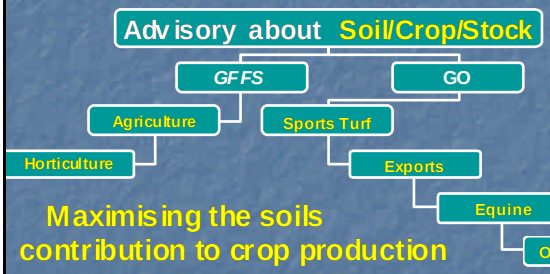
Glenside
FERTILITY FARMING SYSTEMS

Welcome

- Better Informed Soil Management –
= Increased natural productivity
= Better Resource Management
= More Profitable Crops, Healthier
= More Profitable Livestock

The Glenside Group Limited Founded 1982



Maximising the soils contribution to crop production UK, Ireland & Middle East.

The Food Chain starts in the SOIL

Soil > plant > animal > mankind

How soils are managed has unavoidable Impact on:
Crop Performance
Livestock Productivity
Mankind's Health

Immune System functioning ?

What changed ?
Diet Naturally mineralised

Why Feed or Apply Trace elements TO:-

ANIMALS ? CROPS ?

TE Lacking because
DEFICIENT OR LOCKED UP ?

- POOR SOIL STRUCTURE ?
- POOR SOIL BIOLOGY ?
- ROOT SYSTEMS NOT PERFORMING ?

ALL the above impact on Soil's natural productivity and *REDUCE its CONTRIBUTION to PROFITABLE PRODUCTION*

Bagged Nitrogen – "Plant food"

Blade of grass - doubled YES
Calcium - doubled ?
Magnesium - doubled ?
Silage - Risk excessive ammonia ?
Trace Elements- need to supplement ?

HAS NUTRITIONAL VALUE DOUBLED ?

Efficiency of Fertiliser use is linked to the parameters of natural productivity

- Ensure optimal soil structure for better Drainage and Root development
- Ensure nutrient levels & pH are balanced to avoid lock-up
- Encourage Soil biology – better use of resources
- Use bio-stimulants to improve nutrient gathering
- Implement nitrogen and phosphate substitution strategies

How to improve volume and quality of grass yields ?

- What's the start point ?
- What do we need to know to be able to grow more grass/better quality crops ?
- *"To be a successful farmer one must first know the nature of the soil." –*

Xenophon, Oeconomicus, 400 B.C.

Measure and Manage.

- What's the start point ? Soil Test
- Standard: P,K, Mag, pH , OGM
  - Does this tell us the Nature of the soil?
- Glenside Albrecht:
  - Knowledge based on soil type

Full Glenside Albrecht® Soil Survey reports on:-

- *Soil Characteristics* - Cation Exchange Capacity, Colloidal Organic Matter, Soil type.
- Trace elements - Boron, Iron, Manganese, Copper, Zinc Chloride, Molybdenum.
- Base saturation % - Calcium, Magnesium, Potassium, Sodium, Hydrogen & Others
- Acidity/Alkalinity - pH.
- Cation Surpluses/Deficits - Desired & found values in kg/ha for cations, Ca, Mg, K
- Values for - Sodium, Sulphate and Estimated Nitrogen Release (ENR)
- Phosphate - Found and Desired in kg/ha.
- "Totals" –

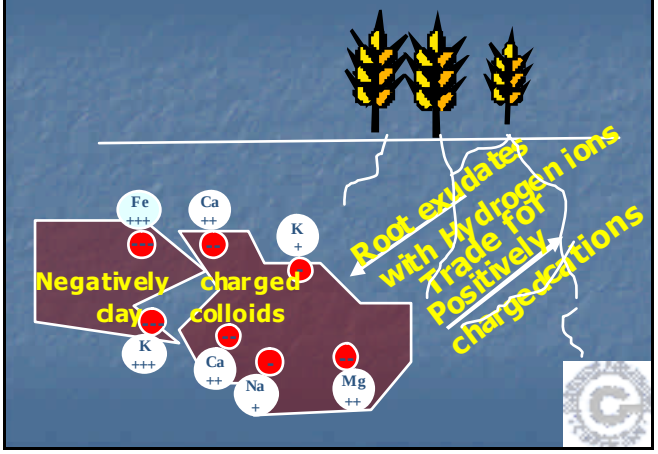
Combined total of available and currently unavailable – *but exploitable soil reserves* of:- Calcium, Magnesium, Phosphorus, Sulphur, Potassium & Sodium.

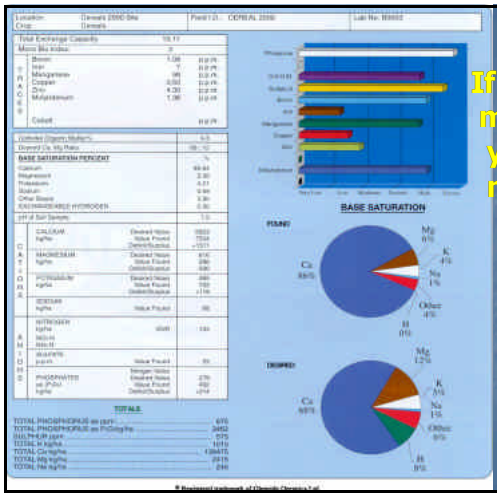
Glenside Albrecht® Soil Survey

Provides a picture of the soil :-

- CEC – *Cation Exchange Capacity*
- COM – *Colloidal Organic Matter*
- Boron – *Starch transfer, Nitrogen use*
- Iron – *Indicator, Relationship to Mn*
- Mn – *Chlorophyll, Photo'is, Disease resist*
- Cu – *Photo'is, Disease resist, Stock health*
- Zn – *Starch form Disease resist Skins Feet*
- Mo – *N fix bacteria Relationship to Cu*

CATION EXCHANGE IN ACTION





If you don't measure it you can't manage it

Glenside Albrecht® Soil Survey

Comparing desired levels for different CECs

CEC	10 light	15 Medium	20 Heavy	45 Very heavy
Calcium kg/Ha	3000	4500	6000	13500
Magnesium	320	480	640	1440
Potassium	360	500	600	800
Phosphorous	268	272	278	396

Same pH - Very Different Reasons

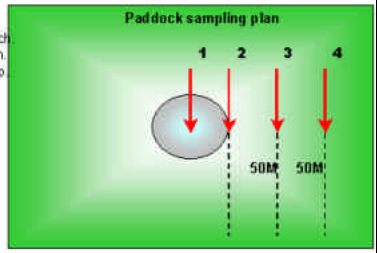
Ref. Nos.	11107	6249	"Ideal"
pH	6.5	6.5	6.5
Base Saturation %			
Found			
Ca	79.93	59.09	68
Mg	5.75	25.49	12
K	0.88	2.06	4
Na	1.04	0.96	1
Others	4.9	4.9	7
Exch H	7.5	7.5	7.5

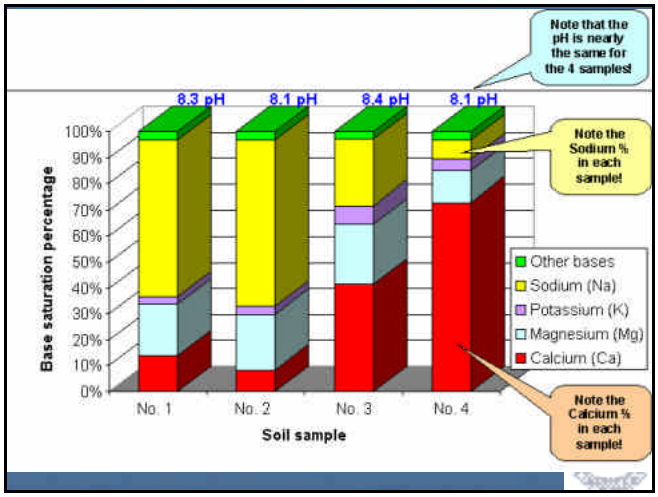
Here's a classic actual illustration of how the pH of the soil can be constructed;

Four soil samples were taken from certain positions in and around a salt patch in a paddock, starting in the centre where nothing would grow and working out to the area where the crop was flourishing.

Samples taken as follows;

No. 1 Taken at the centre of the salt patch.
No. 2 Taken at the edge of the salt patch.
No. 3 Taken 50m from edge into the crop. (struggling)
No. 4 Taken 50m further into crop. (flourishing)





Glenside Albrecht® Soil Survey

Total Exchange Capacity:			17.06	Total Exchange Capacity:			25.59
Colloidal Organic Matter %		10332	4.2	Colloidal Organic Matter %		10333	4.0
Soil Type: SILT LOAM				CLAY			
TRACES	BORON	p.p.m.	1.15	TRACES	BORON	p.p.m.	1.06
	IRON	p.p.m.	865		IRON	p.p.m.	12
	MANGANESE	p.p.m.	83		MANGANESE	p.p.m.	49
	COPPER	p.p.m.	1.90		COPPER	p.p.m.	0.30
	ZINC	p.p.m.	6.10		ZINC	p.p.m.	3.30
	MOLYBDENUM	p.p.m.	1.40		MOLYBDENUM	p.p.m.	1.76

Same Field - Changes '02 –'03

Ref. Nos.	17451	18203	"Ideal"
	'02	'03	
COM	3.8	3.9	5.0
Boron	0.91	1.52	0.8-1.5
Iron	1.0	73	300/700
Mn	58	107	80-120
Copper	0.4	1.2	2.4-5.0
Zinc	1.3	6.9	6-10
Mo	3.24	1.48	0.7-1

Glenside Albrecht® Soil Survey

Ref 9670.02		Index
CEC	8.24	0
COM	4.3	0
B	0.60	0
Fe	1470	0
Mn	53	0
Cu	5.6	0
Zn	2.6	0
Mo	1.4	0

%Ca	Mg	K	Na	others	H	pH
65.28	6.67	2.10	2.35	5.6	18.0	5.9
"L"	VL	VL	Hi	Sulphate L		

Good Grass field?

Ref. Nos.	Index	1551	"Ideal"
pH	7	7.1	6.5
	Index	Base Saturation %	
Ca	0	82	68
Mg	2.6	7.6	12
K	2+	4.6	4
P	2	-56 kg	
Na	0	1.35	1
Others	0	4.3	7
Exch H	0	0	7.5

Good Grass field?

Ref. Nos.	Index	1551	"Ideal"
pH	7	7.1	6.5
	Index	PPM	
OGM	0	3.5	5-10
B	0	0.45	1.5
Fe	0	793	400
Mn	0	123	130
Cu	0	2.9	4
Zn	0	8.7	10
Mo	0	1.8	0.8-1

Different approach 1 cut Grass.

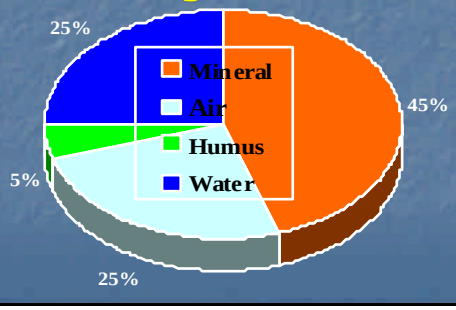
Provides a picture of the soil :-

- Index system:
  - 40Kg P205
  - 60Kg K20
- Glenside:
  - Aeration (Air-life-Biological contribution)
  - 39kg Mgo (as 150Kg Kieserite)
  - 50Kg P205
  - 50Kg K20
  - Trace elements, Copper and Boron

Soil is an eco-system –

No Biological contribution = lower productivity

'Soil Life' needs the right environment



Soil Biology = Worms, Fungi, Bacteria, Mycorrhizae, Rhizobia

Your partners in profit

They Reduce Costs by Improving root function
= Use nutrients more efficiently
= Strengthen plants immune system
= Limit pests and disease

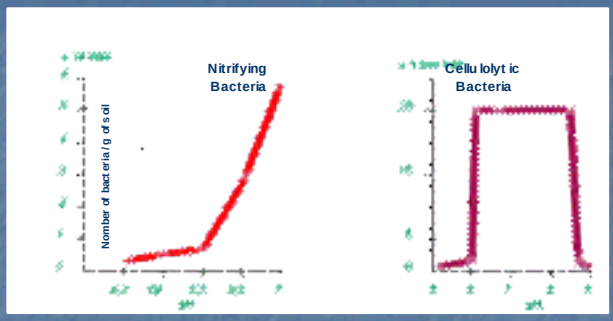
Nature's Workers – Real Partners…….

Work 7 days a week
Don't knock off at 5pm
No double time on Sundays

It pays to look after the unseen workers !

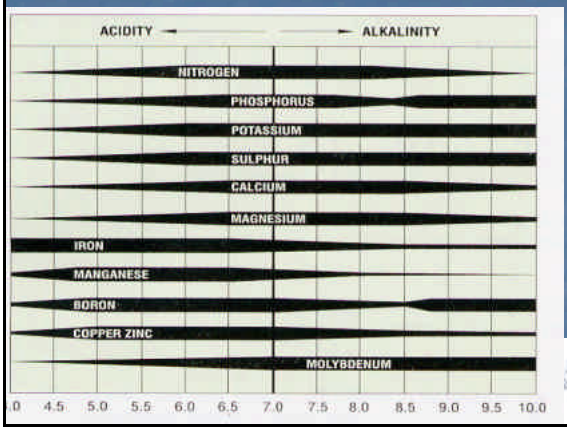
(perhaps you are one of them?)

Soil pH affects microbial activity



Optimising soil pH increases nutrient availability AND stimulates microbe numbers and activity.
Result: Improvement in Natural soil fertility.

Soil pH & Chemical availability



'The Law of the Minimum'

'Crop performance will be determined not by the total of resources available but by the scarcest resource'

- Justus von Liebig 1803-1873

Mycorrhizae

- "Fungus-root"
- Extend to absorb P from more soil
- Decline with increasing P fertility, fallow

Effect of fertilizer P on corn mycorrhizae.

Fertilizer P_2O_5 Rate, kg/Ha	Roots colonized at 6-leaf stage	Corn dry matter at silking, tons/A
0	21%	4.5
62.5	19%	5.0
125	15%	5.2

Mean of 2 years, 1997/98, Quebec. Soil test P (Mehlich 3) was 65 to 87 ppm. Adapted from Liu et al., 2002

Grassland Recovery
with Aeration & Root Stimulation

Grass analytical data

Analysis %	M4638	M4637 Treated	Increase %
Dry matter	17.5	19.6	+12
Protein	17.3	17.4	
Calcium	0.40	0.44	+10
Magnesium	0.16	0.16	
D Value	68	74	+8.8
ME (dm)	10.8	11.7	+8.3
Beverley	Analytical	Laboratory	2005

Nitrogen

Use in plant:

Fundamental for growth, amino acid production, ATP and chlorophyll& Photosynthesis.

Factors effecting Availability:

- Low CEC/OGM soils (leaky)
- High Rainfall
- Low soil moisture = volatilisation
- pH
- High raw OGM
- Poor soil structure, wet compacted
- Low S
- Low K
- Low Mag
- Poor rooting

Phosphate

Use in plant:

ATP (adenosine tri-phosphate) energy transfer in the plant. Nucleic acid, protein and carbohydrate metabolism.

Factors effecting Availability:

- Low OGM soils
- Low Soil Biology
- High Iron
- Low Zn
- pH, too low complex with Al and Fe, Too high Complex with Ca
- Poor soil structure, wet compacted
- Poor rooting

Potash

Use in plant:

Regulation of cell water, stomata function and enzyme activator

Factors effecting Availability:

- Low CEC/OGM soils (leaky)
- High Rainfall/irrigation
- pH too low or too high
- Poor soil structure, wet compacted
- High Ca
- High Mag
- High Na coast .
- Low Soil Biology
- Poor rooting

Magnesium

Use in plant:

Chlorophyll, Protein and Nitrogen metabolism, regulation of H20,

Factors effecting Availability:

- Low CEC/OGM soils
- Too high levels of Mag
- pH too low or too high
- Poor soil structure, wet compacted
- High Ca
- High K
- High Na
- Low N
- Low Soil Biology
- Poor rooting

Calcium

Use in plant:

Cell division and elongation, cell wall strength, permeability of the cell membranes.

Factors effecting Availability:

- Low CEC/OGM soils
- High OGM soils (fen/peaty)
- pH too low or too high
- Poor soil structure, wet compacted
- High K
- High Na
- High P
- High Al
- Low Boron
- Drought,
- Low Soil Biology
- Poor rooting

If you don't measure it you can't manage it

Sulphur

Use in plant:

Protein and vitamin development

Factors effecting Availability:

- Low CEC/OGM soils
- Low atmospheric deposits
- Applied OGM
- pH too low
- Poor soil structure, wet compacted
- Drought,
- Low Soil Biology
- Poor rooting

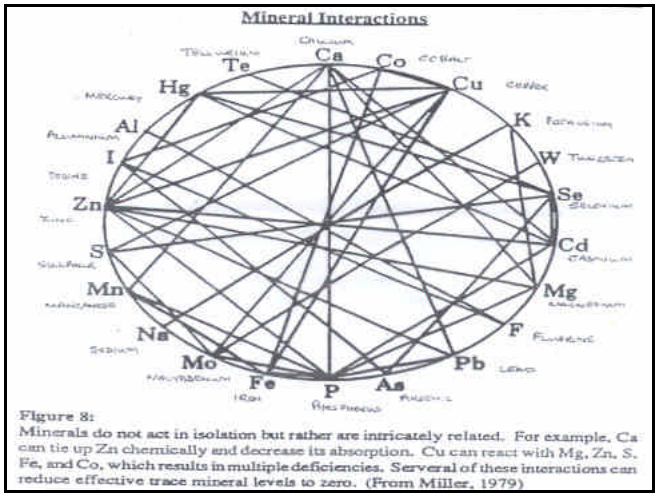


Figure 8:
Minerals do not act in isolation but rather are intricately related. For example, Ca can tie up Zn chemically and decrease its absorption. Cu can react with Mg, Zn, S, Fe, and Co, which results in multiple deficiencies. Serveral of these interactions can reduce effective trace mineral levels to zero. (From Miller, 1979)

Manganese

Use in plant:

Photosynthesis, nitrogen reductase, enzyme systems

Factors effecting Availability:

- Low CEC/OGM soils
- Too high OGM
- pH too low or too high
- Poor soil structure, wet compacted overworked fluffy soils
- Drought
- High Ca
- High Fe
- Low Soil Biology
- Poor rooting

Boron

Use in plant:

Starch transfer, Calcium movement, development of growing points, carbohydrate metabolism & pollination

Factors effecting Availability:

- Low CEC/OGM soils
- Too high OGM
- pH too low or too high
- Poor soil structure, wet compacted
- Drought
- High Ca
- High N
- Low Soil Biology
- Poor rooting
- Potatoes are susceptible to over applied boron. Must test before applying

Copper

Use in plant:

Nitrogen reductase, photosynthesis, cell walls and lignin

Factors effecting Availability:

- Low CEC/OGM soils
- Too high OGM
- pH too low or too high
- High levels of rainfall or irrigation
- Poor soil structure, wet compacted
- Drought
- High Ca
- High Fe
- High N
- Low Soil Biology
- Poor rooting
- Similar conditions and interactions as Mn

Iron

Use in plant:

photosynthesis, protein synthesis

Factors effecting Availability:

- Low CEC
- pH too low or too high
- High levels of rainfall or irrigation
- Drought
- High Ca
- High Cu
- High Zn
- Low Soil Biology
- Poor rooting

Zinc

Use in plant:

Skin, Enzyme systems, needed for making auxin

Factors effecting Availability:

- Low CEC/OGM soils
- pH too low or too high
- Poor soil structure, wet compacted Drought
- High Ca
- High Fe
- High P or applied P
- Low Soil Biology
- Poor rooting

Animal health

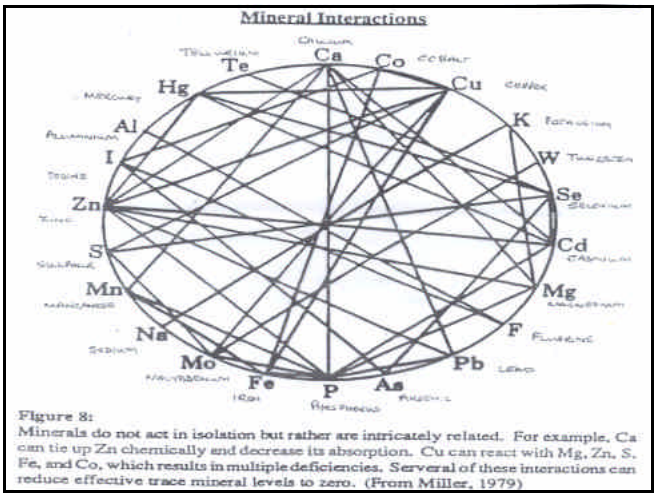
Excess	Effects of	Deficiency
Increased P requirement, reduces Cu, Mn, Fe & Iodine functions	Calcium	Rickets, poor LWG, Milk fever
Ca:P ratios, increase P and Vit D requirement	Magnesium	Staggers, Milk Fever, Teeth, bones
Lower Mn, increases need for Ca, Fe, Mag, Mn	Phosphate	Increase Vit D req. Lowers LWG, Milk output

Animal health

Excess	Effects of	Deficiency
Increases Mag and Ca requirement, Complex with Fe	Potassium	Unlikely
Poor appetite, liver damage, increased demand for Ca, Zn, Fe	Copper	Poor LWG, fertility, sway back, gingering
Lower Feed intake, reduces Cu level in liver, lower metabolic rate	Zinc	Poor bone growth, feet issues, poor regeneration of tissues

Animal health

Excess	Effects of	Deficiency
Increases metabolic rate, lowers intakes	Iodine	Lowers metabolic rate, poor reproduction, dead offspring
Lowers Fe absorption, lowers intake/LWG	Cobalt	Poor vit B12 synthesis, weak lambs, body wasting
Lowers intake, lameness, poor skin/coat	Selenium	Ill thrift, lowers fertility, white muscle



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Minerals do not act in isolation but rather are intricately related. For example, Ca can tie up Zn chemically and decrease its absorption. Cu can react with Mg, Zn, S, Fe, and Co, which results in multiple deficiencies. Serveral of these interactions can reduce effective trace mineral levels to zero. (From Miller, 1979)

Conclusions

Livestock health does start in the soil

- **Measure and manage**
- **Rarely a single causation**
- **Soil Chemistry, Physics and biology**
- **Applications can cause more problems than solve**
- **Use the Glenside Albrecht® system to measure and understand the soil.**