

## Soil Program Recommendation

**Grower:** John Brown

**Consultant:** TNN Industries P/L

### Soil Test No: K0001

These comments and suggestions are based on our interpretation of soil analysis figures from your Norsearch soil test report. Our aim is to achieve a nutritionally well balanced, biologically active healthy soil, having optimum potential to grow any plants well. Crop specific nutrient applications are of most value when applied to well balanced healthy soils.

Norsearch's soil test is based on the Albrecht soil model in conjunction with a Reams test.

The Albrecht soil model is a well proven format of mineral balance using base level requirements of nutrients designed to build soils for the long term as well as feed plants in the short term. Adequate Calcium levels are the basis on which this format is built. A good soil pH is not considered as a means of achieving optimum fertility levels but more as a result of achieving optimum levels of Calcium, Magnesium, Potassium and Sodium, which will produce maximum levels of fertility for a given soil.

The Reams component of our soil test includes the Soluble Tests, Conductivity (Ergs) and Nitrate N test.

Soluble tests are determined by use of the Morgan Extract, sometimes referred to as the La Motte Extract because La Motte make and sell the extract. This test was developed by Carey Reams to simulate as close as possible, the availability for uptake by plants of the soil nutrients Calcium, Magnesium, Potassium, Phosphorus and Nitrate Nitrogen.

Conductivity (Ergs) is a measure of soil energy release equal to grams/sec, indicating whether or not there is enough energy reaction going on in the soil to grow good plants.

Ammonium Nitrate test, which is recommended by Carey Reams, is only run if specifically asked for, as there is no way of determining how much Ammonia is from fertilisers versus biological life, causing false and confusing test results, where Ammonium fertilisers have been used.

## General Comments

Your soil CEC (Cation exchange Capacity) is in the heavy soil type range. The exchange capacity of 33.1 indicates an increased amount of clay and a substantial nutrient holding capacity which requires larger quantities of added nutrients to change their relative levels in the soil. The “Base Saturation” of a given soil, is the specific percentage of nutrients that grows crops best, i.e. “Desirable Levels” of “Percentage Base Saturation” in your soil report. True soil balance is achieved by adding the required amount of each nutrient to achieve the desired level indicated for that soil type, an excess of a given nutrient will complex and cause a deficiency of another nutrient needed for proper plant nutrition. Fertility is the balance between elements in a biologically active soil.

Low Calcium is causing an imbalance and limiting your soil fertility. A good pH level is the product of balancing the CEC “Base Saturation Percentages” of Calcium, Potassium, Magnesium, Hydrogen and Sodium as per their desirable levels for a given soil CEC. As the Calcium concentration is increased, so is efficiency in getting other nutrients into the plant.

As Calcium levels are raised with introduction of lime to the soil, adequate and low Magnesium levels will be pushed down. A desirable Ca/Mg ratio is the key to good soil structure, enabling air and water movement through the soil profile and is vital for microbial proliferation and activity.

Your test indicates a low level of Potassium which is vital to photosynthesis, essential in protein synthesis, necessary for the formation of sugars and improves water use efficiency. It can increase yields, improve crop quality and reduce disease.

Phosphorus is a limiting factor in your soil and will need building to achieve good yields and quality. Plant growth and health is reliant on Phosphorus for its function in respiration, cell division and growth, sugar and starch formation, uptake and movement of nutrient in the plant. Good Phosphorus levels in the plant help to maintain high sugar and protein content which can ward off insect attack.

A less than desirable biological activity is evident, signified by high Organic Matter and low plant available nutrient conversion from reserve nutrient levels, i.e. “Ammonium Acetate and Bray 2 Test” figures compared with “Soluble Test” (Reams) figures in your soil report.

Low pH and the associated soil acidity will be limiting biological presence and activity in your soil.

Nitrate N figure indicates Nitrate Nitrogen levels at the time of taking the soil samples, this level can quickly change, depending on rain, temperature and other environmental changes. Nitrate N is the main form of nitrogen taken up by a plant, it is not stable in the soil, easily leached and moves up and down in the soil profile. Therefore the lab extracted Nitrate N can be considered as a snap shot of this form of nitrogen at the time of sampling.

Low tests are to be expected at the end of the cropping period, during winter and early spring, and after a period of heavy rainfall. Under such conditions, when all other factors are favourable, the absence of nitrates may not necessarily indicate poor availability of soil nitrogen. However, the crop is apt to respond to the addition of a readily available nitrogenous fertilizer.

High conductivity as indicated in your soil can be due to an excess salt content. High ERGS (Energy Release per Gram of Soil. Established by Carey Reams), can dehydrate plant rootlets This condition can be reduced as the soil is brought closer to a desirable balance.

Low total nitrogen relative to an adequate level of total carbon is causing an unfavourably wide carbon/nitrogen ratio in this soil. There is ample organic matter available for microbial food, but decomposition by microbial activity is less than desired. The level of nitrogen required for good plant growth and the proliferation of microbial life is not there, a supplementary nitrogen supply is needed to boost this process. While Nitrate nitrogen level might be adequate, it only represents a small fraction of the total soil nitrogen (1% approx), it is a form of nitrogen produced from biological activity which is taken up by plant roots. There are an hundred or more nitrogen forms that go to make up total soil nitrogen.

Some trace elements are low and availability will be reduced because of low soil biology. These trace element deficiencies can be reduced with the application of tracelime, monitoring of trace levels is advised.

Your Soil Labile Carbon (active carbon) level is 2.15% which represents 23.4% of the Soil Total Carbon level. This test gives an indication of active carbon that is cycling through the soil, which is closely associated with the active Microbial Biomass, for this reason it varies up or down depending on soil management practices and is a guide to soil sustainability. An approximate average for the labile carbon percentage range of total carbon is 25-30 %.

Fulvic and Humic acids can play a significant part in improving this soil. Fulvic for its ability to penetrate and increase soil aeration, promote root growth and enhance soil structure. Humic acid or Humates for their ability to increase soil humus content, to buffer or protect plant roots from nutrient excesses and to promote the conversion of Phosphorus and other elements into plant available form by enhancing soil biology.

Audit of fertilizer requirements to raise deficient nutrients to desirable levels in this sample.

	A
Calcium	3885 kg/ha
Magnesium	98 kg/ha
Phosphorus P	49 kg/ha
Potassium K	174 kg/ha
Zinc	8.6 kg/ha
Manganese	46.2 kg/ha
Copper	0.8 kg/ha
Boron	2.0 kg/ha

**Recommendations:**

Calcium is the first consideration when planning a soil improvement program. TNN TraceLime is an evenly ground, highly concentrated Calcium source, incorporating a full range of micronutrients, more suited for long term calcium remediation. The fineness of particle size together with the infused nutrients, makes the availability of this lime much faster and more complete than normal Aglime.

Fish emulsion is a natural nitrogen rich food source for soil microbial life, it enhances microbial activity which promotes cellulous (crop residue) decomposition to form humus. Fish oil, which is a component of fish emulsion, is an excellent food source for beneficial soil fungi.

K Humate for its ability to increase water and nutrient holding capacity, improve soil aeration, increase Carbon content and enhance microbial activity. Humic acid buffers salt, insulating the plant and biological life from the toxic effects of elements in excess and high salt conditions.

Urea Supreme, an humate coated form of urea that ensures optimum plant utilisation by soil application of this product. The humate coating reduces volatilization and enables a slower release of nitrogen.

Formula 1 microbial soil rebuild is a concentrated microbial compound including an initial food source, based on bacillus bacterium, designed to increase and enhance microbial presence and activity in the soil. This will boost organic matter decomposition, thereby increasing the all important soil humus content and in turn, nutrient availability for plants.

FCMP (Fused Calcium/Magnesium Phosphate), Rock Phosphate or MAP is recommended as a starter and long term source of phosphorus. Your base Phosphorous levels will need to be built over time.

Low Potassium levels would best be addressed with the addition of liquid Potassium Humate if deficiency is marginal. If solid application is preferred, Potassium Sulphate or Potassium Nitrate is the recommended source. Avoid Potassium Chloride (Potash) if possible, as the chloride can be very harmful to soil biology.

We recommend regular soil testing to monitor nutrient levels and establish a fertility improvement trend.

**Suggested Applications in Order of Priority**

	A
TraceLime	1000 kg/ha
FCMP	150 kg/ha
Potash	80 kg/ha
Urea Supreme	50 kg/ha
Formula 1	30 kg/ha

**Suggested Liquid Applications in Order of Priority**

	A
K Humate	10 ltrs/ha
Fish Emulsion	15 ltrs/ha

**Suggested Long Term Program**

	A
TraceLime	1000 kg/ha
FCMP	150 kg/ha
Potash	80 kg/ha

Rates can be varied to suit budget, consult your TNN representative

**Further Comments:**

The above recommendations are based on your soil fertility and have not been developed for specific crops. “Good soil” will grow any crop well. Your crop fertility program should be reviewed in conjunction with the above recommendations.

Please remember that the aim is to build the soil over time, to spread out the cost and add in foliar fertilizers to overcome what is lacking while the soil fertility is being built.

**Disclaimer:**

“The above program is not intended to be exhaustive and will be effected by soil variations, testing error and seasonal factors. Any recommendations should be viewed and acted upon as part of an ongoing fertility program. No responsibility can be accepted by the company in respect of consequences of any of the above matters or other matters beyond our control.”

**Sample No:** 4138  
**Ref:** JA4542/9  
**Sampled At:** House  
**Date Sampled:** 21/04/08  
**Crop:** Pasture  
**Soil Type:** Loam/Dk Brwn      **Hectares:** 35

**Soil Analysis by**  
**NORSEARCH LTD**  
 Environmental Analysis Laboratory  
 Military Rd. East Lismore. NSW 2480  
 P.O. Box 5152  
 Ph: 02 6620 3335

	Nutrient		Laboratory Analysis Data		Evaluation		
					Units	Results	Desirable
Soluble Tests Reams	Calcium	Ca	ppm	1292.6	Kg/Ha	2585	3803
	Magnesium	Mg	ppm	271.9	Kg/Ha	544	529
	Phosphorus	P	ppm	6.4	Kg/Ha	13	86
	Potassium	K	ppm	178.4	Kg/Ha	357	387
Calcium/Magnesium Ratio					Ratio	4.8:1	7:1
Ammonium Acetate & Bray P <sub>2</sub>	Calcium	Ca	cmol <sup>+</sup> /kg	14.10	Kg/Ha	5638	9523
	Magnesium	Mg	cmol <sup>+</sup> /kg	3.56	Kg/Ha	854	952
	Phosphorus	P	ppm	61.55	Kg/Ha	123	172
	Potassium	K	cmol <sup>+</sup> /kg	0.77	Kg/Ha	600	774
	Sodium	Na	cmol <sup>+</sup> /kg	0.43	ppm	100	114
Water Soluble Tests	Nitrate	N	ppm	78.93	Kg/Ha	158	30
	Sulphate	S	ppm	56.39	Kg/Ha	113	58
	pH (Water)		units	5.14	units	5.1	6.5
	Conductivity	Erqs	∞S/cm	339.00	∞S	339	200
	Organic Matter		%	16.05	%	16.1	5.5
	Aluminium	Al	ppm	18.74	ppm	19	<54
CEC	Cation Exchange Capacity		cmol <sup>+</sup> /kg	33.07		33.1	
Percent Base Saturation	Potassium	K	%	2.3	%	2.3	3.0
	Calcium	Ca	%	42.6	%	42.6	72.0
	Magnesium	Mg	%	10.8	%	10.8	12.0
	Hydrogen	H	%	42.6	%	42.6	6.5
	Sodium	Na	%	1.3	%	1.3	1.5
Micronutrients	Zinc	Zn	ppm	1.68	ppm	1.7	6.0
	Manganese	Mn	ppm	1.85	ppm	1.9	25
	Iron	Fe	ppm	363.95	ppm	364	100
	Copper	Cu	ppm	2.04	ppm	2.0	2.4
	Boron	B	ppm	0.95	ppm	1.0	2.0
	Cobalt	Co	ppm	4.52	ppm	4.52	5.0
	Molybdenum	Mo	ppm	0.33	ppm	0.33	2.0
	Selenium	Se	ppm	1.05	ppm	1.1	2.0
	Silicon	Si	ppm	69.2	ppm	69	50
	Labile Carbon		%	2.15	%	2.15	
C/N Ratio	Total Carbon	C	%	9.2	%	9.2	
	Total Nitrogen	N	%	0.66	%	0.66	
	Organic Matter/Nitrogen		Ratio	24.46	Ratio	24.46	18 - 25
	Carbon/Nitrogen		Ratio	13.97	Ratio	13.97	10 - 12/14

Sample No: K4138

