# Fluid News

## Farmer Profile > Bill Blumson

The success of the Bob Holloway and co trials on the Eyre Peninsula in South Australia was enough to swing cereal grower Bill Blumson to fluid fertilisers.

Now in his fifth year of using fluids, Bill saw the potential for greater efficiency on his property near Smoky Bay in SA.

“We wanted to try and increase our water use efficiency by using a more efficient form of phosphorus,” he said.

Bill acknowledges fluids are more expensive, but believes that they are the best option long-term.

So far, Bill has been using four units of phosphorus, 4kg per hectare. This works out to be equal with 10kg of granular in cost.

### In Brief

6000ha property near Smoky Bay on the West Coast of South Australia
Grows wheat, barley and oats
Annual rainfall 315mm
No-till farming system, almost continuous cereal

“I’m not sure if we are seeing the huge benefits yet, but I think we are starting to.”

This year, Bill has increased the phosphorus to 5kg and already the crops look better.

Bill said the set-up and switch to fluids on his property had been fairly cheap estimating all up about $30,000. This included his cart which came ready to go, saving him the time and money of modifications

“It’s starting to pay its way,” he said.

Bill has extensively used Ammonium Polyphosphate since the start, sourcing his products through Agrichem and unlike many SA farmers he has little problem with supply. He stores much of his season’s requirements on site in three 27,000L polytanks – although he had to order an extra load this season.

“The price has really been a restriction on using APP at a reasonable rate. And I found that mixing Magnesium with APP is extremely difficult,” he said

“I’d like to see some more research done on trace elements and how to get the right amount in the fertiliser. I’d also like to see some research on effects on harvest index with different rates of fluid P.”

## From the editor

The First Australian Fluid Fertiliser Workshop is upon us. I would like to take this opportunity to thank industry for their generous support, which has enabled us to keep the costs down. I would also like to thank the 200 participants and hope that they found the information useful and relevant.

As part of the workshop we have produced a workshop proceedings with abstracts of the presentations given in the workshop. The quality of the information contained in these abstract will be a valuable resource for industry and farmers. These proceedings will be available for sale following the workshop. Please register your interest by contacting me.

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# 2004 research plans for Upper Eyre Peninsula

*The fluid fertiliser research program on Upper EP in 2004 is based at seven sites- Minnipa, Cungena, Talia (Elliston), Warramboo, Mt Cooper (Pt Kenny), Tooligie and Koongawa.*

## Suspension fertilisers

### Dr Bob Holloway- Sardi, Minnipa

Suspensions are a major subject of investigation in 2004 because initial research suggests they may perform as well as clear liquid fertilisers on calcareous soils. Suspensions are more difficult to store long term than granular or clear liquid fertilisers. They are more difficult to transport – so why bother with them?

Clear liquids are relatively expensive to purchase in Australia. For broad-acre cereal cropping, particularly in the low rainfall areas of South Australia, the major infrastructure and investment resources are in the granular fertiliser industry. Most of the materials used in clear liquids are imported. There are no facilities in Australia for large scale production of ammonium polyphosphates. Most of the phosphoric acid is imported from China or elsewhere. Technical grade MAP and DAP are also imported.

Suspensions can be made from solid base products which are available in Australia. This includes granular DAP and MAP, or fines of these products before granulation. These solids are mixed with water and if needed, with other nutrients like zinc, manganese and copper. Bentonite or attapulgite clay are added and the gelled clay prevents the nutrients from settling out for some time. Suspensions can be manufactured to almost any prescription. A wide range of macro and micronutrients can be distributed evenly through the fertiliser band - a feat unique to suspensions and a few, but not all, clear liquids.

"In 2004, we are looking at the rates of response of wheat to increasing rates of P applied as granular, clear liquid or suspensions," Minnipa Agricultural Centre's Brendan Frischke said.

"This hasn't been done before but we need to know how the three types of products, all supplying the same nutrients, will perform on calcareous soils. The sites are at Warramboo (MAP-based suspension) and Talia (DAP based suspension).

"Applying suspensions sounds difficult but isn't, given the right equipment. A ground driven squeeze pump handles suspensions easily.

"A very coarse filter can be used to take out large particles when suspensions are added to the application tank.

"After that, no need for filtration. A squeeze pump will comfortably push out anything from neat suspensions to clear liquids through tubes of around 6 mm internal diameter.

"Is it necessary to add water to the suspension? Our aim this year is to find out by comparing a range of applications from neat suspension to a mixture with 40% water. The site of this experiment is Warramboo."

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*John Blue Squeeze pump mounted on plot seeder. Each tine has an individual hose in the pump that are squeezed by the rollers forcing fluid along hose. The pump has a common input to all hoses and dosent have valves alowing coarse products to be pumped. John blue manufacture pumps with up to 48 output hoses.*

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## Residual effects of fluid and granular fertilisers

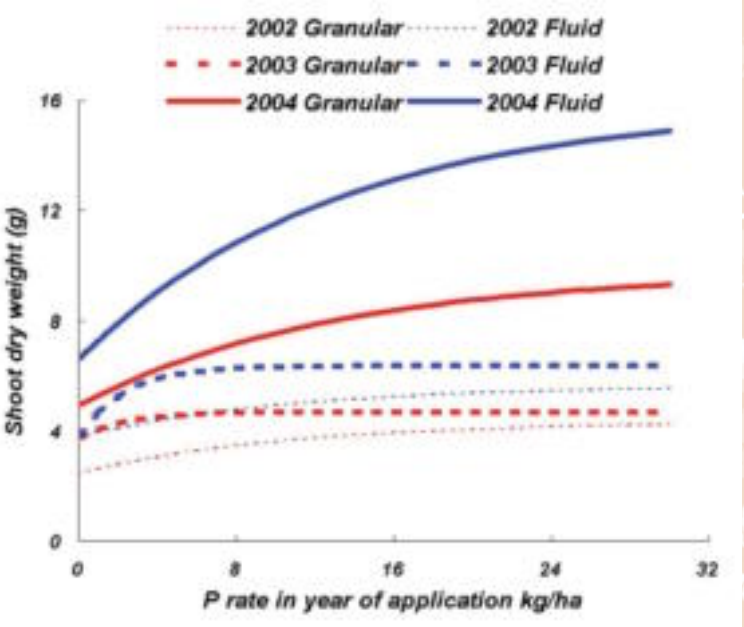
Experiments designed to compare the residual effects of both fluid and granular P fertilisers were established at Warramboo and Minnipa in 2002. They are being compared over four years. Each year, new plots are sown with fluid and granular sources of P. The previous years' plots are fertilised only with N and Zn in each following year. The soil at Minnipa is a red brown sandy loam with a relatively low calcium carbonate content. At Warramboo the soil is a highly calcareous grey sandy loam (calcium carbonate content about 65%).

## Reducing N losses after application

It is widely recognised that nitrogen can be lost from the soil by nitrification (conversion of ammonium ions to nitrate followed by leaching, and conversion of urea to ammonia vapour when urea or UAN is applied to the soil surface) after N fertilisers are applied. The last process is driven by the urease enzyme which catalyses the hydrolysis of urea to carbon dioxide and ammonia. The enzyme is found in bacteria, yeasts and some plants. Urease inhibitors can reduce the losses associated with surface application of UAN, urea solution or granular urea. Ammonium thiosulphate (ATS) and calcium nitrate have been proposed as possible nitrification/urease inhibitors although there is some controversy about whether they are effective in this role or not.

"In 2003 at Warramboo and Minnipa , mixing ATS with UAN provided some evidence of improved early growth of plants," Mr Frischke said.

"This experiment has been extended to include calcium nitrate in 2004."




*Shoot dry weight response of wheat grown in 2004 to residual P from APP or granular fertiliser applied in previous years (2002 & 2003) at Warramboo. Nitrogen and zinc only were applied to the residual plots. The 2004 responses are to APP or granular P applied (with N and Zn) in the current season.*

## Evaluating High Pressure Nitrogen Injection

Using the Root Zone Injector (RZI), a machine manufactured in Canada, fertilisers are injected into the soil without soil engaging tools and hence no soil disturbance. The RZI can also be used post emergent with out damaging the crop. The RZI is being evaluated as a post emergent nitrogen applicator that has no reliance on rain to be effective and being compared to deep banding urea and broadcasting urea at several crop stages and weather conditions. Trials are being conducted in barley at Mt Cooper and Tooligie Hill.

*Applying nitrogen to barley at ealry stem elongation with high pressure using the root zone injector (RZI) at Mt Cooper.*

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## Copolymers

Copolymers are experimental fluid or granular products which have several useful properties in fertilizer compounds. One of these is to maintain a constant pH around them in the soil for a considerable part of a season. This means that nutrients that are more available or less subject to precipitation reactions in the soil in an acid environment can be kept in a low pH environment by the copolymer.

“The products we are testing belong to Specialty Fertiliser Products in the USA and early results indicate improved performance with both fluid and granular sources of P in our highly calcareous soils,” Mr Frischke said.

Copolymer experiments are sited at Cungena and Warramboo.

## Long term P placement effects.

Is there a difference in the residual effects of fluid and granular fertilisers if they are applied in the same band of soil each year? With precision guidance now a reality, small plot experiments are being conducted at Warramboo and Talia to see if the availability of P can be improved by concentrating fertiliser applications in the same band of soil each year, versus random placement. A secondary effect to be tested will be whether the relative gains by fluid fertiliser over granular at this site are maintained where fluids have been used previously.

## P and canopy management

In many fluid vs granular P experiments, early growth can be improved with fluid P by up to 50% but at harvest, this advantage often drops to 5-15%. We often see granular plots “catching up” later in the season, particularly from head emergence onwards. It is possible that this is a soil water issue – due to the early use of soil water by more rapidly growing plants which then have their growth limited by soil water constraints later in the season. To test this, fluid and granular fertilisers have been applied to a range of different wheat plant populations. It is possible that lower plant populations may reduce the water use early in the season. This experiment is being conducted at Cungena.

## Nutrient omission

It is well known that plant growth is limited by lack of adequate P, N, Zn and/or Mn in our environment. Because all essential plant nutrients are needed together, adding one nutrient alone often does not give optimum responses because other nutrients may also be limiting. Improving the availability of P will not work if N is limiting as well.

The question is sometimes asked about whether such nutrients as K or Mg are limiting plant growth. The best way to test this is to provide all of the other nutrients which may be limiting and leave out the one to be tested. This should show if improving P availability with fluids induces limitations in some other nutrients. This experiment was conducted at Cungena.

## Creep feeding plants with P using the Root Zone Injector (RZI)

P is a major nutrient which is most needed early in the life of the wheat plant and our fertilisation systems are designed to provide all of the P at sowing. Although we know that plants need to take up P right up until just before the crop is ripe, we are not sure what happens in highly calcareous environments where P tends to be rapidly fixed. Is there an advantage in applying P later in the growth cycle using the RZI which places nutrients into the root zone where they can be absorbed immediately? This experiment is also being conducted at Cungena.

## Micronutrients in seed

“It is now well known that seed from highly fertile sites grows better in nutrient limiting environments than seed from the limiting environment,” Mr Frischke said.

“Fluid fertilisers applied to calcareous soils have been able to improve seed uptake of P and Zn particularly.

“The application of micronutrients to wheat in the heading stage has also been able to improve micronutrient concentrations in the seed.

“This is colloquially referred to as ‘supercharging’. In this experiment, ‘supercharged’ seed, seed sown with fluid formulations in 2003 and seed from other sources is being compared to seed produced locally using granular fertilisers in determining final grain yield.”

The experiment is being conducted at Nunjikompita.

# Agrichem releases growers' bible

Owen McCarron- Agrichem www.agrichem.com.au

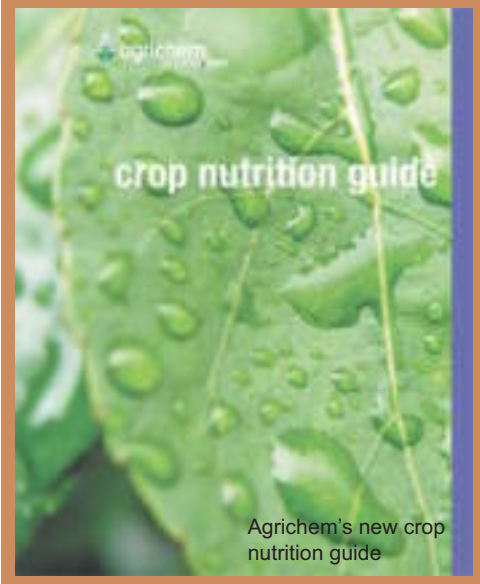
Liquid nutrition specialists, Agrichem, will be launching a pioneering nutrition manual at the Inaugural Australian Fluid Fertiliser Workshop to be held in Adelaide from September 21 to 22.

The manual will contain essential information about major and minor elements alongside overviews of liquid fertilisers and application techniques, nutrient interaction and soil health. It will also contain detailed deficiency information for 22 major crops, conversion charts and product information sheets on Agrichem's 80 products.

Agrichem VP Marketing, Annette Welsford says the manual is an important component in Agrichem's educational strategy.

"The aim is for Agrichem to become a technical partner to growers.

"Our liquid nutrition range is based on extensive research and testing and we're keen to share this knowledge with growers to help them improve crop performance."



Agrichem's new crop nutrition guide

Agrichem will also be releasing a series of mini-manuals for each crop type. The Cotton Manual was the first in this range and was released at the 12th Australian Cotton Conference held in early August on the Gold Coast.

Mrs Welsford says the company's new priorities are evident on its website, www.agrichem.com.au, which now contains a database cataloguing the compatibility of Agrichem's products with commonly used agricultural chemicals.

"With more than 10 000 records the database may be the largest of its kind ever compiled," she said.

"It's an extremely informative document that provides growers with valuable information about tank mixing and helps them to choose products that are compatible. This will reduce the number of applications and provide the grower with significant labour and time savings."

Mrs Welsford says that in addition to consulting the website and manual, growers and distributors are always welcome to ring head office on 1800 654 758 for more personalised technical advice.

# Cutting-edge technology to understand P chemistry in soil

Dr. Enzo Lombi
Senior Research Scientist
CSIRO Land and Water

Scientists at CSIRO and DPI Victoria have secured funds from the Australian Synchrotron Research Program and the Victorian Department of Infrastructure and Regional Development to conduct research aimed at investigating how different forms of P react with different soil particles at the molecular level.

They will focus their investigations on whether there are any similarities between the reaction products, primary P sinks around granular fertilisers and in fertiliser bands.


Studies on how different forms of P react with soil particles will be conducted at the Advanced Photon Source near Chicago.

Most research conducted on precipitation/ dissolution processes controlling P solubility and availability in soil has used 'bulk' soil samples and 'wet chemistry'. Commonly used techniques have severe limitations in assessing the fundamental and very localised processes that occur in and around P fertilisers.

Under this research project, scientists will take a different approach. Bulk soil analyses will be replaced by studies at the micro-scale using synchrotron technology. Synchrotron technologies make use of synchrotron light, which is generated when electrons are forced to travel in a circular orbit at a speed close to that of light. This very particular light is an extremely powerful tool to understand chemical processes taking place in the soil at molecular level.

Since this technology is not yet available in Australia (the Australian Synchrotron will become operational in Melbourne in 2007), this study will be conducted at the Advanced Photon Source (APS) near Chicago. The APS is one of the most powerful synchrotron in operation.

# High cost deters the uptake of liquid technology

Extensive trials show farmers on calcareous clay soils can increase cereal crop yields by up to 40 percent by using phosphorus as a fluid fertiliser. But are the results as good on other soil types? This report by Pamela Horsley, from the Kondinin Group, writing in Farming Ahead, June 2004, looks at the fluid, liquid and gas fertiliser options available to farmers, and whether there is an advantage in using fluid fertilisers over granular formulations.

Fluid Fertilisers can increase crop yield on calcareous soils but studies show they have no advantage over granular fertilisers on other soils.

While fluid fertilisers (both liquid and suspension formulations) are more expensive than granular fertilisers to buy, store and apply due to the specialised equipment required, their advantage is convenience.

The products are easy to use, offer accuracy of placement and can be mixed with other chemicals such as herbicides and pesticides.

Whether farmers decide to use fertilisers depends on how much they are willing to pay for convenience.

## The cost of convenience

The price of fluid fertilisers will always be higher than granular fertilisers due to the cost of nutrients it contains.

For example, while granular urea could cost up to $400 per tonne delivered in some areas, the main fluid fertiliser available anhydrous ammonia is almost double the cost at $713/t.

Another fluid fertiliser urea ammonium nitrate solution (UAN) is cheaper at about $340/tonne but because of its lower nitrogen content, UAN often costs more per hectare to apply. Farmers also will have to invest in new application, storage and handling equipment or modify existing equipment.

So, the decision to use fluid fertilisers will be based on the return on investment. That is, the total applied cost of the fertiliser, including product cost, labour, application costs and an allowance for new equipment and modifications, compared with any additional return from increased yield and protein, convenience and savings from fewer passes or higher rates of nutrient application.

## At a glance

Fluid Phosphorus used on calcareous soils can increase crop yields significantly but most trials on other soil types fail to show any significant yield and protein advantages over granular products.

The main reasons for using fluid fertilisers are convenience, ease of use, variable rate application, application accuracy and the ability to mix with pesticides.

When switching to Fluid Fertilisers, consider:

- Soil type, seasonal conditions, associated costs and availability will determine if fluid fertilisers are cost effective.
- Match the fluid fertiliser with soil type for best results and consider the response of other additives such as trace elements.
- Compare the costs of equipment set-up and using fluid fertilisers with the likely benefits, gauged from trial results and actual use of the products in the local area.
- Application equipment can range from simple and inexpensive modifications of existing boomsprays to more expensive purpose built stainless steel equipment.

# Nutrition X Disease Interactions on Grey Highly Calcareous Soils of EP

Alison Frischke (SARDI, Minnipa Agricultural Centre) and David Roget (CSIRO Land & Water)

## Fluid Fertilisers Reduce Disease Severity

In 2002, an experiment comparing fluid and granular fertilisers was established on a grey Calcarosol (Hypervescent Hypercalcic Calcarosol) at Streaky Bay on Upper Eyre Peninsula. The experiment was designed to measure the efficiency of suspension fertilisers compared with granular fertilisers and commercial clear liquid fertilisers.

The results suggest that where root disease inoculum levels were high, there was the same incidence of root infection irrespective of the fertiliser treatment. However, there were significant differences (P>0.5) between treatments in terms of dry weights of shoots, with APP producing 36% more shoot weight at Feekes 10 than granular DAP. Despite the similarity in the severity of root diseases, plants sown with the more effective fluid fertiliser were better able to acquire soil immobile nutrients like P and Zn and this was demonstrated by increased shoot growth. The severity of root disease decreased with the application of fluid fertiliser and the production of shoots increased.

Associated with the ability of fluids to increase nutrient uptake was a trend towards a reduction in the area within each plot affected by disease, and an improvement in grain yield.

## Total Disease Control Enhances The Effects Of Fluid Fertiliser

A series of experiments designed to measure the effects of soil fumigation on crop production were conducted in 2002, a relatively dry season. The experiments were continued in 2003, allowing confirmation of results from the previous year and to further evaluate impacts in a better rainfall season.

The fumigation trial was established to determine if: there were any biological limitations to wheat production that may be inhibiting the full benefits of improved nutrition (fluids); and whether there are other non-biological factors still limiting crops from reaching their yield potential.

Granular fertiliser was applied as di-ammonium phosphate (DAP) and urea, while the fluid treatment was applied as ammonium polyphosphate (APP) with urea ammonium nitrate (UAN) and zinc, copper and manganese chelates. The site was sown to barley (Hordeum vulgare L. cv. Barque) on June 14.

The fertiliser treatments were intended to compare the district practice application of granular fertiliser, with increased and more available nutrients (i.e. improved nutrition), which were supplied by the fluid fertiliser.

Dry weights of shoots at early tillering (Feekes 3) was increased by 24% with the fluid treatment and by 113% with the fluid plus fumigation treatment compared to the standard granular treatment. There was only a relatively small response (23%) to fumigation with the granular fertiliser treatment. These early differences carried through to harvest with the fluid treatment following fumigation giving the highest yield of 5.3 t/ha compared to the granular treatment with 3.0 t/ha. Without fumigation, the fluid treatment increased yield by 0.7 t/ha over the granular treatment. Maximum production required both the improved nutrition of the fluid treatment and the disease reduction from the fumigation treatment. Rhizoctonia root rot was the major disease at this site and the fumigation responses were largely due to the control of this disease.

## Conclusions

When the nutrient supply to deficient plants is increased, plants are better able to cope with root disease. Fluid fertilisers providing P, N and Zn are known to be more available on highly calcareous soils, and consequently P, N and Zn uptake is greater with fluid fertilisers than with granular fertilisers. The use of fluid fertilisers on highly calcareous soils does not eliminate disease patches, but plants within the diseased patches are less affected. The combined effects of improved nutrient uptake and reduction in disease severity results in overall grain yield improvements with applications of fluid fertiliser compared with granular fertiliser.

The potential to lift production on the grey calcareous soils is substantial. The advent of fluid fertilisers has provided a viable option to remove one of the major production constraints. Cereal root disease is now the major limiting constraint on grey calcarosols and practical controls should be re-evaluated now that nutrition issues can be addressed. In the longer term, as productivity increases with subsequent increases in the production and retention of crop residues, there is the potential for increasing both soil microbial activity and biological suppression of key cereal root diseases.

agrichem plant nutrition solutions

# Agrichem, proud sponsor of The First Australian Fluid Fertiliser Workshop

International company Agrichem has been named the naming rights sponsors for the inaugural Australian Fluid Fertiliser Workshop in September.

With an 18-year association with liquid fertilisers in the country, Agrichem was the logical choice.

“We are honoured and proud to be the naming rights sponsors for the inaugural Fluid Fertiliser workshop in Australia in September,” national sales manager Owen McCarron said.

Since the company was established in Australia in 1986, it has initiated research in a variety of areas including funding the initial trial work of Bob Holloway and his team on the Eyre Peninsula. Agrichem also sponsors the work of Adelaide Uni PHD student Therese McBeath.

“We have a deep history with liquids in Australia,” Mr McCarron said.

“We are happy to put money back into the industry.”

Agrichem’s Technical Services Director Erin Conza, who is on the technical advisory committee for the US Fluid Fertilizer Foundation, will also present at the September workshop.

“Agrichem is more than pleased with the quality of researchers who will present in September,” Mr McCarron said.

Company representatives are looking forward to spending time with growers and sharing trial results and grower experiences from all over the world.

“We will have a number of new products which will be available for the 2005 cropping season which we will discuss at the workshop,” he said. “We will also be showcasing our new Nutrition Manual – Australia’s first comprehensive technical manual on liquid nutrition. It covers a range of nutrition and application issues and provides recommendations for nutrition programs for 22 crops.”

Agrichem has welcomed the support of other leading industry representatives as sponsors - Fertisol, CSBP, GRDC, Incitec, Liquid Systems SA, DPI Vic, Tessenderlo Kerley, SARDI and the Fluid Fertilizer Foundation - who have come on board to jointly develop the awareness of fluid fertilisers and nutrient products in Australia.

“We are certainly impressed with the calibre of the other sponsor,” Mr McCarron said.

He said it was now time for farmers to take grasp of the technology available and “run with it – the workshop is critical to growers continuing to uptake the technology.”

“We want to see as many growers, agronomists, consultants and distributors as possible attend the conference,” Mr McCarron said.

“We look forward to an increasing understanding and uptake of use of fluid fertilisers in Australia post the workshop.”

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