



Soil - Pasture - Livestock - Profit

10/12/2020
Mr. Chris Black
General Manager
Wingham Beef Exports
PO Box 13, Wingham NSW 2429

Dear Chris,

RE: Historical Soil Test Comparison 2010 – 2020

Please see a detailed soil test comparison for the three representative sampling areas of LHS Flat, RHS Flat and Ridge at Glenyarra. Bare in mind there is some error to be allowed for year-on-year; but the overall trends are what we are looking at.

Regards

Matt Thompson
MNC Agronomy Pty Ltd

Disclaimer

The recommendations made in this report are based only on information available at the time of writing, and the success of implementation is reliant on many management and environmental factors out of the control of MNC Agronomy Pty Ltd. MNC Agronomy Pty Ltd does not have any detail of the current management practices and prevailing pasture status, and as such will not be liable for any damages suffered as a result of implementation of any of these recommendations.

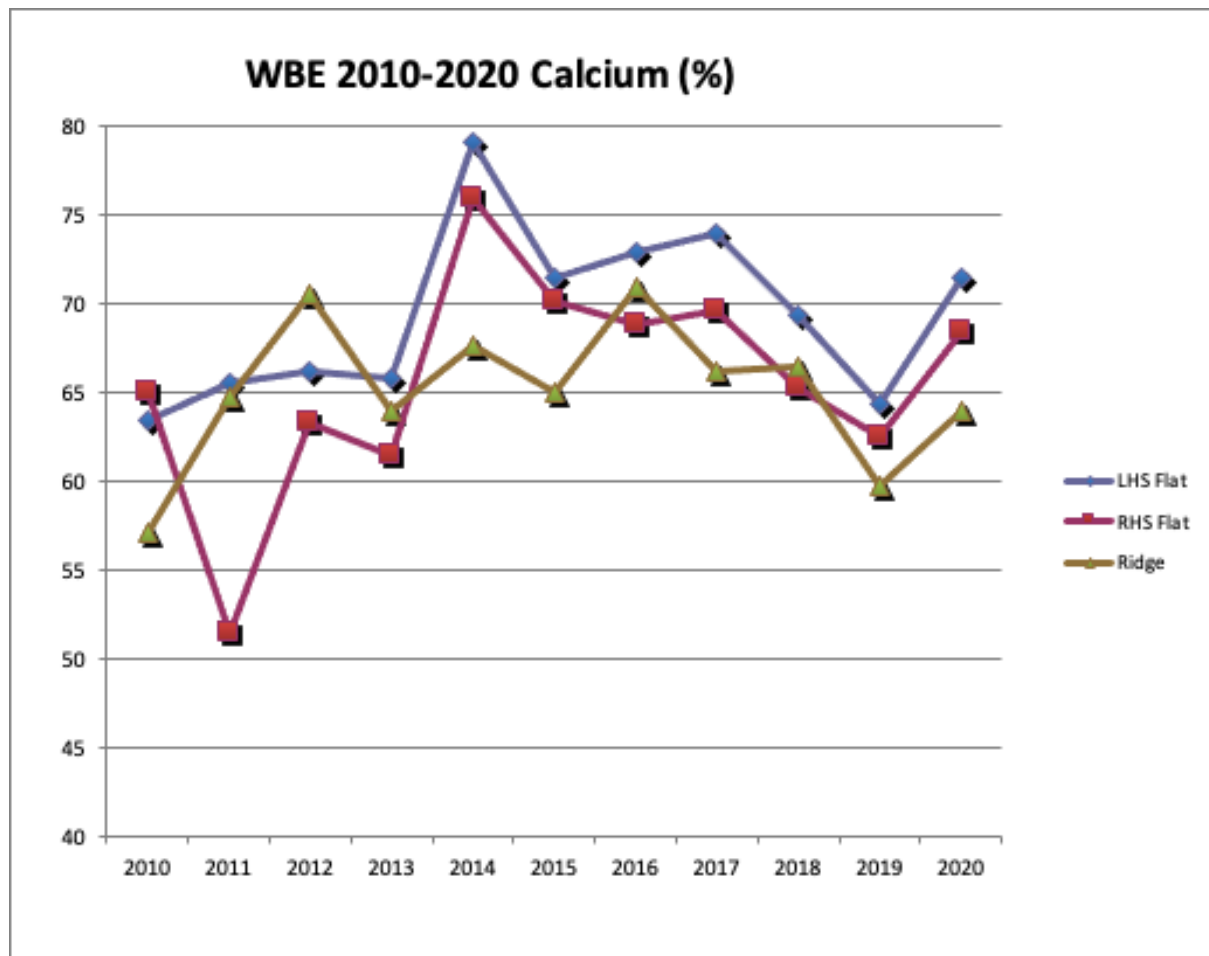
If more specific information and/or advice are sort after, MNC Agronomy Pty Ltd recommends engaging its services to carry-out a specific and detailed audit of its current soil, plant and livestock system, thereby allowing for more specific and detailed recommendations.

Key Soil Health Comparisons

1. SOIL STRUCTURE

Calcium (%) (target = >68%)

Calcium (Ca) is a major contributor to soil structure and the plant availability of all 16 other essential nutrients. It is also involved in the proper functioning of growing points (especially root tips), maintaining strong cell walls, and legume growth. In a high water/irrigation input system, such as this, Calcium levels are continually being depleted and replacement of soil calcium is a major contributor to yields and productivity. The higher the N, Na and K levels inputs (through irrigation) the increased need for Ca input.

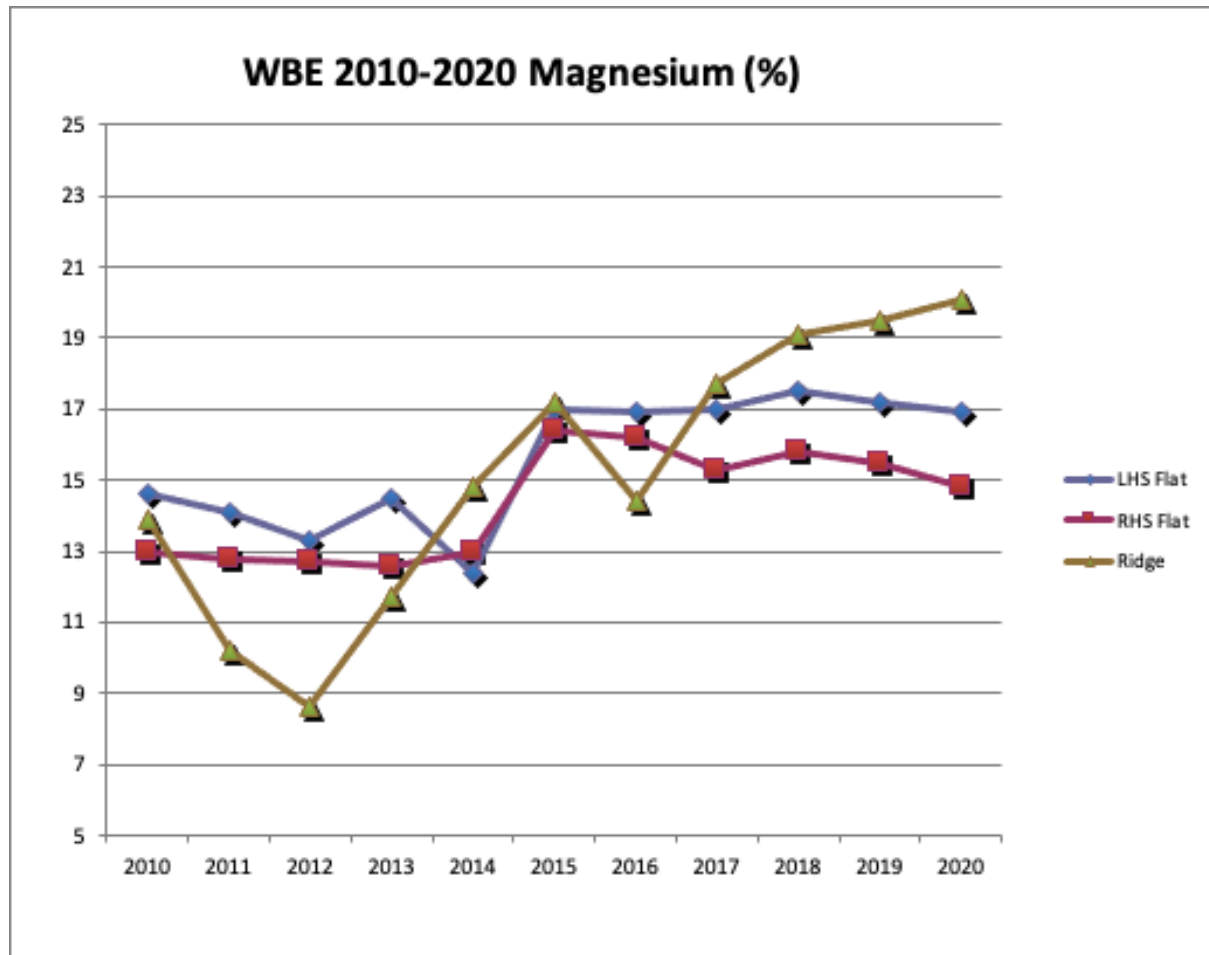


Calcium input last year, in the form of a CalciPrill, has reversed the slight decline in soil Calcium percentage. This ensures friable soil structure, improved root development and Phosphorus is available to growing pastures rather than just building up in the soil with poor utilization. The Ridges are still slightly Calcium deficient, so a small application when over sowing pastures in autumn is recommended. Recommendations are:

Irrigated Ridges - drilled or spread with ryegrass based pasture in April 2021 CalciPrill @ 100kg/ha

Magnesium (%) (target = <18%)

Magnesium (Mg), along with Calcium, is a major contributor to soil structure. Magnesium levels need to be in adequate proportions in relation to Calcium to ensure a friable soil structure with good water holding capacity and a low propensity to waterlogging and Sodium retention. It is also an essential component of chlorophyll and is required for the transport of phosphorus around the plant.



Historic Magnesium levels were low, but levels improved gradually until 2015. Current soil analyses show soil Magnesium levels are excellent in proportion to Calcium. Improvement in the right direction has been made in all paddocks. However, we need to be mindful that levels can become excessive and cause a tight soil structure, hence the Calcium application required on the ridges to offset this.

Sodium (%) (target = <5%)

Sodium (Na) is needed in relatively small amounts by growing crops compared to most of the other macro-cations. Excessive Na causes plant water regulation deficiencies, particularly in relation to K%. It also causes other plant metabolism issues, such as reducing plant root uptake of Nitrogen (for example). Na retention in the soil is generally proportional to soil Mg levels, therefore reducing soil Mg% to less than 20% is desirable to reduce soil retention of Na.

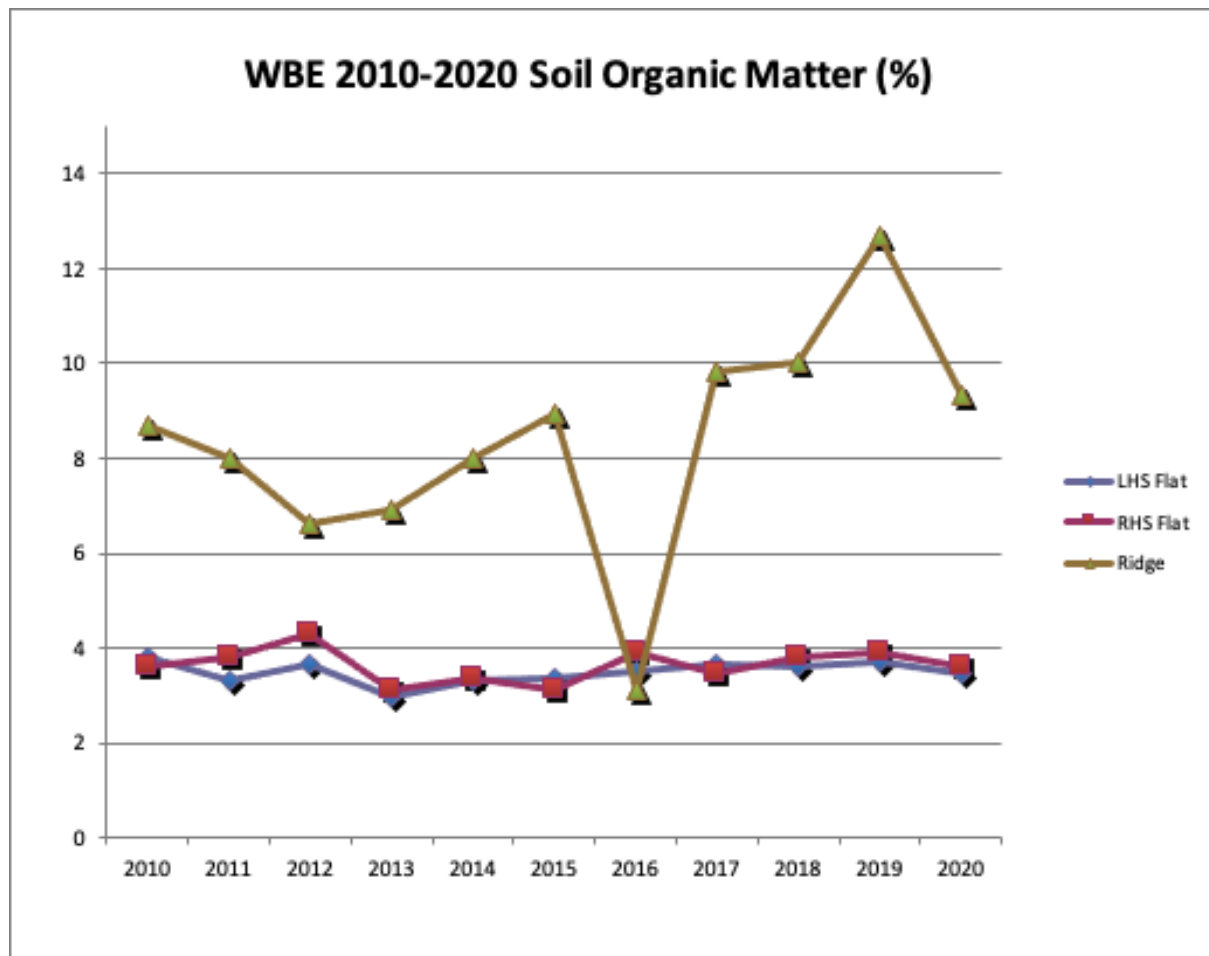
WBE sodium levels are largely a function of annual rainfall. Levels have fluctuated year-on-year, with wetter years (i.e. less irrigation per hectare) highlighting lower Na%, but years like this, Na levels on the LHS flat and Ridge have elevated. Calcium (lime) will offset Na, and the largest negative is reduced Potassium (K) uptake by plants when Na is higher in %.

Na input in effluent is an issue, but as long as K is in equal or greater proportions than growth will not suffer. It is important to note that subsoil Na levels are much less than surface, which highlights a concentration in the soil surface due to increased irrigation the past 12 months during the drought.

The calcium recommendations above largely address the Na, whilst rainfall will see the concentration of Na in the surface reduce as it is spread deeper into the profile. It is important that we keep K levels up in the lucerne paddocks in particular, as this is the key driver to production.

Organic Matter (OM%) (target = >3%)

Soil organic matter is the other key factor in soil structure. Organic matter (dead or decaying plant or animal material) is essential to improve several soil functions; surface water penetration, water holding capacity, nutrient holding capacity, humus production, nitrogen utilization, microbial activity; the list goes on.

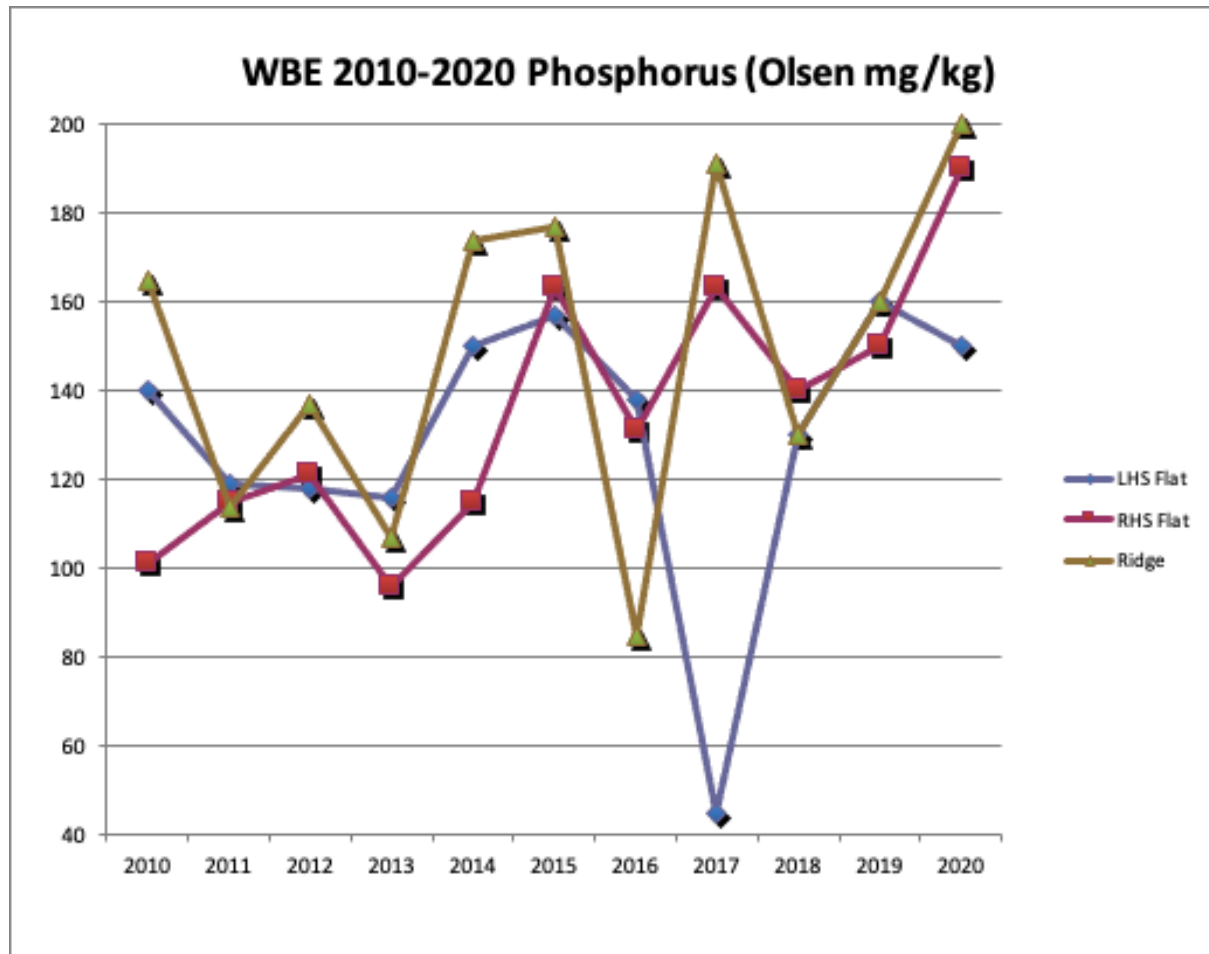


Ridges are naturally high in OM due to the kikuyu based pasture proving year-round groundcover. One negative to the straight Lucerne stands on the flat is there is little recycling of OM backing into the soil, so over time OM levels will reduce. We have some options to address this, including applying composted materials, but they also can further increase soil P levels which is undesirable. My recommendation is to oversow the Lucerne stands with either cocksfoot or tall fescue as they are coming towards the end of their production. These deep-rooted grass species can fill the gap between the thinning Lucerne, effectively turning them into a semi-permanent pasture for 2-3 years, then ideally grazed with stock to help with the recycling process and reverse the trend. The example of this is the Centre flat at the moment, which should stay like this now for two summers, before being renovated back to a straight Lucerne stand in late winter 2022.

2. MAJOR NUTRIENTS

Phosphorus (Olsen, ppm) (target = >25ppm)

Phosphorus (P) helps run the 'power station' inside every plant cell and has a key role in energy storage and transfer. Phosphorus is necessary for all growth processes and for the nodulation of rhizobia bacteria and nitrogen fixation.

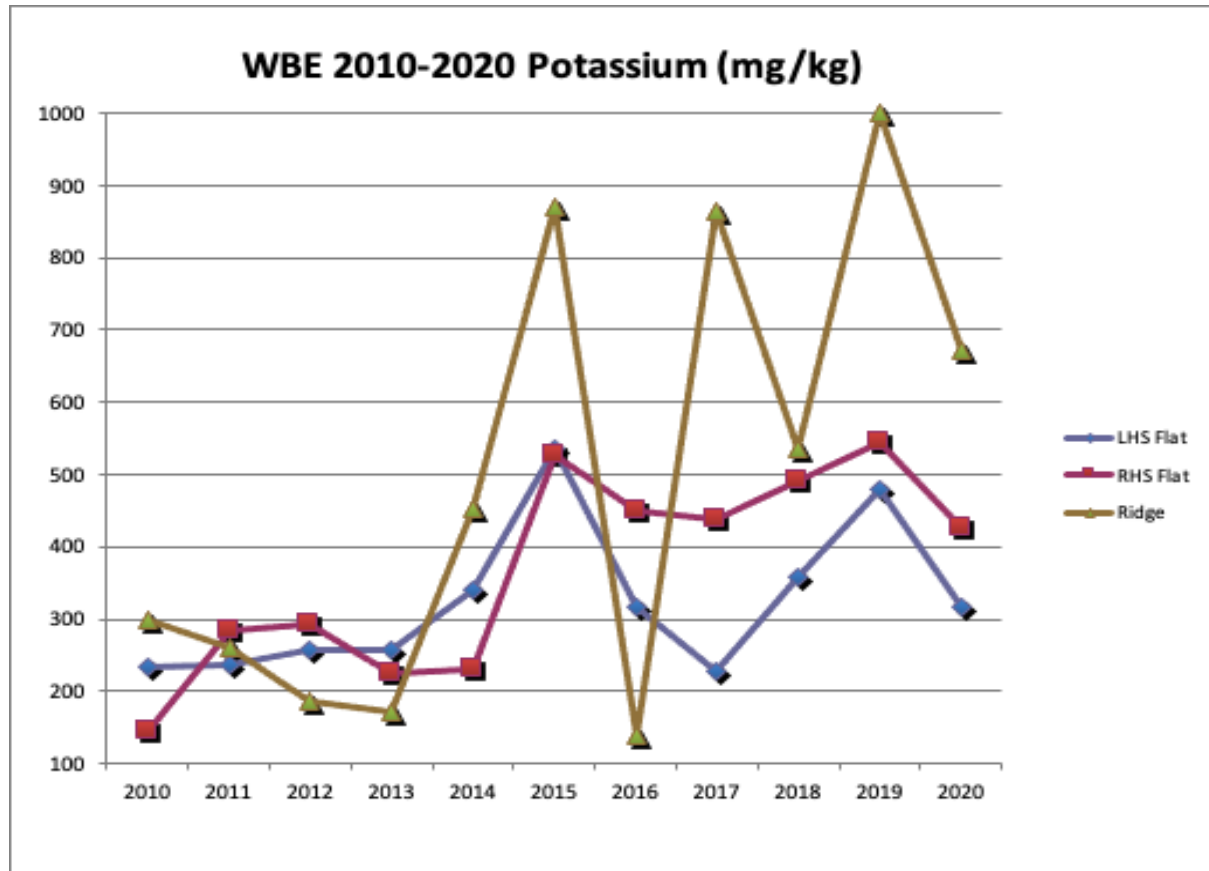


Phosphorus levels have always been high on all irrigation areas at Glenyarra. However, availability has been an issue due to tie-up issues. Plant available P has steadily increased as soil structure has improved. There has been some fluctuation year-on-year in terms of the samples, but all levels have been within a range of 100-170 generally, and as long as we continue to grow healthy, deep-rooted pastures (such as lucerne) the risk of any Phosphorus movement out of the soil is minimal. It is important to note the 30—40cm reading for the RHS flat has low soil P levels, as levels gradually decline to this point.

No P inputs are required in the future.

Potassium (ppm) (target = >5%)

Potassium (K) is needed for a wide range of important processes within the plant, including cell wall development, flowering and seed set. Potassium has a key role in regulating water uptake and the flow of nutrients in the sap stream of the plant. It helps legumes fix nitrogen and also helps the plant to resist stress from weather, insects and diseases. Excessive plant Potassium is undesirable to grazing livestock; reducing palatability as well as nutritional value, and will cause animal health issues in severe cases.

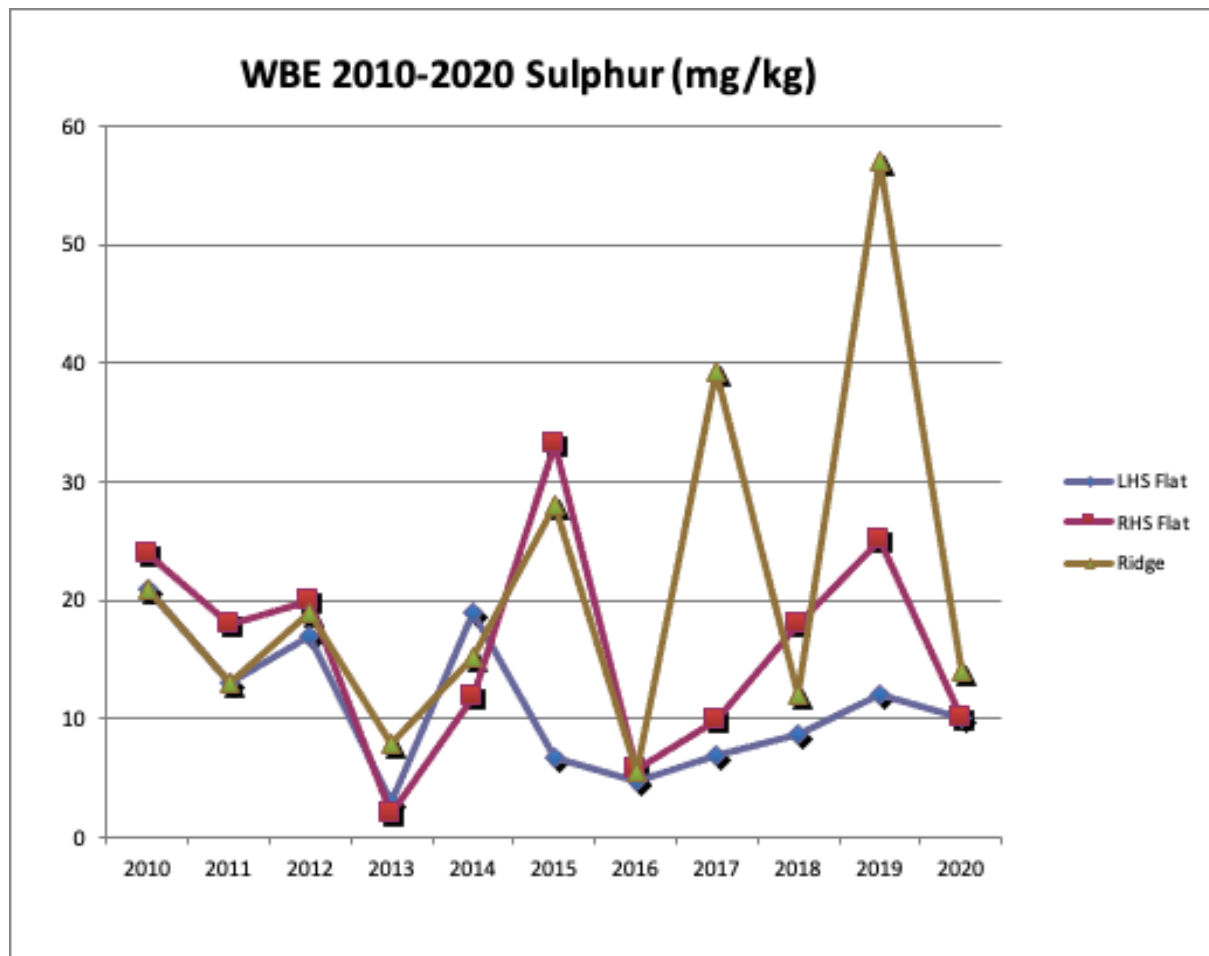


Potassium is a key nutrient in water use efficiency, particularly in proportion to Sodium. Ridge levels have fluctuated year to year; this fluctuation is due to a shallow soil type that struggles to hold Potassium during waterlogging events, hence high levels last year (18 months of no heavy rainfall) and lower levels this year (after heavy rainfall in February/March). Flats are much more consistent due to the deep, alluvial soil. Potassium is continually removed with hay and silage, and largely recycled with grazing stock. The Potassium levels are slightly low in LHS and RHS Flats, so one application this summer is advised as per the following recommendations:

An annual application of SOP to all lucerne stands @ 100kg/ha is recommended for January 2021 following the next cut, and it is important to note low K levels in the subsoil of RHS flat means we may see some deficiency symptoms towards the end of summer if large cuts are harvested from the lucerne, in which case a maintenance application (e.g. SOP @ 100kg/ha) may be required.

Sulphur (ppm) (target = >20ppm)

Sulphur (S) is required for the formation of several amino acids, proteins, and vitamins and for chlorophyll production. It also helps the plant to resist stress from weather, insects and diseases. Sulphur is highly leachable and tends to be depleted in wet years or following waterlogged conditions.



Sulphur levels have plateaued now after they increased across all paddocks over the previous 4 years. The fluctuation in S on the ridges is very similar to the Na and K fluctuation; weakly charged elements that are very mobile will fluctuate year-on-year dependent on rainfall. S have been a limitation to production on the flats in recent times (very low levels in irrigation water) hence the input in the form of SOA (at sowing of crops) and SOP (in the lucerne) to increase S levels. Again, the better the soil structure the better S utilization and plant protein production.

SOP will address the low S levels in the Lucerne on the flats. SOA (21:0:0:23) should continue to be used at sowing and/or topdressing of annual crops (Ridges, under dam wall and Centre flat) to ensure adequate S (and N) levels to drive growth. Recommendations will vary from crop to crop as required.

3. MICRO NUTRIENTS

The micronutrients or trace elements, include Molybdenum (Mo), Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe), and Boron (B). Although only required in small amounts, minor nutrients (micronutrients, or trace elements) are essential for plant growth and livestock health. These nutrients often act as catalysts in chemical reactions.

Plant tissue tests are far more reliable than soil tests for assessing what was available for plant uptake, but even these are not always correct and must be taken at the appropriate times of the year to increase their accuracy and reliability.

Some of the micronutrient deficiencies in plants can cause nutrient deficiencies in the animals that graze those plants. In some cases (for example, copper and manganese), these micronutrients are also essential for plant growth. In other cases (for example, selenium), they are not required by the plant. Thus, in many cases of animal nutrient deficiency, it may be better to treat the animal rather than to apply fertilisers to pastures to overcome the problem.

Iron (ppm) (target = <70ppm)

Iron (Fe) is associated with the production of chlorophyll and helps to carry oxygen around the plant cells. Iron is also involved in reactions that convert nitrates to ammonia in the plant.

Soil Iron levels historically have been moderate to high across all areas, which is common in this area. Maintaining improved Ca levels through liming will ensure the high Fe levels have minimal effect on P, Zn and Cu availability. WBE soil structural improvements have seen a reduction in soil Fe levels with a positive effect on plant P availability, So generally Fe is not of concern to production.

4. Summary

- Key soil structural indicators Calcium and Magnesium have improved slightly since last year and are still in a good zone. Maintenance required on the Ridges.
- Soil structurally; increasing Organic matter (Ridges) is a sign of a healthy soil with improving nutrient and water holding capacity. We need to have a rotational pasture program on the flats to reverse OM decline which occurs with straight Lucerne stands that are cut for hay and silage regularly.
- Potassium (K) and Sulphur (S) levels are marginal and need to be applied strategically to ensure Lucerne health and production remain high.
- Soil Phosphorus (P) levels are high, but are within historical levels. Utilisation of deep-rooted perennials (i.e. lucerne) will ensure any movement of P into the soil profile is unlikely beyond 40cm.