



## Know Your Stuff With Dr Will Talbot

---

# What's so Super about Superphosphate?

### Key Points

- Phosphorus (P) and sulphur (S) are essential for the growth of plants and animals, making them essential for productive farming systems.
- Most soils in New Zealand are naturally low in plant-available P and S, which can limit pasture growth due to deficiencies.
- Superphosphate is a cost-effective source of plant-available P and S, addressing these potential deficiencies and leading to significant increases in both plant and animal production.
- Long-term fertiliser trials, such as those at Ballantrae and Winchmore, have demonstrated substantial increases in pasture growth and clover levels, resulting in higher animal production and increased earthworm numbers under Superphosphate application.
- For over a century, Superphosphate has been a cornerstone of New Zealand agriculture for these very reasons.

## Introduction

The vast majority of NZ soils are naturally low in plant available phosphorus (P) and sulphur (S), two nutrients essential for plant and animal growth. So, why are P and S so important for plants and animals?

Phosphorus is essential for all life on Earth. Our teeth and bones contain significant amounts of P. All living organisms use P to transport energy between and within cells. It's literally in our DNA, and every living cell has a P-containing membrane that separates it from its surroundings.

Sulphur is also essential to all living things. One of its most important functions in both plants and animals is its involvement in protein synthesis. Sulphur is a component of three S-containing amino acids, which are the building blocks of protein. Protein is crucial for producing our high-quality meat, milk, and wool.

## What Impact Does Applying P and S Have on Pasture and Animal Production?

Lucky for us, there is a plethora of field trials demonstrating the effects Superphosphate (P+S) has on pasture production, clover content, and earthworm numbers. One of the benefits of entering our second century of field trials!

## Pasture Composition/ Clover Content

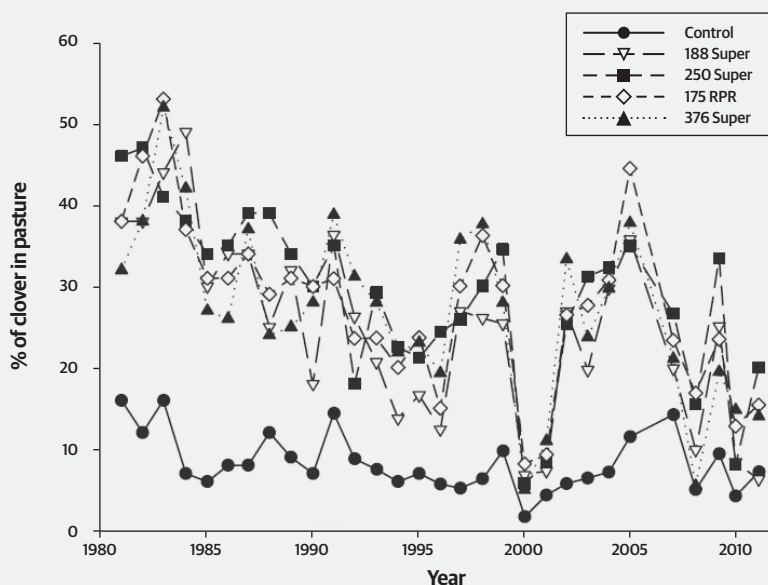
Clovers are the basis of our pastoral agricultural system in NZ. They fix nitrogen (N) from the atmosphere, which is then recycled through our animals into our soils, fueling our pasture growth.

If you go out into your paddock and pull out a clover plant and a grass plant, you'll notice that the grass root system is more voluminous than the clover root system. This allows grasses to be better at scavenging for nutrients, making them more

competitive than clovers in low fertility environments. So, how do we tip the scales in favor of our friend, the N-fixing clover? By providing them with a higher fertility environment, where the competitive advantages of the grass root system are minimized!

As you can see below, applying superphosphate to paddocks consistently results in much higher clover percentages compared to no fertiliser treatments. At the Winchmore long-term trial, the superphosphate treatments had approximately 25% clover in the sward, while the control averaged below 10% clover.

Effect of phosphate fertiliser application on clover content in the summer (January) sward for the period 1980-2011



**Applying superphosphate has been shown to help high-fertility grasses, such as ryegrass, and clovers thrive in competition with lower-fertility grasses like browntop, crested dogstail, and various weed species. This means better quality feed for your stock and more N entering your system via clovers to fuel pasture growth.**





## Pasture Production

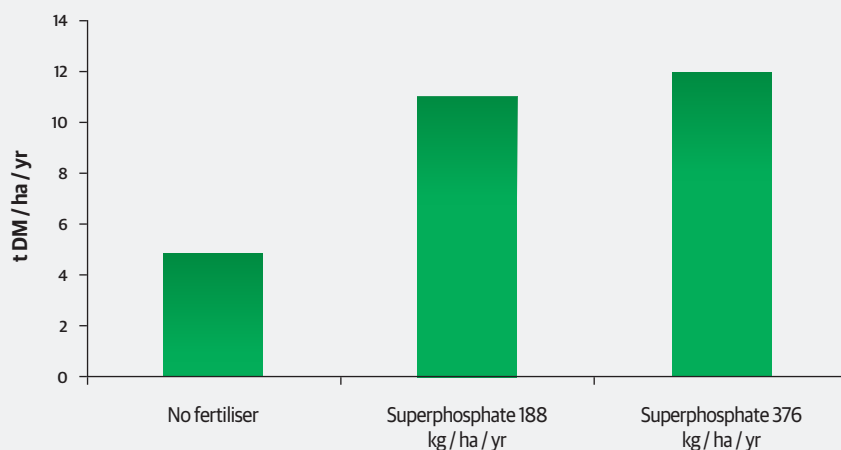
So, what happens when we apply superphosphate (P + S) and provide plants with the nutrients they need for growth? The example below shows that superphosphate fertiliser treatments resulted in an average growth of 11-12 t/ha, over a 31-year period, which is double that of the no fertiliser control at 5 t DM/ha. This clearly shows the potential increase in pasture production by addressing the P and S deficiencies that were holding the pastures back. This means more high-quality pasture for your stock.

It's important to note that there was no difference in this system between the 188 kg Super/ha

(Olsen P ~20) and the 376 kg Super/ha (Olsen P >40). This shows that at an Olsen P of around 20, P was no longer the limiting factor for pasture growth

in this situation. This highlights the importance of soil testing and applying the right rate of P to maintain the optimal Olsen P level for your farm system.

Mean Annual Dry Matter Production 1952 - 2002



## Higher Growth Throughout the Season

The example below highlights how superphosphate affects pasture growth throughout the season. As you can see, there is significantly more growth in spring, autumn, and winter in the high soil fertility (Olsen P >25) farmlet compared to the low soil fertility (Olsen P <10) farmlet. This high fertility pasture growth curve aligns much better with animal demand.



## Earthworm Numbers

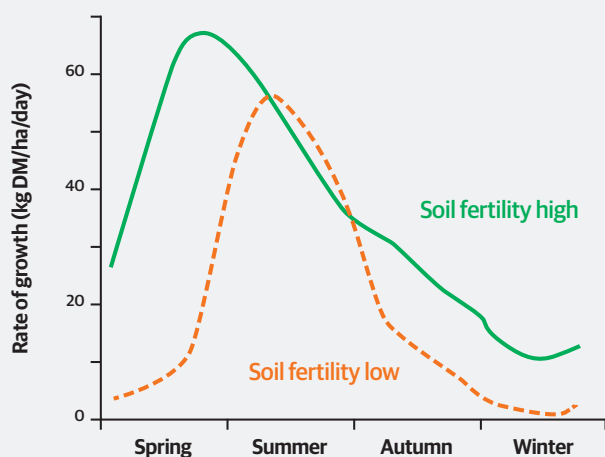
A common myth you may have heard is that superphosphate kills earthworms. Well, if you drop a 1-tonne bag on them, then yes. However, in paddocks where superphosphate has been applied, earthworm populations actually increase. Why is that? Growing more pasture with superphosphate increases dead litter and dung return, which is food for the earthworms.

Additionally, earthworms thrive in soil with a pH of 5.6-6.2, so remember to lime your soil when necessary. Fortunately, superphosphate doesn't directly acidify the soil. However, as you grow more grass and produce more product, you will indirectly acidify the soil more quickly.

## Is Super Old Fashioned?

Why has superphosphate been a staple of New Zealand farming for so long? Why hasn't it been replaced after all this time? Even though years have passed, the fundamental principles of soil chemistry and plant physiology have stayed the same. Superphosphate remains the most cost-effective source of P and S for plants, making it an enduring choice for New Zealand farmers. Despite extensive research into alternatives, just because something is old doesn't mean it's not the best choice – after all, we still use the round wheel that was developed thousands of years ago!

How superphosphate affects pasture growth throughout the season.



Earthworm numbers under different treatments.

