Fluid News

fluid fertilisers

march 05

Farmer Profile > Ian Stanley

After five seasons using fluid fertilisers on his Western Australian central wheat belt property, Ian Stanley has found it worthwhile.

Ian, together with wife Robyn and sons Travis and Clint, has used CSBP's Liquid-N on his 18,000 ha farm since 1999 and is happy with the results.

"Our experience has been very good," he said.

The main benefit for Ian's large family farm is the streamlining of operations. When using urea, they were hiring a contractor to spread 800ha a day, meaning they had to have a dedicated loader – an extra expense.

In Brief

Western Australia,
Central wheat belt

- Grows wheat, slowly phasing pulse crops out of rotations
- Soils - A fair percentage of medium loams
- No till system used, with no blades

"Now we can put nitrogen through our boom which, pardon the pun, gives us flexibility," he said.

Other benefits included the ease of storage – the Stanleys can comfortably store enough product for a year. Living in WA, has meant there have been no supply issues for Ian. He has ten tanks strategically located across his property in pairs. If they empty one tank in a day, he is immediately in touch with the distributor and he has never been held up through supply issues.

Ian is not sure there has been any major yield increase. He believes there is a perception that there is a more efficient use of nitrogen with Flexi-N than urea.

"Our net benefit is one of efficiency and if that means that you get your crop in early at less cost then I guess that improves the bottom line," he said.

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From the editor

Jim Kelly

It has been an interesting and busy time since the last fluid news.

Australian Researcher, Dr Bob Holloway, was recognised for his significant effort and contribution to the knowledge of how fluid fertilisers work in calcareous soils, at the recent Fluid Fertiliser Forum.

Further to this, Jonathan Hancock, Dr Bob Holloway from MAC and I were invited to hold a fluid fertiliser workshop for farmers and advisors in North Dakota USA.

The workshop was well attended with 26 delegates fascinated to hear of the research being undertaken in Australia. Of particular interest was research into the use of fluid P and trace elements, and the effect of placement on crop yields.

We are always looking for farmers using fluid fertiliser experiences, let other growers learn from your experience.

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GRDC
Project UA CS0231

CSIRO

Victoria Department of Primary Industries

SARDI
South Australian Research and Development Institute

Government of South Australia

The University of Adelaide Australia

Fluid Fertilizer Foundation

Farmer Profile > Ian Stanley

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Ian uses about 50L/ha and depending on the conditions he may follow up with anything from none to another 50L per ha post emergent spraying.

It has not been a cheap exercise switching to fluids. Ian estimates he would have spent about $270,000 on new equipment.

When they first started using Flexi-N, they had a conventional boom they used for herbicides. After trying various methods for the first two years, including increased agitation, they switched to a self-propelled boom.

“We could do 800ha a day,” Ian said. “We married that up with a nurse tank and that revolutionised the process.”

Initially it was hard to secure the right equipment, especially to locate a self-propelled boom that wasn’t underhorsepowered. So, Ian developed his own equipment, taking a Terragator tractor fitted with a 7600 litre stainless steel tank. He went to Hardi Spray Systems for a 36m force boom. Now he has a 36m spray boom on a 320hp tractor purpose built for spraying and this has proved to be very successful.

The Stanley’s system of storage tanks across the farm and a system whereby the operator has no contact with Flexi-N has meant there has been no handling issues. But he does add the corrosiveness of Flexi-N is a downside.

“I think that is the nature of the beast,” he said.

Ian said maintaining strict hygiene for the boom is one way to combat this problem, saying as part of their system they wash the boom down after each use. At his ten tanks located across his property, there is a washdown hose and a 600L freshwater tank. He advised minimising Flexi-N’s contact with parts like small motors that will be susceptible to Flexi-N – and be prepared for a higher turnover of those parts.

But overall, Ian’s experience with fluids has been good.

“ I think with our farm being of a reasonably large size, in our circumstance, Flexi-N has been worthwhile.

“It’s an expensive form of nitrogen when compared with Urea, and given there is no real gain in yield then its probably not for everybody.

“But it fits with what we do. It makes the best use of our machinery.”

Ian said he can see a healthy future for fluids – certainly from his point of view.

“We will continue to keep an eye on the latest technology and advances,” he said.

He urged farmers to research which options will suit their individual needs, to ensure they have a system that will work for them.

“If I offered any advice it would be to research very thoroughly.”

Australian researchers recognised nationally

Each year, the Fluid Fertilizer Forum is held on the outskirts of Scottsdale; the winter climate is mild and the scenery reminiscent of central Australia, apart from the giant cacti and manicured golf courses.

Delegates came from across the USA, Mexico, Canada, and the growing Australian contingent included visitors from Western Australia, South Australia and Queensland. Mary Hughes, Secretary of the Forum, registered and, with husband Jerry, welcomed the 115 (approx) delegates.

Monday morning, delegates arrived for breakfast and Dr Larry Murphy's, (President of the Fluid Fertilizer Foundation), welcome. Larry, former Professor of Agronomy at Kansas State University and later of the Potash and Phosphate Institute, is a legend in the fluid fertilizer industry in the US. He has the unique ability to put people at ease and never forgets a name. He welcomed everyone and summarised the thrust of the forum, "Exploring the Value of Fluid Flexibility".

The first session was "The Challenges of Building Markets" and key speaker Wayne Crofts', CSBP Wesfarmers, topic was "Building a Fluid Market in a Dry Market Environment - Western Australia". Wayne spoke about the phenomenal success of CSBP's entry into the fluid market in Western Australia, initially with UAN. The company is now also marketing clear phosphorus-based liquids and suspensions.

During lunch, the Fluid Fertilizer Foundation's annual meeting was conducted and awards presented. Larry Murphy announced SARDI's Bob Holloway as the Foundation's researcher of the year for 2004. The award was "in recognition of outstanding research contributions and communications in fluid fertiliser and soil fertility research, during tenure of grants from the Fluid Fertilizer Foundation".

During the after lunch session, Bob gave presentations on "Field Evidence for Efficiency and Value of Fluid Fertilisers" and also "Hydrolysis and Sorption of Pyrophosphate in Australian Soils" on behalf of CSIRO PhD student Thérèse McBeath. The session concluded at 5pm and at 6pm the social hour started. Some delegates dinned at "La Cholla" restaurant, where patrons eat outside among giant cacti under gas heaters. The second day's emphasis was again on market development. One of the most interesting presentations of the Forum was by Phil Needham of Opti-Crop, a consultancy firm based in Kentucky, with customers throughout the world, including Australia.

Farmers adoption of Opticrop's attention to detail management style was responsible for a major increase in the wheat production of Kentucky. Phil's presentation was entitled "The Value of Fluid Flexibility in Intensive Winter Wheat Management".

The Forum provided an excellent venue for interaction between researchers and industry representatives, both in the USA and Australia. It provided Australian researchers with the opportunity to discuss common problems with American and Canadian researchers and learn about fluid fertiliser production technologies. Fluid fertilisers, have been marketed there for 40 years. It also gave them the opportunity to share research approaches for dealing with extremely difficult soil types.

Larry Murphy (r) announced SARDI's Bob Holloway (l) as the Foundation's researcher of the year for 2004

The unconditional support and funding provided by the Fluid Fertilizer Foundation made an enormous contribution to the development of a fledgling fluid fertiliser industry in Australia, based on the solid foundation of extensive field and laboratory research.

Flexi-N is equally effective as urea for wheat and canola in WA

Dr Stephen Loss, CSBP Limited, Western Australia.

In Australia most nitrogen (N) fertiliser is applied to broad-acre crops as granular urea topdressed immediately before sowing and/or within eight weeks after sowing. However, Flexi-N (urea ammonium nitrate solution; 32% N w/w) is rapidly replacing urea as the preferred N fertiliser in WA. A series of field trials conducted by CSBP has shown that Flexi-N applied through a boomsprayer is as effective as urea topdressed for most wheat and canola crops in WA.

Flexi-N use is expected to increase because of its advantages in terms of:

- long shelf life,
- ease of storage, handling, and application,
- speed, uniformity and accuracy of application,
- reduced labour and logistical considerations when applied with pesticides; and
- ease of split applications.

How the trials were done:

Between 1997 and 2003, CSBP conducted a series of 40 wheat and canola field trials to compare the benefits of Flexi-N (UAN) applied through a boomsprayer with urea topdressed. In total there were 132 comparisons of Flexi-N and urea at the same rate of N and timing of application.

The Flexi-N and urea treatments were generally applied immediately before sowing and in some cases post-emergent applications at four to 12 weeks after sowing were also included. In each trial, urea and Flexi-N were compared at between one and three N rates, along with a nil N treatment. Application rates of N varied depending on the crop requirements at each trial site, and ranged from 15 to 134kg N/ha. Plot sizes were 2.1m wide (9 or 11 rows) by 20m or 40m long and all trials included three replicates of each treatment.

Grain yields

Across the 132 comparisons where Flexi-N and urea were applied at the same time and rate of N, grain yields ranged from 0.62 to 5.04 t/ha and 0.45 to 1.53 t/ha, for wheat and canola respectively, when fertilised with either N source. Importantly, yields typically increased with N application indicating that the trial sites were responsive to N and hence, valid comparisons of Flexi-N and urea could be made.

Yield from crops fertilised with Flexi-N and urea were highly correlated for wheat (r2 = 0.98) and canola (r2 = 0.91) over the range of N applications (Figs. 1a and 1b). Of the 104 Flexi-N and urea comparisons with wheat yields, 20 differed significantly, and of these, 11 were positive (Flexi-N yielded 4 to 17 per cent greater than urea) and nine were negative (Flexi-N yielded 4 to 16 per cent less than urea). For the 28 canola comparisons, seed yield differed significantly on five occasions, with three being positive responses (Flexi-N yielded 6 to 23 per cent greater than urea) and two being negative (Flexi-N yielded 15 to 20 per cent less than urea).

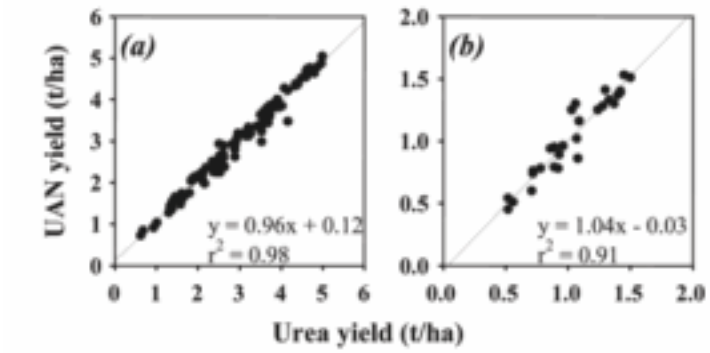

Figure 1. Grain yield of wheat (a) and canola (b) when using Flexi-N (UAN) compared with granular urea applied at the same N rate.

Protein and oil content

The percentage of protein in the wheat grain sampled over the seven-year trial period ranged from 8.3 to 15.2 per cent. Protein responses from 104 wheat comparisons between Flexi-N with urea were also strongly correlated (r2 = 0.90). There were only two comparisons between Flexi-N and urea where the protein content differed significantly

In the 28 treatments over two years where canola was evaluated, the percentage of oil in the seed produced varied from 38.7 to 45.6 per cent. There were no statistical differences observed between the seed oil content (per cent) of the Flexi-N and urea comparisons, and oil content with Flexi-N was highly correlated with those for urea (r2 = 0.83).

Implications

The main conclusion from this study was that Flexi-N applied through a boomspray is equally effective as urea topdressed for the majority of wheat and canola crops grown in WA. Since the commercialisation of Flexi-N in WA in 2001 its early adoption has been rapid because of advantages in terms storage, handling, and application, rather than an agronomic benefit.

One of the practical advantages of Flexi-N over urea is the uniformity of application with boomsprayer technology compared with topdressing urea with spreading machinery. Most fertiliser spreaders in Australia rely on overlapping swaths to achieve a uniform application across the paddock, which is not possible along fence lines, around dams, trees or other obstacles. In addition, the spread of fertiliser is often affected by changes in weather conditions, slope and operator error, resulting in waves of good and poor crop growth within the paddock. By comparison, boomsprayers are capable of applying liquids accurately up to the edge of the paddock and around obstacles under most weather conditions. As the urea was spread uniformly over the plots in these trials, differences in spreading were not measured. However, farmer experience suggests poor N application could be worth up to $25/ha in N responsive situations.

Boomspray applications of Flexi-N are also considerably faster than topdressing urea. Most large boomsprays are capable of covering a paddock in less than half (even maybe a quarter) of the time that it takes a fertiliser spreader to do the same job. Time savings are even greater when pesticides are incorporated into the Flexi-N application. At the critical sowing period, this can mean less manpower is required and more time spent sowing crops rather than spreading N or spraying pre-sowing pesticides.

Leaf tip necrosis (often referred to as leaf scorch or burn) occasionally damages cereals and canola crops when Flexi-N is applied post-emergent, especially when mixed with emulsifiable concentrate formulations of pesticides or those containing adjuvants. Experience from North America and WA demonstrates that crops quickly grow away from leaf scorch and no impact on grain yield has been measured provided the damage occurs before the stem elongation stage of cereal development. Another cause for concern among growers is the corrosive nature of Flexi-N. Suitably resistant materials of construction and good hygiene can minimise corrosion on boomsprayers, tractors and other equipment.

Horwood Bagshaw Liquid airseeder

The steadily-growing interest in fluid fertilisers in Australia is leading to the development of specialised agricultural machinery.

South Australian-based agricultural machinery manufacturer Horwood Bagshaw is one such company that leapt to the challenge. Based on Australian farmers' needs, Horwood Bagshaw has produced a range of robust yet simple Airseeders, offering farmers all the advantages and technology.

The liquid airseeder developed for 2004/05 is a 13,000L capacity tow behind quad-wheeled model with:

- 4500L stainless liquid tank, and
- 8750L granular bin (4250L seed/4500L granular fertiliser or 3550 seed/5200L granular fertiliser – changed by reversing an internal divider)

The liquid tank is fitted with two agitators to maintain mixes in solution. A 300L flush tank is incorporated in the liquid tank for:

- handwashing, and
- easy flushing of lines, pump, valves and main tank after operation

Either a Farmscan or KEE variable rate controller can be used to control both:

- liquid flow – using the tractor's hydraulics to drive a 75L/min diaphragm pump
- granular metering – using electric motors to drive the metering shafts

An integrated liquid control circuit is housed in a Liquid Control Box mounted on the outside of the chassis for easy access.

Other features include:

- 50mm camlock fittings for tank filling and draining
- Over-fill pipes fitted to each tank
- Two filters fitted for suction and pressure filtration
- Multiple Dosatron units can be connected to meter either trace elements or spray chemicals into the liquid line

Liquid models can be developed for other Horwood Bagshaw triple bin Airseeders.

For further information please contact Horwood Bagshaw:
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Horwood Bagshaw history

Horwood Bagshaw is a South Australian based company founded on ingenuity and the principles of excellence in design and manufacture.

John Stokes Bagshaw started the company in 1838, making agricultural and other implements for early settlers. When Bagshaw made the first winnowing machine, he used old packing case timber, wooden pulleys driven by rawhide belts and copper wire from a ship. By 1880, up to twelve Winnowers emerged from the Bagshaw Works each day. "If worth doing, do it well" became the company's trademark for quality.

By the early 1900s, J.H. Horwood & Co. were not only involved in engineering work primarily for mining, but also had a growing interest in the sale of Illman agricultural implements. Eventually, having taken over the Illman operations, J.H. Horwood joined J.S. Bagshaw, forming Horwood Bagshaw in 1924.

Business boomed. By 1958, through a policy of expansion and acquisition, Horwood Bagshaw had increased its range of implements to probably the largest in Australia. At the same time, Horwood Bagshaw's engineering division diversified and grew to include activities such as the manufacture of cranes. This innovation continued through the 1980s, when radically different designs like the 1070 P.T.O. and 2140 SP Headers came into being.

Today, nothing much has changed. Under the direction of Managing Director Peter Sweeney, the company continues to look for new ways of improving agriculture and is still commited to excellence in design and manufacture.

Canadian Experiences with using fluid sources pf N and P to maximise grain production

By Dr Cindy Grant
AAFC Brandon Research
Centre, Canada.

Fluid fertiliser efficiency and flexibility has made them a popular choice for producers in Western Canada.

Speaking at the inaugural Australian Fluid Fertiliser workshop, Dr Cindy Grant said the safety, efficiency, flexibility in formulation of liquid blends and ease of fabricating or modifying equipment for application has provided important advantages.

Grain and oilseed production in western Canada is dominated by spring-seeded wheat, Canola durum wheat and barley, with smaller areas of winter wheat. Other crops include field peas, lentils, sunflowers, flax, chickpeas, field beans and corn. Seeding generally occurs in May with harvest occurring in August and September.

In western Canada, where fluids are popular, the growing season is short, ranging between 90-110 frost-free days over much of the region. Therefore, it is important to get the crop seeded rapidly in the spring to avoid frost damage in the fall, but not so early that the crop suffers from a late spring frost.

Drought is also a major problem across much of the prairies, so reduced tillage systems are popular as a method of conserving moisture as well as reducing input costs. Fluid fertiliser management has been widely adopted to allow efficient fertiliser management.

Fluid sources of N and S are most popular, with urea ammonium nitrate (UAN) providing good use efficiency and flexibility of application.

“Nitrogen is the most commonly limiting nutrient in agricultural systems in western Canada,” Dr Grant said.

“Therefore, effective nitrogen management is a critical component in crop production, not only to improve financial returns, but also to maintain soil quality and reduce the likelihood of damage to the environment.”

Effective nutrient management must ensure an adequate supply of nitrogen is present, in a position where the crop can access it when it is needed. Much of the research in Canada has, therefore, focused on UAN as a nitrogen source.

Studies have shown UAN is particularly suited to one-pass seeding and fertilising systems and to post-emergent surface application.

Phosphorus is relatively immobile in Canadian soils and so remains near the site of placement. Since P will not move through the soil, it must be placed in a position where the plant roots can contact it early in the season. Research has indicated fertiliser P is most efficiently used when seed placed. Ammonium polyphosphate (APP) is an effective phosphate source, however the dramatic improvements over monoammonium phosphate (MAP), as indicated in South Australian studies, have not been observed in Canadian soils. There have not been the large increases in yield or early-season P uptake when compared with MAP. Coupling this with the almost 40% higher cost of APP when compared with MAP, APP is not used as widely in western Canada.

Modified Coulter for reduced tillage.

Soil disturbance at 5 - 6.5 kph.

Precision, deep and high pressure placement of fluids

By B Frischke, B Holloway,
S Doudle and D Brace

High pressure injection of fluid fertiliser is being evaluated as an alternative method of applying fertiliser beneath the soil surface in an attempt to reduce volatilisation losses.

This will eliminate reliance on ground engaging tools to apply nitrogen to growing crops without relying on rain to move nitrogen into the root zone.

Investigations are also being conducted into a system that uses high-pressure injection together with ground engaging tools to place multi-nutrient fertilisers up to 40cm deep in sand over clay soils.

Increased yields and improved fertiliser efficiency of fluid phosphorus fertilisers compared to granular forms on sandy grey calcarasols on Eyre Peninsula have attracted interest from agricultural industries and research groups across Australia. Soil applied fluid fertilisers are a recent innovation in dryland agriculture.

Besides the calcarasols, a significant amount of Eyre Peninsula's arable land consists of siliceous sand over clay or duplex soils. The depth of clay varies from a few centimetres to more than a metre. Root growth in the subsoil is often constrained by salt and boron. The sandy topsoils are usually infertile, have little organic matter and are usually highly water repellent. Wheat grown in these soils has poor early vigour and very low water use efficiency.

Annual rainfall in cropping districts on Eyre Peninsula varies between 250-400mm. The rainfall pattern is winter dominant and becomes more variable in spring. Predicted rainfall events often yield less than 2-5mm.

Under these conditions broadcasting urea is subject to heavy N-loss due to volatisation.

Two trials with the same treatments were established in 2004 on barley crops – at Mt Cooper and Tooligie Hill on the Eyre Peninsula.

All treatments were sown with a basal dressing of 14kg P/ha and 12.6 kg N/ha as DAP, Micronutrients zinc, copper and manganese in sulphate form were applied as a foliar spray at late tillering.

In both trials, high pressure injection produced the highest yields, indicating there is potential to place fertiliser where needed.

However, several years' data over different seasonal conditions is required to assess the comparative performance of fertiliser applied with high pressure.

In the case of deep placed nutrients, power input data of each method is also required before economic assessments can be made, because of the different draft required for tines at different depth, coulters and the power required to pump fluid under pressure.

Barley Evaluation Trials - 2003

	Mt Cooper t/ha		Tooligie Hill t/ha	
RZI after rain @ late tillering	4.01	a	2.86	a
Deep band urea@ sowing	3.94	ab	2.50	c
RZI before rain @ 2nd node	3.81	bc	2.83	ab
BC Urea after rain @ late tillering	3.80	bc	2.51	c
BC urea before rain @ 2nd node	3.74	c	2.47	c
Control	3.56	e	2.10	d
F pr.	<0.001		<0.001	

Note: Yields in the same site (column) with the same letter were not significantly different.

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