Farming Systems (SFS), the Hyper Yielding Cereal (HYC) Project is funded by the Grains Research and Development Corporation (GRDC) and is aimed at boosting Tasmania's production of high quality feed grain cereals, thereby reducing its reliance on supplies from the mainland.

Today's event not only gives us the chance to demonstrate the 2017 trials programme but it also enables us to discuss the first year results from the HYC project. 2016 results from the project were extremely encouraging for the project team with yields setting new benchmarks for the productivity of feed wheat in the state. Whilst yields at this stage have only been generated in research plots, the highest grain yields were in excess of 16t/ha, giving confidence that commercial yield targets of 14t/ha could be achieved.

The GRDC recognised some time ago that a huge opportunity exists for Tasmania to produce much greater volumes of feed grain cereals with new irrigation schemes coming online. It also recognised that with favourable quality attributes there was a growing market in the state's dairy sector.

<u>How did the project originate?</u>

Despite a more favourable climate for grain production compared with the mainland, and greater yield potential, Tasmania remains a net importer of cereal grains. The average yield of red grain feed wheat in Tasmania is less than 5t/ha and the state imports approximately 150,000-200,000 tonnes of cereal grains compared to a domestic production of 60,000-80,000 tonnes. The HYC project aims to make Tasmania more self-sufficient in its capacity to supply feed grain to the State's dairy industry and other livestock users.

The project aims to bridge the gap between actual and potential yields through genetic improvement of cereal crops, best practice in terms of management of those crops and recognition of quality for the key end users. To that end, much progress has already been made in the initial screening of new cultivars for high yields, disease resistance and traits suitable for the Tasmanian environment.

Project objectives

With input from national and international cereal breeders, growers, advisers and the livestock industry, the project is working towards setting record yield targets as aspirational goals for growers of feed grains. In year one the project achieved this in the research plots, now the project team has to translate this into commercial yield gains. The newly established focus farms which are trying out high flying candidates from 2016 are the first steps towards commercial gains, but dare I say establishing a new Australian wheat yield record for commercial crops here in Tasmania would be a great way to build on the objectives of this project. With the right incentives, the project steering group believe it will be possible to encourage breeders to place greater focus on the needs of Tasmanian growers and the more general needs of the long season High Rainfall Zone (HRZ).

To focus on these objectives, the project has been set the challenge of:

- *Increasing average Tasmanian red grain feed wheat yields from 4.4t/ha to 7t/ha by 2020;*
- *Delivering commercial wheat crops which yield 14t/ha by 2020;*
- *Identifying and endorsing the value of metabolisable and digestible energy in feed grain cereals through engagement and collaboration with the dairy and other end users in the Tasmanian industry.*

Today's event

The event will feature research trial demonstrations, a panel discussion and a line-up of international, mainland and Tasmanian speakers who will discuss various aspects of improved germplasm and agronomy, grain quality and livestock nutrition strategies.

To endorse the project's international linkages and our quest for higher productivity, our keynote speaker for today's event is Eric Watson, the current world wheat yield record holder (classified by the Guinness World Records). Eric with his wife Maxine crop nearly 500ha near Ashburton on the Canterbury Plains of New Zealand. He will discuss the key ingredients and challenges for achieving higher yields in wheat and obtaining the world record itself. Eric and Maxine's world record wheat yield established in February 2017 stands at 16.79t/ha and beats the previous record held in northern England by over a quarter of a tonne.

Last season it was very clear that to achieve high yields it's essential to select cultivars with the correct phenology for the sowing date being adopted; this is particularly important for earlier sowing where spring wheat germplasm can frequently develop too quickly and be liable to frost damage. One of Australia's foremost experts on developing and selecting the correct germplasm for earlier sowings on the mainland is Dr James Hunt from La Trobe University. James joins us today to discuss the fundamental differences in wheat germplasm and the different development signals that affect the growth and development of spring and winter wheats.

Interaction with livestock sector as an end user of feed grains remains an essential component of the HYC project. Today's event includes discussions on the needs of the dairy, sheep and poultry sectors in terms of cereal grain quality required. In addition, there are two sessions including a panel session looking at the use of feed grain cereal crops for grazing and grain production in Tasmanian mixed farming systems.

Should you require any assistance throughout the day, please don't hesitate to contact a member of the FAR or SFS team who will be more than happy to help.

Thank you once again for taking the time out of your busy schedule to join us today; we hope that you find the presentations useful, and as a result take away new ideas which can be implemented in your own farming business. Have a great day and we look forward to seeing you again at future project events.

Nick Poole
Managing Director
FAR Australia

Funding acknowledgement
The Hyper Yielding Cereal Project steering group would like to place on record its grateful thanks to the Grains Research & Development Corporation (GRDC) for their funding support for this event and project.

Sponsorship acknowledgement
The Hyper Yielding Cereal Project steering group would also like to acknowledge the sponsorship support given by Roberts to assist with catering.

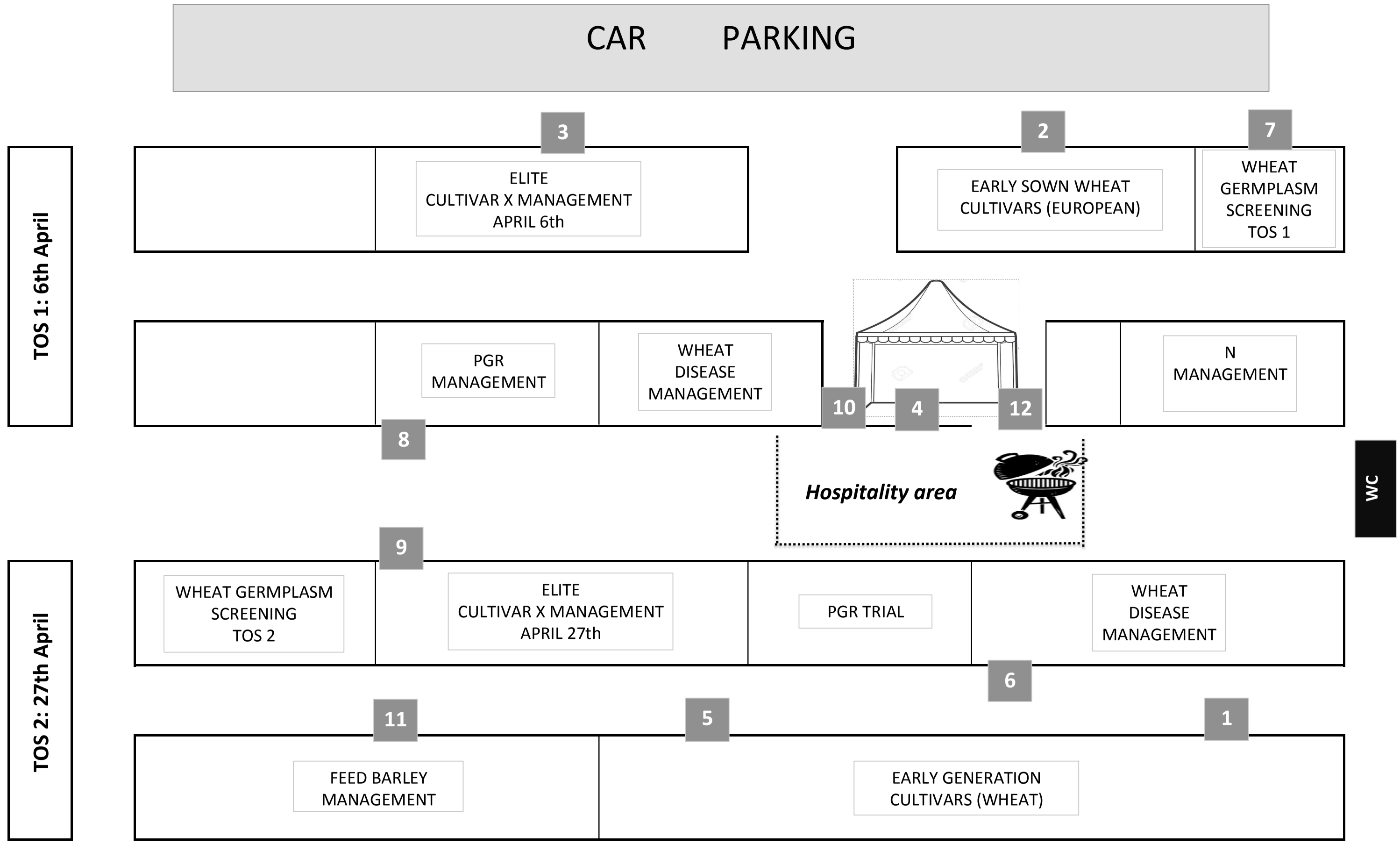
Other acknowledgement
The Hyper Yielding Cereal Project steering group would also like to acknowledge the land owner Mr Don Badcock for his continuing support on the research site.

TIMETABLE

Opening address by Tom Giles, GRDC Senior Manager, National Variety Trials

In-field presentations	Station No.	10:00	10:30	10:45	11:15	11:45	12:15	12:45	1:45	2:15	2:45	3:15	3:45
Winter wheat vs spring wheat germplasm - what's the difference with regard to optimum sowing date and management? **Dr. James Hunt, La Trobe University**	1	morning tea	welcome and opening address					lunch (kindly sponsored by Roberts)					afternoon tea and close
What are the key ingredients for a world record wheat yield? **Eric Watson, Cropping Farmer, New Zealand**	2												
How can feed grain cereal crops be used in Tasmanian mixed farming systems to optimise both grain and livestock production? **Cam Nicholson, Director, Nicon Rural Services**	3												
Smart use of grains in sheep programmes. **Anthony Shepherd, Sheepmatters, Cootamundra, NSW**	4												
The role of feed grain cereals in pastoral based dairy production systems. **Richard Rawnsley, Dairy Centre Leader, TIA**	5												
Are high yielding feed wheat cultivars more dependent on a diet of high fungicide input? **Tracey Wylie and Darcy Warren, FAR Australia**	6												
What yields can we achieve with new germplasm and agronomy techniques in Tasmania? **Nick Poole, Managing Director, FAR Australia**	7												
What is the yield penalty associated with lodging in wheat when you have a yield potential of 14t/ha? **Jon Midwood, CEO, Southern Farming Systems**	8												
Can we have hyperyielding cereals without hyper input costs? **Ian Herbert and Georgina Moloney, Southern Farming Systems, Tasmania**	9												
What are the feed grain requirements of poultry producers in Tasmania? **Tristan Nichols, Agricultural Manager, TasFoods**	10												
Irrigated spring barley - can it be the wonder crop? **Nick Pyke, CEO, FAR New Zealand**	11												
Panel discussion facilitated by Cam Nicholson: Use of feed grain cereal crops for grazing and grain production in Tasmanian mixed farming systems. Cam will be joined on the panel by farmers: **Sam Lyne, Campbell Town** **Brett Donlan, Ross** **Rob O'Conner, Benham**	12												
In-field presentations	Station No.	10:00	10:30	10:45	11:15	11:45	12:15	12:45	1:45	2:15	2:45	3:15	3:45

SITE PLAN



Not to scale

Station 1

10:45am and 1:45pm

Dr. James Hunt
La Trobe University

Winter wheat vs spring wheat – what's the difference with regard to optimum sowing date and management?

All crops have what is referred to as a 'critical period', which is the time in the crops life cycle during which yield is most sensitive to stress. For wheat, the critical period extends from flag leaf emergence to approximately ten days after flowering. A key aspect of maximising yield in any environment is making sure that the critical period coincides with the most favourable conditions likely to be experienced during the growing season. In other words, wheat must flower at the right time of the year in order for potential yields to be achieved.

In the drier wheat growing regions of Australia, optimal flowering time is defined by increasing risk of heat and drought stress, and decreasing frost risk, which tends to occur in early spring. In Tasmania which has cooler temperatures and higher rainfall, radiation and average temperatures become more important, and optimal flowering time is likely to be in the second half of spring. High yields come when radiation levels during the critical period are high, driving rapid growth, but temperatures are relatively low (average temperatures <15°C) driving slow development. This is part of the reason that very high yields can be achieved in places like Tasmania, NZ and the UK.

In order for crops to flower at the right time of year, the right cultivar needs to be sown at the right date. There are two major types of development pattern in wheat – *winter* wheats and *spring* wheats. The development pattern of a cultivar has strong influence on when crops should be sown. Winter wheats have a strong vernalisation (cold) requirement, meaning they need to experience a winter before they will flower, and provided they are sown before winter flowering time is very stable. Spring wheats have little or no vernalisation requirement, and flowering is driven by accumulation of thermal time (i.e. the warmer it is they faster they will flower). Flowering time in spring wheats is unstable, and they have only a ~2 week period in which they can be sown in a given environment. Both winter wheats and spring wheats can also be sensitive to day length (photoperiod), and will be faster to flower in long days.

The vernalisation requirement of European winter wheats that have performed well at the Hyperyielding Cereals site (e.g. RGT Accroc) is likely to be ~8 weeks of temperatures around 5°C (vernalisation stops when temperatures drop below -2°C or go above 16°C). Consequently, they are well adapted to the Tasmanian environment as this ensures that they flower at the right time provided they are sown in autumn. Winter wheats bred for the drier growing regions of Australia (e.g. Kittyhawk, Wedgetail) have a vernalisation requirement closer to 4 weeks, which in Tasmania is so quickly met that they behave almost like a spring wheat and cannot be sown too early.

Station 2

12:15pm and 3:15pm

Eric Watson
Cropping Farmer, New Zealand

What are the key ingredients for a world record wheat yield?

Eric and Maxine Watson farm a 490ha, fully arable, 97% irrigated, property at Wakanui near the coast on the Canterbury Plains, in the South Island of New Zealand.

They grow a wide range of crops including cereals (wheat, barley, triticale), grass for seed (perennial ryegrass, fescues), alternative pasture species (chicory, plantain), vegetables for seed (spinach, radish, pak choi, red beet, corn salad) and seed peas, faba beans and linseed. On average the farm is sown in approximately one third cereals, one third grass and the remaining third from the other crops listed.

Wheat Yield World Record Achieved

On 17th February this crop was harvested – there were some exciting moments when the yield meter tipped into the 20 tonne range, but some heart stopping runs where the tramlines and irrigator runs caused it to drop below 15 tonne. The final yield, when all the wheat had passed over the weighbridge, and had been verified by the auditor with weights checked against moisture content, was 16.791 tonne/hectare at 15% moisture. Despite all the attention and additives it received, or perhaps because of them, this crop's gross margin was greater than any of the other wheat crops we grew this season, which goes to prove that greater yield leads to greater prosperity and more food for the world.

The Issues

The greatest potential threats to achieving high wheat yields are the weather, disease and man-made limitations.

The weather, whether it be climate change or just the normal vagaries of the seasons, can have a huge effect both positive and negative on wheat yields. Prolonged periods of cold damp weather can be detrimental to development, low sunshine hours at grain-fill can also compromise yield. Conversely hot, dry winds and extremely high temperatures can cause the crop to shut down, with the same resultant effect.

Yet another aspect which can be exacerbated by weather conditions is disease. The mild winter meant that aphids did not die away but were a threat right throughout the winter into spring. The cool, damp conditions in September and October greatly heightened the risk of fungal diseases like rusts, septoria and fusarium. Once these become established in the crop, though treatable to a certain extent, the damage is done and yield is compromised.

There is also a range of threats to high yields in wheat from human intervention. These vary from the over-regulation/restrictions of fertiliser and agrichemical applications to fungicide and herbicide resistance due to over application or lack of variation. There are also threats in bio-security – traditionally our island status so far from the rest of the world has kept disease and infestation risk at bay but situations brought about by the importation of stuffs such as palm-kernel and contaminated seed adds yet another level of threat to our arable industry.

Techniques and practices used

The most important practice in growing this crop was attention to detail. From preparing the seed bed, selecting the variety which was sown with best possible protection, monitoring the progress of the crop through all its stages so that it received the nutrients it required at the correct time; protected by a programme of insecticides, fungicides and herbicides, to maintain plant health and keep the crop as clean as possible. Plant growth regulators were also used. In all of this we were supported by very good agrichemicals and advice from Bayer and sound advice from the Yara rep who undertook foliar analysis on a regular basis to check levels of micronutrients which we know our soils are lacking.

There is no one thing which makes a good crop of wheat into a world record crop of wheat. It is a combination of many factors all coming together in the one season.

The autumn sowing conditions were excellent – the ground was dry and warm and the seed bed well prepared. A Case IH Quadtrac (tracked tractor) is operated to minimise compaction and every effort is made to work the ground as little as possible, using non-inversion tilling methods. This field, and the rest of the farm, has been under extensive soil testing for nine years. Variable rates of lime, phosphate and potash have been applied to even up base fertility. This uses fewer resources, minimises wastage or overuse and gives greater uniformity of yield.

11.9 ha was sown with Oakley at a rate of 65 kg/ha (treated with Poncho, Galmano, Raxil & Peridium Ferti) on 9 April, which was very early for us. The winter was mild and for a time it seemed this may be a problem, as the crop did not slow down its development through much of the winter. However, the spring was cool and damp, and the crop slowed down to the point where it was about a normal stage of development.

Fertiliser

All inputs matched the requirements for a 17 t/ha crop and were applied at the critical growth stages.

Superphosphate was applied at 600kg/ha prior to drilling.

Deep soil nitrogen was tested at the end of July and sat at 100kg, after a high input/high return crop of red beet for seed in the previous season. Nitrogen inputs were in line with FAR recommendations and applied at GS 30, GS 32 and GS 39. 258 kg N in the form of urea were applied to the crop, with a total N uptake of 22kg/T/grain removed.

Both herbage testing and Yara N tester values were used to determine the crop inputs during the growing season. Potassium was applied in early spring and sulphur as sulphate sulphurs during the growing season. Trace elements have always been an issue in Mid Canterbury cereal growing areas especially Manganese, Zinc and Copper - optimum trace element levels were maintained with inputs of Gramitrel, Mantrac, and Zintrac at label recommended rates.

Spray programme
This was rigorous and preventative. All agrichemicals used at recommended rates.
Herbicides are necessary evils to maintain a clean crop – competition with weeds can affect yield considerably.

Insecticides and fungicides were applied with a 'prevention rather and cure' philosophy - if an infestation of aphids or rust attacks the crop you can say goodbye to high yields. The mild winter saw flights of aphids persisting throughout the period with the resultant high risk of the Barley Yellow Dwarf virus they transmit.

Fungal diseases such as rusts, septoria, fusarium, are a constant issue, one needs to monitor the crops at least weekly – if the wheat is not treated for the prevention of these diseases they will rob the crop of any yield potential.

PGRs were applied several times to strengthen the straw to help hold up the very heavy heads necessary to achieve high yields. If the crop becomes lodged the yield potential is greatly reduced.

Irrigation
The weather treated us very kindly with regular and timely rainfall throughout the growing season, and only two irrigations, each of 25 mm, were required. The water was applied by lateral-move, overhead-spray machines, with soil moisture levels being measured on a weekly basis via neutron probes.

Seven of our nine laterals have variable rate control – they water the ground according to computerised maps of the soil's water-holding capacity which prevents over- or under-watering, cuts out overlaps, and enables one irrigator to water different crops on widely different soil types simultaneously. This gives considerable savings in water, electricity and time.

On 17 February 2017 the Watson's harvested a 11.9 hectare paddock that yielded 16.791 tonnes per hectare. This is a new world record for wheat yield that has been officially recognised by Guinness.

Summary - What are the key ingredients for a world record wheat yield?

Eric & Maxine Watson farm a fully arable, 97% irrigated property at Wakanui near the east coast on the Canterbury Plains. Crops grown: cereals (wheat, barley, triticale), grass for seed (per. ryegrass, tall & amenity fescues), alternative pasture species (chicory & plantain), vegetable for seed (spinach, radish, pak choi, red beet, corn salad), also seed garden peas, faba beans & linseed

The Issues

- Weather
- Disease pressures
- Human intervention – regulation
- Bio Security

Techniques and practices used

- Attention to detail in every aspect from cultivation to harvest
- Advice from Bayer and Yara
- Cultivation
    - Range of modern implements
    - Non-inversion tillage, as few passes as possible
    - Maintain soil structure
- Extensive soil testing leads to variable rate spreading of base fertiliser
- Fertilisers
    - Inputs matched requirements for 17 t crop
    - Deep soil (residual) N 100 kg
    - N applied according to FAR recommendations, GS 30, 32, 39
    - Total N uptake 22 kg/T/ha grain removed
- Herbage testing to determine crop inputs
    - Potassium & sulphur
    - Trace elements - manganese, zinc, magnesium
- Spray programme
    - Rigorous and preventatative
    - All agrichemicals used at recommended rates
    - Herbicides – necessary to maintain clean crop, weeds compromise yield
    - Insecticides – warm winter = long period aphid activity = high risk BYD virus
    - Fungicides – cool damp spring/early summer heightened risk of rusts, septoria & fusarium
    - PGRs – large heads need strong stems against lodging, wind damage
- Irrigation
    - Soil moisture levels monitored by neutron probes, read weekly
    - Regular, timely rainfall of great assistance this season
    - 2 applications of 25 mm each
    - 7 of 9 lateral move, overhead spray irrigators have variable rate application

The Crop

- 9th April 2016, 11.9 ha planted in Oakley wheat at 65 kg/ha
- 17^{th} February 2017 harvested 11.9 ha, yield 16.791 t/ha at 15% moisture
- 4^{th} April 2017 Guinness accepts as new world record for highest wheat yield
- Gross margin very good – inputs for high yieling wheat don't compromise profitability as long as yield is achieved

Station 3

11:15am and 2:15pm

Cam Nicholson
Director, Nicon Rural Services

How can feed grain cereal crops be used in Tasmanian mixed farming systems to optimise both grain and livestock production?

Long season cereal crops with strong winter habit provide great opportunity to have your grain and eat it too. From a whole farm perspective, enterprise diversity helps manage price and production risk. There is no correlation between the price of wheat and livestock products such as wool (e.g. 18u, r = 0.33), meat sheep (e.g. heavy lambs, r = -0.11) and cattle (e.g. trade steers, r = -0.38)[1]. A vegetative crop can be used as an alternative or complementary feed supply to permanent pasture and if it fails, say due to frost or waterlogging, can be used for silage or hay. The stubble can, at times, also have useful grazing value.

However most of the focus is in utilising the vegetative phase of the crop and then taking it through for grain. The 'value' in this approach is to maximise early dry matter production but preserve and possibly enhance grain yield.

The Grain and Graze program has investigated the grazing of crops in their vegetative stage over the past decade. This is summarised in the *Grazing Cropped Land* booklet (www.grainandgraze3.com.au/cb_pages/news/Grazing_cropped_land). A number of insights are worth highlighting.

Sow early to maximise early vegetative growth. Early sowing provides the opportunity to maximise drymatter production, especially if there is favourable early rainfall or irrigation available. Early sown (mid April) wheat crops produced more than 3 t/ha of dry matter about 12 weeks later when adequate moisture was available, however most results ranged between 700 kg/ha and 1700 kg/ha.

The vegetative growth is of very high quality. The metabolisable energy in the leafy material is more than 12 MJ ME/kg (>80% DDM), with protein levels above 25%. This is equal, if not better, than most pastures. Unfortunately with this 'rocket fuel' there can be digestive upsets in the animals that we are not completely on top of.

Grazing delays anthesis (flowering). This can be a dual edged sword, as flowering later can avoid frost events but can extend flowering into times of heat and moisture stress. The later and longer the grazing, the greater the delay in flowering (measured at between 3 days – early grazing and 14 days – late grazing). In addition uneven grazing in the vegetative stage can lead to uneven maturity at harvest.

Observe chemical withholding periods. Some common herbicides, seed dressings and insecticides used in cereal crops can have long (>10 week) grazing withholding periods.

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[1] www.agprice.grainandgraze3.com.au (from 01-01-2005 to 01-01-2015)

Complete grazing before stem elongation (GS 30). When stem elongation commences, the embryonic grain ear starts to run up the stem of the tiller. Grazing this removes potential grain bearing heads and therefore reduces yield.

Cease grazing to allow full crop recovery before flowering. Leaf biomass is required for grain fill. Obviously if there is insufficient biomass at flowering, the potential yield will be compromised (if other factors such as moisture, disease, nitrogen are not limiting). This can be managed by leaving some residual biomass after grazing, ceasing grazing early and grazing the 'right' varieties. In a recent trial at Inverleigh (Vic), there was significant recovery and grain yield differences between cv *Bolac*[2] (minimal effect) and cv *Revenue*[3] (large yield effect)[4].

As a rule of thumb a 5t/ha grain yield needs 9 t/ha of biomass at flowering. The lock up dates to minimise yield loss is being refined with a new calculator developed by UTas and the CSIRO that will be available on the Grain and Graze 3 website soon.

[2] Mid late season spring white wheat
[3] Long season winter red wheat
[4] SFS trial results 2016 – Victorian ed. pp. 102-105

Anthony Shepherd
Sheepmatters, Cootamundra, NSW

Smart use of grains in sheep programmes

As a general observation I believe the Australian sheep industry underfeeds its breeding ewes.

A classic example would be sheep left on stubbles for an extended period, (more than four weeks) where in fact the digestibility in stubbles rapidly declines to under 50%. With a dry breeding 50kg ewe needing 8.5 Mega Joules (MJ) of metabolising energy cereal stubble paddocks will not meet the ewe's energy needs after three to four weeks. Typically a feed test on cereal stubbles shows 33% digestibility, 4% energy, 2.5% protein and 70% dry matter around four weeks post-harvest. This doesn't even come close to meeting the ewe's energy and protein requirements. So as an example if you were to leave your dry ewes on a stubble paddock for more than four weeks and using the above numbers, you would need to provide a cereal grain (eg. barley) at 420 grams/hd/day to make up for the difference in energy needed.

Energy (MJ/ME) Requirements to Maintain Condition Score in a 50kg Breeding Ewe

Production Stage	MJ/ME Needed per day	Barley@ 12ME x 90% DM = 10.8MJ/ME Available Energy
Dry	8.5	780 grams/hd/day
Pregnancy Scanning	10.5	975 grams/hd/day
Lambing	18	1.65kg/hd/day
20 Days Post Lambing	26	2.45kg/hd/day
Weaning	10.7	995 grams/hd/day

Table 1. The above table shows you the energy requirements of a 50 kg breeding ewe through its breeding cycle and if the only feed available was supplemented barley, what they would need *per day to maintain condition.*

Understand the value of your grain you are feeding to your sheep

When you purchase a car, do you ask for the service record, the fuel economy etc? If you buy in grain, do you ask for a feed test? Some grain can be cheap per tonne, but depending on the feed test can be very expensive when it comes to feeding to what the sheep needs!

Firstly we can work out what the sheep needs per day and calculate a value. So if you purchased barley at $250.00 tonne that comes back to $0.25 kg. If the barley tested at as fed was 10.8 Mega Joules of Metabolising Energy (MJ/ME) then the cost per unit of energy is 2.3 cents (25 cents/10.8). As a dry 50 kg sheep needs 8.5 MJ/ME every day, then it would cost to feed the sheep $0.20 for the 780 grams a day.

So with the above example, if we change the cost per tonne of the grain to $230.00 tonne and it has tested 8.8 as fed MJ/ME, the price per unit of energy would be 2.6

cents and the cost to feed the same sheep would be $0.22 day. This extra $0.02 cents a ewe per day may not seem much but if you were to feed a 1000 ewes for 30 days, then the price difference would be $600.00 to meet the mobs energy requirements. This also means that in this poorer tested barley you would need to feed out 1.2kgs vs 780 grams per hd per day with the better testing barley. So going with the 1000 ewes being fed over 30 days, this would equate to you needing an extra 12.6 tonnes of the poorer tested barley to meet the ewe's energy requirements. Even though it cost you $20 a tonne less, because of the poorer energy test, it will cost you an extra $2430.00 to feed those 1000 ewes to meet their energy requirements over 30 days.

It is in your best interest when buying in feed grain to ask for a feed test. If you don't, your real risk is that, as shown above, that cheaper grain per tonne can be very expensive!

Grain Nutritional Values

Cereals and Pulses	Metabolisable Energy(MJ/ME/kg) Average (range)	Crude Protein (%) Average (range)	Dry Matter (%) Average (range)
Barley	12(9.8-13.3)	11(6-18)	90
Wheat	13(12-13.5)	14(9-20)	90
Oats	12(10.5-13)	9.5(6-17)	90
Triticale	13(12-13.3)	12(8-21)	90
Faba Beans	12.5(11.8-12.8)	25.6(19-29.2)	90
Lupins	13(12-14)	31(27-41)	90
Peas	13(12-14)	24.4(17-33)	90
Maize	13(12-14)	9.1(5.5-16.4)	90

Table 2. The above table shows energy, protein and dry matter values to more commonly used cereals and pulses.

More Starch = More Risk

Grains such as wheat, triticale and barley need a higher degree of management when feeding out to sheep, due to a more rapid rate of starch digestion. Higher amounts of digestible starch means quicker rates of fermentation will lead to increasing the risk of acidosis (pH in sheep's rumen <5.8)

Younger ruminants (lambs, weaners) are very susceptible to acidosis and so any transition from pasture to cereal based diets (barley, wheat and triticale) should be done slowly to allow the rumen to adjust.

Low risk cereals and pulses are oats, lupins, peas and faba beans.

As an example in a grain diet you would introduce 90% oats/ 10% barley onto weaners at 100 grams/ hd/day and every 3rd day change the ratio 70% oats / 30% barley and then again 50% oats / 50% barley, and then so on until you reach 100% barley. You would then increase the grams/hd/day by doubling it every 3rd day until you reach your full ration. You would do this with good hay being available as well, as ruminants require fibre for efficient microbe activity = more efficient digestion of cereal grains / pulses.

Always have calcium based lick available in high grain diets (barley and wheat), especially with male lambs/weaners. Also include ammonium chloride at half a percent of ration to reduce water belly (urinary calculi)

Opportunity with feeding grain(s)

- Extend pasture life (little and often)
- Complementary feeding
- Supplementary feeding
- Pulses vs cereal grains
- Pre joining flushing
- Lactation
- Pre Lambing
- Drought lot / feedlot
- Creep feeding (wean rumen before weaning!)
- Imprint feeding
- Measure conversion

Station 5

11:45am and 2:45pm

Richard Rawnsley
Tasmanian Institute of Agriculture

The role of feed grain in pasture based dairy production systems

Tasmanian Dairy Farming Systems
Tasmanian dairy production systems are predominantly pasture based. On average, home grown feed comprises approximately 70% of a dairy cow's diet in Tasmania. Comparing 12 years of Tasmanian dairy benchmarking data (2004/05 – Current) pasture consumption per hectare has increased from an average of 8.0 to 10.8 t DM/ha (Figure 1).

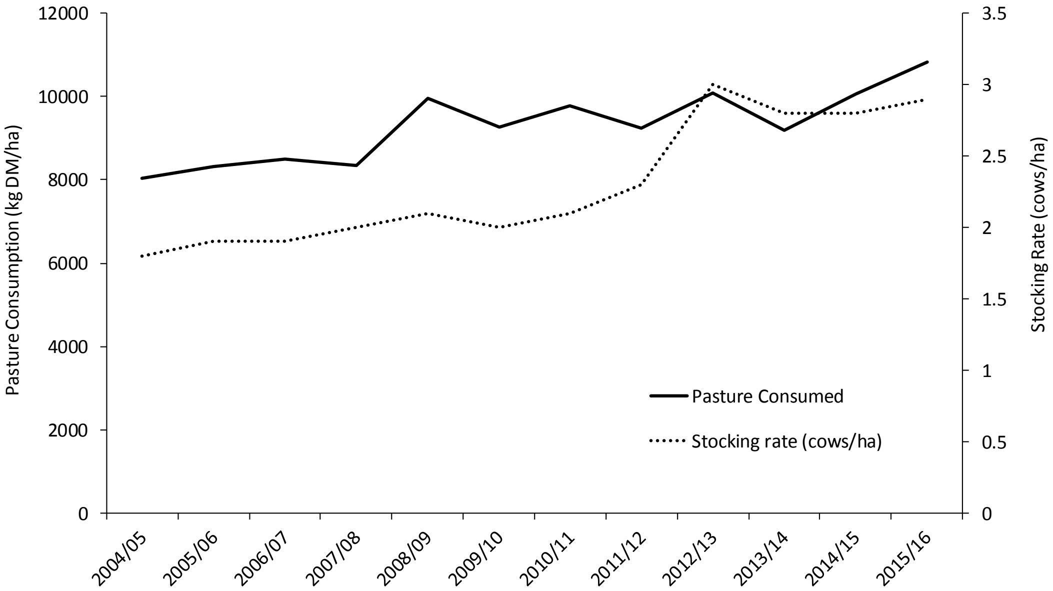

Figure 1. Change in stocking rate (cows/ha) and Pasture consumption (kg DM/ha) since 2004/05. Source TIA Dairy Business of Year (2017).

Stocking rate (cows/ha) has also increased in this time, along with increasing usage of nitrogen (N) fertiliser and a greater percentage of dairy land being irrigated (Figure 2).

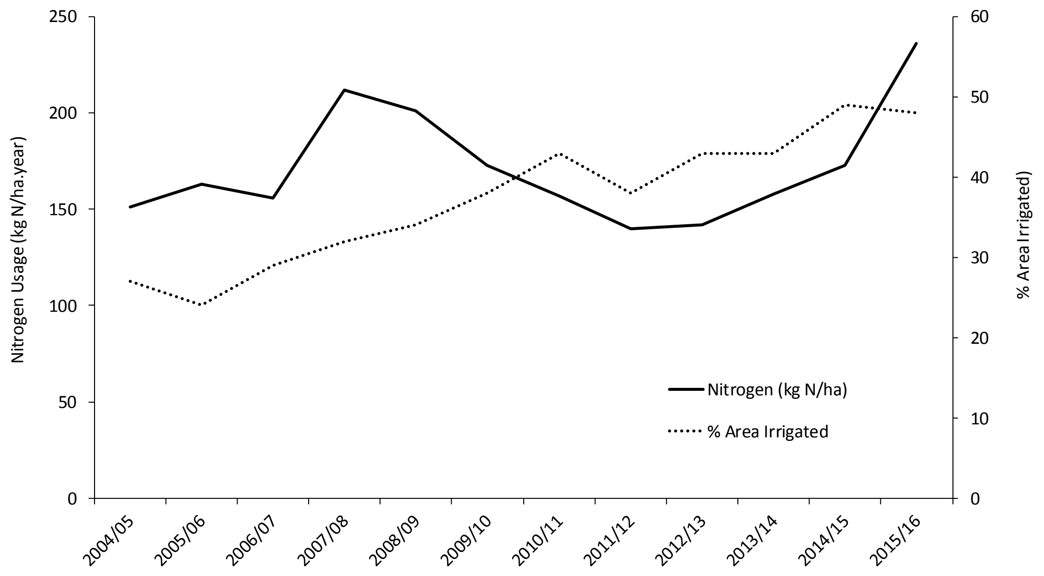

Figure 2. Change in nitrogen usage (kg N/ha) and area irrigated (%) since 2004/05. Source TIA Dairy Business of Year (2017).

Whilst pasture consumption is considered a key contributor to farm profitability, we have seen a significant increase in the level of grain fed per cow and rising per cow production (Figure 3).

During the past decade, factors such as milk price volatility, climate variability, changing regulations and increasing consumer demand have progressively challenged dairy farm systems throughout Australia and New Zealand (Raedts *et al*. 2017). We have also seen an increasing level of diversity of farm systems throughout Australia, although there is evidence of continuing evolution of intensification and this is supported by the Tasmanian benchmarking data.

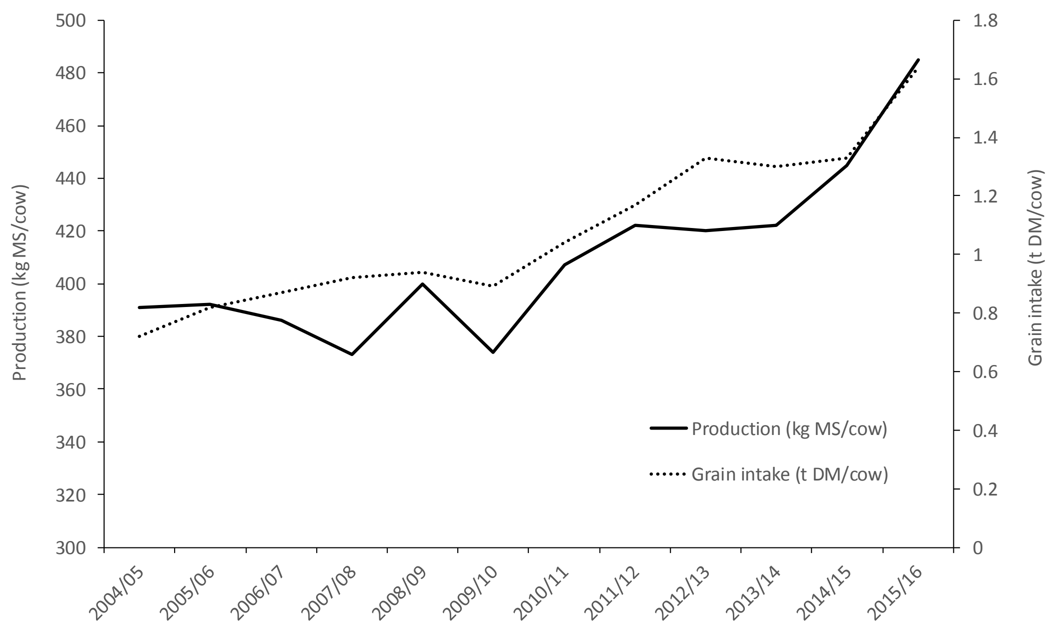

Figure 3. Change in production per cow (kg MS/cow) and grain intake (t DM/cow) since 2004/05. Source TIA Dairy Business of Year (2017).

Marginal Responses

The profitability of a dairy farm is very dependent on efficient use of resources; cow, land, water, labour etc. (Beever and Doyle 2007). In biological systems, as we input more the output changes; we can have increasing returns or diminishing returns from adding an extra unit of input (Figure 4).

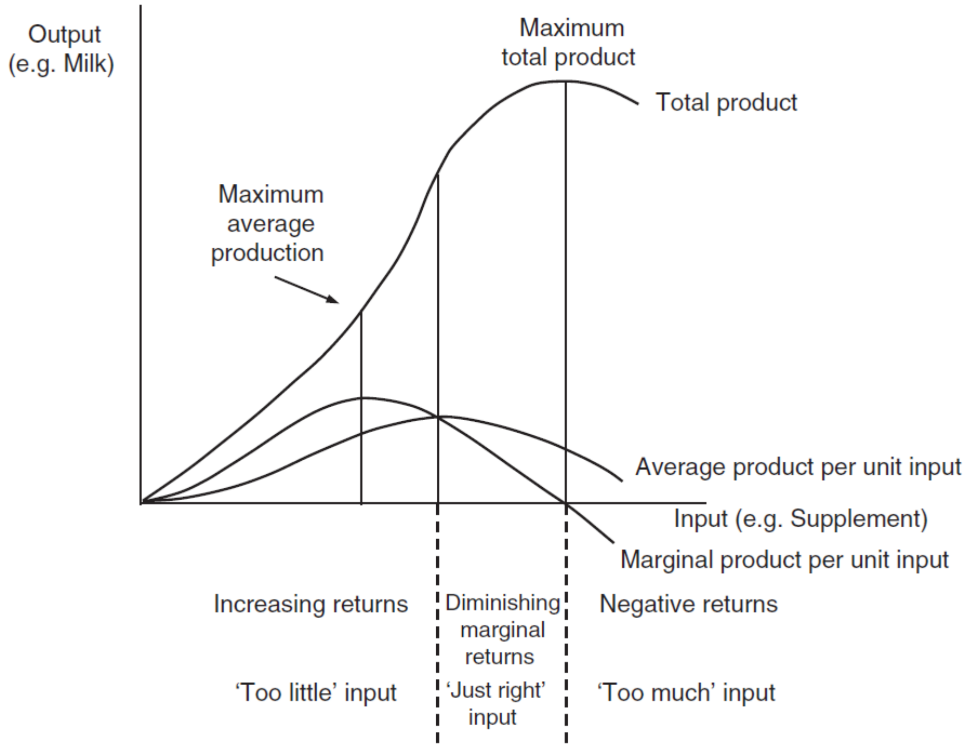

Figure 4. Response functions: input to output (adapted from Malcolm et al. 2005) and taken from Ho et al. (2017).

Economic theory states the maximising profit point occurs where the marginal revenue (the revenue received from the last unit of input) equals the marginal cost of the input. Feed is a large variable cost in most dairy businesses and economic theory states feeding grain will enable a dairy farm to improve profit, as long as the marginal revenue received from the milk produced exceeds the marginal cost of the grain (Ho *et al*. 2017). There is a very important difference between the margin and average response to feeding and this is illustrated in Figure 5. The marginal response of milk per unit of grain fed generally follows the law of diminishing returns, where the first units of grain fed are most profitable, and each extra unit yields a lower return.

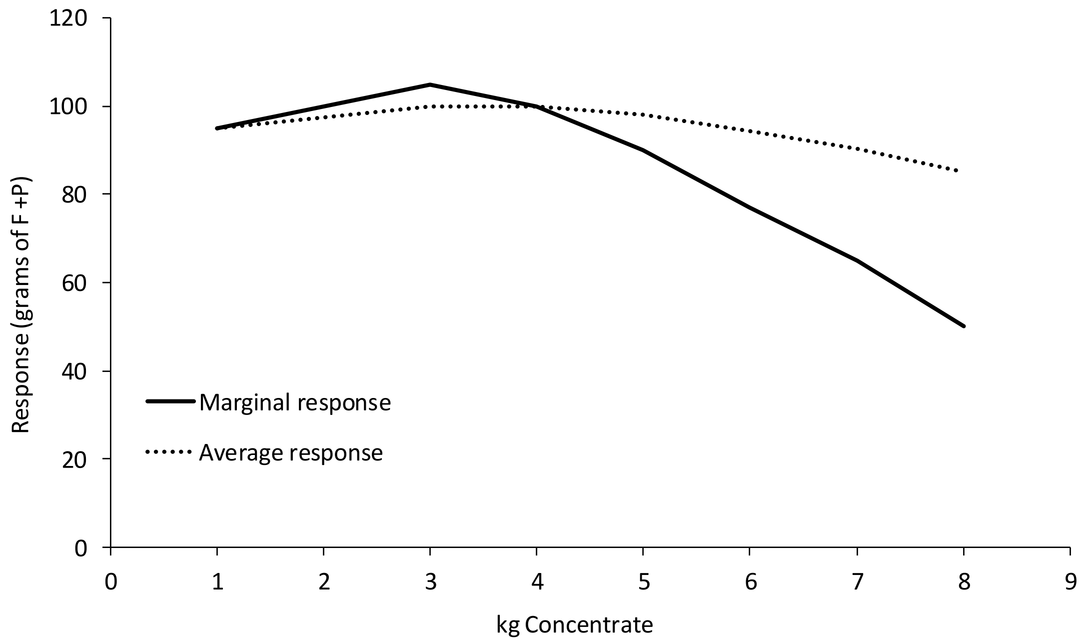

Figure 5. A hypothetical marginal and average response curve to extra grain input. Demonstration purpose only. Adapted from Gibbs and Malcom (2006).

Energy is the most limiting nutrient for dairy cows on pasture-based systems. Expected milk responses to grain fed vary and *inter alia* are influenced by stage of lactation, cow genotype, amount and type of grain being fed and current pasture allocations. Whilst recommendations such as those from Pennsylvania State University, of 1 kg of grain concentrate per 4 Litres of energy corrected milk for early lactation (maximum of 7 to 8 kg) and a grain to milk ratio of 1:5 to 1:6 for late lactation cows (https://extension.psu.edu/supplementation-of-lactating-cows-on-pasture), are sound guiding principles, these should be applied with caution. Such feeding decisions need to consider the current environment, particularly in relation to grain and milk price, but more importantly how such feeding decisions influence the whole of farm systems.

Pasture Substitution

Currently, when a farmer makes a decision about how much grain to feed they are making a judgment about the expected benefits. A cow's response to concentrate in a pasture system will be different to those in a confinement system, because grazing cows invariably reduce their pasture intake as grain feeding levels increase. This is called pasture substitution. Pasture substitution should be minimised to optimise the return from grain feeding. Theoretically the potential response to 1kg of grain supplementation of 12 MJ/ME is between 2 and 2.5 litres depending on grain type and milk composition. However the actual milk response varies considerably and is significantly lower and this is considered the major factor limiting the successful use of grain concentrates in pasture-based systems. Pasture substitution has a very strong influence on this variability (Figure 6).

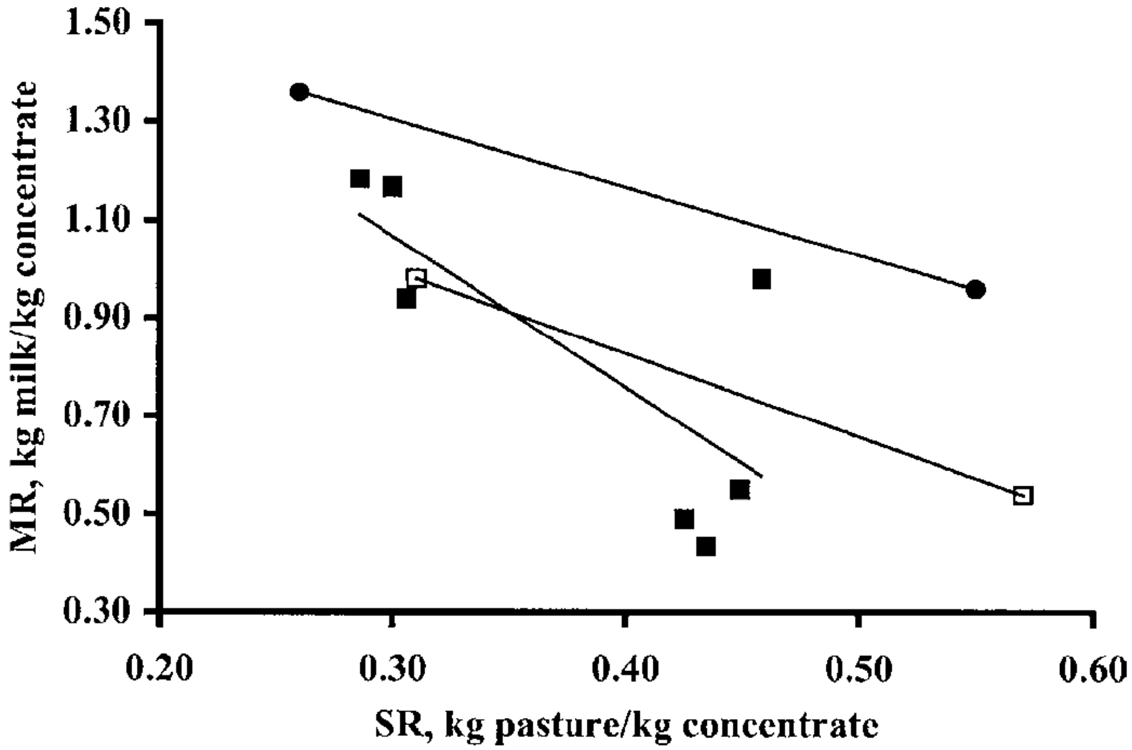

Figure 6. Relationship between milk response (MR) and substitution rate (SR) by grazing dairy cows supplemented with concentrate on studies evaluating the effect of pasture allowance. (Taken from Bargo et al. 2003).

Feeding grain

At the whole farm level, where the dairy farmer is the system expert, it is not surprising that our current benchmarking data suggests that farmers are getting better at minimising pasture wastage in response to high grain feeding. We have seen both pasture consumption, cow production and grain feeding increase over the last decade. With such changes in the intensifications of our pasture based dairy systems one of the biggest challenge is finding effective ways to feed grain concentrates to optimise profit in a volatile environment. Successfully managing a feeding program within a pasture based dairy, requires skill in monitoring and evaluation and an ability to make sound informed decisions. The decisions needed to optimise the whole of farm system performance are undoubtedly learnt from the dairy system expert – the dairy farmer.

References

Bargo, F., Muller, L. D., Kolver, E. S., & Delahoy, J. E. (2003). Invited review: Production and digestion of supplemented dairy cows on pasture. *Journal of dairy science*, *86*(1), 1-42.

Beever, D.E and Doyle, P.T. (2007). Feed conversion efficiency; an important determinant of dairy farm profitability. *Australian Journal of Experimental Agriculture, 47*(6), 645-57.

Gibbs, I and Malcolm B. (2006). Show me the profit! Victorian Dairy Conference, Shepparton, June 2006.

Ho, C. K. M., Heard, J. W., Wales, W. J., Jacobs, J. L., Doyle, P. T., & Malcolm, B. (2017). Evaluating the economics of concentrate feeding decisions in grazing dairy cows. *Animal Production Science*.

Malcolm B, Makeham J, Wright V (2005) 'The farming game: agricultural management and marketing.' (Cambridge University Press: Melbourne)

Raedts, P. J. M., Garcia, S. C., Chapman, D. F., Edwards, G. R., Lane, N., and Rawnsley, R. P. (2017). Is systems research addressing the current and future needs of dairy farms?. *Animal Production Science*, *57*(7), 1311-1322.

Station 6

12:15pm and 3:15pm

Tracey Wylie & Darcy Warren
FAR Australia

Are high yielding feed wheat cultivars more dependent on a diet of high fungicide input?

From the 2016 hyper yielding cereal disease management results it was evident that fungicide alone was not enough to control the high disease pressure experienced in the long season, high rainfall environment of Tasmania. The contributing factors to the challenges around controlling Septoria tritici blotch (STB) in 2016 were a combination of cultivar susceptibility, warmer than average autumn temperatures and increasing pathogen insensitivity to fungicides. This all puts added emphasis on the value of cultural control practices to reduce the dependency on fungicides.

Time of sowing

Although early sowing is extremely valuable in extending the growing window, it does increase the crops exposure to disease pressure. When assessed on the 1st November, SQP Revenue sown on the 6th April was at mid flowering and carried an average of 47% infection on the top three leaves which contribute the most to yield, verse SQP Revenue sown on the 27th April which was at head emergence and carrying an average of 21% infection on the top three leaves (Figure 1). Though the earlier sowing is at a more advanced growth stage the drier nature of the later spring period typically assists the prevention of disease.

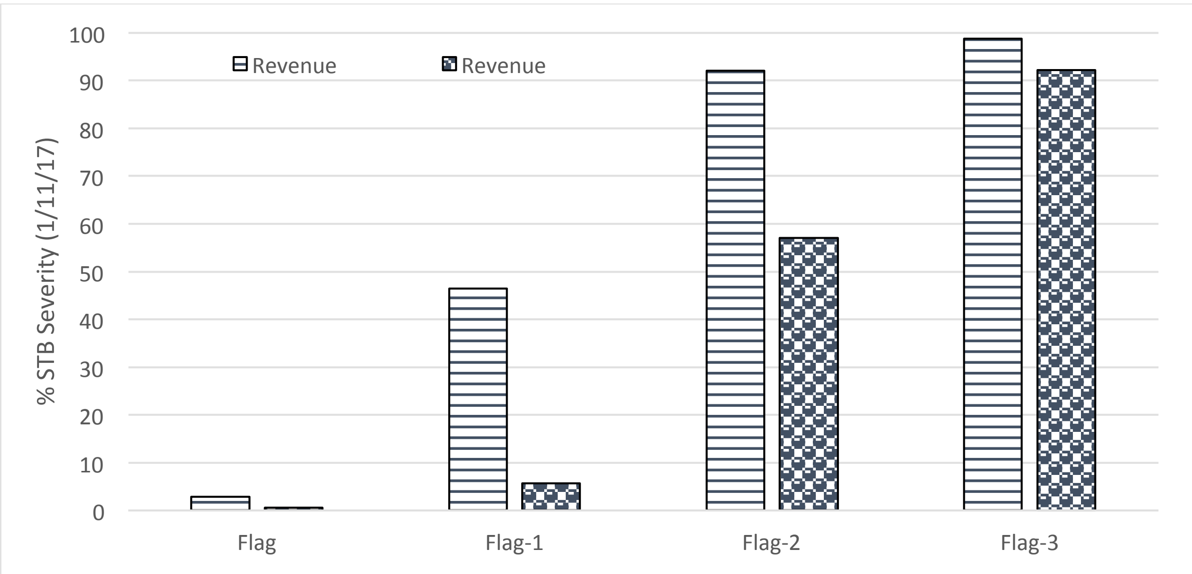

Figure 1. *Influence of sowing date on the severity of STB infection assessed on the 1 November (TOS 1 GS65 and TOS 2 GS55) on the top four leaves of untreated SQP Revenue.*

Cultivar selection

In 2016 working with 6th April sown SQP Revenue the disease management trial at the HYC showed that despite yield responses of 60% to fungicide application, controlling STB and leaf rust with fungicides was only partially effective.

Exciting new options in European germplasm are proving to provide a huge step forward in terms of resistance to STB. Assessments made at mid-flower on the 1st November showed that Relay and RGT Accroc gave 90-100% control of the STB observed in SQP Revenue (Table 1).

Table 1. Influence of variety on STB infection on the Flag, Flag-1 and Flag-2 and the % total leaf area infected (LAI) on the top 3 leaves in untreated crops.

	Flag		Flag-1		Flag-2		% Average LAI Top 3 leaves
RGT Accroc	0.3	de	3.5	de	18.8	d	7.5
Relay	0.0	e	0.0	e	2.2	e	0.7
SQP Revenue	2.9	b	46.5	b	92.0	a	47.1
Mean	0.8		18.2		46.8		
LSD	0.5		9.0		8.2		
P Value	<0.001		<0.001		<0.001		

Extract from larger data set

Early season fungicide options

The STB pathogen population in Tasmania is displaying an increasing level of insensitivity to some Group 3 triazole fungicides, such as tebuconazole and flutriafol. This incomplete form of fungicide resistance is affecting the field performance of flutriafol incorporated at sowing and some foliar fungicide applications, but other Group 3 triazole fungicides, such as Jockey seed treatment (fluquinconazole) or foliar fungicides such epoxiconazole are still relatively effective at preventing early infection. Applying a fungicide treatment at sowing or at late tillering is an option for reducing the build-up of initial disease pressure. Figure 2 shows that at 188 days after sowing an application of an experimental SDHI seed treatment or Opus applied at late tillering were the most effective options for reducing STB disease pressure. Unfortunately at this stage flutriafol is performing on par with the untreated control, since the R8 strain or isoform 11 type of STB has been confirmed present.

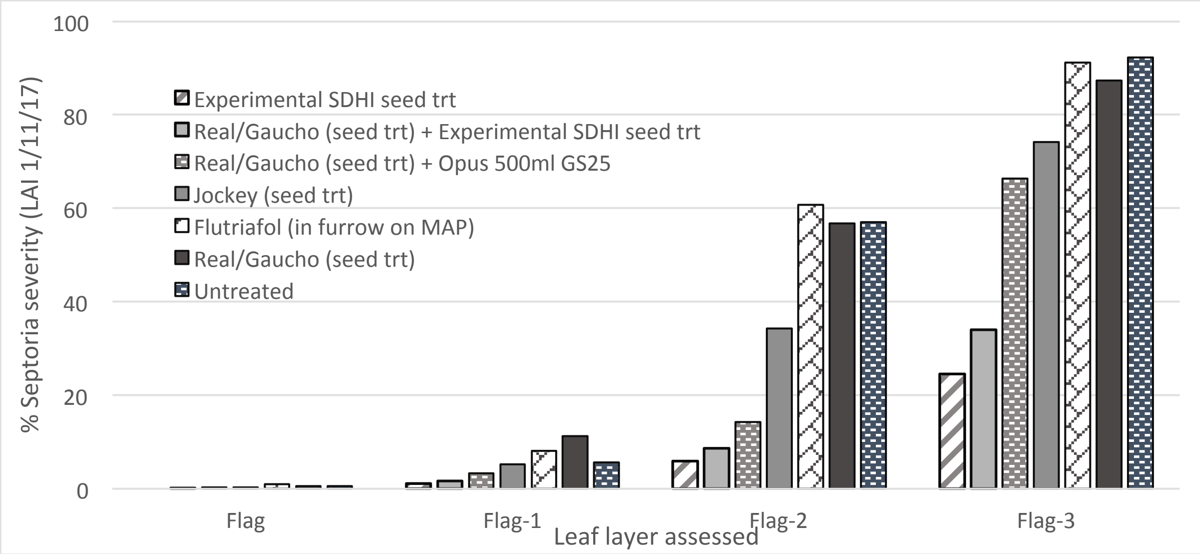

***Figure 2.** Influence of early season fungicide application for the control of STB, assessed 2nd November GS55 cv SQP Revenue sown 27 April 2017 HYC.*

***Table 2.** Influence of early season fungicide application for the control of STB, assessed 23rd August GS25, 2nd October GS32 and 2nd November GS55 cv SQP Revenue sown 27 April 2017 HYC.*

Treatment	**23-Aug (GS25)**		**2-Oct (GS32)**			**1-Nov (GS55)**			
	3rd leaf	4th leaf	Flag-3	Flag-4	Flag-5	Flag	Flag-1	Flag-2	Flag-3
Bare seed	7.2	57.0	1.4	10.7	61.6	0.6	5.7	57.1	92.2
Experimental seed trt	0.2	1.3	0.0	1.1	6.5	0.0	1.1	5.9	24.5
Jockey s.trt	1.1	12.7	0.7	3.6	22.5	0.3	5.2	34.3	74.2
Real/Gaucho + Experimental seed trt	0.0	0.3	0.0	0.4	3.6	0.2	1.7	8.6	34.0
Flutriafol in furrow on MAP	3.9	31.4	0.6	6.0	40.7	1.0	8.1	60.7	91.2
Real/Gaucho s. trt Opus GS25	4.6	47.4	0.5	1.8	10.3	0.3	3.3	14.3	66.3
Real/Gaucho s. trt	4.6	47.4	1.1	6.6	50.3	0.6	11.2	56.8	87.3
Mean	**2.8**	**25.0**	**0.6**	**4.7**	**29.7**	**0.3**	**4.5**	**30.5**	**63.9**
LSD	**2.5**	**10.9**	**0.9**	**3.3**	**16.9**	**0.4**	**2.7**	**17.2**	**15.1**
P Val	**<0.001**	**<0.001**	**0.043**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**

Extract from larger data set

The early signs from 2017 are encouraging, results show that new high yielding wheat cultivars may not be dependent on a “diet” of intensive fungicide inputs.


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Station 7

11:45am and 2:45pm

Nick Poole
Managing Director, FAR Australia

What wheat yields can we achieve with new germplasm and agronomy techniques in Tasmania?

The 2016 season saw the production of the first year results from the GRDC funded Hyper Yielding Cereal (HYC) project. The project which has the objective of lifting irrigated feed grain productivity in Tasmania has generated extremely encouraging results setting new yield benchmarks for feed wheat in the state. With cultivars tested under a range of management regimes, it has been French wheats that have topped the yield tables with traditional sowing windows in late April and UK and German germplasm performing more strongly when sown earlier in April. Yields of the top cultivars in the research plots were in excess of 16t/ha with final harvest dry matters of the highest yielding cultivars in the range of 30-35t/ha. The first year results illustrated that there were three key cultivar ingredients for achieving higher wheat yields in the state, these were:

Phenology - Selecting cultivars with the correct “time clock” for the chosen sowing date is essential in order to match crop development to the optimum environmental conditions for growth. In 2016 a number of the elite cultivars provided by breeders developed too quickly in the warm autumn conditions and as a result were badly frosted in late winter/early spring. Conversely the long season UK cultivar Relay that attracted a great deal of attention at last year’s event performed relatively poorly when sown later in April yet topped the yield table when sown early in April. To achieve the optimum yields with Relay in 2016, the optimum flowering period appeared to be in mid-late November, rather than early-mid December which was the case when sown in late April.

Disease resistance - The Tasmanian environment is more disease prone than the mainland, principally due to a longer growing season and a generally wetter environment, this is particularly the case where crops are irrigated. In 2016 disease pressure in cereal crops was very high with Septoria tritici blotch (STB) and leaf rust being the dominant diseases influencing results in the project. This disease pressure was exacerbated where crops were sown in early April. With the susceptible cultivar SQP Revenue and other coded germplasm four fungicides were not completely effective at keeping the crop clean, therefore for early April sowings resistance to STB and leaf rust is a must if we are to achieve high yields.

Standing power - Although the germplasm x management trials had good plant growth regulator (PGR) input, good cultivar standing power and straw strength becomes essential when grain yields are in the range of 10-15t/ha.

Identifying cultivars that have the correct phenology for April sowing dates combined with good disease resistance and standing power was difficult, since a number of cultivars possessed two attributes but not a third. For early April sowing (April 6) where 14.5t/ha was the yield ceiling it was the UK cultivar Relay that out yielded all other cultivars except RGT Accroc, Genius and Conqueror. These four cultivars were 2.5 – 3.0t/ha ahead of the current commercial controls SQP Revenue and Manning that despite comprehensive disease management packages were badly affected by disease. In the late April sowing (April 27) the yield ceiling in research plots at the site proved to be higher, peaking in the range of 15-17t/ha, although in this case the cultivar topping the tables was Calabro followed by RGT Accroc, Manning, Conqueror and AGTW-001, the latter being the earliest to flower (GS65 approximately late October sown on April 27).

PGR and disease management played a pivotal role in optimising yield in 2016 (papers presented by project colleagues). The following comments are indicators of sowing windows based on the first year of work at the HYC.

Relay – Very good resistance to STB and leaf rust combined with very long season attributes (longer season than Manning and SQP Revenue) so in first year work more suited to early April sowing than late April sowing.

RGT Accroc – Performed more strongly when planted in the late April sowing window with development slightly quicker than SQP Revenue. Though more resistant than Revenue for STB and leaf rust, both diseases need to be watched. At higher yield potential straw strength may need support from a PGR programme.

Calabro – Less suited to early April sowing in terms of yield and fungicide input, however it was the highest yielding wheat cultivar on the HYC when sown in late April. STB needs careful management, although a later April sowing window will assist disease control.

These cultivars and other high yielding wheat germplasm will be further described at the end of year two of the project, prior to establishing research on Variety Specific Agronomy Packages (VSAPs) research protocols in 2018/19.

Response to inputs

When planted in late April “elite” cultivars provided by the breeders were subjected to two levels of management; standard and high input. High input included an additional fungicide and PGR. Figure 1 shows the additional yield created by the higher input in the 19 cultivars.

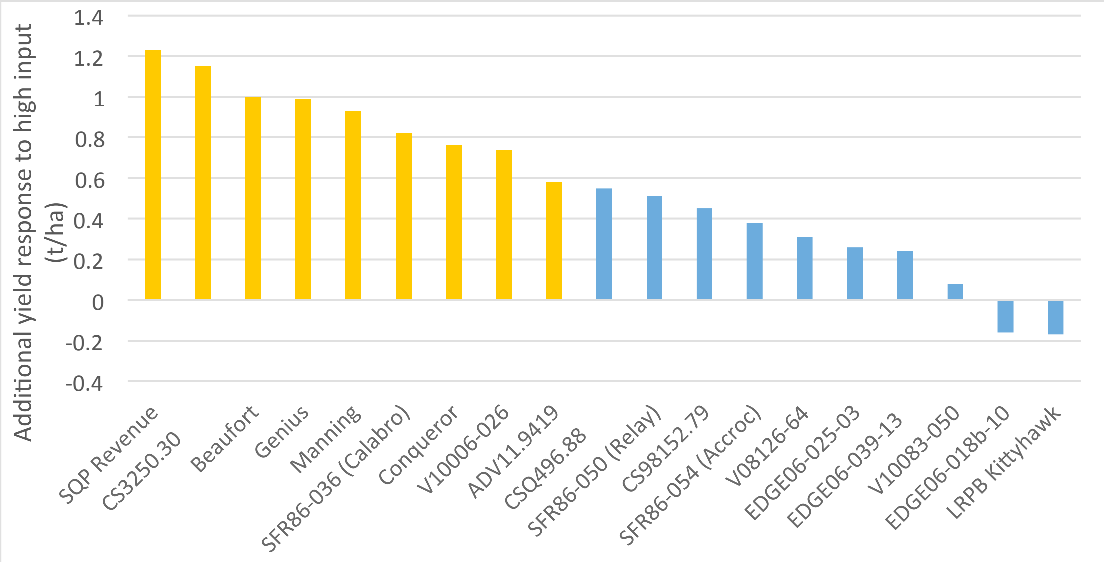

Figure 1. *Additional yield response associated with the high input management (yellow bars depict statistically significant yield increase with high input management over standard management).*

Crop Canopy Composition - *How many heads/m² to create wheat crops with yields of 14-16t/ha?*

In the 2016 trials head numbers of 550-650/m^2 maximised yield with early April sown wheat whilst with late April sowings this range was typically no greater than 450-550/m^2. Since the later April sowing (April 27) at HYC was higher yielding than the earlier sowing (April 6) it questions the importance of increasing head number to achieve high yields. Maximising grain number/m^2 has been shown to be the key component in achieving higher yields in many studies, however in the 10-15t/ha yield range, provided head number don't fall below 500 heads/m^2, grains per head and to a lesser extent thousand seed weight are likely to be more important.

Station 8

11:15am and 2:15pm

Jon Midwood
CEO, Southern Farming Systems

What is the yield penalty associated with lodging in wheat when you have a yield potential of 14t/ha?

The majority of wheat crops in Australian broadacre farming are grown under conditions not usually associated with yield reductions due to lodging. However in high production systems such as irrigated crops and cereals grown in high rainfall zones, the risk of yield reductions due to lodging is considerably higher, especially when seasonal conditions favour such events. When these conditions combine with traditional management practices in high production systems, lodging can result in significant reductions in yield and grain quality.

There are several factors which influence whether a crop will lodge or not and often just one of these factors in isolation will not be sufficient to cause a significant issue. However when combined their effect can be significant.

Factors impacting lodging:

- Variety
- Sowing date
- Plant population
- Residual soil nitrogen levels
- Amount and timing of applied N fertiliser
- Use of plant growth regulators
- Grazing of crops prior to GS30/31

In 2016 one of the trials run in the Hyper Yielding Cereal Project was the wheat PGR agronomy trial in which a few of these key issues which influence lodging were trialled. The data produced from this trial needs to be considered in the context of the 2016 season, which was extremely high yielding. The key take home messages from this trial were as follows:

- Manning sown on April 6 lodged severely and generated yield responses to plant growth regulator (PGR) input of between 0.11 – 2.51 t/ha (1 – 24%).
- The highest yielding PGR strategies were associated with those programmes that gave the greatest height reduction, best lodging control and kept the crop standing for longest.
- The most successful PGR programmes were where applications were made at GS31-32 with Moddus Evo 0.2 l/ha + Errex 1.3 l/ha (label recommendation) or sequences applied at the start of stem elongation (GS30) and (GS32).
- The research demonstrated the importance of canopy structure in the absence of PGRs since by reducing plant population there was a trend for yields to improve (not significant).

- Many of the PGR sequences were experimental and further evaluation is being carried out in 2017.
- The concept of regulating the canopy in the late autumn at early tillering (GS22) was ineffective from both a lodging and yield perspective.

As the 2017 field day approaches we have experienced a very different growing season at the HYC site, with considerably less disease, colder average temperatures and lower soil residual nitrogen following pyrethrum. The application of well-timed PGR's often gives a yield response, even in the absence of lodging; this season we may be able to confirm this effect from trials grown under a high production system.

JM 11/17

Station 9

10:45am and 1:45pm

Ian Herbert and Georgina Moloney
Southern Farming Systems

Can we have hyper yielding crops without hyper yielding costs?

The 2016 season was a stellar growing season for cereals at Hagley with the Hyper Yielding Cereal (HYC) trials establishing new benchmarks as to what wheat varieties can perform to in Tasmanian conditions. The challenge for growers is can they grow these Hyper Yielding Cereals profitably.

Last year's growing season was characterised by an autumn and winter with higher than average minimum temperatures and then a cooler than average maximum temperature from September through to December. These temperatures combined with monthly rainfalls which were significantly above the average delivered an ideal growing season.

These ideal growing conditions whilst providing for excellent crop growth also provided a perfect environment for disease to flourish, in particular the early arrival of leaf rust. Due to the level of fungal diseases and the resulting effectiveness of the various management options, including comprehensive fungicide programs, significant yield differences for the two times of sowing and management strategies were observed. Using the variety Manning as an example, the cost structures associated with each input has been compared, and by using the resultant yield a gross margin established for comparison purposes.

The Gross margin results show that the strategies employed to achieve the 2016 hyper yields have different cost bases and due to the yield variation produce varying levels of profit.

Sowing date	Standard inputs	High inputs
27 April 2016	$3203	$3390

Table 1; Gross margin returns for wheat (cv Manning) under different management regime

Station 10

11:15am and 2:15pm

Tristan Nichols
TasFoods

What are the feed grain requirements of poultry producers in Tasmania?

Worldwide chicken meat (broiler) production has been revolutionised over the past 50 years with heavy research and investment in genetics, technology and nutrition.
These developments have resulted in per capita consumption of broiler meat in Australia to increase from less than 10kg/head in 1950 to almost 50kg/head today.
Consumers have been driven toward poultry meat as an affordable and healthy source of animal protein, with poultry meat prices falling 75% since 1975.

Development in poultry genetics and nutrition are the key driver to maintaining low costs of production within the sector. In 1975 it took 64 days to grow a chicken to 2kg with 4.66kg of feed at a feed conversion rate (FCR) of 2.33.

Today a meat chicken can reach 2kg by 35 days of age after consuming 3.4kg of feed at an FCR of just 1.5-1.7. With such an efficient FCR it is no wonder poultry production is seen as one of the most sustainable methods of converting vegetable protein to animal protein in the world.

Since 1975 the chicken industry in Australia has increased in size several times over. From processing 100 million birds to 600 million birds in the past 40 years alone.
In Tasmania there are two poultry companies operating. Nichols in the north and Inghams in the south.

At Nichols we currently process 65,000 birds per week into supply many different markets. We grow 95% of our birds under the RSPCA approved farming scheme standard with 5% being grown in our budding Nichols Ethical Free Range (NEFR) 'field'.

Regardless of how we grow broiler one thing remains certain, they all require the essentials for growth, which is feed. Feed is the single most important input into growing broiler chickens and sits above chick quality, shedding environment and management.

At Nichols we operate 3 broiler rations. These are called starter, grower and finisher. Each ration changes in protein and energy to ensure the broiler bird is getting everything it needs at the various stages of growth across its life, which is anywhere from 35 to 45 days for RSPCA or longer for NEFR.

The key ingredient in our ration is Tasmanian wheat. This represents approx. 60% of every tonne produced. Wheat is used due its affordability, ability to add 'bulk' to a ration and its energy content. Protein is of course also present in wheat and a real driving force behind the costs per tonne of the required feed. Therefore, Nichols remains committed to wheat usage and is particularly interested in wheat that has a protein percent greater than 10%. If higher protein can be achieved consistently through the Tasmanian wheat growers the grain industry would find a net increase in the wheat requirement by chicken feed millers as the rations would be formulated with less meals such as soy or canola and more wheat.

Nick Pyke
FAR, New Zealand

Irrigated spring barley – can it be the wonder spring crop?

Spring barley yields have been increasing at 125kg/ha/year (Figure) in New Zealand. This is a combination of genetic gain and agronomic gain. The genetic gain has been 25kg/ha until recently when new varieties have given a significant yield increase. Agronomic gain in has been 100kg/ha/year and has returned an extra NZ$32/ha per year (excluding increased input costs). Thus over the 18 years in the graph below farmers should net an extra NZ$576/ha.

Spring barley has many advantages as a cereal crop where adequate moisture is available from irrigation or rainfall and high temperatures do not reduce yield. Spring barley can be grown entirely under favourable conditions for growth, warm weather and long days maximising the conversion of sunlight to yield. A spring planting allows farmers to maximise the value of winter crops or pasture, often for grazing, and minimises the exposure of the crop to pests and diseases, particularly wet weather diseases such as Rynchosporium (scald). However, careful disease management will be required to manage later season diseases, such as leaf rust or Ramularia, if it has established in Tasmania. A spring planting can allow strategic use of other inputs, such as nitrogen (N) by using good knowledge of predicted yield and soil N levels at the time of N application.

In New Zealand, the use of ProductionWise allows farmers to benchmark the performance of their spring barley crops against other crops, farms or years. Based on 2016/17 benchmarking information yields have ranged from a lower quartile of 8.0t/ha to 10.0t/ha with mean input costs of NZ$1877/ha and a mean gross margin of NZ$1139/ha. Further, it is possible to determine the gross value/ha per day. Barley sown in May accumulated value at NZ$10.80/ha per day, whereas September and mid –October sown barley accumulated value at NZ$12.96 and NZ$13.13/ha per day respectively.

To accumulate the greatest gross value spring barley needs to be matched with a good winter crop to achieve greater than NZ$10.80/ha per day. Spring barley can be a wonder crop it depends on how it is grown and what it can yield.

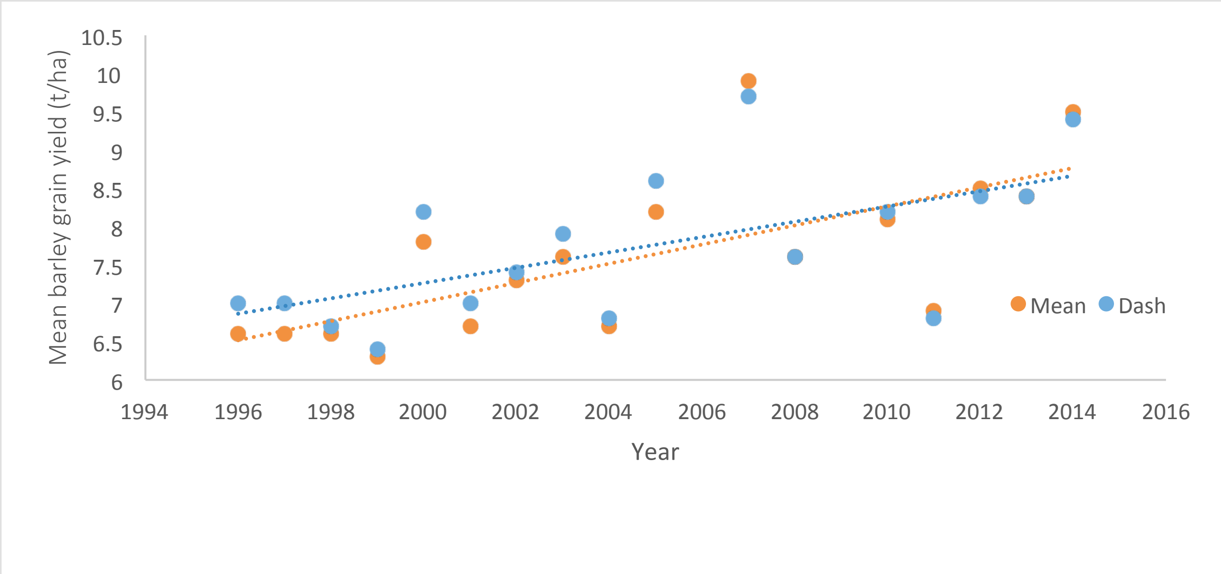

Figure 1. *Increase in three year rolling average barley yields in Cultivar Performance Trials. The orange line is increase in yield as a combination of agronomic and genetic gain, the blue line is the agronomic gain in a single variety.*

Station 12

12:15pm and 3:15pm

Panel Discussion

Use of feed grain cereal crops for grazing and grain production in Tasmanian mixed farming systems

Cam Nicholson, Director, Nicon Rural Services will facilitate a panel discussion with farmers:

Sam Lyne, Campbell Town
Brett Donlan, Ross
Rob O'Connor. Benham

Notes:

2017 Hyper Yielding Cereal Project Site Information

Location:	Hagley, Tasmania
	Latitude 41°29'21.63"S, Longitude 146°55'3.81"E
Rainfall:	
Annual (to date):	496.7mm
GSR (to date):	412.5mm
Irrigation applied:	30mm – 24th October 2017
Soil:	
Type:	Alluvial Dermosol
Sowing information:	
Sowing date:	6/7 April 2017 – Time of Sowing 1
Sowing date:	27/28 April 2017 – Time of sowing 2
Sowing Equipment:	SFS knifepoint coulter & presswheel
Row Spacing:	22.5 cm
Paddock history:	
2017/2018	Wheat
2016/2017	H1 Pyrethrum
2015/2016	Establishing Pyrethrum
2014/2015	Poppies
2013/2014	H1 Pyrethrum
2012/2013	Establishing Pyrethrum

2016 Meteorological Data

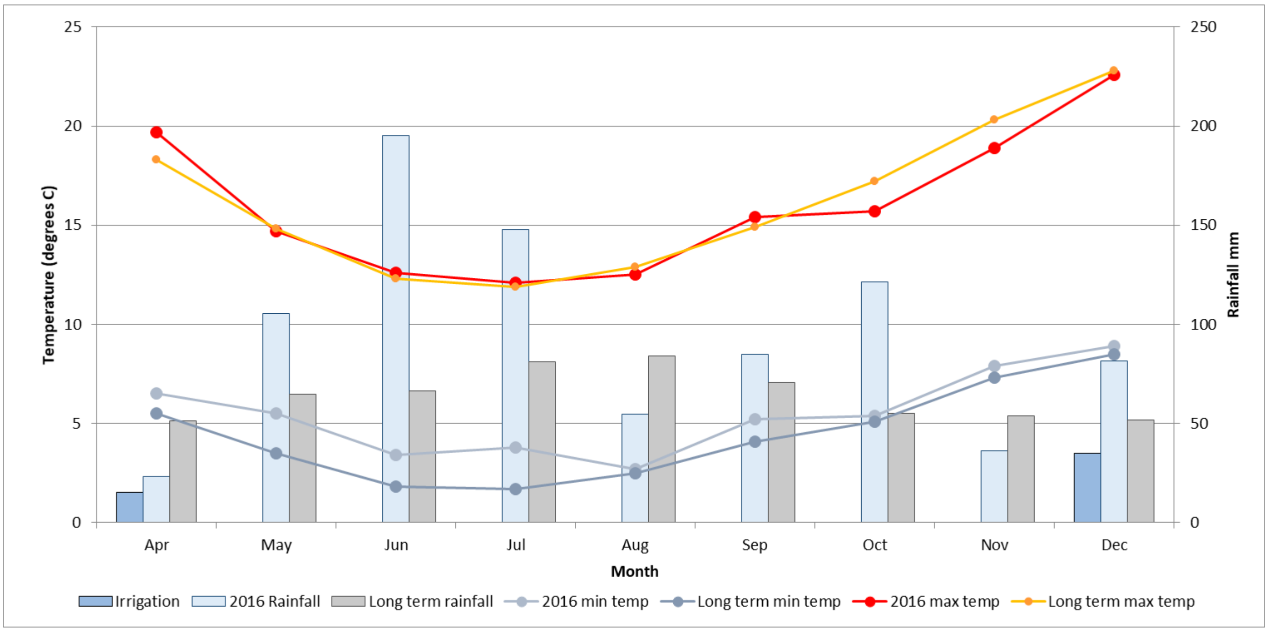

Figure 1. *2016 growing season rainfall, 2016 irrigation (applied on 11-April and 3-December) and long term rainfall (1965-2016) (recorded at Hagley (Fairbank)). 2016 min and max temperatures and long term min and max temperatures recorded at Cressy Research Station (1999-2016).*

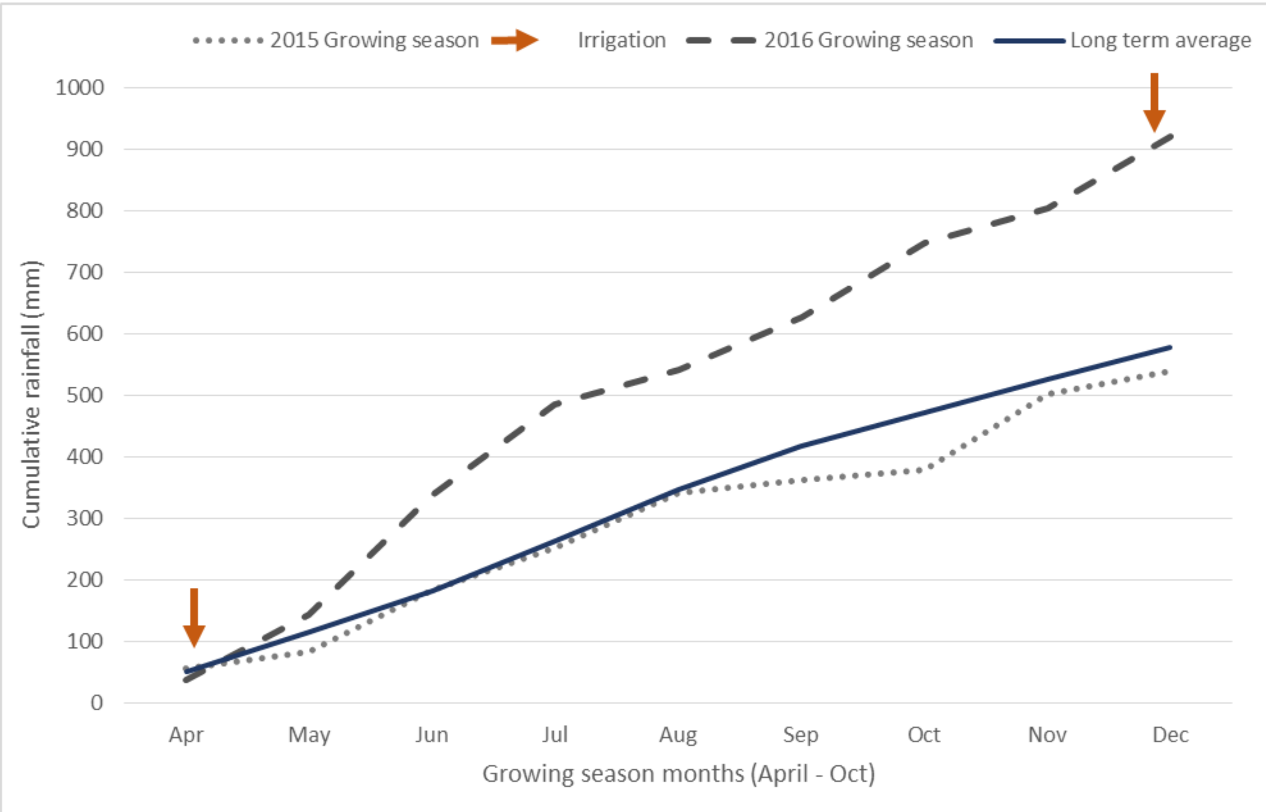

Figure 2. *Cumulative growing season rainfall for 2015, 2016 (including irrigation applied on 11-April and 3-December) and the long term average for the growing season (April-Oct).*

2017 Meteorological Data

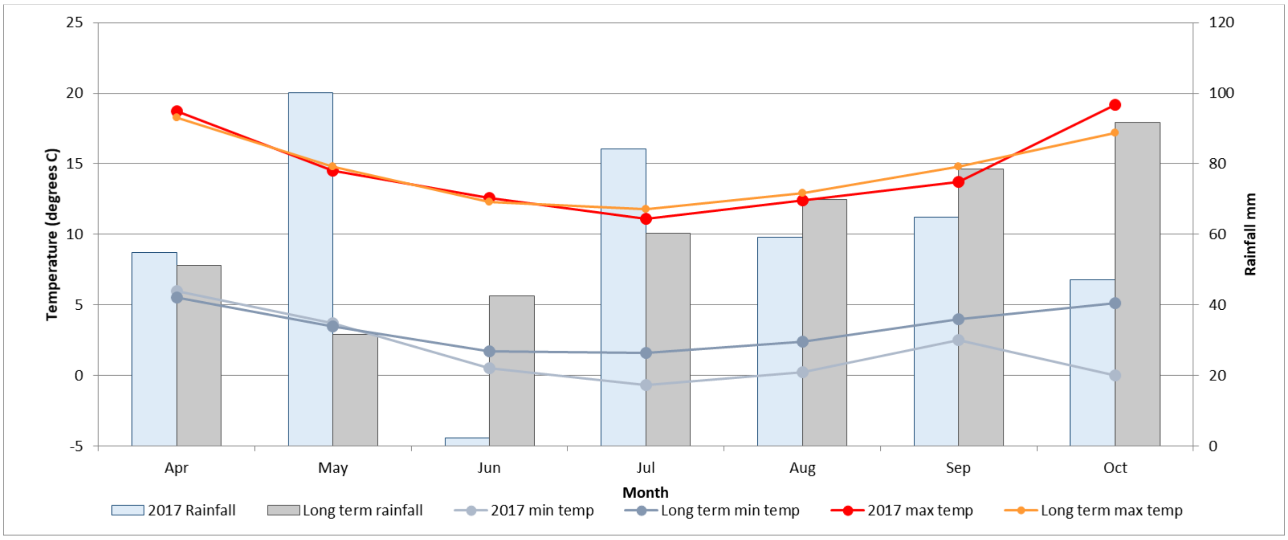

Figure 3. *2017 growing season rainfall and long term rainfall (1965-2017) (recorded at Westbury), 2017 min and max temperatures and long term min and max temperatures recorded at Cressy Research Station (1999-2017) for the growing season (April-Oct).*

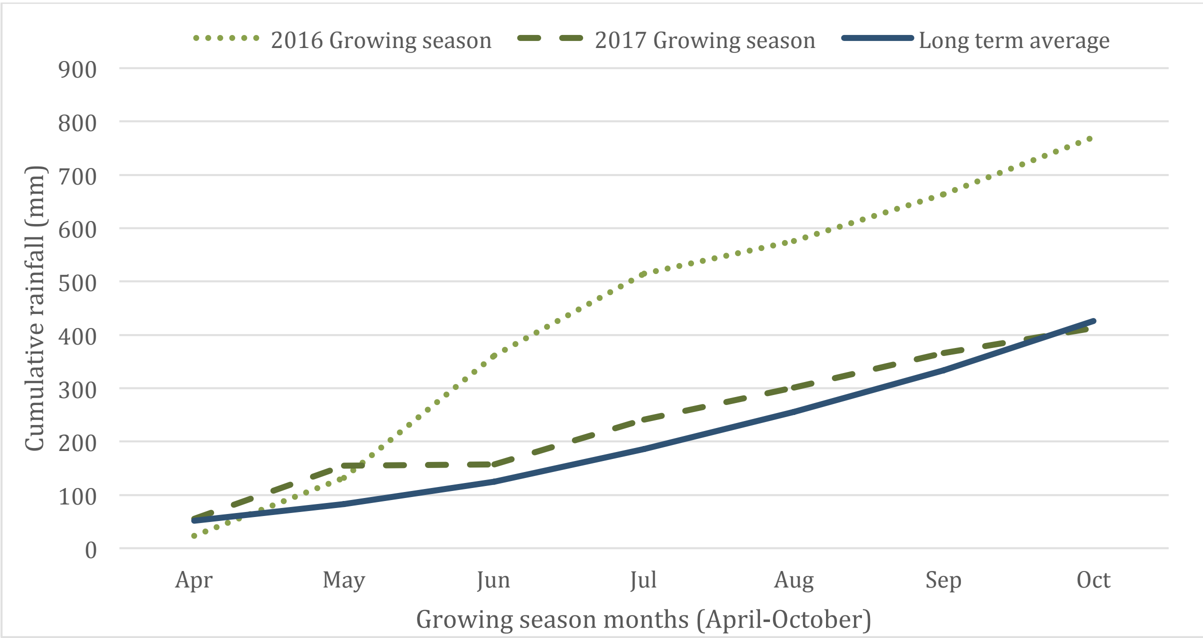

Figure 4. *Cumulative growing season rainfall for 2016, 2017 and the long term average for the growing season (April-Oct).*

Notes:

Notes:

Hyper Yielding Cereal Project
A FEED GRAIN INITIATIVE

2017 Hyper Yielding Cereal Project Site *(photo courtesy of Darcy Warren)*

Foundation for Arable Research Australia
Address: 23 High Street, Inverleigh, Victoria, 3321, Australia
Ph: +61 3 5265 1290 ● Fax: +61 3 5265 1601 ● Email: admin@faraustralia.com.au
Web: www.faraustralia.com.au

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