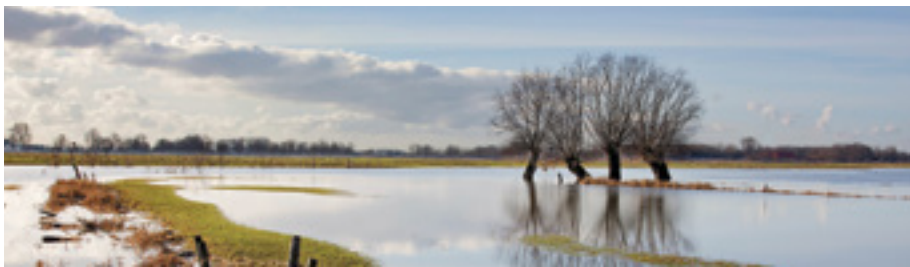




We LOVE rain, but 2022 ...?! Time to rebuild your soil fertility and soil health

The 2023 farming year is set to bring more challenges to farmers. In addition to the current challenges of high costs of inputs, some sectors have been impacted by reduced yields due to weather or low commodity prices, and soggy soils.



The wet 2022 winter and spring across eastern Australia did not allow farmers to properly prepare for the 2023 season due to heavily saturated soils. Many farmers were therefore forced to change their crop selection strategy, with some having to forego the opportunity to grow high demand crops.

The Bureau of Meteorology forecasts the continuation of La Niña into early 2023, with above average rainfall for much of the eastern two-thirds of mainland Australia and north-east Tasmania in early summer.

Continuing heavy rains and flooding can cause significant loss of soil nutrients due to leaching, runoff or loss of topsoil, including even those less mobile nutrients* and organic matter. Flooding can also increase levels of salinity.

For sandy loam soils, the situation can be worse due to the ease that water flows through the soil, taking with it soluble nutrients below a crop's root zone. In contrast, clay soils are better able to retain nutrients, but they are prone to waterlogging. This damages crops by depriving oxygen to feeder roots that consequently die. Furthermore, soils lacking oxygen are more prone to increased pathogens, encouraging root rot and negatively impacting crops.

BioAg can help address the many soil fertility and health issues currently facing farmers across eastern Australia, including nutrient deficiencies and toxicity (salinity/sodicity, and pH related issues), soil structure, and water infiltration (hydraulic conductivity) issues.

Evaluation of soils after heavy rains or flooding starts with an in-field inspection and soil testing. This enables a full evaluation of the needs of the soil and the development of plans to improve soil recovery and fertility. We can provide recommendations for immediate soil needs and utilise these actions into building a long-term soil fertility program. *(Article continued page 5)*

Welcome to 2023!

The BioAg team hope you and your families enjoyed a safe and cheery Christmas season.

As 2023 kicks off, our focus is on supporting growers to get their soil health back on track after a soggy 2022, and set-up for a good year ahead. For our part, we're offering a great price deal for early commitment, plus guaranteed supply. Contact your BioAg area manager now for more details (see the back page).

This Summer/Autumn edition focuses on soil recovery after flooding. Plus, we introduce you to a conventional dairy that 'accidentally' became organic, now growing more pasture with less inputs by using the soil to do all the hard work.

Enjoy the read and we're here to help if you have any questions.



BioAgPhos Fertilisers: the perfect solution for ALL conditions

With the record-breaking wet conditions in 2022 and the elevated cost of fertilisers, matching the right product type and amount to meet your soil fertility and productivity needs this summer is more important than ever.

Many soils will have been subjected to large nutrient losses due to flooding, high run-off and leaching events, coupled with several years of above average production-related nutrient removal. With the BOM forecasting more rain into early 2023, accessing a more sustainable source of phosphorus (P) and related fertiliser products should be top of mind, particularly where key macronutrients are needed to maintain fertile soils.

BioAg's solid fertiliser range is based on *BioAgPhos* which is a high-grade, highly reactive rock phosphate (RPR) combined with BioAg's proprietary microbial digesting agent (a fermented culture). The result is a natural and sustainable alternative to water soluble/acidulated phosphates which are highly susceptible to run-off and leaching events. *BioAgPhos* is less reliant on rainfall to be plant available, making it also ideal for application in dry seasons. Given its high-grade and high reactivity, it can be used at lower volumes, and spread at any time of the year, allowing farmers to take advantage of opportunistic low-cost freight or spreading.

***BioAgPhos* delivers both an immediate and continuing release of P and calcium (Ca) over a 2 to 3 year window, with 100% of P being plant available over this timeframe, giving growers full value for their investment. With the slow digest and release advantage, farmers can choose either an annual or biennial (every second year) application, making the product extremely cost and time effective.**

Analysis wise, *BioAgPhos* contains 12.7% P, 35% Ca, and 1% sulphur (S). We source our RPR from Algeria as it is the best product to meet the production needs of our customers and is also a reliable supply source. *BioAgPhos* is produced from natural minerals and biostimulants and is certified for use in organic input by both Australian Organics (ACO) and the USA National Organic Program (NOP). With less than half of the cadmium content of Australian-made Single Superphosphate (SSP), the *BioAgPhos* range of solid fertilisers is safe to spread on all areas including near waterways.

BioAgPhos physically incorporates quickly into the topsoil due to its high density and fine particle size, with a more even surface area and distribution of nutrients providing greater accessibility to foraging plant roots (refer to page 6 for more information on Nutrient Mobility). It can also be mixed on farm with other soil ameliorants like lime and gypsum to be spread in one pass. Again, another time and money saving advantage. Custom blends with other macro and micronutrients such as sulphur, potassium, magnesium, copper, boron, zinc and molybdenum can be prepared as required to suit specific soil needs.

Due to its high reactivity, it is 41% Citric acid soluble, and 73% Formic acid soluble, a really important indicator as to its performance as a P fertiliser. Independent testing by the National Measurement Institute (NMI – the Australian Government's reference laboratory), has determined that around one-third of P and Ca are immediately available, with the balance slowly digested and released over 2 to 3 years.

The 35% Ca component of *BioAgPhos*, means it has around half the neutralising effect of lime on a tonne for tonne basis. Water soluble phosphate fertilisers, on the other hand, contribute to soil acidification and are more susceptible to loss pathways such as leeching, runoff, and tie up in antagonistic and acidic soils. *BioAgPhos*, however, will only really be lost if the topsoil is washed away which is rare, particularly when there is good ground cover present.

(Prices exclude GST)	Single Superphosphate
Analysis	P 9.0%, S 11%, Ca 19%
Estimated cost delivered on farm	\$660/T
Spreading Costs	\$55/T
Application Rate ²	125kg/ha
Total Cost/ha	\$89.38/ha
Effects on pH	Acidifying
Water Soluble	Yes
Plant Availability	Immediate with rain
Total Plant Available	97%
Certified Organic Use	No
Environmental Risk	Moderate to High
Leaching Loss Risk*	Yes (dependent on soil)
Run Off Loss Risk*	Moderate to High
Tie Up Loss Risk*	Yes (dependent on soil)

¹ Based on Spring 2022 promotion.

² Based on applying the same units of plant available P, additional benefits from reduced losses are not factored in.



Conventional fertilisers such as SSP have traditionally been considered as ‘a low-cost ready source of P and S’. However, water soluble phosphate fertilisers are just that – they quickly dissolve into the soil solution, which makes them highly susceptible to loss pathways in wet conditions. When you consider the bigger picture of rising fertiliser and application costs, supply-chain uncertainty, and wet conditions continuing, not to mention impacts on the environment and food nutrition from synthetic fertilisers, that perception of ‘low-cost’ no longer rings true.

Take a look at the comparison below, between SSP and BioAg’s *Superb* solid fertiliser natural alternative.

Extensive trials have shown that BioAg’s *Superb* applied biennially gives equal if not improved yields to conventional fertilisers.

Scan for the case study results on our website.



In terms of cost and return on investment, particularly with highly antagonistic or wet conditions, the effectiveness of *BioAgPhos* based fertilisers represents a safer, more sustainable and financially smarter solution.

BioAg <i>Superb</i>®
P 8.4%, S 7%, Ca 31%
\$605/T ¹
\$50/T (\$100/T every 2nd year)
257kg/ha
\$84.21/ha
Neutralising
No
1/3 Immediate and 2/3 Sustained release over 2-3 years
100%
Yes
Low
Very Low
Low
Very Low



* The amount of loss will vary depending on soil type and texture, and rainfall. With recent heavy rainfalls and flooding, losses would be expected to be high.

More pasture with less inputs – true!

If someone told you they were growing more pasture using no synthetic inputs, and saving a fortune in the process, would you believe them?

You should, as that's exactly what one large-scale organic dairy operation in Tasmania has been doing for several years now. Mark and Roslyn's transition from conventional practices to biological farming, and then to full organic certification, was completely unintentional at the start of their journey. They were just trying to solve the problem of milk fever occurring in the herd.

Through research and their own trials, they began to deeply understand the symbiotic relationship between healthy soil, healthy plants, and healthy animals, unconsciously embarking on a 10-year transition to organic certification.

The first challenge Mark said was changing their mindset – looking to do the same things as before but using different methods and inputs. It was a little confronting, unknown and therefore felt a bit risky.

“However, once you embrace change, you're opened up to a world of new opportunities, new products you've never noticed before, and new ways to achieve what needs to be done,” said Mark.

Next was looking at the farm's soil health and what was in balance and what wasn't.

Their soil pH pre-transition was 5.6, which was addressed with lime and dolomite, and today it is sitting around 6.7 to 7.0. Phosphorus (P), sulphur (S) and calcium (Ca) imbalances were not overlooked, with Mark seeking a natural and sustainable alternative to conventional chemical P and S fertilisers. That is how Mark discovered the *BioAgPhos* solid fertiliser range, which is certified for organic use. It is a high-grade and highly reactive phosphate rock combined with BioAg's proprietary microbial digesting agent. Mark opted for BioAg's *Superb* blend as it included P, S and Ca and applied at the rate of 250kg/ha in biennial application.

“With a third of P, S and Ca immediately available and the other two-thirds sustainably and steadily released over a 2-3 year period, we've only needed to apply *Superb* every other year, which has saved us a lot in input, storage and application costs, and importantly time,” said Mark.

After implementing improvements below the ground to improve the soil health, Mark and Roslyn started to see significant improvements above the ground in both pasture health, yield and animal health.

“The pastures just bloomed with growth once we balanced the soil and got the pH above 6.5. The soil microbes love it, they are the ones that do the work for you, they are the ones that pull the nitrogen out of the air.

“

Now we are growing more grass organically than we ever did conventionally, with a lot less inputs and greater biodiversity. The grass is greener, taller, and more robust with different plant species at different growth stages, and our cows are much healthier as a result.

Mark

”

“Taking slightly longer has allowed us to do it at our own pace, understanding the process and appreciating the journey; for us it was win-win situation,” Mark concluded.



Scan for the complete Case Study on our website.



A fruit salad pasture mix of 18 species, allowing the herd to self-medicate and eat what they need for their health



An organic smorgasboard – Dandelion, Plantain, Vetch, Sheeps Burnett, Red Clover, Chicory, Phacelia



Organic dairy farmer and soil health advocate, Mark

We LOVE rain, but 2022 ...?! Time to rebuild your soil fertility and soil health *(continued)*

Just as prescribed medications are not issued without first doing tests, we recommend soil testing post-harvest. Whether it's for predicting soil constraints/imbbalances, monitoring soil trends, diagnosing issues or positive outcomes or compliance – why guess what's going on with your soil health when you can accurately measure and map? Every member of the BioAg agronomy team is Fertcare Level C accredited and we can assist you with the soil sampling process.

Soil is a living organism and impacted by natural and man-made influences. Given the 2022 extreme wet season, the start of 2023 is the right time to evaluate your soil health and rebuild its nutrient density so that it's able to best serve your future crops.

* The term 'nutrient mobility' refers to macro and micro elements behaviour within the soil and plant. Nutrients which are important for plant growth vary in their ability to move within the soil and plant. It is their mobility that determines their plant availability as well as their loss due to leaching or runoff. See article on page 6 for more information.

Soil is a Living Organism



Soil is a living thing – it is a complete and self-sustaining ecosystem, alive with living organisms such as worms, fungi, insects, bacteria, and organic matter. Healthy soils are the foundation of our food system with ~95% of our food directly and indirectly produced utilising soil.

Ever wondered how plants grow underground, and how mycorrhizas, bacteria and soil life form an inseparable system?

Visit the BioAg website homepage bioag.com.au and watch the incredible animation developed by Plant Health Cure (PHC Netherlands) to see how harmonious soil biology works.

Thank you PHC for permission to share this film to help educate the world on the role of soil in nature and food production.



Nutrient Mobility explained

The term 'nutrient mobility' refers to characteristics of macro and micronutrients within the soil and plant. Nutrients which are important for plant growth vary in their ability to move within the soil and plant. It is their mobility that determines their plant availability as well as their loss due to leaching or runoff.

Understanding nutrient mobility is helpful in diagnosing plant nutrient deficiencies.

Biological, chemical and physical forces can change the state of those elements and make them more or less mobile. Since immobile elements do not easily move within the plant, deficiency symptoms show up in new growth. When mobile elements become limiting, they can be scavenged from older growth and moved to where they are most needed, causing deficiency symptoms in older growth. Most nutrient deficiencies do not show up until the plant is at a peak growth period or at times of high nutrient demand such as fruit set.

There are 17 different elements essential to plant growth. The first three – carbon, oxygen and hydrogen – are non-mineral and are absorbed from air and water during photosynthesis. The other 14 elements are minerals and are typically obtained from the soil after being dissolved in rhizosphere and then enter the plant as roots take up the water.

	Symbol	Mobility in plant	Mobility in soil	Role in plant
Macronutrients (plant requires large quantities)				
Structural				
Carbon	C			Energy source for microbial and plant functions
Hydrogen	H			
Oxygen	O			
Primary				
Nitrogen	N	Yes	Mobile as NO ₃ ⁻ , immobile as NH ₄ ⁺	Formation of amino acids, vitamins and proteins; cell division
Phosphorus	P	Yes - somewhat	No	Energy storage and transfer; cell growth; root and seed formation and growth; winter hardiness; water use
Potassium	K	Yes - very	Yes - somewhat	Carbohydrate metabolism, breakdown and translocation; water efficiency; fruit formation; winter hardiness; disease resistance
Secondary				
Calcium	Ca	No	Yes - somewhat	Cell division and formation; nitrogen metabolism; translocation; fruit set
Magnesium	Mg	Yes - somewhat	No	Chlorophyll production; phosphorus mobility; iron utilisation; fruit maturation
Sulphur	S	Yes	Yes	Amino acids formation; enzyme and vitamin development; seed production; chlorophyll formation
Micronutrients (plant requires small quantities)				
Boron	B	No	Yes - very	Pollen grain germination and tube growth; seed and cell wall formation; maturity promotion; sugar translocation
Chlorine	Cl	Yes	Yes	An essential micronutrient of higher plants and participates in several physiological metabolism processes such as osmotic and stomatal regulation, evolution of oxygen in photosynthesis, and disease resistance and tolerance
Copper	Cu	No	No	Metabolic catalyst; functions in photosynthesis and reproduction; increases sugar; intensifies colour; improves flavour
Iron	Fe	No	No	Chlorophyll formation; oxygen carrier; cell division and growth
Manganese	Mn	No	Yes	Involved in enzyme systems; aids chlorophyll synthesis; P and CA availability
Molybdenum	Mo	Yes	Yes - somewhat	Nitrate reductase formation; converts inorganic phosphates to organic
Nickel	Ni	Yes	Yes - somewhat	Nitrogen metabolism and fixation; disease tolerance
Zinc	Zn	No	No	Hormone and enzyme systems; chlorophyll production; carbohydrate, starch and seed formation

Table source: Courtesy of Michigan State University Extension, NRCCA Resources, Cornell University and BioAg research

Alleviating Soil Toxicity

No matter if it is issues that have appeared with the recent flooding events or pursuing old issues present for some time, heavy metals toxicity and salinity/sodicity can be alleviated or rectified by rebuilding soil fertility and nutrient equilibrium, improving organic/soil carbon content, and soil health.



Toxicity of heavy metals and salinity can be increased as a result of high rainfalls, flooding or leaching of water through soils which 'washes' out beneficial cations such as calcium (Ca), magnesium (Mg) and potassium (K) of the topsoil and is a particular concern in sandy soils. In some cases, flooding or more particularly erosion, will remove topsoil and organic matter which act as a beneficial buffer to heavy metals and salts.

Heavy metals are nonbiodegradable and can be a natural part of the soil or can accumulate in soils from different sources, for example, improper disposal of the industrial waste or sewage, or long-term applications of pesticide and fertilisers containing heavy metals. Irrigation with water containing salts or heavy metals, even at low levels, will also result in a build up over time of these elements in soils.

Salinity and sodicity defines the level of sodium (Na) in soils. Excessive Na in soils can lead to accumulation in cell walls rapidly leading to osmotic stress within the plant cells. This affects photosynthesis mainly through a reduction in leaf area, chlorophyll content, and stomatal conductance. Soil salinity also impacts a plants ability to access other nutrients within soils, and significantly reduces a plants phosphorus (P) uptake.



Scan to read more about
Soil Toxicity on our website.

Distributor Spotlight Agrifert Fertilisers, Tas.

With their mission to provide the best quality and scientifically tested fertiliser products and solutions to growers throughout Tasmania, Agrifert has played a pivotal role in encouraging the development of sustainable agriculture across the pristine Apple Isle.



Based in the agricultural-rich Northwest Tasmanian region in Somerset, Agrifert services all of Tasmania including the renowned produce regions of King and Flinders Islands.

David Barnes and his son Nick saw the opportunity almost 30 years ago to service the sustainable agricultural market. Today, Agrifert is the leading supplier/distributor of natural and sustained release fertilisers and biostimulants in Tasmania.

"Being locally owned, we understand the needs of our farming community and we want the best outcomes for their business. We work with farmers to provide solutions to suit their needs, including taking into account environmental and economic challenges that arise," said Nick.

Agrifert has been supplying the full range of BioAg products to Tasmania's dairy, beef and horticultural industries for almost two decades.

Tasmanian agriculture has a reputation for producing pristine clean and green products in an unspoilt environment, and BioAg products are a perfect fit for our clients' farming practices.

"Our website has terrific feedback from clients on BioAg products, how they use them and what results they are getting, so it's not surprising why we have had a long-term relationship with the BioAg team - great product and great people," concluded Nick.

agrifert.com.au

NZ pasture trial – significant results

An independent and ongoing trial commenced by AgScience Research in 2021, continues to demonstrate statistically significant growth and yield responses in low rainfall zones with the application of *BioAgPhos (BAP)*, lime and various rates of *Soil & Seed*.

Previous research and market perception is that Reactive Phosphate Rock (RPR) fertilisers are only effective in year one where rainfall is above 850mm, or by year 4 when rainfall is over 700mm. Additionally, there is a prevailing view that applying lime with RPR fertilisers will make the RPR ineffective as a fertiliser.

The trial was undertaken in the Mackenzie basin on the south island of New Zealand. A total of 516.5mm of rain was recorded in the district over the eight-month period, which is typical for this low rainfall area.

BAP in combination with lime and sulphur, to provide the phosphorus, significantly increased the dryland pasture production and positively changed species composition pasture (see photos below).



Scan to read more about the trial on our website.



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