Autumn 2016

Fertilizer News

Confidence with in-season calculations

Making the most informed decisions on nitrogen rates and timings during the growing season is vitally important to push crop growth through to optimum yields and maximum returns. Nutrient rich strips are a simple and very effective way of getting dynamic and real-time feedback on crop growth status - compared to crop with nutrient limitations.

SummitQ Services offers access to an in-season nitrogen (N) calculator that uses on-the-spot measurement of plant biomass through a normalised difference vegetation Index (NDVI). When combined with crop establishment information, Summit can calculate a more precise amount of N required to maximise the yield potential of a paddock where N is a limiting factor.

In 2015, SummitQ Field Research implemented formal trials to demonstrate and test the in-season

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SUMMIT FIELD RESEARCH

For more information talk to your local Summit Area Manager

SUMMIT FERTILIZERS

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N calculator system on eight sites through the Wheatbelt, each with different conditions.

The trials involved:

- NDVI assessment of plots that simulated farmer seeding fertilizer practice, with or without N at establishment and a N-rich strip (N Gauge).
- Replicated and randomised plots to apply a series of tactical N treatments based on the predictions of optimal N application, determined by the Summit In-Season Nitrogen Calculator after Greenseeker® NDVI readings of the assessment plots.

The 2015 trial data builds confidence in the in-season nitrogen calculator as a decision support tool to guide nitrogen top-ups. Observing differences in NDVI to the N-rich strip provides real-time and continual feedback, allowing the crop to tell whether or not nitrogen limitations are holding back growth.

Utilising Summit N Gauges and the In-Season Nitrogen Calculator tool to predict yield potential during a broad window of the growing season will mean growers can have increased confidence in their nitrogen application decisions and decrease the risk of over-application and inefficient fertilizer usage.

SUMMIT FUEL GAUGES

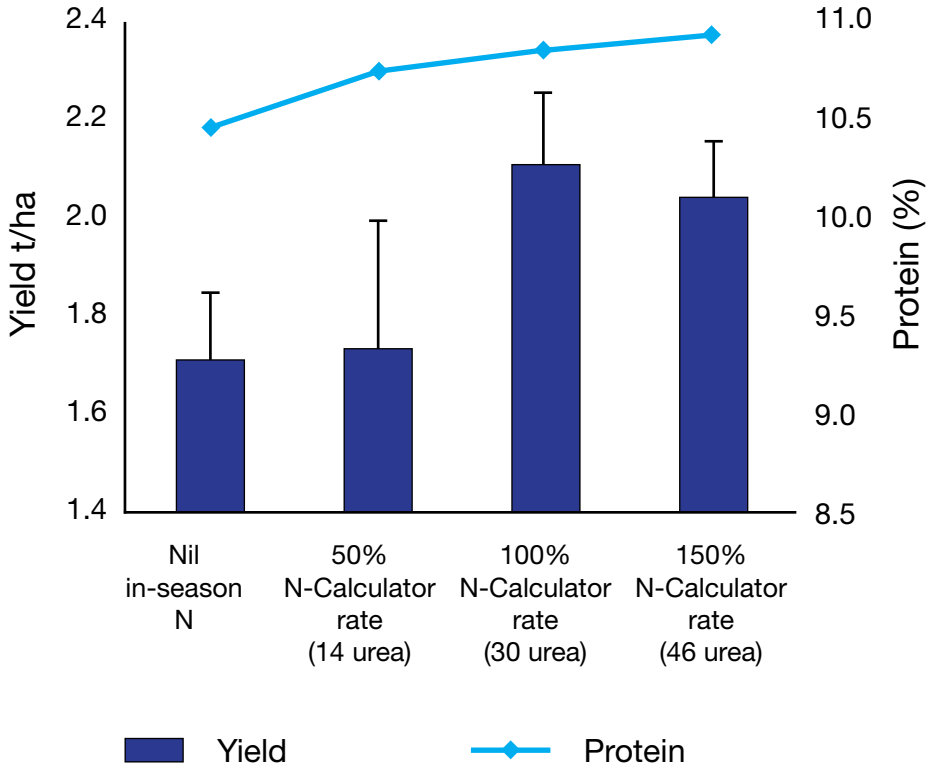

Figure 1. Example of yield and protein response to nitrogen top-ups at Mingenew, 2015. Yield maximum was achieved using the Summit In-Season Nitrogen Calculator recommended nitrogen rate.

Table 1. Summary of SummitQ NDVI and Nitrogen Calculator field trial yields and returns in 2015

Location	Crop	N Calculator recommended rate N kg/ha*	N Calculator yield prediction	Actual yield t/ha and (gross margin)#		
				50% N rate	100% N rate	150% N rate
Mingenew	Wheat	14	2.95	1.73 ($396)	2.11 ($493)	2.05 ($466])
Binnu A	Wheat	11	2.52	1.96 ($456)	2.46 ($589)	2.68 ($643)
Binnu B	Wheat	21	2.21	2.14 ($505)	2.85 ($690)	2.60 ($607)
Corrigin	Wheat	7	2.48	3.00 ($724)	3.15 ($759)	2.98 ($705)
Morawa	Wheat	0	2.69	-	3.53 ($902)	-
Esperance	Wheat	8	4.87	6.27 ($1400)	6.44 ($1463)	6.42 ($1394)
Dowerin	Wheat	14	2.11	2.26 ($531)	2.39 ($556)	2.38 ($545)
Wandering	Oats	10	2.54	1.66 ($399)	2.12 ($530)	2.09 ($514)
Gnowangerup A	Barley	6	^	4.21 ($889)	4.19 ($882)	4.29 ($901)
Gnowangerup B	Barley	18	^	4.43 ($930)	4.73 ($985)	4.62 ($946)

**In-Season Nitrogen Calculator recommended application rate for 10.5% protein target*

 # Gross margin = grain value for delivery grade tonnes minus all fertilizer costs

^ Not yet calibrated for yield predictions in barley

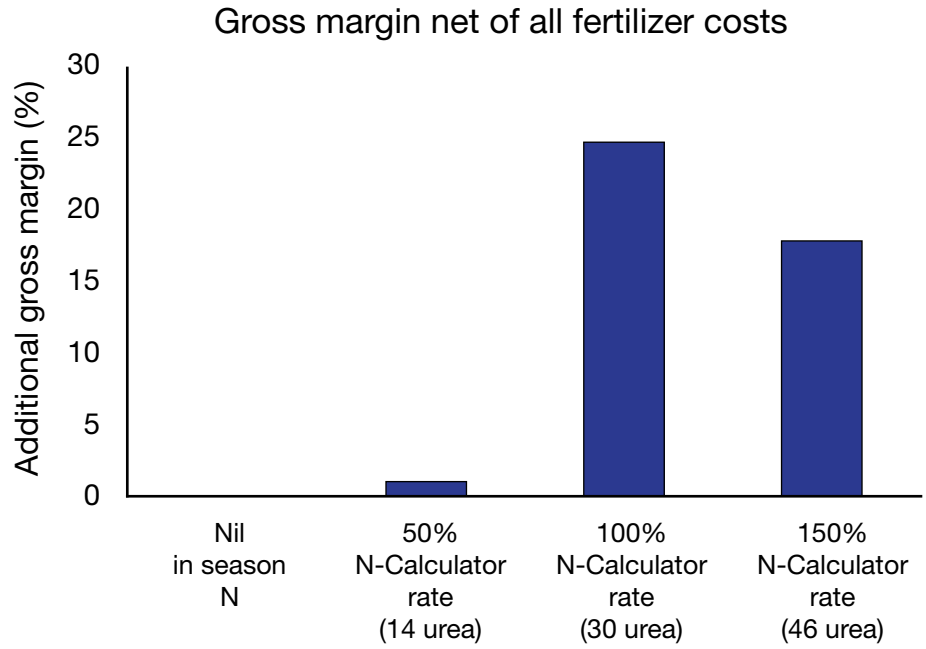

Figure 2 (left). Applying the Summit In-Season Nitrogen Calculator recommendation optimised crop returns at Mingenew in 2015. The Mingenew trial data was typical of that seen across the range of sites in 2015 in broad-scale testing.

N-rich plot (left), N 30 kg/ha (centre) and nil N (right) at Corrigin, July 2015.

N-rich strip in a barley paddock at Burracoppin, July 2015.

2015 Fuel Gauge observations

- Yield improvement from recommended nitrogen applications was very accurately predicted by the nitrogen calculator models (e.g. Mingenew actual +0.4 t/ha versus predicted +0.38 t/ha).
- Yields were maximised when nitrogen top-ups were applied at the precise rate recommended by the nitrogen calculator. Applying rates higher and lower than the recommended rate resulted in lower yields, often significantly.
- At the Morawa site, the nitrogen calculator recommended nil N be applied. This site went on to yield strongly with high returns without top-up nitrogen.
- Grain protein was very close to the targeted 10.5% (e.g. Mingenew 10.8%), indicating that the recommended nitrogen applications were not excessive to crop requirements for maximising yield.
- When grain quality analysis was translated to delivery grades, the grain value and gross margin can be calculated (Table 1). This showed the nitrogen calculator recommendations optimised grower returns in all cases.
- Overall, final yields were slightly lower than those predicted by the nitrogen calculator model. They were impacted by rainfall, in particular the dry finish throughout most of the Wheatbelt.

The value of adding potassium

The quantity of potassium required to grow healthy plants is almost equivalent to nitrogen. Although it's generally an element that's quite abundant as a total amount in soils, usually less than one per cent of the total is present in water-soluble or exchangeable forms that are available for uptake by plant roots.

Despite the well-known requirement, potassium is sometimes viewed as a luxury fertilizer addition and its application fluctuates with price. However, continual potassium export through grain crops, hay and other products can deplete plant-available soil potassium over time to levels where it can limit growth and response to other essential nutrients.

If soil reserves become depleted, as almost one third of recent samples from the Dandaragan and Moora Shires showed (Figure 3, above right), replenishment of potassium to maximise production can be an expensive exercise.

SummitQ Field Research ran a number of trials in 2015 investigating crop response to potassium under a range of conditions.

The Ballidu site (Figure 4 - right) was a strong example of the impact of potassium on improving wheat growth, both in itself and in combination with nitrogen and phosphorus applications. Soil at this site was moderately low in Colwell-extractable potassium (36 mg/kg topsoil, 35 mg/kg subsoil).

The replicated field trial was established using four rates of nitrogen (4, 25, 50 and 75 kg/ha) and four rates of phosphorus (nil, 6, 12 and 18 kg/ha). Each plot was split and received either nil or 25 kg/ha of potassium (K) as muriate of potash (MOP).

Wheat growth, vigour and yield responded significantly to N, P and K applications in this trial ($p<0.05$). The addition of K at seeding improved yield at every combination of N and P rates. Yield ranged from 1.5 t/ha with nil P, nil K and N 4 kg/ha applied, to 2.57 t/ha with P 12, K 25 and N 75 kg/ha applied.

At Merredin, a trial with marginal Colwell potassium (48 mg/kg topsoil, 34 mg/kg subsoil) mirrored the results of those at Ballidu.

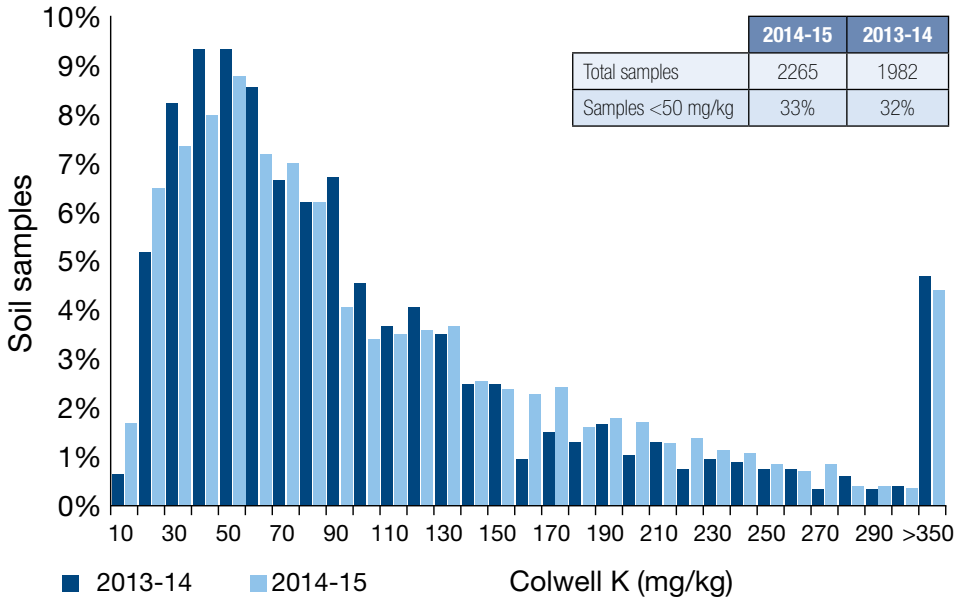

Figure 3. Results of soil sample analyses for potassium in the Dandaragan and Moora Shires show a significant proportion with Colwell K at marginal and deficient levels.

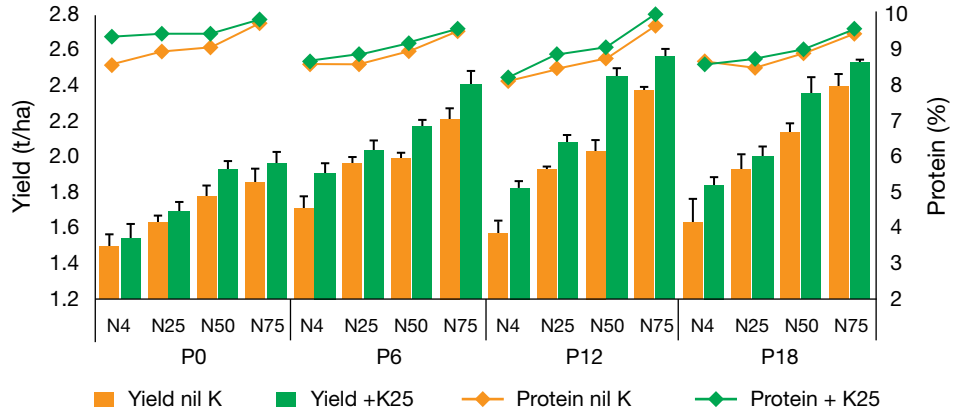

Figure 4. Yield and protein response to N at different P rates with and without K at Ballidu 2015.

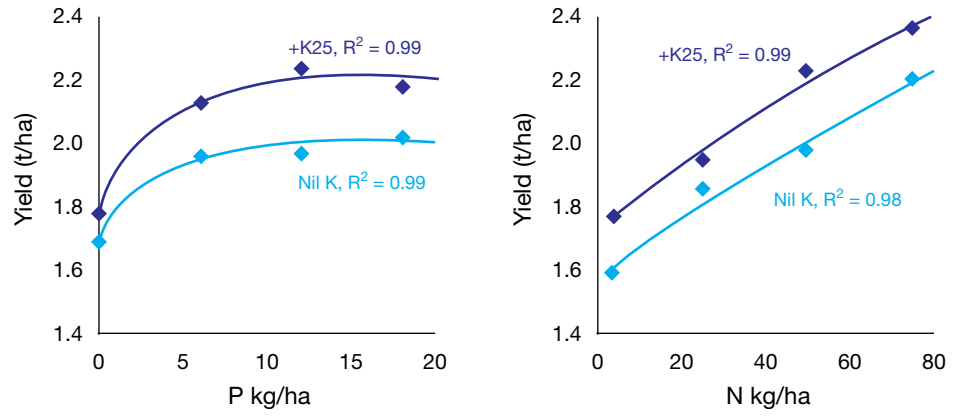

Figure 5. Average yield response to P and N with or without K applied at Ballidu. Mitscherlich function fitted.

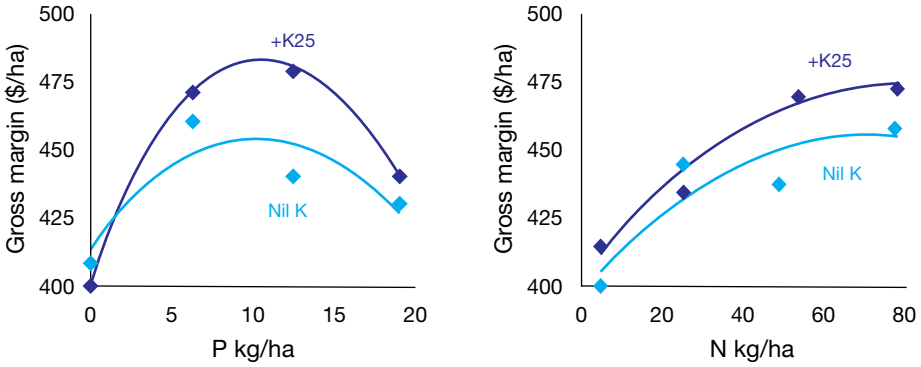

Figure 6. Gross margin averaged for N and P rates at Ballidu, net of total fertilizer costs. Quadratic function fitted.

Potassium form

Potassium can be applied in either sulphate (SOP: K_2SO_4) or muriate (MOP: KCl) form. SummitQ field trials in Dandaragan, Corrigin and Esperance in 2015 compared these forms as well as timing of application and top-dressed versus banding placement. While the results varied with site and rainfall conditions, a trend toward better efficiency of banded treatments was evident. Yield response to SOP was commonly higher than MOP, however the price premium for SOP gave it little advantage over MOP in margin returns.

SOP and MOP can be supplied as straight products in blends, although there can be risks to handling and storage as these are designed primarily as spreading products. Alternatively, Summit

offers potassium fully compounded in granular products designed for handling and application at seeding. Examples are SOP in the Gusto range and MOP in the newly formulated Vigour range.

Gusto performed extremely well in 2015 trials and was very efficient in supplying potassium to growing wheat crops. Vigour has been introduced to the Summit range in 2016 and will receive significant attention in field trials in the coming season.

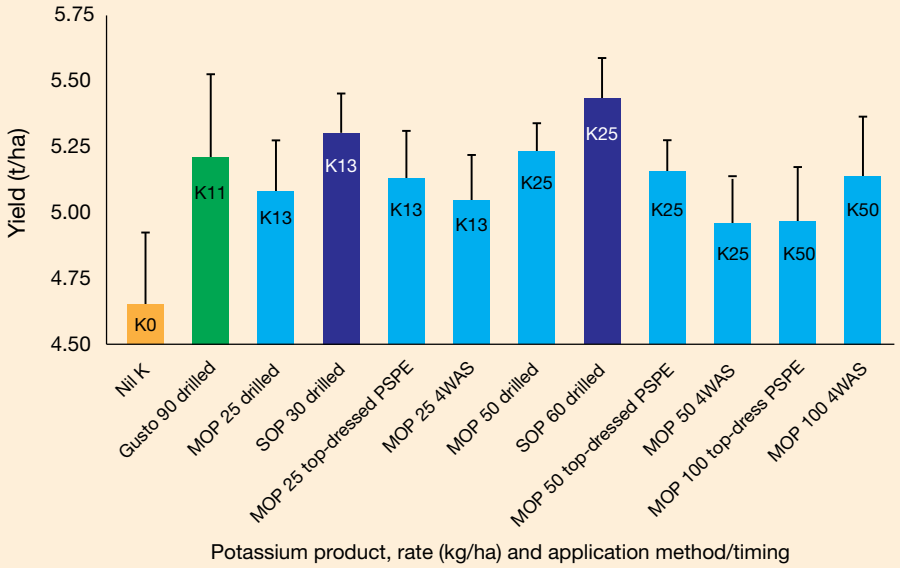

Figure 7. Wheat yields in and Esperance 2015 trial highlighting the performance of Gusto and drilled SOP.

Important observations from 2015 K trials

- Application of phosphorus and nitrogen significantly increased yield and the addition of potassium at seeding enhanced grain yields across the range of nitrogen and phosphorus rates.
- Application of all three macro nutrients was required to optimise yield and returns.
- Notably, the application of potassium did not change the rates of nitrogen or phosphorus required to optimise yield and returns, but produced a large step up in yield at all nitrogen and phosphorus rates.
- Maximum yield and gross margins were seen at N 75 kg/ha, P 8-12 kg/ha with added K at 25kg/ha.
- Adequate potassium and phosphorus nutrition is imperative. They promote early growth and vigour and set up the crop to be able to utilise nitrogen efficiently and gain maximum value from in-season nitrogen applied to take advantage of local rainfall conditions. Without sufficient potassium or phosphorus, the response to nitrogen is not as strong.

Phosphorus trial responses highlight challenges in interpreting critical soil P levels

By Dr Mark Gherardi
Summit Fertilizers
Field Research Manager

Do you know what a critical phosphorus (P) value means? How critical is critical? Is a critical value on that soil type over there applicable on this soil type over here? How can you use soil analysis and critical phosphorus to decide on a fertilizer program for maximum profit?

There are a number of publications and tools that seek to help growers and advisors answer these questions. Some are technical and specific while others seek to combine information from a broad range of sites and conditions. The most relevant ones however, are based on trial data and the more localised and specific they are to your local growing conditions and soils, the more confidence you can have in applying the findings to your farming situation.

In the case of the eastern Wheatbelt, Summit has a long history of conducting fertilizer response trials to validate nutrient recommendations to maximise grower returns.

When we look at the last five years of trials, the data clearly points to potential grower value being missed by applying broad scale and generic interpretations of critical soil P.

Australian soil and plant nutritionists have compiled a database of fertilizer trials under the Better Fertilizer Decisions for Cropping (BFDC) systems project. The project helps agronomists and advisors make decisions on fertilizer recommendations based on soil tests. The BFDC Interrogator can create calibration curves for relative yield at a range of soil P levels and is a useful tool, but care needs to be taken when applying it.

Taking phosphorus as an example, for the BFDC Interrogator to derive a valid response curve for wheat at Merredin, a region with and area of more than 18,000 square kilometres must be selected and a number of representative soils removed. If this is done, it suggests that soil with a Colwell P value of 19 mg/kg will produce at least 90% of the maximum possible yield of a non-phosphorus limited crop.

Is this local enough and is 19 mg/kg representative of a soil P level that will give the best returns without P fertilizer application?

Other researchers have also found that soil conditions, such as the ability to bind P – what we now measure as PBI – affect the level of soil P where fertilizer will not produce a crop response.

The expectation is that on soil with P above these critical levels, no response to applied P should be seen. However, roots still need to access this P, especially during early growth and in the majority of SummitQ Field Trials in the local area, wheat responded to P applied at seeding. Responses were seen at what are considered reasonable soil test P levels and across a range of good and poor-yielding seasons.

Phosphorus dynamics in soil is complex. Many factors can affect how a crop will respond. Soil pH has a strong influence (including lime impacts), as well as gravel content, water availability and repellency, other root constraints, tillage, application method and crop rotation.

Phosphorus is quite immobile in most soils. Acidic soils exacerbate this. So, placing an effective amount of P fertilizer near a germinating seed makes a plant's task of intercepting and taking up an adequate amount of P to promote growth much easier.

Yield response of wheat to P does vary with site and conditions. The true test of effective fertilizer P use, is a positive economic return. Gross margin calculations for SummitQ Field Trials in the eastern Wheatbelt consistently show a P rate of 8 kg/ha (range 6-10 kg/ha) banded below the seed at establishment to be the most efficient. At this P rate, we see positive effects on nutrient uptake, significant yield improvement and maximised return on fertilizer investment.

Providing an adequate base of P nutrition also has other impacts.

Phosphorus-deficient plants are unable to respond to nitrogen application. If the crop is to be driven to optimum yield and/or protein

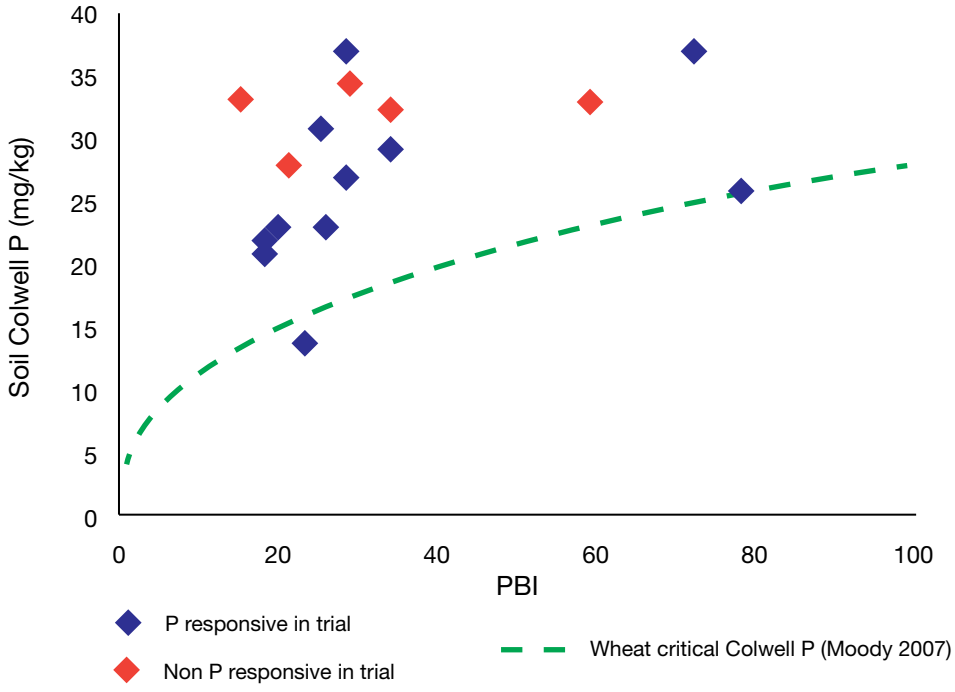

Figure 8. Soil Colwell P and responsiveness of wheat to P application in eastern Wheatbelt trials 2012 – 2015.

content from seeding or opportunistic in-season N applications, adequate P is required. For example, a Nungarin 2015 trial shows (Figure 10) there was little response to N without P applied, even with reasonable soil Colwell P.

So the keys points are to take note of soil test P and indicative levels where responses might be expected, but seek out as much local information as possible to assist your fertilizer decisions. SummitQ Field Research will continue to establish trials through the agricultural regions to provide a resource base to keep growers informed of what is most applicable to their local situation.

Summit Area Managers can always be approached to arrange trial site visits and discuss the local nutrition issues.

For more information, see the electronic paper published as part of the GRDC 2016 Grains Research Updates at http://www.giwa.org.au/2016researchupdates

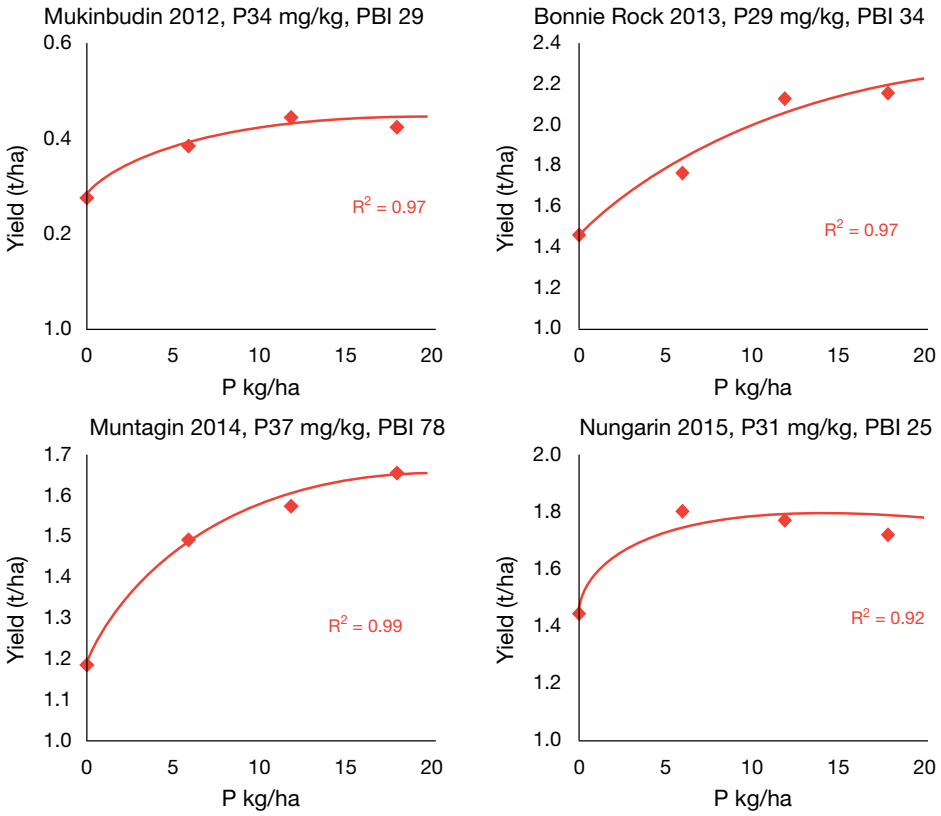

Figure 9. Examples of mean wheat yield response to P application in trials at a range of sites 2012-2015. Lines are fitted Mitscherlich functions.

Key messages

- **Summit Fertilizers field trials consistently find growth and yield responses to phosphorus, even at soil test concentrations above published critical levels.**
- **There are real risks of crop growth penalties and sub-optimal grower returns if P is not applied at sowing. Additionally, driving increased crop yields with N may not be fully effective if levels of P (and other elements) are not adequate.**
- **Summit data and growth response curves suggest P at 6 to 8kg per hectare will optimise growth, yield and returns in the eastern Wheatbelt.**

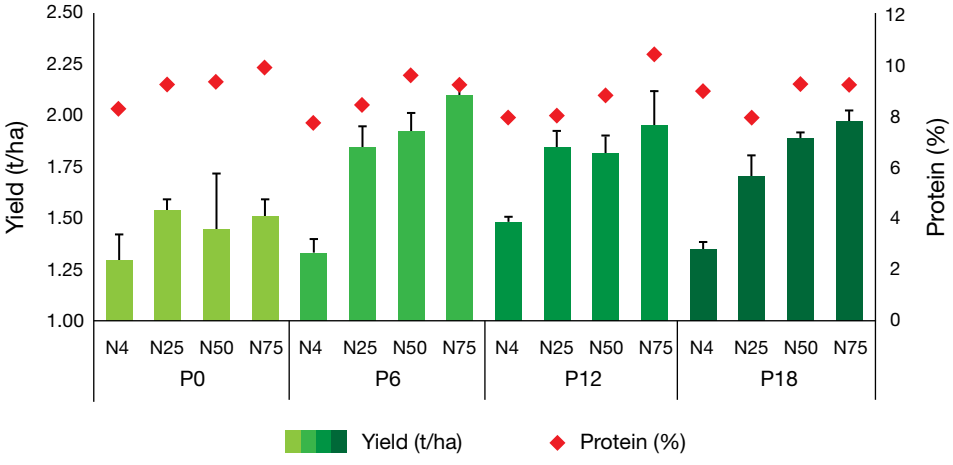

Figure 10. Yield and grain protein response to N application at different establishment P rates, Nungarin 2015. Colwell P 31mg/kg, PBI 25, pH topsoil 5.0, pH subsoil 4.7.

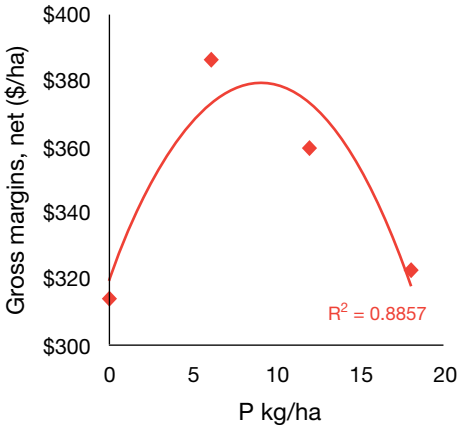

Figure 11. Gross margins, net of P fertilizer cost at Nungarin 2015 trial reinforce the optimal P rate at 8 kg/ha.

Summit Superphosphate

Improved Summit Pasture

Summit Fertilizers has been working to deliver a consistently high quality product in Summit Pasture. The past has shown the optimum amount of dry sulphur that would stick to and remain on the granule was about 7%. Higher concentrations on the finished product tended to become unattached in dry storage conditions, creating a dusty product with irritation and handling issues.

How to effectively boost the sulphur content has been a vexing question and Summit has been working on a solution to find a binder that would give 9% total sulphur without the dust.

This was achieved by incorporating a proportion of the sulphur into a suspended slurry with a special binding agent. Because the suspended sulphur was applied to the product wet we didn't need to add the 9% as a dry sulphur. The amount of dry sulphur applied was less than the optimum 7% and combined with the suspended sulphur gave the required 9% total sulphur.

Extended despatch times this season

As the season ramps up, Summit Fertilizers will increase its operating hours to enable customers and transport operators to get in and out of the depots as quickly as possible.

- Kwinana will work 24/7 during periods of high demand.
- Summit country depots will extend operating hours as required.

Check times with your local depot.

High quality pasture fertilizers

Top quality fertilizers have consistent granule size, low dust, low moisture absorption and adequate granule hardness. These characteristics allow trouble free storage and handling. Even application is also enhanced with quality fertilizer meaning all plants receive the desired rate of nutrition. Uneven application means some plants receive too much fertilizer which is a waste of money and other plants receive too little which is a loss of production.

Size of granules

Fertilizer should be granulated to give flow characteristics such as being able to be poured, augured or stacked. Granules should be large enough so they have a low surface area per unit weight and so, are less likely to absorb moisture. Larger granules also won't get blown around as dust and won't pack down in a heap or set hard. Granules that are too large however are less agronomically effective as nutrients can become concentrated in point sources around each granule. A happy medium appears to be the industry standard of 2 - 4mm granule size.

Spread of granule size

For broadcast fertilizers a range of granule sizes ensures evenness of spreading, with larger heavier granules travelling furthest from the spinner and light granules landing a shorter distance from the spreader. Too large a spread in granule size risks the fertilizer segregating in transport and handling or having too much dust or oversize fraction.

Dust

The very fine fraction of fertilizer can become airborne very easily making handling difficult. While the weight of dust in a product is usually insignificant, the nuisance caused by dust is not.

Granule hardness

The hardness of granules determines how well they survive in storage and handling before generating dust and smaller particles. If granules are too hard there will be insufficient shattering by the spinners of topdressing equipment and not enough small particles may be generated to cover the short distance closer to the spreader. Granules that are too soft break down in storage and handling and generate large quantities of fine material.

Products

- ***Summit Superphosphate*** is the highest quality Superphosphate in WA with consistency of granule size, low dust and good granule hardness.
- ***Summit Pasture*** is a concentrated pasture fertilizer with the same level of sulphur as Superphosphate, but with twice the phosphorus content meaning savings on freight and storage for the same level of phosphorus fertilization.
- ***SuperPasture*** combines the benefits of both Superphosphate and Pasture with half the sulphur in sulphate form and the other half in elemental form.

Nutrient content (% wt/wt)	P	S	Ca
Superphosphate	9.1	11	20
Pasture	18.2	10	14
SuperPasture	13.7	10.5	17

Delivering product quality

By Phil Jacob
Summit Executive Manager - Operations

It's very important to Summit clients that we preserve the high quality of our products. We need to ensure fertilizer stored in our sheds is not exposed to the elements and to do that, we have an ongoing, year round maintenance programme in place.

In a fertilizer environment, corrosion issues are important. We continually review the integrity of the roof sheeting and fixings. Routine painting of steel beams, trusses and replacement of roof sheeting is carried out each year.

During the off season, from September through January, the despatch plants are stripped down for maintenance. Equipment is thoroughly cleaned down, all bearings are checked and replaced if required. All screens, buckets, belts and elevators are cleaned, inspected and replaced if required.

During periods of higher despatch, operations staff do daily inspection and maintenance on all equipment. When there's particularly high demand throughout the week, our staff work on weekends to ensure the equipment is fit for purpose the following week.

Mobile Equipment

It's equally important to have reliable mobile equipment. All Summit front end loaders are Caterpillar, of varying sizes depending the requirement. By using Caterpillar we have the service backup from Westrac to ensure minimum downtime.

Reliability is the major focus within Summit operations to ensure all equipment is well maintained to reduce downtime and any inconvenience to clients.

Product integrity

When Summit takes in product we can do a number of tests to ensure the fertilizer is fit for its intended use.

We have a laboratory at the Kwinana depot that enables us to test for certain quality parameters. Testing is carried out on representative samples of the stock during receival.

Humidity test

The product sample is placed in a humidity chamber for up to 48 hours under conditions of 20C and 80% humidity. It is weighed at 24 and 48 hours to determine the amount of moisture it has absorbed.

Once removed from the chamber the granule is tested for integrity and dried to ensure it is still hard

This information can be used to advise customers how to best care for the product while in storage at farm i.e. liming and tarping products during wet and humid weather conditions

Phil Jacob

Hardness testing

We test for hardness to ensure the granules are not susceptible to breaking down during handling, either ship to shed, shed to customer's trucks, farm storage to seeding equipment and finally seeding equipment to ground.

A hardness of 4 to 6kg's is what we expect to achieve.

Screening

Summit does a screening test as a way to measure the amount of fines (<2.0mm size).

External testing

Independent laboratories are used for nutrient analysis.

AMMS replaces CWMMS

The Accredited Mass Management System (AMMS) is set to replace the old Certified Weighbridge Mass Management Scheme (CWMMS) for loading trucks on April 27th, 2016. Transport operators who have renewed their CWMMS permits prior to that date will have been issued with the new AMMS permit and all current CWMMS permits will roll over to AMMS on April 27th. Under AMMS, registered trucks will need to have satisfied Main Roads WA that the truck and trailers have been loaded to the axle groupings allowable under their permit conditions.

All companies loading trucks under AMMS must have their weighbridges approved by Main Roads WA. Once approved the weighbridges are listed on the Main Roads website.

- Summit Fertilizers currently has a total of nine weighbridges over six depots. The weighbridges are of differing configurations. Procedures have been developed for each so they meet AMMS requirements.
- On completion, the procedures where presented to Main Roads WA for review. We're happy to say that all our weighbridges have been accepted for AMMS and are listed on Main Roads WA website.

Increased liquid UAN storage and despatch capacity

With increasing demand for Summit liquid fertilizer there was a need to review capacity at the Kwinana depot. Over the next 12 months Summit will double the Kwinana UAN storage capacity from 2100 tonnes to 4200 tonnes. This will enable continued UAN manufacturing during the quiet periods with more storage to meet customer demands during the busy periods.

Summit is also installing a dedicated weighbridge for the despatch of liquid fertilizers. The new weighbridge will be situated undercover and adjacent to the current urea despatch weighbridge. A central control room will service both weigh-bridges. The additional weighbridge will allow for greater efficiency, faster despatch and will lessen yard congestion.

Another improvement will be the ability to receive ammonium nitrate in a melt (solution) form. This will boost Summit's manufacturing capability of UAN substantially.

The real benefits of quality

Fertilizer quality is not generally considered in the fertilizer purchase until the impact of low quality is felt first hand. One of the major impacts is down-time during seeding. Not only is this a source of frustration, but the cost can be much more than just additional labour, as the following example shows.

In this example we assume a seeding program of 4,000 ha and seeding around the clock for a total of 20 hours/day actual seeding. We also assume poor fertilizer quality delays seeding by three hours each day through the time taken checking and clearing hoses, distributors and metering systems and repairing any breakages. Yield loss for each day of delay in seeding is assumed to be 25 kg/ha/day.

Table 2 shows the figures generated from the calculations using these assumptions. A total of 147 tonnes of grain, or $40,425 worth of income (if wheat is valued at $275/t) would be lost due to three hours/day downtime over the course of a 20 day seeding program. This is in addition to other impacts of poor quality fertilizer such as blockages (rows missing where single shooting, or, rows seeded but not fertilized if double shooting), build-up (affecting rate of application), additional labour costs and additional wear and tear on machinery.

Table 2. Yield and on-farm net return for high versus low quality fertilizer

Day	High quality fertilizer, program sown without down-time			Poor quality fertilizer, program sown with down-time			Total grain difference (t)	Value of difference ($)*
	ha sown per day	Yield (kg/ha)	Total grain (t)	ha sown per day	Yield (kg/ha)	Total grain (t)		
1	240	3000	720	204	3000	612		
2	240	2975	714	204	2975	607		
3	240	2950	708	204	2950	602		
4	240	2925	702	204	2925	597		
5	240	2900	696	204	2900	592		
6	240	2875	690	204	2875	587		
7	240	2850	684	204	2850	581		
8	240	2825	678	204	2825	576		
9	240	2800	672	204	2800	571		
10	240	2775	666	204	2775	566		
11	240	2750	660	204	2750	561		
12	240	2725	654	204	2725	556		
13	240	2700	648	204	2700	551		
14	240	2675	642	204	2675	546		
15	240	2650	636	204	2650	541		
16	240	2625	630	204	2625	536		
17	160	2600	416	204	2600	530		
18				204	2575	525		
19				204	2550	520		
20				124	2525	313		
Total	4,000		11,216	4,000		11,069	147	$40,425

** Assumes APW wheat @ $275/tonne on-farm*

Fertilizer spreading tips

Once the decision is made on what type of fertilizer is to be applied and how much is needed, growers need to turn their attention to other important factors like spreader setup.

Spinner speed is one of the most important factors in achieving an accurate spread pattern. Variations in spinner speed by as little as 50rpm will alter spread pattern. Running spinners too slow will mean growers won't get the desired spread width and running them too fast can mean the fertilizer granules can break up, producing fine material that won't carry.

Most modern spreaders have a tachometer that measures the rpm of the spinners. The best spinner speed depends on the spreader model, so growers should check with the manufacturer specifications. Growers should also check for wear on the spinner, the location of the spinner vanes and their angles relative to the centre of the disc and also the chute position. All those factors are really important for correct setup.

Of course, every product will spread differently depending on its bulk density, granule size, variation in granule size and granule shape. Some material will spread to wide widths, such as granulated single super, while lime and gypsum will only be capable of spreading to a narrow width. The application rate for the spreader can be set as per the charts for the machine or by calibrating the spreader. The charts use empirical values to determine the door setting. Different products flow at different rates. For instance, urea flows faster than more irregular shaped products. The chart will determine the door setting required for the various application rates.

Growers can also do their own calibration test.

Add up the true costs with sulphate of ammonia

Sulphate of ammonia (SOA) is often favoured as a source of nitrogen and sulphur because its price per tonne is low and it can be spread during late summer or autumn. But, there are other factors to be considered if SOA is to be compared to urea or other nitrogen sources.

Cost of freight

SOA contains only 21% nitrogen (N), much less than more concentrated products such as urea (46% N) or UreaPlus (37.2% N). Table 3 (below) shows tonnes and freight cost to provide the same amount of nitrogen as 100t SOA. The other products require less freight, storage, and handling during spreading.

Adding the cost of freight to the price of the SOA and other nitrogen sources when calculating the cost per unit of N shows marginal savings in nitrogen cost with SOA.

Storage and handling

SOA is a crystalline product which is more likely to attract moisture and deteriorate or set hard in storage. Stored for more than a few weeks it will start to settle as it contains the perfect cementing composition of small and large particles. After two to three months the stack can settle significantly and often requires reconditioning to be able to put it through a spreader.

Spreading

With uneven particle size, SOA is difficult to spread evenly. Its smaller particles are spread less which tends to cause stripping of nutrients in the paddock. Stripping means areas of the crop get too much fertilizer and other areas are under fertilized, which leads to potential yield loss.

To get an even application, spreading widths need to be reduced. A common swath width for SOA is 12m compared to 30m for urea, which increases application costs.

Narrower swath widths also results in extra wheel tracks across the paddock which can lead to increased soil compaction.

Acidification

Nitrogen fertilizers vary in their acidifying effect on soils and SOA is severely acidifying. Urea is slightly acidifying, but only if the nitrogen is leached out of the root zone.

With SOA, even if all the nitrogen was taken up by the plants, growers would need to apply around 4kg of lime for every 1kg of applied N. If all the nitrogen was leached, they would need to apply 7.2kg of lime for every 1kg of N.

For example, 200kg/ha of SOA would supply 42kg N/ha. A grower would need to apply up to 335kg/ha lime with a 90 per cent neutralizing value to balance the acidifying effect of the SOA. Spreading 1t/ha of lime every three years, if SOA is continually used, can remove any potential savings in nitrogen costs when using SOA.

Leaching

Because SOA tends to be applied in larger quantities in summer or early autumn the risk of nitrogen leaching is greater than other nitrogen sources which tend to be applied at seeding or post-emergent when crop roots are able to better utilise the applied nitrogen. This increases the risk of acidification if using SOA.

Summary

When comparing SOA to other nitrogen sources it must be remembered that SOA requires more product to be carted and stored, a narrower swath width for spreading, and can be more acidifying than the alternative products.

Table 3. Compare the cost of SOA with other nitrogen sources

	SOA	Urea	UreaPlus
Analysis	21% N, 24% S	46% N	37.2% N, 8.4% S
Equivalent tonnes required	100	45.6	56.4
Freight cost*	$2500	$1140	$1410

** Based on $25/t*

How to handle high humidity conditions

Fertilizers vary considerably in their ability to tolerate atmospheric moisture with fertilizer blends generally having lower critical relative humidity than their components. In some cases it will be significantly lower, making some blends impractical.

Regardless of product, it's good practise to spread a thin layer of hydrated lime on the floor of the fertilizer storage shed. This helps stop the fertilizer drawing up moisture through the concrete.

After the shed is filled, growers can spread more hydrated lime lightly over the fertilizer and ideally, cover it with a tarp or plastic. That helps keep air and moisture out and is especially important if the shed doorway faces the prevailing winds. All fertilizer should be covered whenever it is practical to do so.

When sowing in humid conditions and first thing in the morning (especially in dewy situations) it is good practise to throw a handful of hydrated lime into the fan of the seeder. This will be blown throughout the seeding rig and dry everything out before you start.

Leaving seeder tynes on the ground overnight can cause problems because it will suck moisture up to condense in the boots. When loading fertilizer into the seeder, sprinkling a little hydrated lime onto fertilizer going up the auger will coat the granules and again, prevents the granule from sucking in moisture.

When the fertilizer bin is full, add another 1-2kg of lime to the top. This little extra amount will flow through the system and keep things dry. Over-use of hydrated lime should also be avoided, because this can create its own problems.

Hydrated lime is caustic so appropriate care should be taken when it is being handled, including appropriate clothing, dust mask and eye protection.

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