Fluid News

fluid fertilisers

August 05

Farmer Profile > Danny Sanderson

The need for a new rig last year helped Danny Sanderson take the step to convert to fluid fertilisers. A change that has allowed Danny to manage application timing more accurately, which in turn has maximised his yield.

People often think the change to fluid fertilisers is an expensive exercise however, if it is timed right there can be little to no extra cost burden.

'I needed a new rig last year, so there was no real extra cost,' Danny said.

Danny wanted to ensure that he didn't come across any supply or storage issues so he had three 43,000 litre Flexi-N storage tanks installed on his property. This allows him to store a full year's supply, have it available when he needs it and then fill up in the off season. Danny estimates that he spent approximately $20,000 on the storage tanks, pumps, taps and hosing.

In Brief

Western Australia, Central wheat belt

- 2400 Hectare property West Grass Path – 85 km NW of Esperance
- Wheat, Barley and Peas
- Average rainfall 325mm
- Mainly loamy sand over clay
- Minimum or no-till farming system

'Supply is not an issue for me because I thought about it and decided to be prepared. If you are willing to outlay a little bit then you can avoid supply issues all together,' he said.

Danny sings the praises of Peter Burgess Liquid Delivery as they have helped him get set up for delivering fluid fertilisers and have also assisted him with his storage capabilities.

He says there is a good range of fluid fertilisers and equipment available, but believes that Peter Burgess Liquid Delivery has the most comprehensive and advanced range.

Danny has a Morris 9000 with bar spray with 23 cm spacing, Harrington point and selling boot press wheels. He also has a Morris 8425 air seeder which has the third tank as a liquid tank, which allows him to have a liquid deliver system on the air seeder.

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From the editor Jim Kelly

We have now produced 9 editions of Fluid News, it has been an enjoyable journey seeing the changes that have occurred with all stakeholders in the industry.

We are seeing increased use of fluid fertilisers by the farming community, who are gaining agronomic and/or logistical benefits. There has been a lot of on-farm experimentation as industry has struggled to meet new demands for products and equipment.

There is a constant stream of new information from the research community, with local researchers being recognised for their efforts, locally and internationally

Also, segments of the fertiliser industry have embraced the use of fluids by making research and new products available to meet farmer demands. Many of these new products will offer flexibility to meet crop nutritional requirements that has not been available with granular products.

An important component of Fluid News has been the farmer profiles. They are a valuable source of information as farmers are assessing their opportunities when making the transition from granular to fluid fertilisers. Please keep the stories coming in!

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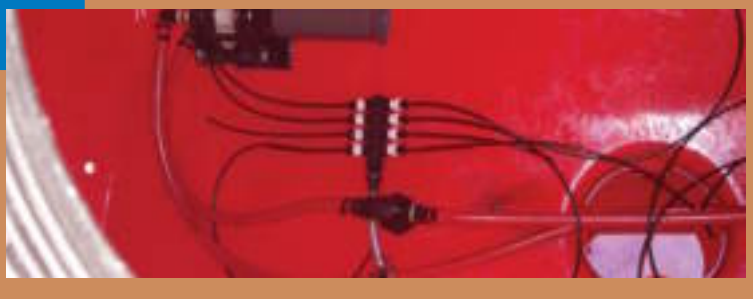
GRDC Project UA CS0231

CSIRO · Victoria Department of Primary Industries · SARDI Research and Development · Government of South Australia · The University of Adelaide Australia · Fluid Fertilizer Foundation



Farmer Profile > Danny Sanderson

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Danny uses Flexi-N, UAN (CSBPs), at seeding he bands 50L and then, depending on the season, he may use another 10L. He can now add Triade powders/ fungicides to the banding at seeding, which has been very successful this year.

'I have not yet sprayed and I am not looking like it because I mixed Triade at banding. Powdery Mildew is a big problem on Barley this year, but this has allowed me to avoid it so far,' Danny said.

The most obvious benefit of liquid fertiliser for Danny has been the ability to maximise yield. Fluid fertilisers are flexible and easy to handle; they have allowed Danny to mix other treatments. In the past Urea was a concern as 'you had to get it, get contractors to apply it and hope for rain,' Danny said.

'Timing is also less of a concern now I can do it myself, I used to worry about not applying enough, now I can apply the right amount with ease, I just have to be mindful not to over do it and apply to much,' he said.

Danny's advice to other growers considering the change is positive. There are some important considerations though. Even though it stores well, it is very corrosive and poly or stainless steel are the best materials to use but it is still important to carefully rinse every night.

'Manage with careful rinsing, but don't use pressure cleaners as they can push it into the weld joints,' Danny said.

If possible, Danny also suggests being prepare in terms of storage, which can eliminate any supply issues.

'The only other thing I can suggest is to be careful when applying onto foliar of crop, be aware of burning; do not spray on damp crops, apply in the afternoon and do not apply on warm sunny, windy days. Although, I haven't experienced yield reduction from scorching,' He said.

Overall, Danny's experience with the change over to fluid fertilisers has been very positive.

International research links

Bob Holloway and Dot Brace of SARDI' s Minnipa Agricultural Centre recently spent two weeks at the North Dakota State University working with Prof. Jay Goos of the Soil Science Department. Prof. Goos has developed a physiological technique to improve the ability of plants to tiller in low N soils and is testing the same technique in low P situations. Bob and Dot assisted with the experiment and also set up a fluid fertiliser experiment to test the ability of acid solutions to improve the ability of soil-applied iron sulfate to correct iron deficiency in soya beans. Iron deficiency is a major problem in the northern great plains and is currently only treatable with foliar applied chelates.

The million dollar rock

By Dr Bob Holloway

Researchers have estimated every hectare of South Australia's highly calcareous soils contains about $260 of accumulated phosphorus - for a 4000ha property, this amounts to more than one million dollars worth of MAP.

This is in soils where plants are endemically deficient in phosphorus.

This research followed a 1997 report in the CSIRO Rural Research Magazine, where Dr Peter Hocking and Dr Gamini Keerthisinghe calculated $10 billion of P as superphosphate was accumulated in soils – an amount of about $83,000 for every farm in the country. The pair estimated there was an average of 400kg of fixed P in every hectare of farmland and only 1% of this was believed to be available to plants. This unavailable fixed P would be enough to replace the P removed by crops in many cropping areas, for 50 years or more.

However, in South Australia, about 2.9 million ha of arable soils are moderately to highly calcareous. These soils rapidly fix P in granular fertiliser. French researcher Dr Isabelle Bertrand came to the CSIRO's Land and Water Laboratories in 2000 to conduct detailed soil chemistry studies of the P sorption properties of the Eyre Peninsula soils.

Part of her work was to investigate the soil dynamics of P when applied as granular or fluid fertiliser. Measuring total phosphorus in the soil from samples provided from all over upper Eyre Peninsula, she discovered about 200-700 mg of phosphorus per kilogram of soil.

Working under the leadership of Dr Mike McLaughlin, she was able to estimate how much of this pool originated from fertiliser. This phosphorus is mostly fixed in the soil as insoluble calcium phosphate. This fixation process occurs rapidly once granular phosphate is added to the soil.

Over the past six years, many field studies have shown plant response to granular P is disappointingly slow. In many cases increases in yields from granular fertiliser are below the economic threshold.

Replacing the amount of P removed by plants, with fertiliser, is often promoted as a responsible agronomic practice. But on highly calcareous soils, most of the P added is totally lost to the whole system. It remains unavailable to plants.

The standard Colwell test used in SA to indicate how much P is available to plants does not give accurate values in the grey calcareous soils of Eyre Peninsula. The extractant used in the Colwell test removes more phosphorus than plants are able to remove, so it seriously overestimates the plant available P in the soil.

Continuing on with Dr Bertrand's work, CSIRO's Dr Enzo Lombi has shown that phosphorus in fluid fertiliser is less rapidly attacked by calcium in these soils and can travel considerably further through the soil for roots to find it. Much less fertiliser can be used to provide the same yield as granular – up to 15 times less in one experiment.

Furthermore, field experiments at Warramboo, by the Minnipa fluid fertiliser research group, have shown improved availability to plants of fluid P lasts longer, for up to three years. Given the increasing availability of more economic fluids it is sensible to use multi-nutrient (P, N and Zn) fluid fertilisers on these soils as they are much more efficient at providing nutrients to cereal plants.

MAC Plant Nutrition Experiments 2005

Bob Holloway, Dot Brace, Ian Richter

MAC: Year 3 of a long-term residual P experiment

Each year, 36 plots have been sown with Wyalkatchem wheat in 12 treatments and 3 reps. The treatments consist of 6 rates of P: 0, 4, 8, 16, 24 and 32 kg P/ha applied as fluid (Tech Grade MAP in 2005) or granular (10:21 Zn 2.5%). All plots receive 30 kg N/ha and 3.8 kg Zn/ha. Zinc deficiency has been recorded at this site, hence the high rate of Zn applied. The previous years' plots are also re-sown with wheat, N and Zn but no P. Measuring yield assesses the residual effects of the P.

Cungena trials on the property of Myles and Kylie Tomney

Canopy management

This experiment is designed to compare the growth rates of wheat with granular and fluid fertiliser on a highly calcareous soil, using NVDI (Normalised Difference Vegetation Index) technology to measure the relative growth rates of plants under the two-fertiliser regimes. On these soils, the dry weights of shoots at mid tillering are often 50% higher with fluid fertiliser compared with granular but by harvest, the difference has often been reduced to less than 20%. Cutting, drying and weighing shoots manually is very expensive and time consuming. Once the NDVI meter has been calibrated it will allow us to take rapid measurements of growth on a regular basis so that the growth characteristics of the two treatments can be compared over the growing season. The two treatments consist of 12 kg P, 15 kg N and 1.4 kg/ha Zn applied as Zn coated MAP granules with Urea or TGMAP, Urea and Zn sulphate solution.

Co-polymers

Wheat sown in plots with 7 kg P, 10 kg N and 0.7 kg Zn/ha applied as ammonium polyphosphate (APP) or suspension with a new copolymer called "Avail" ®. Avail was recently registered for use in the US as an additive to fluid P fertilisers. Copolymers like Avail are designed to maintain an ideal pH in the zone of application so that surrounding soil is less likely to cause pH–induced fixation reactions. Two forms of the copolymer are being tested- a neutral form and an acidic form.

Nutrient Omission

In 2004, this trial was sown at Cungena with clear liquid fertilisers and indicated a yield response to magnesium and possibly potassium. It is thought that responses to these nutrients (they have been applied without a growth or yield response) have previously been masked by P deficiency as granular fertiliser is unable to economically supply the entire needs of the plant on these calcareous soils. The use of more efficient fluid P increased the P supply to plants and magnesium and possibly potassium became limiting factors.

The 2005 phase involves mostly suspensions with combinations of P, N, K, S, Mg, Zn, Mn, Cu, Co, Mo, Ni and a clear liquid containing P, N, K, Mg, S, Zn, Mn and Cu. Various nutrients have been omitted for some solutions so that it is possible to assess which nutrients are deficient and contribute to improved yield of Yitpi wheat. Application rates (kg/ha) of the various nutrients applied are P 10; N 10; K 6-10; S 6-10; Mg 5; Mn 2.8, Zn 1.2; Cu 0.4; Co 0.1; Mo 0.1; Ni 0.02.

Products

This experiment assesses the performance of two experimental products believed to improve tillering in low fertility situations. Normally, plants grown in soil of low P or N status fail to tiller adequately. For optimum yields in most conditions, wheat plants need to have a main head and two tillers. On highly calcareous soils, many wheat plants produce less than the ideal number of tillers. The product MKP (Mono Potassium Phosphate) is also being tested as a fluid fertiliser. There is some evidence that MKP improves the resistance of plants to some fungal diseases.

2004 Suspension Trials

In 2004, suspensions made from various granular products, clay and sulphuric acid were compared with the granular products. Nitrogen and micronutrients were applied to all plots separately as granular

products. The highest yielding suspension was made from a mixture of 17:19 Zn 2.5 and 13:15 Mn 6 where the micronutrients were incorporated within the granules.

2005 Suspension Experiments

In 2005, further testing is being done to see what is the best way to apply micronutrients with suspensions to wheat. Granular 19:13 Zn1.2 Mn 3.3 was compared with DAP with the same micronutrients applied as separate granules or without micronutrients. Similarly suspensions were applied as 19:13 made into suspension (with micronutrients incorporated in the granule), or with DAP with micronutrients added to the suspension, or with DAP suspension with micronutrients applied separately as granules or in solution. P was applied at 10 kg/ha, N at 10, Mn at 1.6, Zn at 1 and Cu at 0.3 kg/ha.

Port Kenny

Trials are on the property of Laurie and Chris Guerin and Simon and Liz Guerin.

Experiments described at Cungena and also sown at Port Kenny include Copolymers, products and suspension ingredients.

Suspension rate response

This experiment compares the ability of a suspension (12:16) with a clear solution (tech grade MAP/ phosphoric acid) and granular 19:13 Zn 1.2, Mn 3.3 (plus Cu granules) to apply P at rates of 0, 4, 8, 12, 16 and 20 kg/ha. N was applied at 25 kg ha and micronutrients at 1.4 kg Zn, 2.5 kg Mn and 0.4 kg Cu/ha to every plot. The micronutrients were applied in solution with the TGMAP/phosphoric acid and added to the suspension.

Incitec Pivot

An experiment has been sown with 30 treatments and four replications, designed to compare the performance of a wide range of fluid and granular products.

Warramboo

Trials are on the property of Tim and Tracey van Loon.

In 2005, our interest is in the residual value of P applied in clear solutions or as suspension in rate response trials in 2004. In this case, the same treatments applied in 2004 will be re-applied to Yitpi wheat in 2005 to see if there are additive effects of the residues on the fertiliser applied this year. We are also resowing a depth of placement trial to assess the residual effects of placement in the previous year. In this case, only N and Zn will be applied.

CSIRO (Dr Enzo Lombi and PhD student Therese McBeath) will be conducting a small trial to look at what happens to APP or TGMAP/phosphoric acid when it is applied to a calcareous soil using DGT (Diffusive Gradient Thin Film Technology) in which plates of gel will be applied to the soil in the field and use the different rates of diffusion of P compounds through the gel to determine how these forms of P change after they have been added to the soil.

New products

EASY Liquids fertilisers

Leading fertiliser supplier, Incitec Pivot Limited, offers a comprehensive range of liquid fertilisers that are easy to use, flexible and efficient.

The EASY Liquids® range of fertilisers includes single and multi nutrient fertilisers fit for a range of cropping and pasture situations.

One of the most popular fertilisers in the range, EASY NTM, is ideal for topdressing nitrogen in winter cereals. It contains 42.5% nitrogen (w/v), in urea, ammonium and nitrate forms.

See the next edition of Fluid News for more detailed information on Incitec Pivot's EASY Liquids fertilisers, including the new nitrogen and phosphorus fertiliser, EASY NP.

Fluid Fertiliser project members James Nuttall and Graeme Price inspect wheat growing in small intact cores collected from a Calcarosol in the southern Mallee and a Vertosol from the Wimmera regions of in Victoria.

An Update from Victoria

By Dr Roger Armstrong

The continued run of poor seasons has significantly hampered progress on the Victorian component of the GRDC Fluid Fertiliser project. Since field trials commenced in 2002, there was a complete failure in 2002 and only one of three trial sites were harvested in 2004. However the challenges posed by the unusual run of dry seasonal conditions has also provided an opportunity to gain a better understanding under what circumstances (when and where) fluid forms of P perform better than granular forms.

Bob Holloway (SARDI) has noticed that fluid fertilisers appear to outperform granulars during 'drier' seasonal conditions. This observation is supported by results from Victorian field trials (2003) in which highly significant dry matter responses (compared to granular forms) were recorded at all three Victorian sites, but in which fluid fertilisers only produced grain yield responses at only one of these sites. The 2003 season was characterised by reasonably good rainfall early during the season but very dry conditions during grain fill.

To formally test this observation, a large glasshouse trial has been established at DPI Horsham. The trial is using intact cores (150 mm in diameter by 650 mm deep) collected from the same sites used in the Victorian field trial component: a Sodosol collected from Birchip in the southern Mallee and a Vertosol (cracking clay) from near Horsham. Using intact cores allows us to recreate the same chemical and physical structure of soil profiles in the glasshouse as experienced by crops in the field. This is important when different water treatments are being imposed, especially for soils where subsoil constraints such as sodicity and high boron may be present. The Horsham experiment is examining the effect of altering the timing of soil water availability (especially post anthesis drought) on the comparative response of wheat to phosphoric acid and granular triple superphosphate. The trials at Horsham will complement recent experimentation undertaken by Enzo Lombi and Caroline Johnston, CSIRO Adelaide, who have studied the effect of different soil water status (for example P applied to a dry sown crop vs that applied following a good (wet) break in the season) on the different reaction products and plant availability of granular and fluid forms of P.

We anticipate that the complementary experiments conducted in Adelaide and Horsham will assist us to make more accurate predictions of when grain growers will maximise their chances of getting a response to applying fluid sources of P in the field.

Successful Fluid Fertiliser Adoption in WA

In the 2005 Fluid Fertilizer Foundation Forum, held in Phoenix Arizona, there were a number of papers presented by Australian Researchers and Industry. One paper of particular interest was prepared and presented by Wayne Crofts – Market Development Manager Cropping and Liquids – CSBP: "Fluid Fertilizer Adoption in Western Australia".

In his paper, Wayne looks at the development of fluid fertiliser research and products in Western Australia and how the industry has embraced the use of fluids in broadacre agriculture.

In the 1990's, representatives of CSBP visited fertiliser producers in South Africa and in 1997 they started research into UAN. In 1999 they targeted fifteen innovative farmers who evaluated the product now sold as Flexi-N. Following this, 100 farmers were invited to purchase tanks and product. In 2001 Flexi-N was commercialised, and since that time there has been strong and rapidly increasing demand. Flexi-N now represents 8% of WA's total fertilizer volume with a prediction of reaching 15% in about three years.

Wayne sees the following benefits as driving the adoption of Flexi-N

- Stability in storage: Flexi-N is stable and non-perishable relative to Urea. This means that farmers can take delivery of Flexi-N well ahead of use without fear of deterioration of the product. In addition, left-over product can be stored and mixed safely with new supplies, increasing the flexibility for farmers in changing application rates to suit seasonal conditions.
- Easy to handle: A simple pump and piping are all that is needed to load and unload Flexi-N to and from transport, storage and application equipment.
- Lower storage costs: The cost of a storage tank for Flexi-N is just over two-thirds the cost of a storage shed for the equivalent amount of nitrogen as Urea. Additionally, positioning tanks at strategic locations around the farm is easier with Flexi-N tanks than with equivalent solid storage.
- Foliar uptake: Foliar uptake of N from Flexi-N provides farmers with a greater range of application timing opportunities.
- Evenness of application: Boomspray application of Flexi-N overcomes the uneven application experienced with broadcasting solid N fertilisers. This is particularly so where the crop has a high proportion of edges, as spreading solid fertiliser with the required overlap is not possible near the crop edge. Boomspray application of fluid fertiliser can also be better controlled with sections of the boom able to be switched on or off.
- Less volatilisation: Flexi-N has around half the potential for gaseous loss (volatilisation) of N. Hence, more N is left for uptake by the crop
- Utilises existing equipment: Flexi-N can be conveniently applied with a boomspray without the need for farmers to purchase specialised application equipment.
- Saves one paddock operation: Flexi-N can be applied with herbicides and pesticides in a single application, saving time and money. Applying herbicides and pesticides with Flexi-N also reduces the need for quality spray water.
- Less weather constraints: Flexi-N can be applied in wet weather.
- Faster application: Flexi-N applied through a boomspray, can increase the speed of application of N compared with spreading solid N fertiliser.
- Less toxic to seedlings: Flexi-N is safer to place near the seed than equivalent amounts of N as Urea.

Adoption has also been assisted by a strong focus on reducing the costs of handling, freight and storage of Flexi-N.

The success of CSBP in the fluid fertiliser market has not been left to chance. New growers are invited to technical meetings to learn about handling, agronomy and use of Flexi-N. These meetings are supported with field days and research trials that have been focused on efficacy, timing and placement of the range of Flexi-N products. They have contracted local consultants to work with farmers.

It is clear from the success of CSBP's experience that the key to successful adoption of fluid fertilisers relies heavily on: trust in the product, a range of products to meet farmers needs and support to help farmers adopt the new technology.

It is suggested that these are the strategies that need to be implemented to initiate the adoption of new fertilisers and accompanying technology in the farming areas to the east of WA.

A full copy of Wayne's paper can be seen in the Fluid Fertilizer Foundation: 2005 Fluid Forum Proceedings.

Nipro, providing bulk liquid fertilisers

Durell Hammond, CEO

The use of fluid fertilisers in Australia is growing every year. With this increase is an increasing need for product supply, application equipment and storage facilities.

Nipro is a privately owned company catering to this growing demand. Established in 1994, Nipro has been providing bulk liquid fertilisers, application systems and distribution infrastructure to the summer cropping areas of NSW and Southern Qld for 8 years. Nipro has 6 offices across NSW, QLD and Victoria and is investigating the South Australian market.

Quick refills allow liquids to be used in zero-till broadacre applications.

Durell Hammond, Managing Director, says their main function has largely been that of a distributor, with a strong focus on improving operational efficiency at the farm level. Fluid fertilisers have assisted farm operational efficiency due largely to handling and application benefits. Improved agronomic performance has not been a factor.

'They deliver the same nutrients as granular fertilisers but in a different physical form. They are logistically easier to use and operational ease has been the company's whole aim,' Mr Hammond said.

Nipro is unique in that they cover many bases when dealing with fluid fertilisers including:

- importing, manufacturing and blending liquid fertilisers
- fabricating equipment for use and storage of liquid fertilisers
- fabrication of application rigs for planting and rootzone banding
- providing storage and logistics services for bulk liquid fertilisers

Nipro's system of liquid application enables efficient use of liquid fertilisers.

Fluid fertilisers are delivered directly to farms where it is stored and then applied by the farmer; all stages are completed using transport, storage tanks and equipment purpose built by Nipro. They are also tackling engineering issues dealing with mixing, transportable storage and farm delivery systems.

Yield differences in NSW & QLD have been insignificant to date and the greatest use of product has been N, P and Zn at planting with row crop equipment. As a result, the growers approaching Nipro are doing so due to their inability to handle solids and/or other operational issues.

Nipro's focus on improving operational efficiency allows them to provide invaluable assistance and advice to farmers with a need to overcome solids handling issues and/or improve on operational efficiency.

Each year Nipro co-operates with local growers to conduct in-field trials, to assist in the research and development of liquid fertilisers. They focus on usable results which deliver positive nutrition advancements to growers. Nipro keeps abreast of international nutrition research through their link with the Fluid Fertilizer Foundation (based in the USA) and applies any promising advances in application and formulation to their range of product and crop situations.

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