Fluid News

Farmer Profile > Tim Van Loon

Five years ago, when Tim Van Loon started using fluid fertilisers, there wasn't a lot of good quality equipment available. So keen was Tim to use fluid fertilisers, he made his own. There is now a large variety of equipment suitable for conversion to fluid fertiliser applications.

Tim's seeding plant includes a 12.5m Connorshea scari bar, coupled to a 6 tonne Fusion box and a home-made 6800L liquid fertiliser cart. Liquid distribution manifolds are mounted to the seeding bar, which is fitted with orifice plates and non-drip nozzles. Stainless steel tubing directs a continuous liquid stream directly into the furrow behind the point, 30mm below the seed.

In Brief

Property 5000ha Warramboo
Central Eyre Peninsula
- Grows wheat, barley and Canola oats
- Annual rainfall 315mm
- Mixture of minimum and no-till farming
- Soil Grey calcareous sandy loams

He also uses high density storage tanks, shuttles, mobile transfer carts and numerous poly lined pumps to handle, mix and transport the liquids.

After five years using fluid fertilisers Tim has experienced many benefits.

From the editor

Jim Kelly

Importantly the research community endorsed the use of fluid forms of P fertiliser at a meeting at the Minnipa Agriculture Centre. Researchers met to provide clear and concise direction for farmers who will benefit from the use of fluid fertilisers on highly calcareous grey soils, on the western and upper Eyre Peninsula, article page 2.

The Fluid Fertiliser Workshop was a great success, with 230 delegates attending to learn about the latest information and research (from Australia and internationally) into the use of fluid fertilisers. Over the next 4 editions of the Fluid News we will be featuring papers presented at the workshop.

Fluid Fertiliser Workshop Proceedings are available for $50.00 plus postage and handling. To secure your copy contact: Kristi Wilson
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"First and foremost are increased crop yields due to the unique qualities and properties of fluid fertilisers.

"Improved phosphorous nutrition is the key as it results in increased early vigor, which in turn helps reduce weed competition," he said.

Over the years Tim has tried all the products and application rates have always been tempered by cost, and product selection governed by quality, cost and availability.

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

Important Fluid Development

P based fluids pass the test on highly calcareous soils

Fertilisers supplying P, N and Zn in fluid form, at seeding to cereals, are the most efficient source of these nutrients on highly calcareous soils on upper and western Eyre Peninsula. They are also the most effective antidote to the problem of rapid P fixation on these soils. The agronomic differences between the various forms of fluid fertilisers available are relatively small.

These conclusions were reached at a round table meeting of soil scientists, soil chemists, plant nutritionists and agronomists at Minnipa Agricultural Centre on Friday January 7, 2005.

Data from six years' field research on the highly calcareous soils by SARDI's Minnipa Agricultural Centre, supported by CSIRO Land and Water soil chemistry research, showed that in 47 of 52 field experiments comparing granular and fluid fertiliser providing the same nutrients, fluids produced 10 to 20% higher yields.

The meeting endorsed the use of mixed nutrient fluids on highly calcareous soils, provided the extra cost of fluid was more than offset by extra profit from increased grain yield. Lower rates of P and Zn could also be used profitably, depending on the substitution rate of fluid P for granular P. In trials conducted on the grey calcareous soils, the same yields could generally be produced by half or less the rate of fluid compared with granular P, depending on target yield and relative costs. When P application rates are reduced, sufficient fluid P should be supplied to at least replace grain removal.

In most cases, P, Zn and N were combined in a single solution.

On a red brown calcareous soil at Emerald Rise, north of Poochera, containing 5 - 15% calcium carbonate, fluid fertilisers also produced, in the majority, yield increases in comparison with granular, especially when the P, N and Zn were combined in a single solution.

For other soils, more research is needed to establish the relative performance of the two forms of fertiliser. Preliminary results suggest that fluids are also likely to improve P uptake efficiency on acid P-fixing soils. Suspension fertilisers are now being investigated as a possible cheaper source of fluid P and other nutrients for South Australian farmers.

It was also noted that the technology and equipment for broadacre agriculture is available in the market place and should not be a barrier to the application of fluid fertilisers at seeding.

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"Generally I've maintained an application rate of 6 units of P and between 5 and 10 units of N with 1 kg of Mn, 1 kg of Zn and a wiff of copper," he said.

Tim uses a water dilution rate that administers a total volume/hectare of 115litres/ha. He finds that this and his use of appropriate handling materials, such as poly, pvc and stainless steel, has allowed him to handle fluid fertilisers without any problems.

"The biggest problem with liquids is the cost. We desperately need a manufacturing facility in SA, then the cost would decrease and supply anomalies would be solved," he said.

Tim estimates that conversion to liquids could cost between $40,000 and $70,000, depending on size and quality of machines to be converted. He also recommends that farmers considering change do their research carefully. They can rest assured that there is enough experience and know-how in the industry to help them get it right the first time.

"88% of trial comparisons, conducted by the Minnipa Agricultural Research Centre, have returned positive yield increases on soils like my own."

"Applying liquid phosphorous in a continuous band to the root zone is the shinning light for improved crop yields in the high pH calcareous regions of Southern Australia," he said.

How fluid fertilisers look at the molecular scale

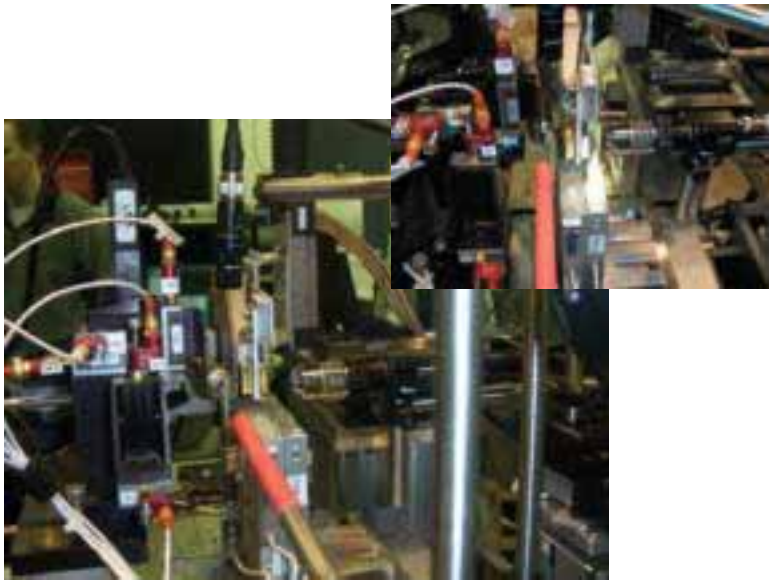
Dr Roger Armstrong
DPI Victoria, Horsham.

Knowledge of the beneficial impacts of fluid fertiliser forms of phosphorus at the paddock increases each season. However, understanding of the mechanisms underpinning these results, especially on highly alkaline soils, remains sketchy.

Recently, two members of the GRDC Fluid fertiliser project team, Drs Enzo Lombi (CSIRO) and Roger Armstrong (DPI), along with Dr Rebecca Hamon (CSIRO) and Dr Kirk Scheckel (US EPA), undertook detailed experimentation, over 5 days, at the Advanced Photon Source (APS), Argonne National Laboratory (near Chicago) in the USA. Using a synchrotron, the team obtained images of the reaction products produced when either fluid or granular forms of phosphorus are applied to the alkaline, calcareous soils that dominate cropping on the Eyre Peninsula and parts of the Victorian Mallee.

A synchrotron is a cross between a huge electron microscope and an x-ray machine, but 1000 times more powerful. The synchrotron can focus large quantities of high energy photons in a very small area, in a very short time and is able to detect chemical composition at the nanometre scale i.e. one billionth of a metre. Although working at nanometer scale, the synchrotron itself is huge and the building housing it has a circumference greater than 1.5 km (adding new meaning to the term 'big science').

Dr Enzo Lombi



End-station at the beam line where the experiment was conducted.

They examined a thin section of soil that was pre-treated with fluid Tech-grade MAP and was much less than 1 mm thick and only several mm in diameter. Normally, synchrotrons are used in areas such as drug design or material science (eg. identifying impurities in computer microchips) or even the geological composition of rocks from the Moon (sponsored by NASA).

This study appears to be the first time it has been used in soil science/agriculture. The resulting maps were compared to the signals produced by a range of 'standard' (known) forms of phosphorus, such as monocalcium phosphate or crytalline forms such as fluroapatite. The high resolution produced by the synchrotron enabled the identification of when phosphorus was adsorbed (or coated) on individual soil particles. Currently there are no synchrotrons in Australia, although one is currently under construction in Melbourne and is expected to be operational in 2007.

Fluid Fertiliser Workshop September 04

Dr. Larry Murphy
Fluid Fertilizer Foundation
Manhattan, KS, USA

The inaugural Australian Fluid Fertiliser Workshop, held in Adelaide in September, has proved so successful that attendees have called for a similar event to be held in the future.

"We were quite nervous," he said. "The workshop was the first in Australia and the industry is quite small in the eastern states, but we were very pleased with how it went.

"We had a good number of growers, industry and scientists who attended – good mix of people. With about 250 people at the workshop, which exceeded all our expectations, it became more of a conference than a workshop."

"The feedback we have received has been excellent – attendees all indicated that they would like to hold another workshop in the future."

Mike McLaughlin, Management committee member

Fluid Fertilizer Foundation president Larry Murphy said the excellent attendance at the workshop showed the widespread interest in fluids.

"It provided a tremendous opportunity for individuals to obtain more information on the fit of Fluid Fertilizer technology in Australian agriculture," he said.

Mr Murphy praised the workshop's organisers and sponsors for "their insight and effort."

"The organisers… brought together a strong program with a sharp focus on fluids and fluid technology," he said.

"The Fluid Fertilizer Foundation and its board were pleased to have been involved in a small way with this excellent meeting."

Fluid Fertiliser Fit with Australian Agriculture

Mr Murphy said the introduction of fluid fertilisers into Australian agriculture did not mean that fertiliser technology used in the past was wrong. He said fluids provided an opportunity for farmers to improve the efficiency and profitability of their operations.

"Flexibility underscores the opportunities for fluid fertilisers in Australian agriculture," he said.

Mr Murphy said some of the specific factors supporting the current interest in fluids included:

- ease of handling;
- adaptability in application techniques;
- precision placement;
- uniformity of application, and
- agronomic performance

Applications of nutrients for both broadacre and high value crops such as vines, citrus and vegetables provide strong impetus for the examination and use of fluids and fluid technology. Broadacre use of fluids focuses on precise placement of nutrients and the opportunity to use existing equipment for application via direct seeding and boom spray techniques.

"Australian farmers must have access to new technology such as fluid fertilisers and will make their own decisions on its adaptability to their operations," Mr Murphy said.

Mr Murphy predicted costs would "moderate" as demand for fluids increases.

"Rapid increases in fluid tonnage in Western Australia provides strong evidence of how growers view this technology fitting into their operations," he said.

"The question now is - how will a fluid source of phosphorus (P) be made available at a price competitive with solids? Researchers and fertiliser companies are now working on a solution. Companies have stepped up and expanded their emphasis on fluids and fluid technology with good reason. The time is now right."

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Larry Murphy

South Australian Research

Dr Bob Holloway and colleagues' research efforts at the Minnipa Agricultural Research Centre initiated much of the interest in fluids across Australia. Their fieldwork has shown distinct advantages for fluids based on improved distribution, proper P placement relative to the seed and better P availability.

Mr Murphy observed the research on a tour of the Eyre Peninsula after the workshop and said current work indicates P suspensions are viable alternatives to true liquid P sources. He said while fluids have not always been comparable to rates of solids, the Minnipa research has shown that with specific and precise placement, P use efficiency can be improved.

"They are also now looking into best methods for applications of fluid N," he said.

"The results - higher yields and higher profitability for growers.

"The Fluid Fertilizer Foundation has been pleased to cooperate in a small way by providing some of the support for this work.

"Of course, the real accolades should be directed to GRDC and SARDI for their decision to encourage and support these investigations… support which is continuing. We should look forward to continued progress from the Minnipa fluid fertiliser researchers and their determination of how and where fluids can be most effective."

"(The workshop) was pretty good, I enjoyed it and thought it was beneficial."

Mr Green said he gleaned "lots of new information, but was hoping there would be a little more information on the biology of soils."

"The workshop catered for everybody – from researchers to farmers"

"I think people enjoyed the opportunity to network and share ideas with each other."

Mr Green believed holding a future workshop could only be good for the promotion of fluids in Australia. "The more you promote them, the more people will be interested."

Robert Green, Forbes NSW, Farmer.

I found the conference very informative. I don't use in-ground fluid fertiliser, I use foliar. There was a lot of information and it seems that in-ground and foliar liquid will be the way of the future. Fluid fertiliser is readily available and can be put on as the season dictates, which makes it more cost effective.

Garry Byerlee, Orroroo SA, Farmer

CSIRO Research

Mr Murphy praised the work of CSIRO researchers under the direction of Drs Mike McLaughlin and Enzo Lombi.

"This work is the finest P soil chemistry work underway in the world today," he said

The CSIRO research group, on the Waite Institute campus, under the direction of Dr Mike McLaughlin and Enzo Lombi has made great strides in helping us understand how fluid and solid sources of P react in highly P-fixing soils. Their research has demonstrated tremendous problems with availability of granular P sources in highly calcareous soils. Now they are expanding that work to the more acidic soils, also capable of fixing huge amounts of P.

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Their work is also indicating basic differences in the soil reactions and availability of P from polyphosphates versus conventional solid orthophosphates such as monoammonium phosphates (MAP) and diammonium phosphate (DAP).

The interaction of basic CSIRO research with field researchers in South Australia, Victoria and other states, and cooperation with industry and growers provides a strong multi-faceted partnership for the accumulation of knowledge and development of practices which will benefit Australian agriculture.

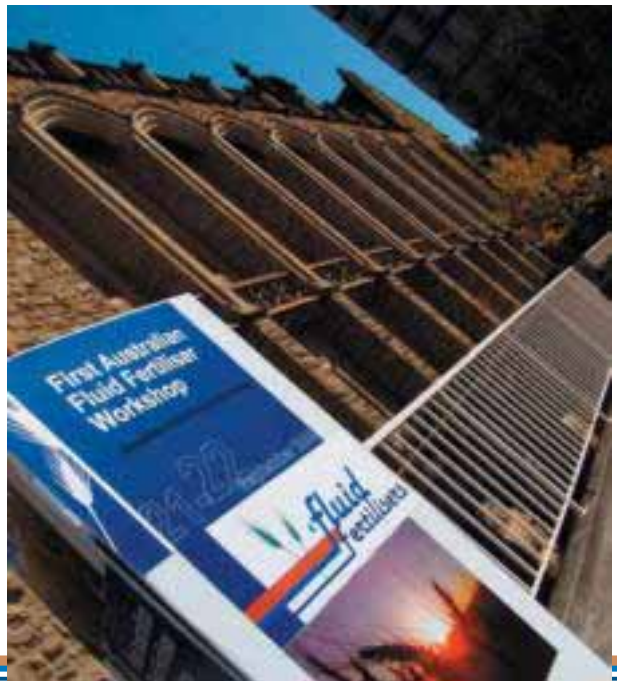
Continuing Education Essential

Mr Murphy said continuing, unbiased education is essential for the transfer of knowledge to agents, consultants, growers and other interested individuals.

“That is why focused efforts such as Fluid News, dissemination of information to the farm press and continued educational programs like the Fluid Fertiliser Workshop are essential to further progress how fluid fertilisers fit in Australian agriculture,” he said.

“What has always been the easiest and most convenient, based on comfort and familiarity, is not always the best fit in profitable farming systems.

“Fluid fertilisers are simply a part of modern farming systems that must be studied for their best, most profitable use.”



The fluid fertiliser workshop seemed more applicable to lower rainfall cropping areas, but I gathered ideas on applications of micro nutrients.

At the workshop, I talked to industry and research personnel on how to improve application and timing techniques, thus I enjoyed most of the sessions.

Presenters, Bob Holloway and Alison Frischke were very practical and easy to understand. John Mortvedt was scientific based, but enabled a greater understanding on how different soils react to certain fertilisers and micronutrients.

The only disappointing factor was there seems to be little research in higher rainfall areas and virtually no research on pastures with fluid fertilisers.

I enjoyed contact with industry representatives and research personnel. The workshop was very well organised and overall provided much food for thought.

Peter Tischler, Edenhope VIC, Farmer

Chris Pinkney loved the format of the Fluid Fertiliser Workshop.

“It worked well with the technical information in the morning and industry representatives in the afternoon. The content and quality of speakers was excellent,” he said.

Although Chris would like to have heard a “bit more” from the international speakers, he said it was well worth attending. He enjoyed the opportunity to share information with consultants, agronomists and farmers from across the country.

Chris believes WA farmers are very fortunate because liquid and granular nitrogen are comparable in price. He believes fluid fertiliser use in the eastern states would rival that of WA if the premium was decreased.

Chris would like to see further workshops held biannually, around Australia.

Chris Pinkney,Geraldton WA, Agrarian Management

Field evidence for efficiency of Fluid Fertilisers

Dr Bob Holloway
SARDI, Minnipa Agriculture Centre

From Fluid Fertiliser Proceedings September 04.

Prior to 1998, there was no reason to believe that soil applied fluid and granular fertilisers would perform differently, in terms of efficiency, on any soils used for cereal production in South Australia.

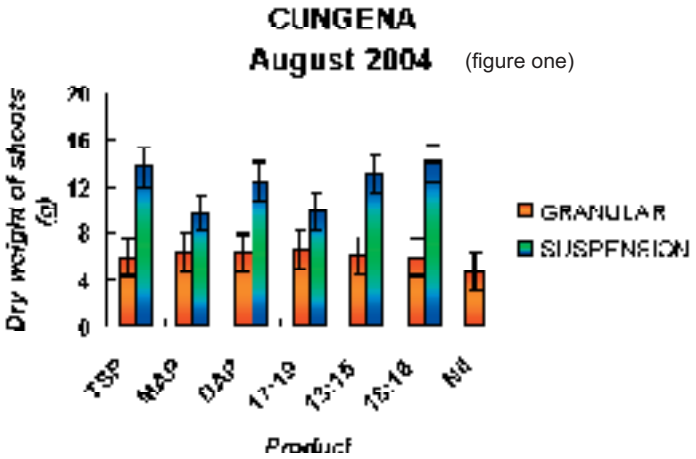
Dr Bob Holloway, delivering a paper at the first Australian Fluid Fertiliser Workshop in September, said the weight of evidence from the USA and Canada seemed to be unequivocal.

“Hence, the initial investigation of fluid fertilisers on Eyre Peninsula produced results that were unexpected,” Dr Holloway said.

Between 1993 and 1996, an investigation into the role of zinc in subsoil infertility on Upper Eyre Peninsula was conducted using fluid mixtures of P, Zn and N.

“The fluids proved to be exceptionally efficient in terms of improving zinc uptake in cereals, but only when all three nutrients were supplied in a single solution,” Dr Holloway said.

It was also apparent that NP solutions had an impact on increasing P uptake in plants compared with granular applications on a red-brown calcareous soil at Minnipa. After 1996, similar experiments at Cungena had spectacular results in terms of early growth and grain yield of wheat (figure one).



(figure one)

At the same time, other researchers identified the serious P deficiency problem of calcareous sandy soils on upper Eyre Peninsula. After applying P as granular triple super phosphate (TSP) at up to ten times the normal commercial rate with little response, they concluded that “current rates of P fertiliser application are insufficient to overcome P deficiency…and increasing the rates….will not improve the situation.”

Using deep ripping machinery to apply fluids to highly calcareous soils (figure two) where sheet rock is common is commercially unviable. With this in mind, a small plot combine was constructed in 1997, with the capacity to sow cereals with granular and fluid fertilisers with the seed or just below. During that year, pot experiments with wheat grown in grey Calcarosols (typical of Upper and Western Eyre Peninsula) clearly showed the possibility of a greater response to P supplied as phosphoric acid rather than TSP, when basal macro and micronutrients were also added.

(figure two)

The early field experiments with fluid fertilisers were based on simple comparisons between clear liquid and granular formulations.

“More emphasis was placed on assessing differences in performance rather than economic or practical considerations,” Dr Holloway said.

Eight years later, more than 90 statistically based field comparisons between fluid and granular alternatives, together with detailed lab experiments, have provided solid evidence for the greater efficiency of fluid fertilisers than the equivalent granular formulations – on moderate to highly calcareous soils on Eyre Peninsula (potentially up to 27% of SA arable cropping soils). There is also evidence that fluid fertilisers can improve nutrient efficiency for cereals and alternative crops on other alkaline and acid soils, particular those that rapidly immobilise P.

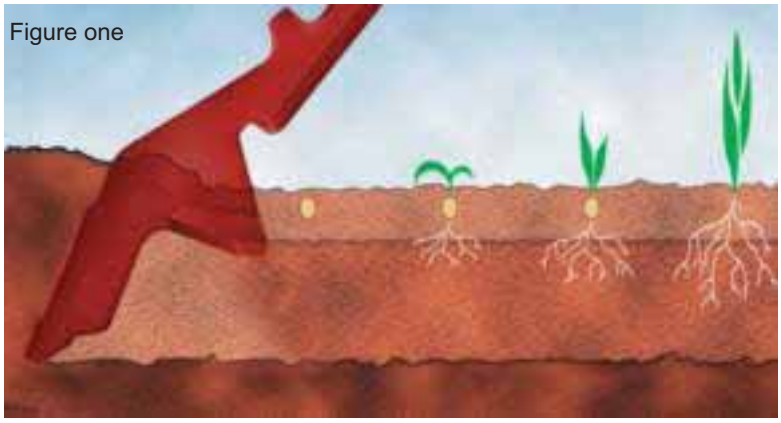
McCoy Precision Fluid delivery

Responding to industry needs

The rapid increase in the use of Fluid Fertiliser, in broadacre cropping, made it difficult for many to keep abreast. Peter Burgess, Liquid Systems SA, recently noted the need for "… precision tools and systems to deliver the correct measure of fluid fertiliser at banding…because….the needs of Australian agriculture are drastically different to those of our North American counterparts".

Many of the benefits from the uptake of fluid fertiliser are contingent upon precise, controlled delivery. For some time, most aspects of fluid delivery have been well serviced with designs from the likes of Liquid Systems and others. The final, in-ground, delivery of fluids (tillage tools) has been less than precise. However, the McCoy Armin Point, with its unique back-filling wing, provides for precision and control at the final, in-ground point when banding fluids at seeding.

Figure one



The McCoy Armin point was designed and developed in South Australia, with the initial aim of providing control of seed positioning in the slot (sowing depth). It is intended for use with modern, high break-out tyned implements and is available to suit a variety of tillage systems including; Slim Wedge, Keech and McCoy Twister.

The Armin Point has a unique, patented, in-built wing immediately behind the knife (Figure one). This design, when in the ground, opens a seeding slot in the conventional manner and then prior to seed delivery, closes it to form a controlled depth seed bed. Effectively, this forms a positive separation between the bottom of the slot and where the seed is placed.

A critical element to success when banding fluid is to retain a positive separation between fluid and seed. The McCoy Armin can be used at sowing to place fluids at approximately 25 – 30mm directly below the seed, and retain separation.

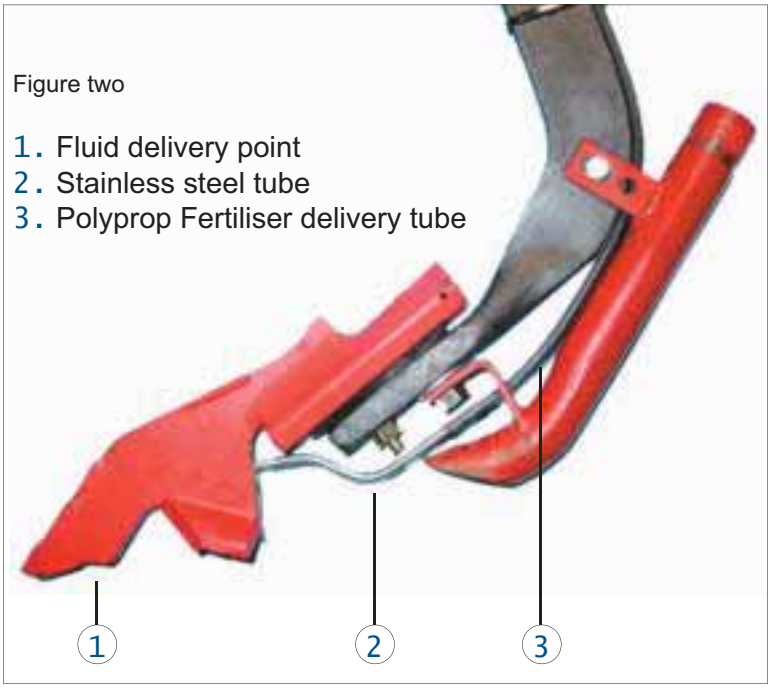
Early developmental work, completed with the assistance of Peter Burgess of Liquid Systems Inc., has been very promising and is currently undergoing field testing (Figure two). This system has been developed in conjunction with Liquid Systems.

McCoy Tillage continues to work on providing tillage solutions for Australian agriculture and has plans for further tillage tool designs in the future.

Please contact your local machinery dealership for further information, or contact:
Jim Lightwood at McCoy Tillage,
p 03 9885 9442 or info@mccoytillage.com.au

Figure two

1. Fluid delivery point
2. Stainless steel tube
3. Polyprop Fertiliser delivery tube



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