

THE Tow and Fert TIMES

Inside:
**REDUCING
THEIR
NITROGEN
REAL WORLD
CASE STUDY
ALIGN FARMS**

TOW AND FERT

VOLUME 5. September 2020

SEE INSIDE FOR | DROPPING UNDER 190KG N/HA | REDUCING 'N' INPUTS BY UP TO 33% | CONTRACTING FERT SOLUTIONS

GETTING TO GRIPS WITH CARBON

From soil carbon to carbon sequestration and carbon credits, carbon is an area of agriculture that farmers need to understand but can sometimes create confusion.

Soil carbon can be considered the holy grail of the farm and is often overlooked for the role it plays in improving production, economic and environmental performance. But what is soil carbon?

Soil carbon is a measurable component of soil organic matter. Organic matter makes up just 2–10% of most soil's mass and has an important role to play in the physical, chemical, and biological function of agricultural soils.

THE ROLE OF SOIL CARBON

Carbon, along with hydrogen and oxygen, is the basis for all life. Soil carbon or soil organic carbon is the major part of soil organic matter. Soil organic matter is made up of micro-organisms and decomposing plant and animal material.

Soil that is rich in carbon has many benefits for dairy farmers including the following:

- Provides the building blocks and is a food source for the cell material of all organisms living in the soil. It promotes dry matter production.
- Is an important source and major reservoir of plant nutrients. A decline in soil carbon reduces the fertility and nutrient-supplying potential of soil.
- Plays a key role in maintaining the pH of soil including helping to buffer the build-up of heavy metals such as Cd, Pb, and As.

- Regulates most biological, chemical, and physical processes in soil which collectively determine soil health.
- Helps develop and stabilise soil structure.
- Cushions the impact of wheel traffic and stock treading increasing the resistance and resilience of the soil to structural degradation.
- Promotes filtration, movement, and retention of water.
- Reduces the potential for wind and water erosion.
- Indicates whether the soil is functioning as a carbon 'sink' or storage facility (sequestering carbon from the atmosphere) or as a source of greenhouse gases.

CARBON SEQUESTRATION AND CARBON CREDITS: Getting paid to improve the environment

We have all heard the term *carbon sequestration* but there is a lot of misunderstanding around what this means and how Farmers can use it to improve their businesses – *and make money*.

Soil carbon sequestration is the process in which CO² is removed from the atmosphere and stored in the soil carbon pool. The draw-down of atmospheric C is only one way to sequester soil C. This process is primarily mediated by plants through photosynthesis, with carbon stored in the form of soil carbon.

Sequestering sufficient carbon can completely offset all environmental emissions, not just agricultural emissions. The sequestration of carbon can have a significant beneficial impact on climate change.

This is where carbon credits come into play. carbon credits are an attempt to mitigate the growth in concentrations of greenhouse gases. Carbon credits can be sold as a means of lowering the carbon footprint of a farming enterprise. By putting a price on greenhouse gases, the Emissions Trading Scheme encourages landowners to establish and manage farms in a way that **increases carbon storage**.

One carbon credit is equal to one tonne of carbon dioxide, or in some markets, carbon dioxide equivalent gases. If farms in NZ sequestered 0.7 to 7 tonnes of C/ha/yr, this would be equivalent to roughly 2.6-25.7 tonnes of CO₂/ha/yr or 2.6 to 25.7 carbon credits.

Carbon credits traded at NZD\$33.55 as at the 23rd July 2020. At a minimum of \$87.23/ha/yr and a maximum of \$862.20/ha/yr you can quickly see that sequestering carbon into the soil has a significant financial payoff as well as an environmental payoff.

Farmers showing good quantitative evidence of sequestering soil carbon should be able to apply for carbon credits rather than being charged a carbon tax.

While sequestering a significant amount of soil carbon over much of the area of the farm



Left: Good quality soil with a high soil carbon component is soft and crumbly.

Right: Hard, compacted soil reduces the ability of plants to grow and nutrients to be taken up by the plants.

can mean a significant financial return, the real benefit of sequestering carbon in the soil comes from all the advantages of building soil carbon mentioned above.

“The notion that farmers are greenhouse gas emitters for no other reason than they are farming is quite incorrect.”

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HOW FARMERS CAN INCREASE THE AMOUNT OF CARBON IN THE SOIL

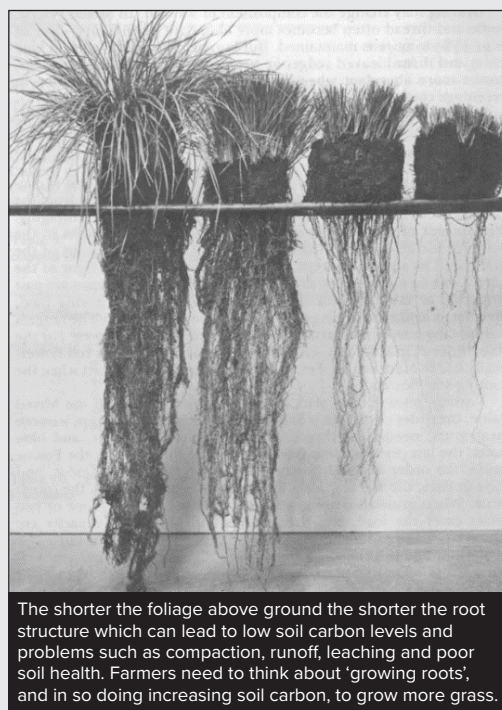
There is a perception that our soils are already carbon rich and it is difficult to increase the amount of carbon further. This perception is quite wrong. Our soils have on average just over 5% total organic carbon which is not high. Remembering the benefits of increased soil carbon outlined above, increasing soil carbon is an important environmental function that can also be financially rewarding.

8 WAYS TO INCREASE SOIL CARBON ON YOUR FARM

Dairy farmers, and farmers in general, can increase the amount of carbon in the soil by:

- 1. Increasing the amount of dry matter produced:** Fifteen tonnes of DM/ha/yr produces about 9.8t C/ha/yr. Ten tonnes DM/ha/yr produces about 6.5t C/ha/yr. Growing more grass through improved soil health by ensuring good aeration, drainage, soil fertility and biological properties and promoting the drought resistance of the soil and the water-use efficiency of the plant will increase DM production and carbon storage.
- 2. Ensuring good soil biological properties:** This includes earthworm numbers and the biomass and activity of the micro-life. Applying biological activators, or biostimulants, in a Tow and Fert, and ensuring good soil aeration, grazing management, soil moisture, food supply, soil fertility (with a pH of around 6.4), and limiting chemical sprays ensures good biological activity including that of mycorrhizal fungi.

- 3. Maintaining good pasture residual levels** promotes dry matter production (*grass grows grass*) and therefore the production of carbon. This means avoiding over-grazing which reduces the length and density of the root system making pastures susceptible to stress.
- 4. Developing the length and density of the root system:** Farmers can do this by sowing deep rooting pasture species and cover crops, whilst avoiding over-grazing. This will



The shorter the foliage above ground the shorter the root structure which can lead to low soil carbon levels and problems such as compaction, runoff, leaching and poor soil health. Farmers need to think about 'growing roots', and in so doing increasing soil carbon, to grow more grass.

help ensure the sequestration of soil carbon in the lower sub-soil between 400-1000mm.

- 5. Maintaining good soil structure:** Good soil structure is soft and crumbly with good aggregation and allows the ready growth and extension of the root system resulting in the input of soil carbon. Feeding the soil biology (your bio-engineers), promoting a good root system and avoiding severe treading damage and over cultivation will help promote good soil structure.
- 6. Minimising soil disturbance:** Soil carbon volatilises into the atmosphere when the soil is cultivated. Avoid or minimise the use of a mouldboard plough, for example.
- 7. Ensuring good soil fertility:** Encourage a good microbial biomass and activity, good soil aeration, and where possible, the addition of nutrients should include foliar spray applications to raise soil fertility. (*The advantages and benefits of a foliar application are well documented in the scientific literature, some of which are covered in Volumes 2 & 3 of the Tow and Fert Tabloids.*)
- 8. Applying carbon farming techniques** that draw-down the CO² in the atmosphere, converting it to dissolved organic C in the soil. In addition to the 7 mechanisms mentioned above, these draw-down techniques include:
 - a. Promoting the photosynthetic capacity of plants,** i.e. the amount of pasture cover, cover-crops etc. grown throughout the year. This increases the 'solar panels' available to capture and convert the CO²

and H₂O in the atmosphere to sugars (dissolved organic carbon) and oxygen through the process of photosynthesis.

- b. Promoting the photosynthetic rate of the plants,** i.e. the ability of plants to increase the rate of photosynthesis and therefore the production of carbon by having good soil fertility, good soil structure, aeration and soil moisture levels, and good microbial biomass, diversity and activity.

The significance of the above mechanisms is not as widely appreciated as they should be. This may be *due to vested interests* and the lack of awareness of how our common management practices reduce the activity of the key microbes involved in the sequestration of soil carbon.

FARMING CARBON: An extension of farming plants and animals.

Soil carbon's importance should not be under estimated and every effort needs to be made, and management practices adjusted, to increase the amount of soil carbon present. I have outlined various ways and means of increasing soil carbon which have many benefits to farming in general including your farms bottom line and the trading of carbon credits, and yet have wider implications for the environment.

With that in mind, in addition to farming animals, New Zealand Farmers should consider becoming carbon farmers as part of their everyday farming practices.



REDUCING THEIR NITROGEN

ALIGN FARMS DROPS UNDER THE 190 UNITS N/HA LIMITATION ONE YEAR BEFORE THEY NEED TO.

This is the story of how they did it.

Rhys Roberts, Align Farms.



Rhys Roberts, CEO of Align Farms, knew they needed to change their nutrient programme. He and his team changed to foliar application, using a Tow and Fert, across the company's five dairy farms. They reduced their nitrogen inputs, grew more grass, and produced more milk one year before the government regulations kick in.

Rhys Roberts has always been early to adopt new techniques of dairy farming, often trialling different things well ahead of the industry curve. In mid-2019, he was contemplating the future of dairy farming in the Canterbury basin region. His company Align Farms owns five farms and two support farms in the region. It was becoming clear that the discussion in the media, at government level and amongst the public, was increasingly focusing on the impacts of dairy farming on water quality. Rhys could see that there was a clear need to change and adapt the farm's practices to ensure they were prepared for any future regulatory development.

Running a system four farm with a conventional granular-based fertiliser programme, led by the major fertiliser companies, Rhys and his team were putting on between 250 and 280 units of nitrogen per hectare every year. Additionally, the Align group of farms would use maintenance fertilisers including P and K as well as an annual requirement of lime.

Rhys started considering how the Align Group could start reducing their use of synthetic based nitrogen products. Rhys says, "We started looking at liquid N alternatives, Tow and Fert alternatives or just making a reduction in granular fert inputs".

“We settled on the Tow and Fert system solely because of the ability of the machine to take granular product in it's cheap, core form, mix it with water or effluent from our own sources and apply it paddock-by-paddock.”

A chance conversation between Rhys and Ricky Taylor, a friend and local farmer, revealed a mutual interest in moving to a foliar fertiliser approach. Ricky and his wife Rebecca were wanting to move into the liquid fertiliser space by founding a contracting company. They had been looking at the different application methods available and had settled on the Tow and Fert for its versatility in dissolving N and suspending fine particle products.

Rhys made the decision to work with Ricky and Fert Solutions. This partnership would enable Align to test the Tow and Fert system without the full commitment of purchasing their own Tow and Fert.

A partnership agreement was made between Rhys (Align Farms) and Ricky (Fert Solutions) and they started on the liquid foliar fertiliser application path, both excited about how this could enable significant improvement in their environmental footprint.

Check out the full case study including videos at www.towardfert.co.nz/align



Align Clearview is set on the banks of the Ashburton River, flanked by the Southern Alps.

LOFTY GOALS:

Reducing nitrogen inputs by up to 33% without reducing outputs.

Rhys and the Align Farms team had set themselves a goal of reducing their synthetic nitrogen inputs in year one by 200 tonne. By Christmas 2019, they were on target having reduced N inputs by 100 tonnes. By the end of May, after a long and hot summer, their total reduction in nitrogen inputs was 160 tonnes.

"The only reason we missed our target was due to the warmer weather in May. We ended up doing 3 weeks extra of N application, so we made an overall reduction of 160 tonne. Generally, our business puts on about 500 tonnes of Urea, so we have made around a 30 to 33% reduction in synthetic N inputs."

"We have managed to reduce our N inputs from an average of 246 units to 173 units, so there is a range on the farms of anywhere from 150 to 190kgs N/Ha."

With the savings made in the business from the reduction of N, Align has been able to reinvest this money into optimising their phosphate, potassium and lime levels. They have also been able to introduce trace elements such as selenium for animal health.

Next, Rhys continues, comes the question of production "was there a drop in productivity on the farm? The answer is no. We didn't see any fundamental shifts in our production. In fact, our calculations show **we grew more grass** with the Tow and Fert system."

"Three of our farms were up on their production year-on-year, recording record production years. The test for us is to see if we can do it again. I am confident we can, whereas 12 months ago I would have laughed at you."

INPUT LIMITATIONS: 190kg N/Ha regulation is a necessary limitation.

Like any farmer, Rhys was concerned about the possibility of input regulations for his farms and the industry, but he takes a pragmatic approach when talking about the new restrictions.

"My take on the legislation and the 190 cap is that we do have to pay for our sins eventually. We need to make step changes and continue to make step changes to be more efficient."

Rhys says, "In my view we have to get more efficient around how we use nitrogen in our systems. One area where the Tow and Fert does work well is you are taking a granular, commodified product off the shelf and mixing it with water or effluent, and using less of it during application."

"To me it's a no-brainer. There are savings to be made there. So not only are we already in line with the restrictions but we are also making a cash saving to our business and being efficient along financial lines as well."

And of moving to the Tow and Fert system and meeting the restrictions soon to be in place Rhys says,

“for me it (moving to the Tow and Fert system) has moved out of the too hard basket and into the no-brainer basket.”

REDUCING NITROGEN INPUTS:

A multi-faceted approach to reducing nitrogen use by increasing round lengths to apply less nitrogen.

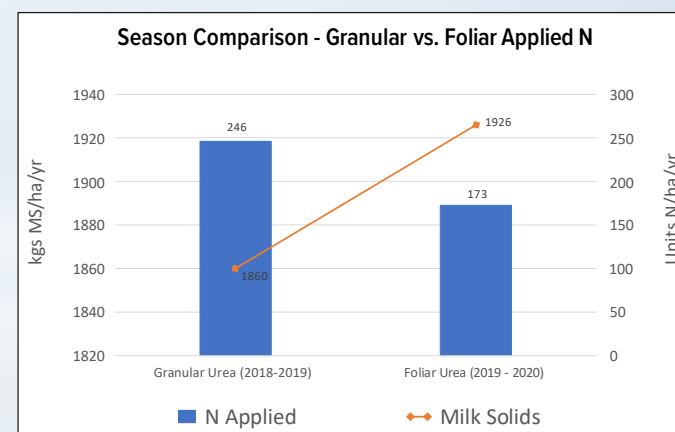
As part of Align Farms nitrogen input reduction strategy, Rhys says that one additional way dairy farmers can reduce their input of nitrogen is to increase their round lengths. As most farms do about 10 rounds of fertiliser input throughout the year, increasing their round length can reduce the number of inputs a farmer puts on each year.

Rhys explains "If your round length is 21 days and you increase it to 24 days, or if you are on 25 days and move to 28 days, you can reduce your rounds to nine per year without even noticing any difference. That is a whole round of nitrogen that is now out of your system. **It might not seem like a big change, but it is a significant drop in N use.**"

The benefit of using the Tow and Fert in a system like Rhys explains above, is that you can apply your fertiliser more rapidly after the cows have grazed the paddock and the uptake by the plant is immediate.

"The challenge with a granular system is the time it can take to breakdown and become plant available. This is because we may have to wait four days to have enough area for the bulky to do the job, and then another four days to be plant available after the irrigator has been over it." says Rhys.

"One of the beauties with a fertiliser product that is in suspension or dissolved in liquid through the Tow and Fert, is that you are getting uptake in the plants on day one and growth from there going forward. **You are maximising your pasture production which is critical on a dairy farm**" shares Rhys.



The reduction in nitrogen use has led to an increase in milk solids at Align Farms, Emilius.

TOW AND FERT: THERE IS ONE FOR YOUR FARM CALL TODAY **0800 337 747**



Ricky Taylor and his Tow and Fert Multi 4000 apply fertliser in mid-Canterbury.

**BENEFITS BEYOND THE GROUND:
A reduction in milk urea**

Milk urea is another area that Rhys and the Align team have noticed some big changes over the course of the last 12 months. Milk urea is directly related to the pasture nitrogen levels so when more nitrogen is applied to a paddock, milk urea levels increase.

For Rhys and the team there has been a marked difference this year in milk urea.

“One area we noticed a huge change, which potentially has a link to animal health and nitrogen loss, is that our milk urea levels were substantially lower,” says Rhys.

Across the Align group of farms, the average milk urea level prior to the change to the Tow and Fert system was around 20 to 25mg/dl, the levels Dairy NZ suggest farmers can expect. Yet for the last 12 months, the Align group of farms have averaged between 3 and 5mg/dl without the expected protein drop.

Rhys explains, “we are quite confident lowering milk urea will collate to lower N loss through soils and leeching. Provided we can hold the protein level, which we believe we can, we are confident this will improve animal health and then improve the water quality leaving our farm.”

**LOOKING TO THE FUTURE:
Continuing to make change
and improve what they do at Align.**

The change at Align farms has been a dramatic one. With the Board determined to lead the way in all aspects of dairy farming, the early move to improve their fertiliser use and efficiency made good business sense.

“18 months ago, I thought that moving from 250 units of N down to 180 or 160 was probably going to be a big push for Align. Now, 12 months in, we have achieved those figures; **we have got under 190 units across the business,**” says Rhys.

With no material changes in pasture production, animal health or milk production Rhys and the Align team are confident in the future of the Tow and Fert system and business in general. **“The Tow and Fert system is versatile, pragmatic and does everything that we need it to do,”** says Rhys

Rhys says Align will continue down the path they are on to ensure their results are consistent and continue to be realised year-on-year. And Rhys’ advice for other farmers considering their options for fertiliser use and meeting the new 190kgs N/ha restrictions,

“My advice to farmers is that doing nothing won’t do anything. So, let’s make change.”

Ryhs Roberts, CEO, Align Farms



Happy and content cows graze on pasture that keeps the milk urea level low between 3-5mg/dl.

Sam Mallard
Align Farms, Emilius Farm Manager



**DOWN ON THE FARM.
LOWER INPUTS, MORE
GRASS & MORE MILK.**

Farm Manager, Sam Mallard, reduces nitrogen inputs, grows more grass with more milk in the vat.

Align Farms has always liked to pre-empt changes in the marketplace and be ahead of the curve when it comes to technology and farm management. This culture runs throughout the team and Sam Mallard, Farm Manager at Align Emilius, had a feeling that change was coming in the freshwater space in the coming years.



Align Emedius grew more dry matter which translated into more milk in the vat.

“We have not changed the products we use at all. We are still using urea that comes to us as a granular prill. We were spreading that on the paddock but now it gets dissolved in the Tow and Fert machine.”

Sam says that they could see the mass wastage of the granular urea prills during application onto the soil, “we were hoping for the best.”

Moving to the foliar application of nitrogen, Sam says they are now targeting the N being taken up directly by the plant in its leaf, meaning the product is used efficiently and its efficacy is greatly enhanced.

“There is also less chance now for leeching of nitrogen. It is all used by the plant as far as we can see.” says Sam.

For Sam, there seemed to be a prime opportunity for change across the business to reduce the amount of nitrogen in the Align Farm System.

Asked whether moving to the Tow and Fert foliar system has meant a change to the Align fertiliser product programme, Sam says,

Ricky Taylor
Tow & Fert Contractor, Fert Solutions



**PARTNERSHIP
BREEDS SUCCESS –
ALIGN FARMS AND FERT
SOLUTIONS TEAM UP TO
TEST THE TOW AND FERT SYSTEM.**

Ricky Taylor, Fert Solutions Contractor, Tow and Fert 4000 Owner.

Just over a year ago, Ricky Taylor and his wife Rebecca had made the decision that they wanted to get into contracting fertiliser application in the liquid fertiliser space. They could clearly see that change was coming and they wanted to be a part of that change leading the way on a contracting front.

Owning 50 hectares of semi-arable land in mid-Canterbury and managing a grazing operation, Ricky and Rebecca looked into the machinery market for the application of liquid fertiliser. They were clear with what they wanted, “we wanted a machine that could dilute or dissolve products properly and handle solid fine particle fertilisers by holding them in suspension.”

In Canterbury there is now liquid nitrogen available however, this is dissolved offsite and then the liquid N is transported to individual farms where it is applied through a traditional boom sprayer. **This method of application is expensive.**

Ricky says,

“ we eventually found the Tow and Fert system and immediately could see the benefits. Farmers can cart in their dry product, dilute it down and away we go.”

This meant that clients of Fert Solutions were only paying the same rates for their dry product and with the reduction in fertiliser required, would end up making significant savings in their own businesses on a financial front as well as in reducing their fertiliser use.



Ricky applying fertliser on his own farm in mid-Canterbury.

NITROGEN REDUCTION:

Growing the same (or more) amount of grass.

In previous seasons Align Emilius had been using, on average, around 240 units of nitrogen per hectare. Production had sat around the 1860kgs/ha milk solids. The major question in the minds of Sam and Rhys was, in changing to the foliar application of N through the Tow and Fert, would they be able to retain this level of milk solids by growing the same amount of grass.

Sam says, "at the beginning of the season, Rhys would phone me asking whether we thought there was more or less grass being grown under the Tow and Fert system. **From the beginning we knew that we were growing the same, if not more grass than we had in the past. It definitely wasn't less.**"

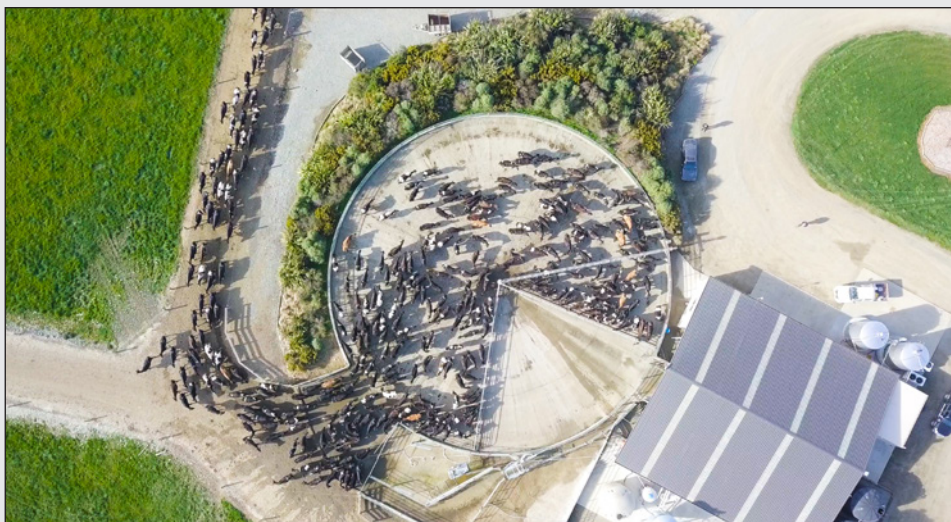
On the performance of the farm this year "This year we did 1926kgs/ha milk solids with less nitrogen used. So that is a brilliant result for us." says Sam. However, Sam is not one to rest on his laurels and, like Rhys, is focused on the future and improving what they are doing already,

"Now we have to go and see if we can push the boundaries of this system and continue dropping the nitrogen rate using the Tow and Fert. We need to find where the equilibrium sits." Discovering that equilibrium is now firmly in Sam's sights.

"Can we reduce our nitrogen inputs by 60% and still get the same results? It will be an interesting season this coming season."

Finally, Sam offers this advice to farmers looking to drop their nitrogen inputs under the 190 limitations. "My advice to other farmers thinking of using the Tow and Fert system is that it is a very good system to help drop under the 190 units which we are now being asked to do."

“You can drop under the 190 cap without compromising grass growth on the farm whilst keeping your production where it has been in the past, if not pushing it forward into the future.”



Milking time at Align Emilius where production has increased from 1860 to 1926 milk solids.

Check out the full case study including videos at www.towandfert.co.nz/align

VERSATILITY, EASE OF USE, GREATER PRODUCTION:

Liquid application of fertiliser delivers the goods.

During his search for a machine that could provide Fert Solutions with their required outcomes, Ricky had been talking with Rhys from Align Farms. They had talked about the potential for a partnership and so with a contract signed, Ricky was able to move forward with the Tow and Fert and begin work with Align Farms as a foundation client.

Align Farms came from a solely granular system, but the decision was made to go quite hard in the first year with the liquid foliar application. Ricky says "Align were applying phosphates, urea etc. in solid form. Then we came in and put everything on through the season using a Tow and Fert. They grew more grass and had more production. They were pretty happy at the end of the day."



On his own farm Ricky Taylor has changed his fertiliser practice with great results.

CONTRACTING FERT SOLUTIONS:

Growth and change, two constants for Ricky and Rebecca.

The uptake for Fert Solutions has been steady. The biggest hurdle has been in changing people's mindsets on how to apply fertiliser and still get the results farmers expect. With granular fertiliser being the only option for decades, farmers have had it drummed into them that that was the only way to apply fertiliser. Ricky says, "changing people's mindsets has been the hardest thing."

On the positive side, Ricky says he is starting to see a change, "Farmers are getting there now as younger farmers come through and they know they have to change. The new freshwater policy has meant that many farmers are keen to give the Tow and Fert foliar system a crack."

“The Tow and Fert fits really well with the new policy because you can use less and apply it in little amounts more often. I can see the Tow and Fert being massively used in New Zealand with the change coming.”

On their own farm Ricky and Rebecca have changed their own farming practices. "It's a good thing. It has been a good learning curve and playing around with different fertilisers has shown us what we can do. We have been able to apply this with our clients as well. It's been a fun 12 months."

Ricky says, "You can pretty much put anything through it you want, as long as it will dilute, or you can keep it spinning around." And on the machine itself, the Tow and Fert Multi 4000, Ricky has this to say,

"the Tow and Fert is very well made. As a contractor the maintenance programme is good, as we go through a fair few parts with the nature of fertiliser. Getting parts out of Tow and Fert is very easy. The service from Tow and Fert has been exceptional."

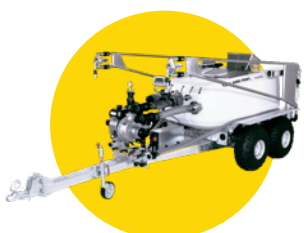
For people wanting to get into foliar application and the Tow and Fert system Ricky says, "surround yourself with good people, fertiliser reps, and agronomists who understand it and want to change. I think you will be pleased once you buy one and get into it. You'll grow a lot of feed."

"Or even better, find a contractor who can do it for you." Ricky says, with a smile. Contact Ricky @ Fert Solutions on 027 648 6856.

The Tow and Fert range

LIQUID FOLIAR SPRAY MACHINES

THERE IS ONE FOR YOUR FARM



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MULTI 1200



MULTI 2800



MULTI 4000

THE BENEFITS OF OWNING A TOW AND FERT:

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- Reduce nitrogen inputs ☒
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- On-farm versatility ☒
- Better animal health ☒
- Better milk productivity ☒

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