NTS
Nutri-Tech Solutions®

The value of soil testing

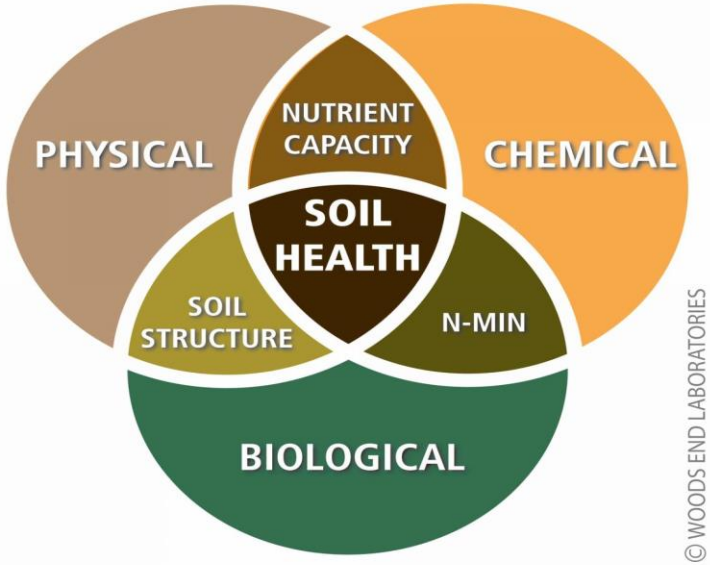
Marco Giorgio Rego

Crop nutrition should never involve guesswork.

Important tool for better understanding your soil's attributes and constraints, therefore we can monitor overall soi fertility

Understanding the data to determine critical shortages and limiting factors in our soils allows us to make accurate and effective recommendations of fertilisers and soil amendments.

Considerations: the **chemical** properties of the soil, **physical** and **biological** factors should also be considered in the interpretation of results and subsequent recommendations to obtain the highest productive potential of the soil.



Valuable information

- Assessing the current state of fertility of a new property to identify its suitability for the intended land use
- Determining the most suitable inputs and amounts of fertilisers and soil amendments to enable us to realise the optimum production capacity
- Monitoring the effectiveness of inputs and practices that have been employed
- Comparing well performing areas with poor performing areas to map different soil types and management practices

Different soil chemistry, different results!

DATE: 26/09/2019
NAME: NTS Farm
ADDRESS: C/- Marco

LAND USE: Garlic
PADDOCK: Garlic Top
SAMPLE REC: 18/09/2019
Email: marco@nutri-tech.com.au

P MONITORING ANALYSIS	VALUE
Phosphorus (Colwell)	37 ppm
P Buffer Index	81 Index
Phosphorus (BSES)	79 ppm
Organic Carbon (W.B.)	2.53 %

ALBRECHT CATEGORY	YOUR LEVEL	IDEAL LEVEL	NUTRIENT STATUS LOW / MEDIUM / HIGH
CEC	5.95		
TEC	7.83		
Paramagnetism	100	200 +	
pH-level (1:5 water)	5.70	6.3	
Organic Matter (IR Gas Anal.)	6.30 %	4 - 10 %	
Conductivity (1:5 water)	0.26 mS/cm	0.1 - 0.2 mS/cm	
Ca / Mg Ratio	4.10 :1	4.33 :1	
Nitrate-N (KCl)	90.3 ppm	10 - 20 ppm	
Ammonium-N (KCl)	19.1 ppm	10 - 20 ppm	
Phosphorus (Mehlich III)	52 ppm	50 - 70 ppm	
Calcium (Mehlich III)	793 ppm	1018 ppm	
Magnesium (Mehlich III)	116 ppm	141 ppm	
Potassium (Mehlich III)	151 ppm	122 - 214 ppm	
Sodium (Mehlich III)	135 ppm	9 - 27 ppm	
Sulphur (KCl)	67 ppm	30 - 50 ppm	
Aluminium (Mehlich III)	4 ppm	< 4 ppm	
Silicon ($CaCl_2$)	22 ppm	> 100 ppm	
Boron (Hot $CaCl_2$)	1.40 ppm	1 - 3 ppm	
Iron (DTPA)	102 ppm	40 - 200 ppm	
Manganese (DTPA)	21 ppm	30 - 100 ppm	
Copper (DTPA)	2.0 ppm	2 - 7 ppm	
Zinc (DTPA)	5.4 ppm	5 - 10 ppm	
Texture	Loam		
Colour	Brownish		
BASE SATURATION			
(Levels are not relevant in soils with a TEC below 5)			
Calcium	50.62 %	65.00 %	
Magnesium	12.35 %	15.00 %	
Potassium	4.94 %	4.00 - 7.00 %	
Sodium	7.52 %	0.50 - 1.50 %	
Aluminium	0.58 %	0.50 %	
Hydrogen	24.00 %	10.00 %	

LAMOTTE/REAMS CATEGORY	YOUR LEVEL	IDEAL LEVEL	NUTRIENT STATUS LOW / MEDIUM / HIGH
Calcium	587 ppm	1000 - 2000 ppm	
Magnesium	96.02 ppm	140 - 285 ppm	
Phosphorus	4.56 ppm	20 - 80 ppm	
Potassium	160.4 ppm	80 - 100 ppm	

Explanatory Notes: The La Motte test gives an indication of the amount of plant available nutrients at the time of sampling.

DATE: 26/09/2019
NAME: NTS Farm
ADDRESS: C/- Marco

LAND USE: Garlic
PADDOCK: Garlic Bottom
SAMPLE REC: 18/09/2019
Email: marco@nutri-tech.com.au

P MONITORING ANALYSIS	VALUE
Phosphorus (Colwell)	43 ppm
P Buffer Index	56 Index
Phosphorus (BSES)	70 ppm
Organic Carbon (W.B.)	1.72 %

ALBRECHT	YOUR	IDEAL	NUTRIENT STATUS
CEC	6.54		
TEC	7.97		
Paramagnetism	90	200 +	
pH-level (1:5 water)	5.90	6.3	
Organic Matter (IR Gas Anal.)	4.60 %	4 - 10 %	
Conductivity (1:5 water)	0.22 mS/cm	0.1 - 0.2 mS/cm	
Ca / Mg Ratio	3.50 :1	4.33 :1	
Nitrate-N (KCl)	27.0 ppm	10 - 20 ppm	
Ammonium-N (KCl)	4.4 ppm	10 - 20 ppm	
Calcium (Mehlich III)	887 ppm	1037 ppm	
Magnesium (Mehlich III)	152 ppm	144 ppm	
Potassium (Mehlich III)	133 ppm	124 - 218 ppm	
Sodium (Mehlich III)	104 ppm	9 - 28 ppm	
Sulphur (KCl)	57 ppm	30 - 50 ppm	
Chloride	0 ppm	16 - 23 ppm	Extremely Low
Aluminium (Mehlich III)	4 ppm	< 4 ppm	
Silicon ($CaCl_2$)	23 ppm	> 100 ppm	
Boron (Hot $CaCl_2$)	1.41 ppm	1 - 3 ppm	
Iron (DTPA)	135 ppm	40 - 200 ppm	
Manganese (DTPA)	16 ppm	30 - 100 ppm	
Copper (DTPA)	3.7 ppm	2 - 7 ppm	
Zinc (DTPA)	8.4 ppm	5 - 10 ppm	
Texture	Loam		
Colour	Brownish		
(Levels are not relevant in soils with a TEC below 5)			
Calcium	55.61 %	65.00 %	
Magnesium	15.88 %	15.00 %	
Potassium	4.27 %	4.00 - 7.00 %	
Sodium	5.69 %	0.50 - 1.50 %	
Aluminium	0.55 %	0.50 %	
Hydrogen	18.00 %	10.00 %	

LAMOTTE/REAMS CATEGORY	YOUR LEVEL	IDEAL LEVEL	NUTRIENT STATUS LOW / MEDIUM / HIGH
Calcium	649 ppm	1000 - 2000 ppm	
Magnesium	116.7 ppm	140 - 285 ppm	
Phosphorus	6.47 ppm	20 - 80 ppm	
Potassium	123.1 ppm	80 - 100 ppm	

Explanatory Notes: The La Motte test gives an indication of the amount of plant available nutrients at the time of sampling.

Soil sampling

- Sampling is the most critical step in the entire analysis process.
- It is essential to submit a sample that is representative of the one soil type.
- Soli properties can vary: Landscape (flatland, hillside, lowland or flat terrain); texture (clay or sandy); previous vegetation (pasture, commercial crop, virgin soil); and management history (soil amelioration and fertilisation).
- In general, the soil sample represents the arable layer of the soil (0-15 cm):
    - Which represents 1,500,000 kg of soil over 1 hectare
    - A proper soil test requires roughly 500 g of soil sample

Timeframe

A couple of months prior to planting

- Enough time to prepare the soil;
- Let the soil amendments do its work.

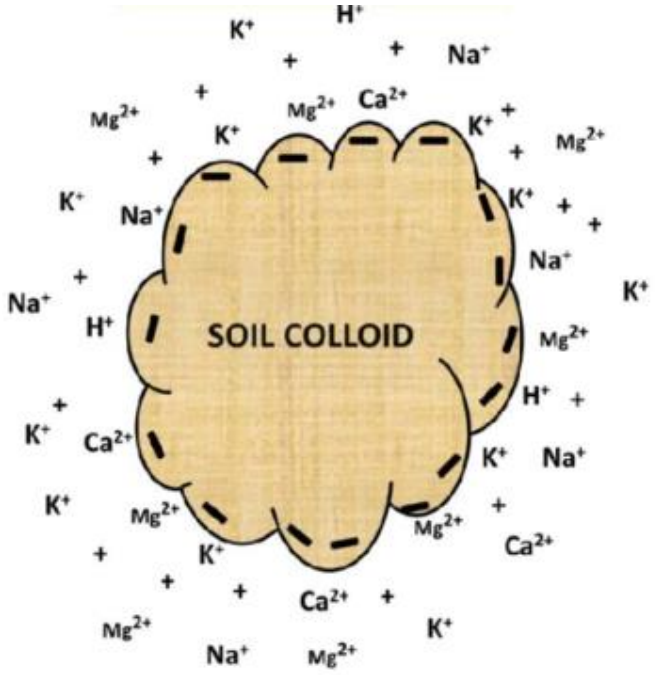
Comparative soil samples should be collected at the same time of the year

Extreme weather conditions should be avoided (i.e., not too wet and not too dry);

Different soil types should be analysed separately

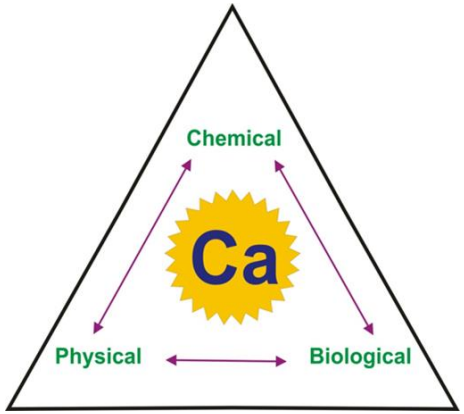
It is more representative to collect sub-samples from the same place in subsequent years

Balanced Base Saturation = Soil Health



- Soil is made up of **clay colloids** (as well as **sand** & **silt**).
- **Clay colloids** are **negatively** charged & are the major storage facility for **cations (bases)** in the soil.

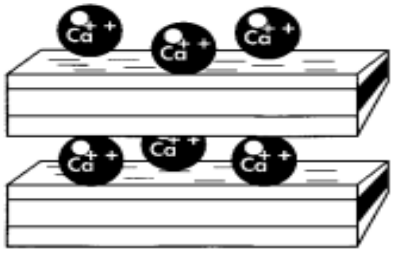
- Ca^{2+}: 60 – 70%
- Mg^{2+}: 10 – 20 %
- K^{+}: 3 – 7%
- Na^{+}: 0.5 – 1.5 %
- H^{+}: < 10%
- Al^{3+}: <0.5%



*The **balance of the major bases** has a huge impact on **physical, chemical** & **biological** properties in the soil, thus, **correcting nutrient ratios, particularly the Ca: Mg ratio** is a great first step to soil **structure improvement.***

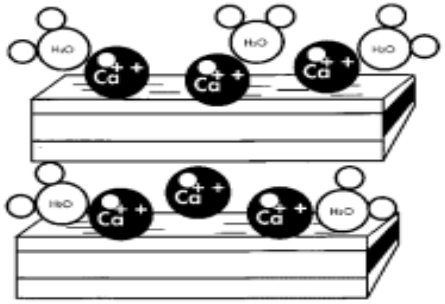
Effect of the Base Saturation on Soil Structure

non-sodic clay



In a non-sodic soil calcium is adsorbed onto the surface of the negatively charged clay particles. This is a small ion with a strong charge.

non-sodic clay and water

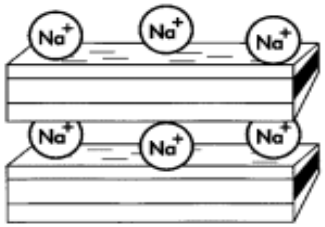


Water can enter between the platelets in a non-sodic soil, which leads to swelling. However, the binding forces between the particles by calcium ions are never completely overcome. The soil does not disperse.

- Flocculation
- Good Soil aggregates

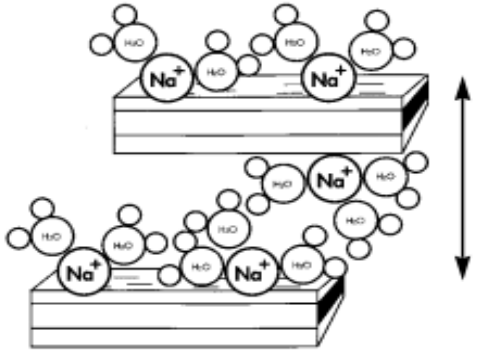
- Clay dispersion
- Prone to erosion

sodic clay (high ESP)



In a sodic soil, sodium, is adsorbed onto the surface of the clay. It is a large ion with a weak charge. The positive ions bind the negatively charged clay particles together.

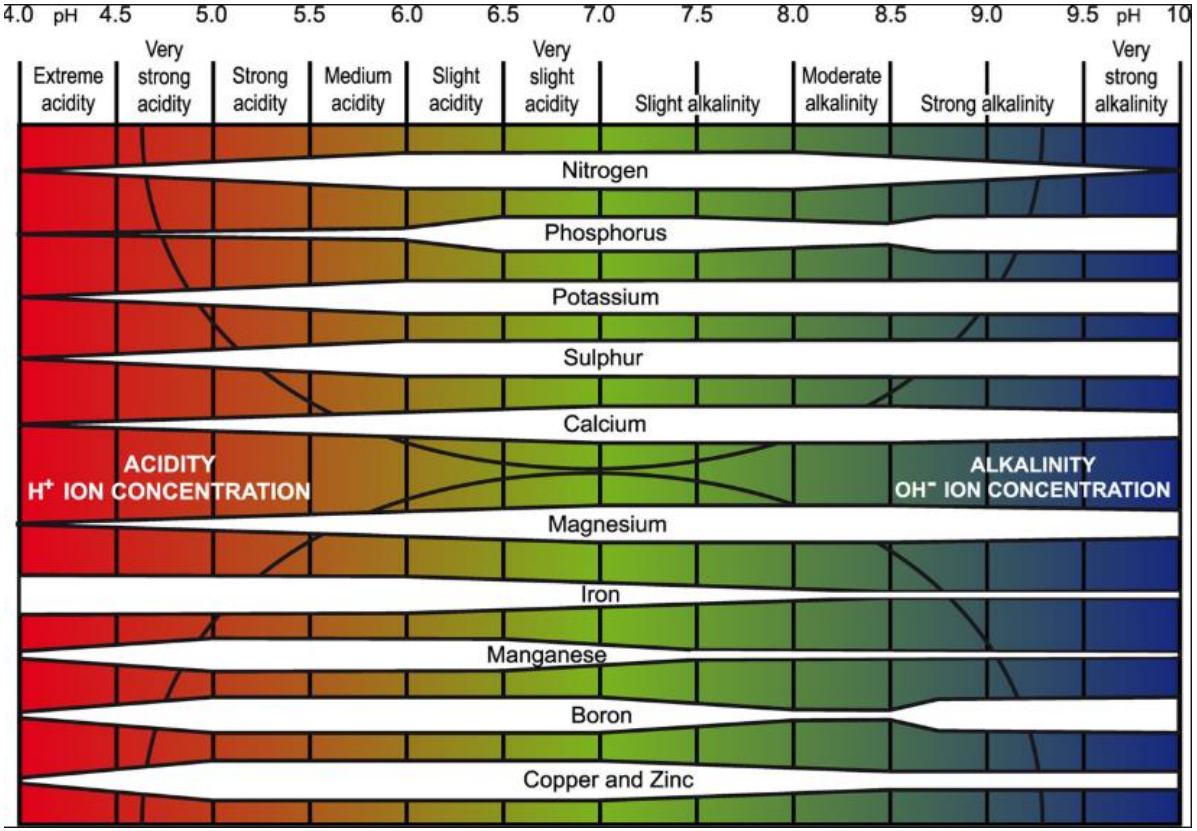
sodic clay + water

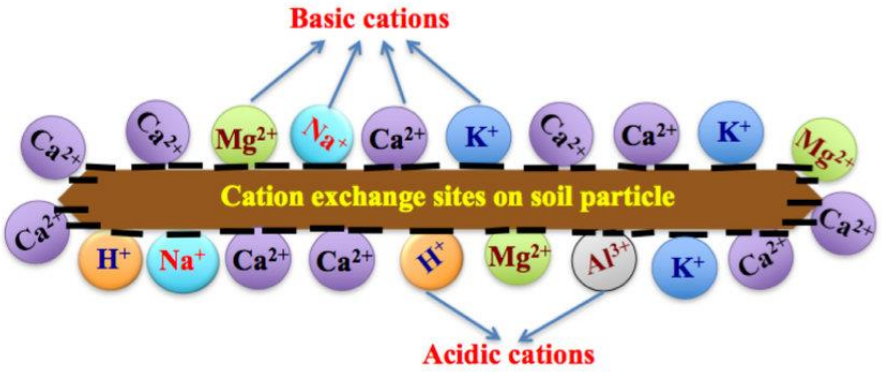


As water is added to a sodic soil the water is attracted to the sodium. The ions hydrate, forcing the plates apart. The ions' role in binding the clay platelets is overcome, and the clay swells then disperses with water.

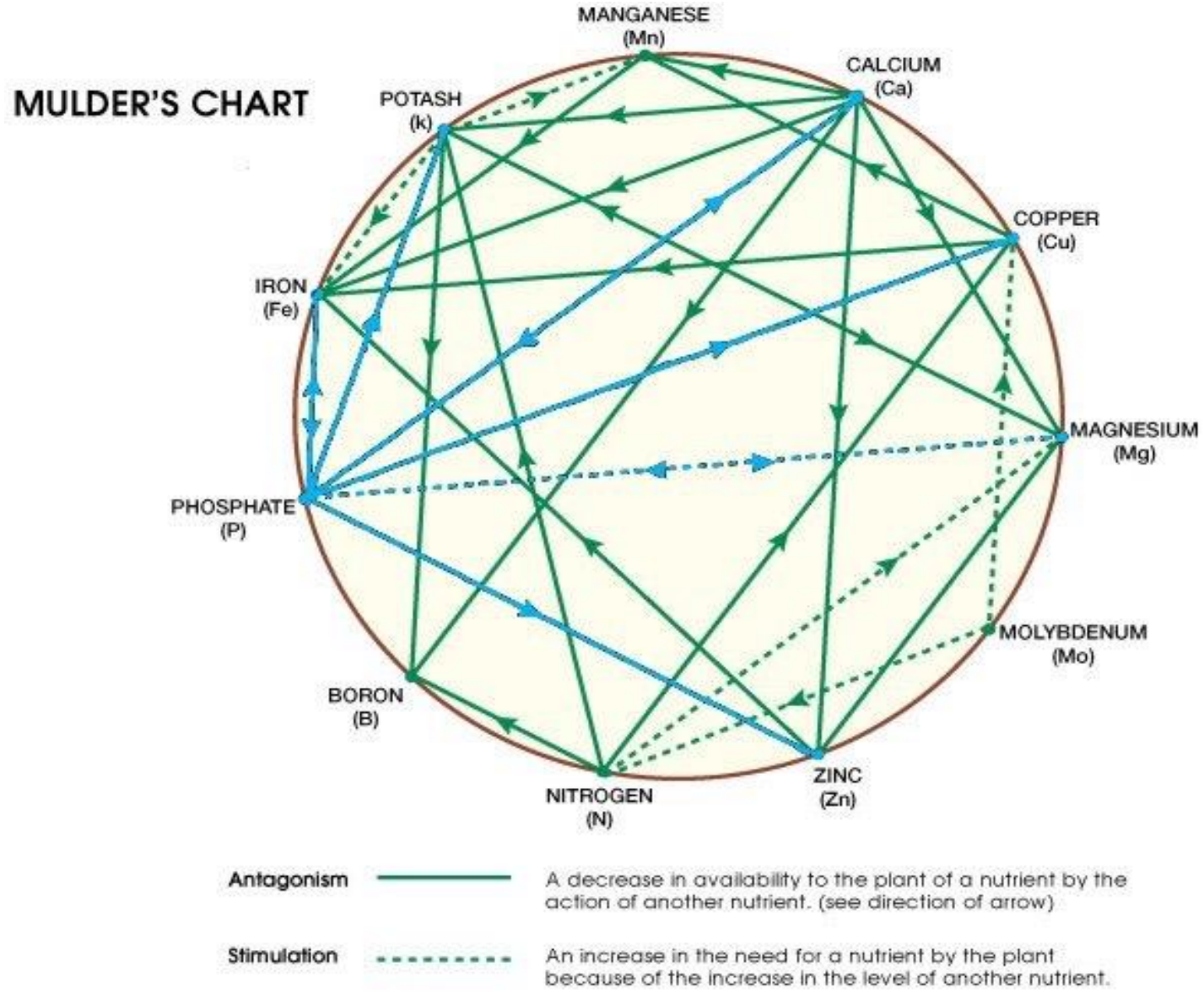
Source: SOILpak for Cotton Growers – 3rd Edition

The value of soil testing

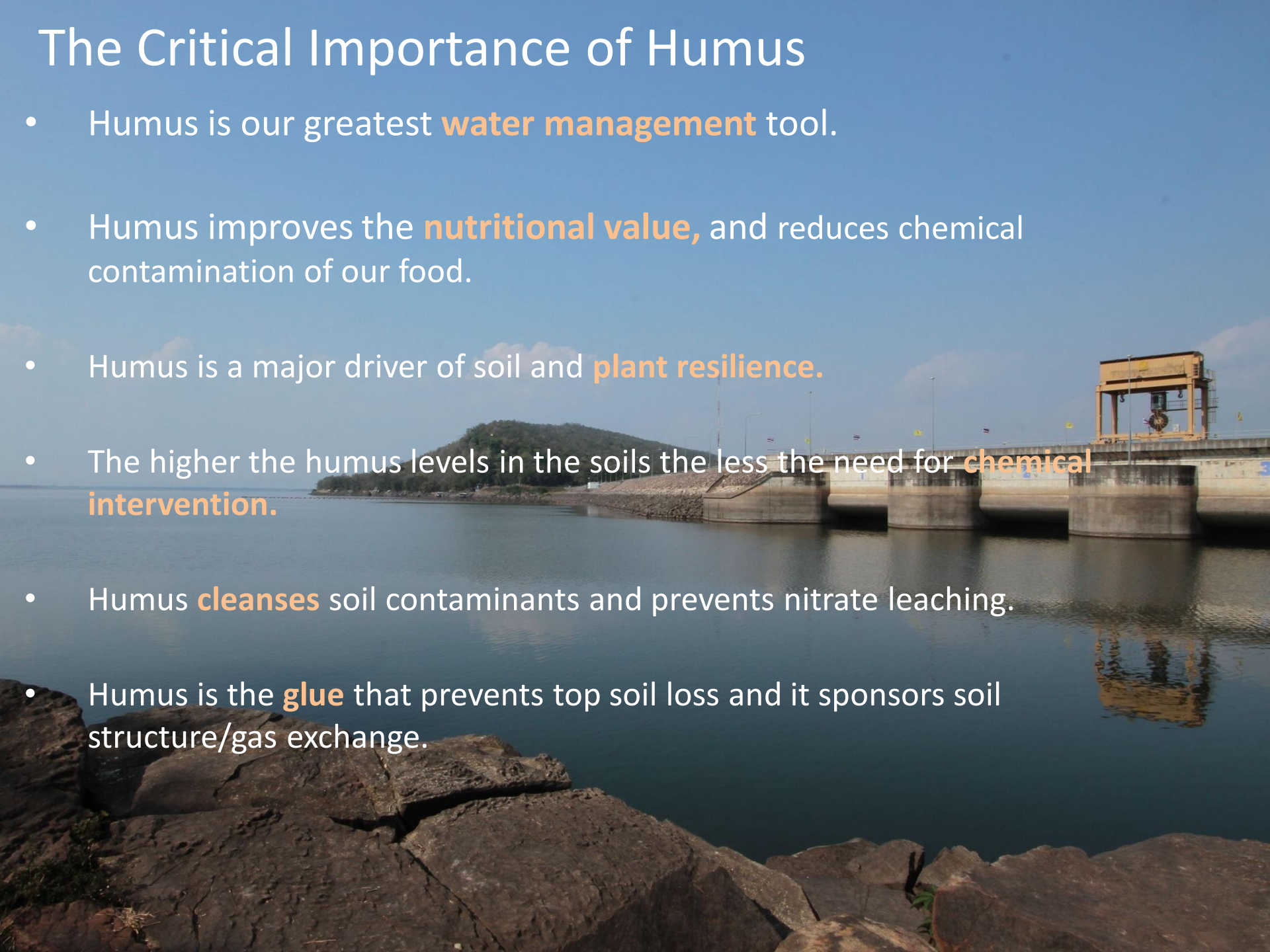




The value of soil testing



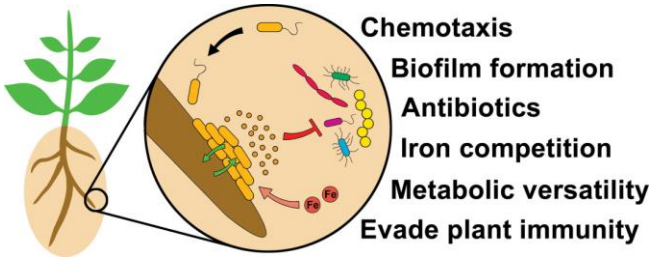
The Critical Importance of Humus



- Humus is our greatest **water management** tool.
- Humus improves the **nutritional value,** and reduces chemical contamination of our food.
- Humus is a major driver of soil and **plant resilience.**
- The higher the humus levels in the soils the less the need for **chemical intervention.**
- Humus **cleanses** soil contaminants and prevents nitrate leaching.
- Humus is the **glue** that prevents top soil loss and it sponsors soil structure/gas exchange.

Ideal soil properties for garlic

- Light-medium textured soils;
- Good drainage (raised beds as an alternative)
  - testing subsoil might be required
- Rich in Soil Organic Matter (garlic responds very well to organic inputs);
- Good moisture retention;
- pH range 5,5 to 6,5 – Ideally 6,3!
- High microbial biomass
- Fungi:Bacteria ratio above 1:1 (important disease suppressant)



Ideal nutrient properties for garli

- Increased nutrient uptake from 45 DAE;
- Larger macroelements requirement N and K;
    - K>N>S>Ca>P>Mg
- Trace elements
    - Fe>Mn>B>Zn>Cu
- Autumn: Very important to keep levels of P, Ca and traces luxury;
- Make sure that there is excellent nutrition for spring;
- Promote soil microbiology, especially at early spring.

The value of soil testing

DATE:	25/02/2018	**LAND USE:**	Garlic
NAME:	NTS NM Farm Stanthorpe	**PADDOCK:**	Pump House Pdk
ADDRESS:	C/- Marco	**SAMPLE REC:**	18/02/2018
		E-MAIL:	marco@nutri-tech.com.au

ALBRECHT CATEGORY	YOUR LEVEL	IDEAL LEVEL	NUTRIENT STATUS LOW	MEDIUM	HIGH
CEC	2.39				
TEC	3.27				
Paramagnetism	240	200 +			
pH-level (1:5 water)	5.60	6.3			
Organic Matter (IR Gas Anal.)	4.99 %	4 - 10 %			
Conductivity (1:5 water)	0.033 mS/cm	0.1 - 0.2 mS/cm			
Ca / Mg Ratio	2.44 :1	3.44 :1			
Nitrate-N (KCl)	1.2 ppm	10 - 20 ppm			
Ammonium-N (KCl)	2.2 ppm	10 - 20 ppm			
Phosphorus (Mehlich III)	28 ppm	50 - 70 ppm			
Calcium (Mehlich III)	286 ppm	496 ppm			
Magnesium (Mehlich III)	70 ppm	86 ppm			
Potassium (Mehlich III)	114 ppm	78 - 109 ppm			
Sodium (Mehlich III)	14 ppm	5 - 14 ppm			
Sulphur (KCl)	6 ppm	30 - 50 ppm			
Aluminium (Mehlich III)	1.7 ppm	< 2 ppm			
Silicon ($CaCl_2$)	16 ppm	> 100 ppm			
Boron (Hot $CaCl_2$)	0.47 ppm	1 - 3 ppm			
Iron (DTPA)	171 ppm	40 - 200 ppm			
Manganese (DTPA)	11 ppm	30 - 100 ppm			
Copper (DTPA)	2.4 ppm	2 - 7 ppm			
Zinc (DTPA)	3.1 ppm	5 - 10 ppm			
Molybdenum (TAE)	N/A	0.5 - 2 ppm			
Cobalt (TAE)	N/A	2 - 40 ppm			
Selenium (TAE)	N/A	0.6 - 2 ppm			
Texture	Loam				
Colour	Brownish				
BASE SATURATION					
(Levels are not relevant in soils with a TEC below 5)					
Calcium	43.67 %	62.00 %			
Magnesium	17.92 %	18.00 %			
Potassium	8.94 %	5.00 - 7.00 %			
Sodium	1.90 %	0.50 - 1.50 %			
Aluminium	0.59 %	0.50 %			
Hydrogen	27.00 %	10.00 %			
LAMOTTE/REAMS CATEGORY	**YOUR LEVEL**	**IDEAL LEVEL**	**NUTRIENT STATUS LOW**	**MEDIUM**	**HIGH**
Calcium	240.8 ppm	1000 - 2000 ppm			
Magnesium	57.1 ppm	140 - 285 ppm			
Phosphorus	3.525 ppm	20 - 80 ppm			
Potassium	104.9 ppm	80 - 100 ppm			

Explanatory Notes: The La Motte test gives an indication of the amount of plant available nutrients at the time of sampling.

DATE:	18/02/2020	**LAND USE:**	Garlic
NAME:	NTS NM Farm Stanthorpe	**PADDOCK:**	Pump Paddock
ADDRESS:	C-/ Marco	**SAMPLE REC:**	5/02/2020
		E-MAIL:	

ALBRECHT CATEGORY	YOUR LEVEL	IDEAL LEVEL	NUTRIENT STATUS LOW	MEDIUM	HIGH
CEC	5.17				
TEC	5.87				
Paramagnetism	300	200 +			
pH-level (1:5 water)	6.20	6.3			
Organic Matter (Calc)	5.20 %	4 - 10 %			
Organic Carbon (LECO)	N/A %	2 - 5 %			
Conductivity (1:5 water)	0.18 mS/cm	0.1 - 0.2 mS/cm			
Ca / Mg Ratio	3.50 :1	4.00 :1			
Nitrate-N (KCl)	19.0 ppm	10 - 20 ppm			
Ammonium-N (KCl)	5.0 ppm	10 - 20 ppm			
Phosphorus (Mehlich III)	70 ppm	50 - 70 ppm			
Calcium (Mehlich III)	700 ppm	752 ppm			
Magnesium (Mehlich III)	120 ppm	113 ppm			
Potassium (Mehlich III)	195 ppm	92 - 160 ppm			
Sodium (Mehlich III)	28 ppm	7 - 20 ppm			
Sulphur (KCl)	35 ppm	30 - 50 ppm			
Chloride	0 ppm	16 - 23 ppm	Extremely Low		
Aluminium	5 ppm	< 3 ppm			
Silicon ($CaCl_2$)	31 ppm	> 100 ppm			
Boron (Hot $CaCl_2$)	1.10 ppm	1 - 3 ppm			
Iron (DTPA)	70 ppm	40 - 200 ppm			
Manganese (DTPA)	12 ppm	30 - 100 ppm			
Copper (DTPA)	4.6 ppm	2 - 7 ppm			
Zinc (DTPA)	6.0 ppm	5 - 10 ppm			
Texture	Loam				
Colour	Brownish				
BASE SATURATION					
(Levels are not relevant in soils with a TEC below 5)					
Calcium	59.58 %	64.00 %			
Magnesium	17.02 %	16.00 %			
Potassium	8.51 %	4.00 - 7.00 %			
Sodium	2.04 %	0.50 - 1.50 %			
Other Bases	0.00 %	5.00 %			
Aluminium	0.85 %	0.50 %			
Hydrogen	12.00 %	10.00 %			
LAMOTTE/REAMS CATEGORY	**YOUR LEVEL**	**IDEAL LEVEL**	**NUTRIENT STATUS LOW**	**MEDIUM**	**HIGH**
Calcium	632 ppm	1000 - 2000 ppm			
Magnesium	103 ppm	140 - 285 ppm			
Phosphorus	13.87 ppm	20 - 80 ppm			
Potassium	297 ppm	80 - 100 ppm			

<u>Strategies over 2 yr:</u>

- Compost;
- Lime at 1 T/ha;
- Rock Phosphate at 500 kg/ha;
- Cover cropping;
- Weekly fertigation program

<u>Responses:</u>

- O.M increase
- Balanced Base Saturation
- Increased nutrient availability by adjusting pH
- More disease resilience
- Better yield

NTS
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Thank you!

Marco Giorgio Rego

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