Euroopa Maaelu Arengu Põllumajandusfond: Euroopa investeeringud maapiirkondadesse

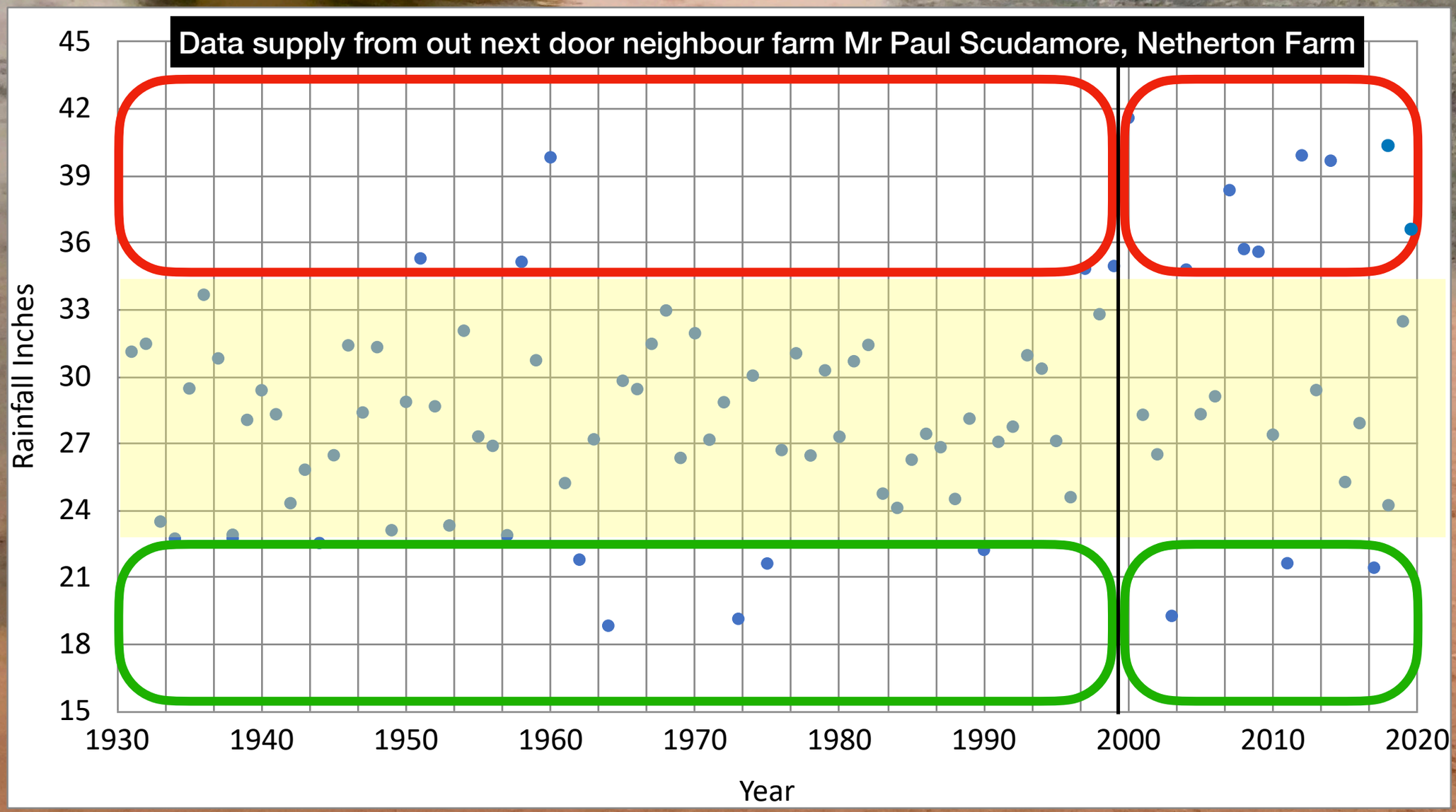
Regenerative agriculture approach

Section 1

“Our soils are great - why do we need to regenerate them”

So were ours!

Rainfall extremes and climate change



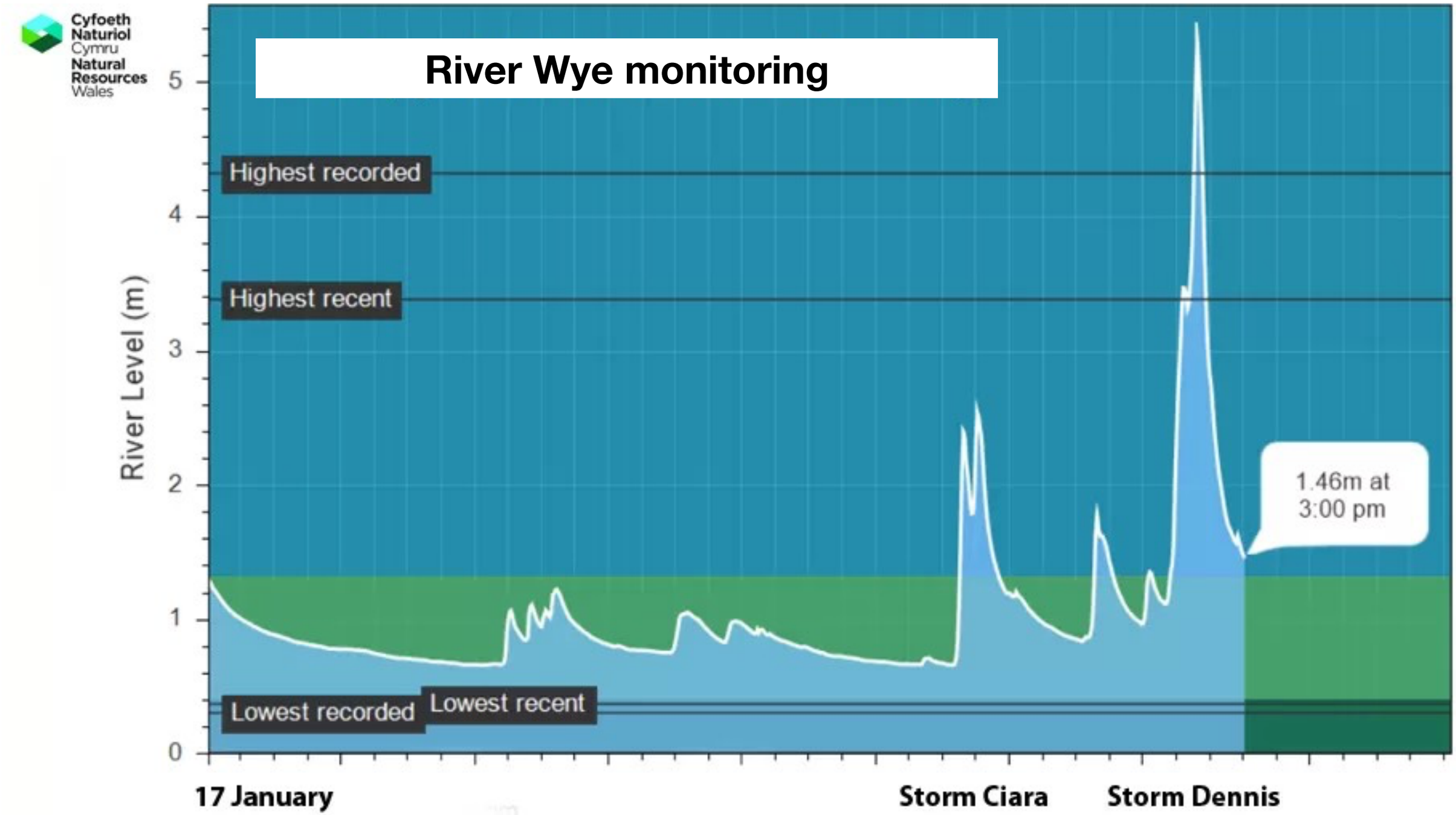
Excessively wet

Average rainfall

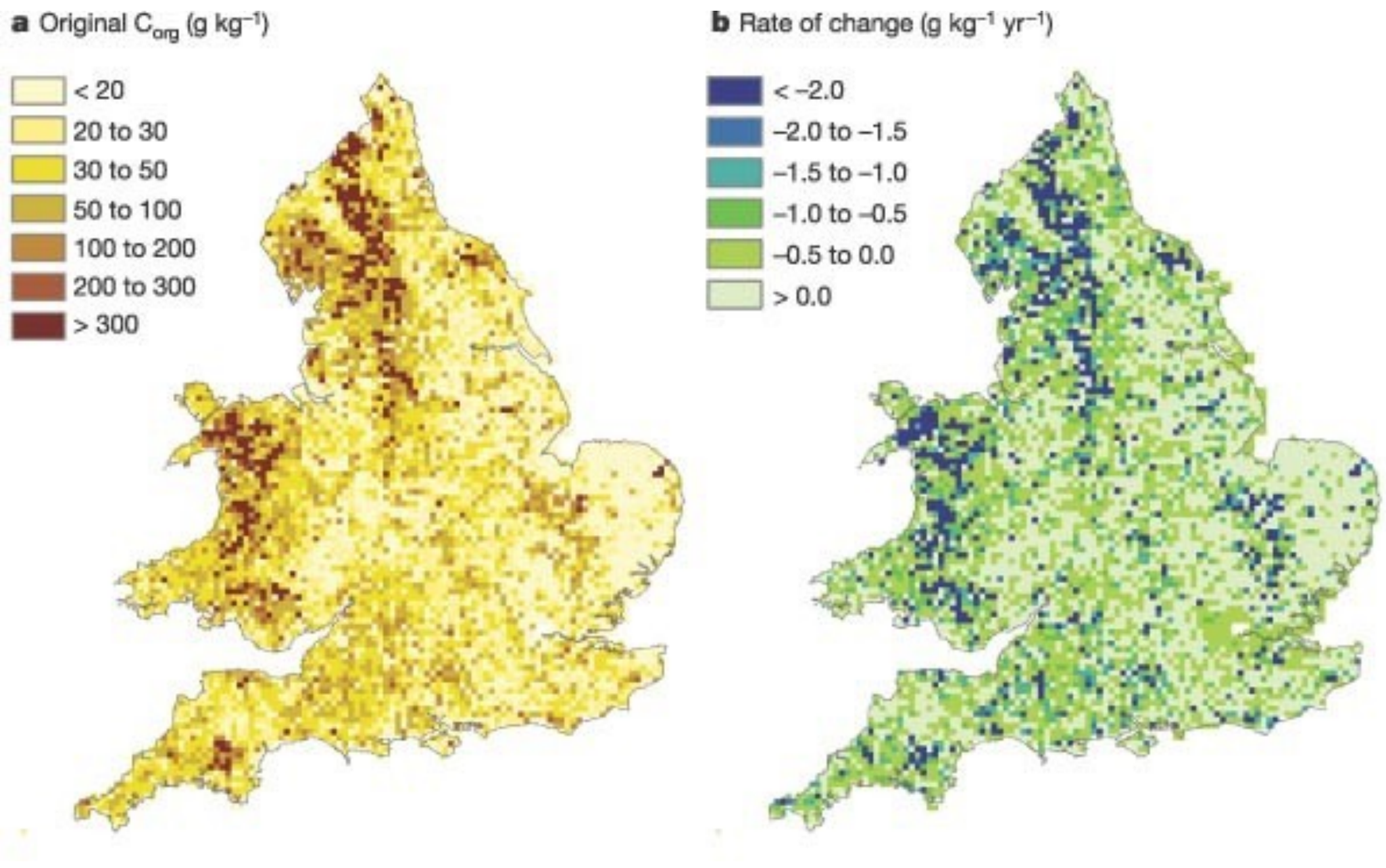
Excessively dry

There are more weather extremes in the past 22 years than there were in the previous 70 years!

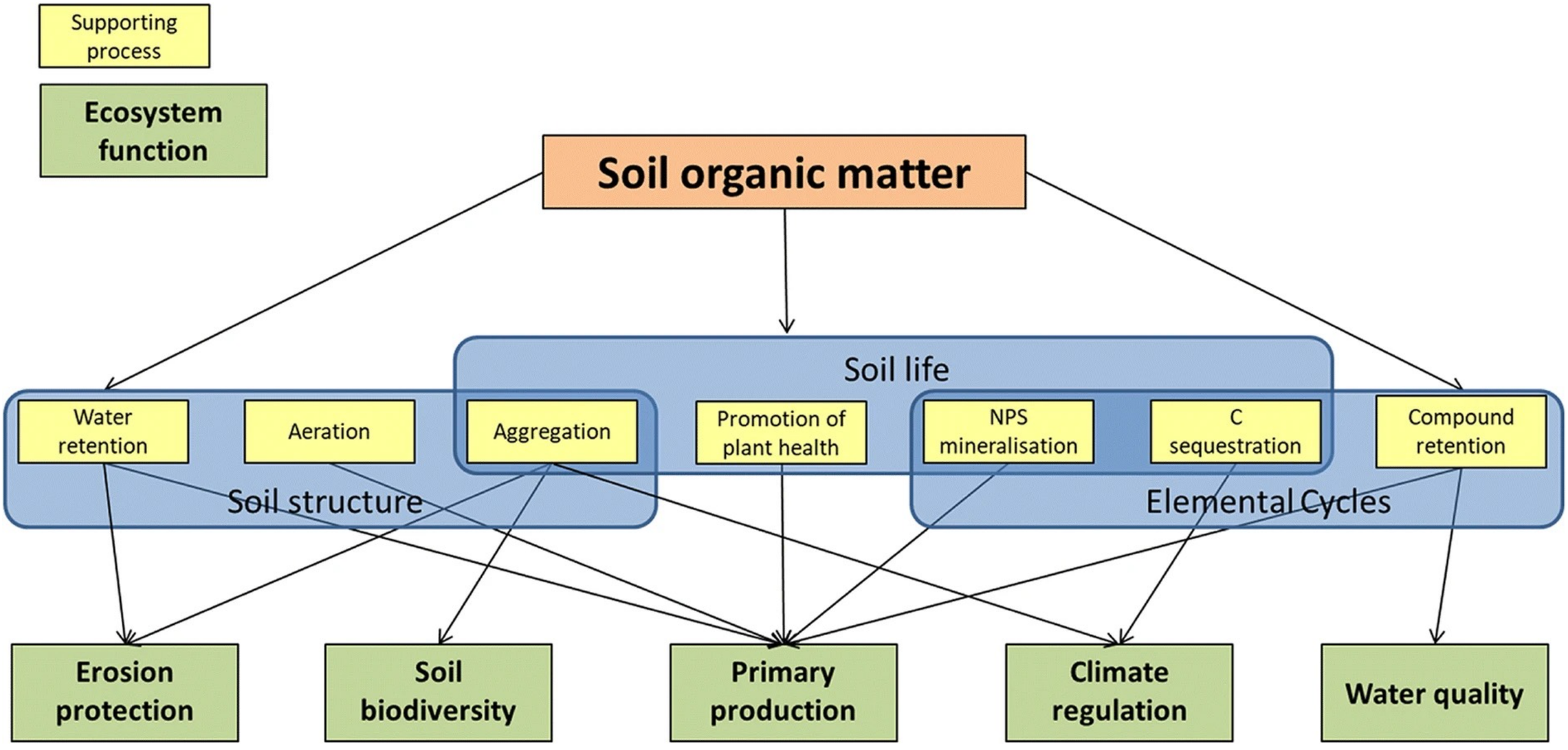
Nothing in the catchment to ‘slow the flow’ cause extreme flooding events



England & Wales Carbon Loss 1978-2003



The importance of soil organic matter



Healthy soils - Why?

The most important of all farming tools

The Soil Food Web

Nematodes
Root-feeders

Arthropods
Shredders

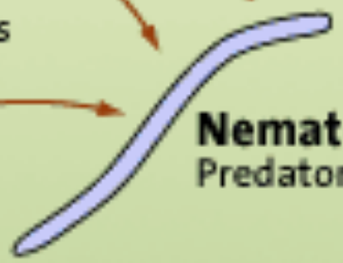
Arthropods
Predators

Birds

Plants
Shoots
and roots.

Fungi
Mychorrhizal fungi
Saprophytic fungi

Nematodes
Fungal- and
bacterial-feeders



Nematodes
Predators

Organic Matter
Waste, residue and
metabolites from plants,
animals, and microbes.

Bacteria

Protozoa
Amoebae, flagellates,
and ciliates

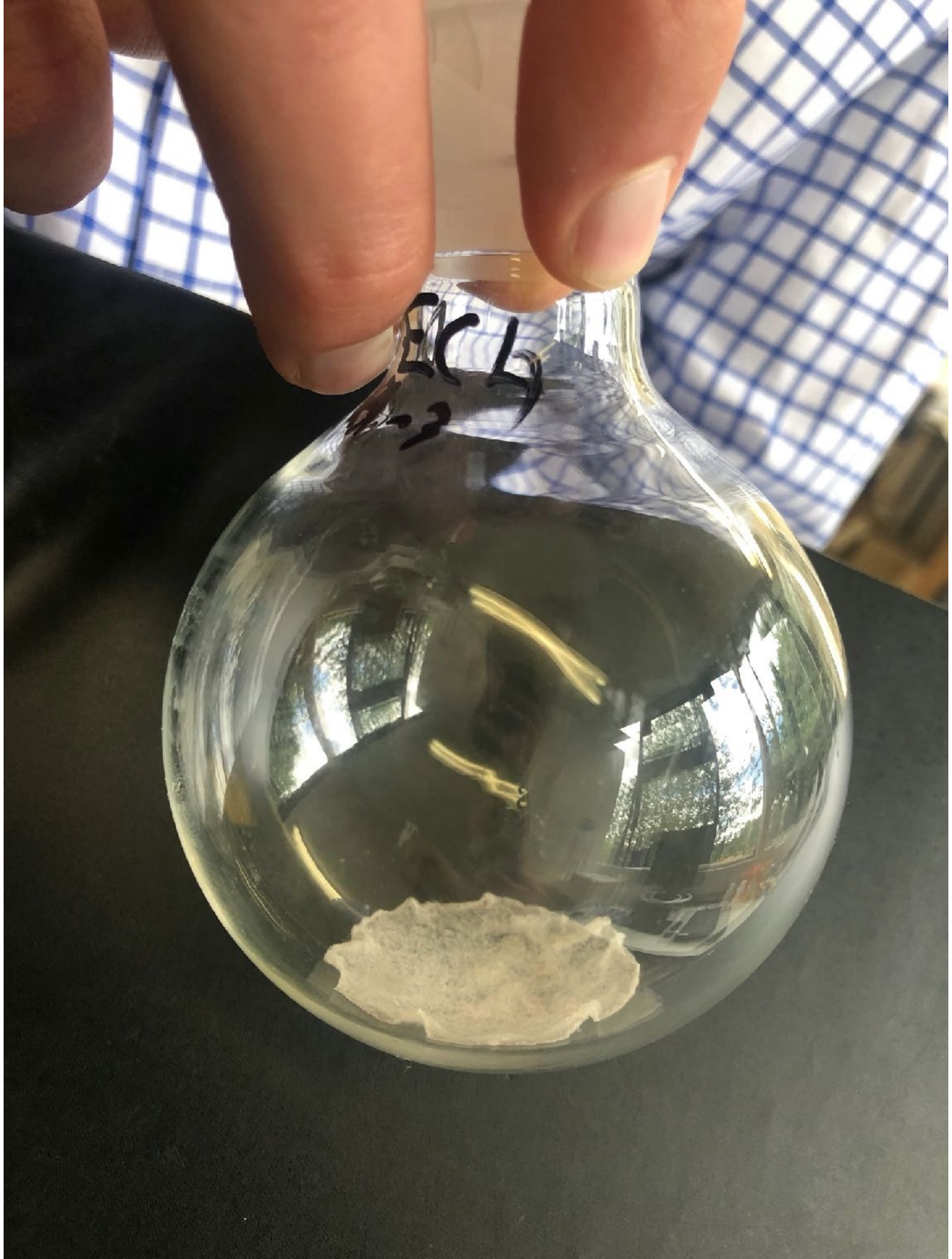
Animals

First trophic level:	Second trophic level:	Third trophic level:	Fourth trophic level:	Fifth & higher trophic level:
Photosynthesizers	Decomposing Mutualists Pathogens, Parasites Root-feeders	Shredders Predators Grazers	Higher level predators	Higher level predators

The exudates of 12 wheat plants in the first 14 days of growth (produced in pure water) and then freeze dried.

<u>Carbon rich</u> (52%) Amino acids produced to feed the below ground biology.

In turn, the below ground biology scavenges nutrients to give back to the plant - Plant/soil symbiosis at its finest

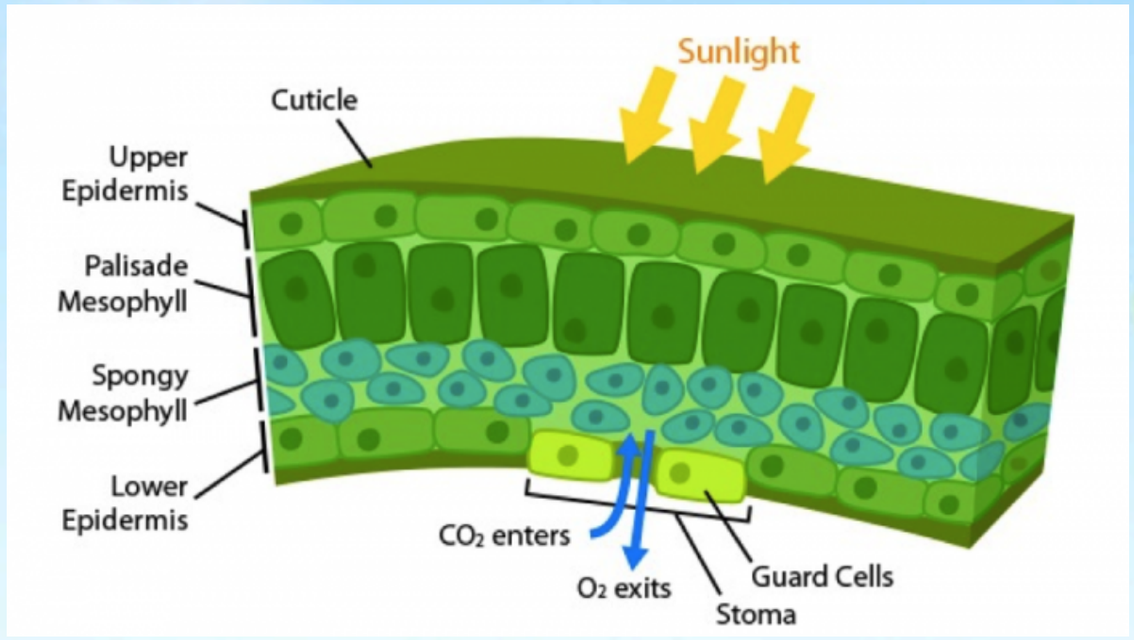


Everyone is a livestock farmer!

It’s just most livestock is invisible!

Feeding livestock above and below the ground - no days off!

Soil microbes in healthy soils weight of 5 cows per hectare!
In order of preference for food
1.Amino acid root exudates
2.Dead plant roots
3.Crop residues.
4.If none of this is available they will feed on OM, reducing the quantity and quality.



O_2 and N_2 replenish into the soil

Stomata (underside of leaf)

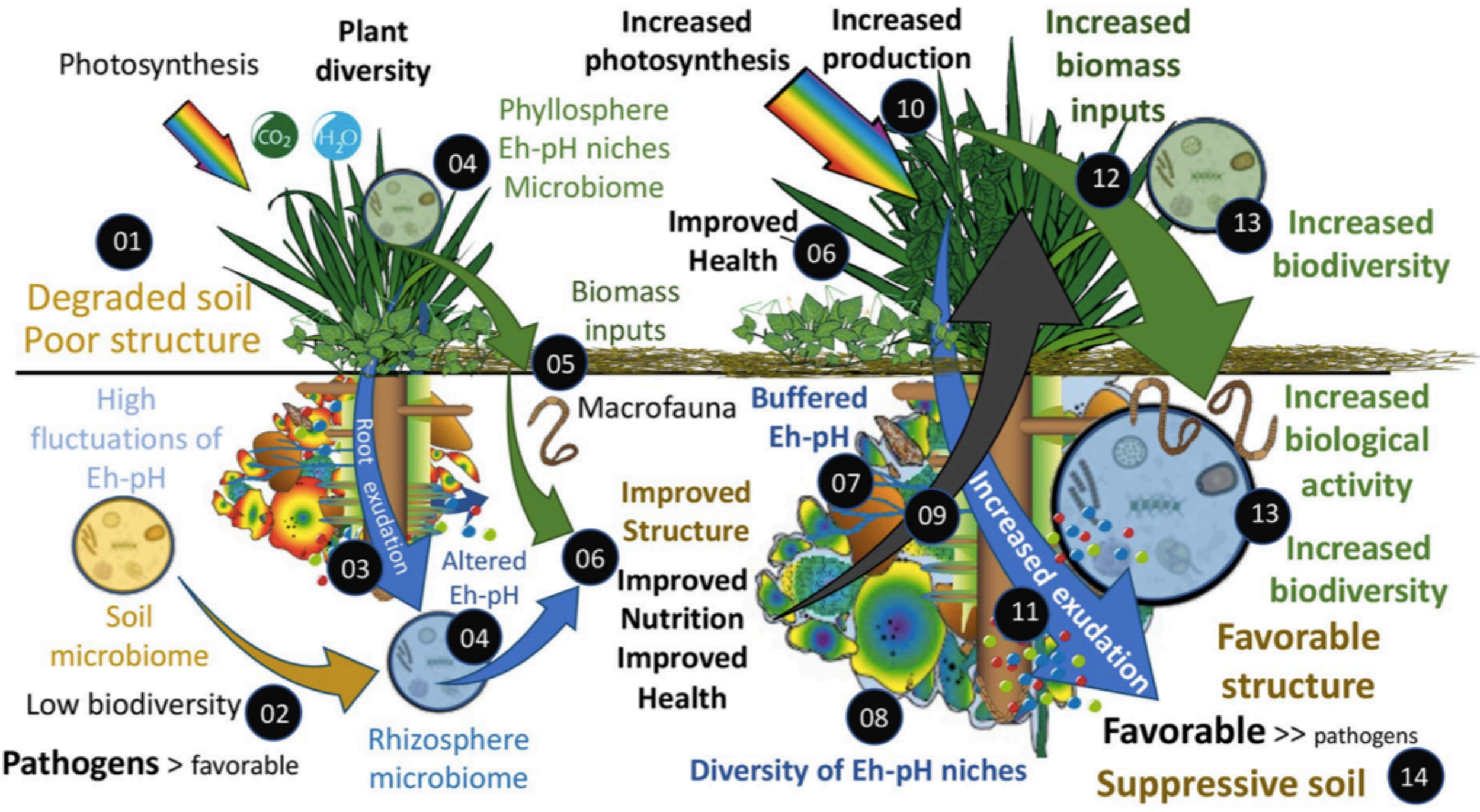
Microbial activity respiring CO_2

Mixing with H_2O to form carbonic acid

Moon pulls water

Soil moisture

How a well structured soil changes everything!




WHO
WHAT
WHERE
WHEN
WHY
HOW
QUESTIONS
ANSWERS

Section 2

“The 5 regenerative principles”

5 principles of soil health

Living roots. Maintain a living root in soil as long as possible throughout the year. Living roots are feeding soil biology by providing its basic food source: carbon. This biology, in turn, fuels the nutrient cycle that feeds plants.

Limited disturbance. Limit mechanical, chemical, and physical disturbance of soil. Tillage destroys soil structure.It is constantly tearing apart the “house” that nature builds to protect the living organisms in the soil that create natural soil fertility. The result of tillage is soil erosion.

Armour. Keep soil covered at all times. Bare soil is an anomaly—nature always works to cover soil. Providing a natural “coat of armour” protects soil from wind and water erosion while providing food and habitat for macro- and microorganisms. It will also prevent moisture evaporation and germination of weed seeds.

Diversity. Strive for diversity of both plant and animal species. Where in nature does one find monocultures? Only where humans have put them! Grasses, forbs, legumes, and shrubs all live and thrive in harmony with each other. Diversity enhances ecosystem function

Integrated animals. Nature does not function without animals. It is that simple. The major benefit is that the grazing of plants stimulates the plants to pump more carbon into the soil. This drives nutrient cycling by feeding biology. If you want a healthy, functioning ecosystem on your farm, you must provide a home and habitat for not only farm animals but also pollinators, predator insects, earthworms, and all of the microbiology that drive ecosystem function.

Living Roots

Limited disturbance


N 14:38
Speed warning
--- mph
37.0 °C
0 km/h
Bare soil
44.6
SELECT
EMIT
°C/°F


Armour
Standing crop
36.5
SELECT
EMIT
°C/°F


Mulch
28.8
12th August

A simple example of diversity in wheat

Integration of Livestock

Mob graze cover crops
For soil health and capturing nutrients

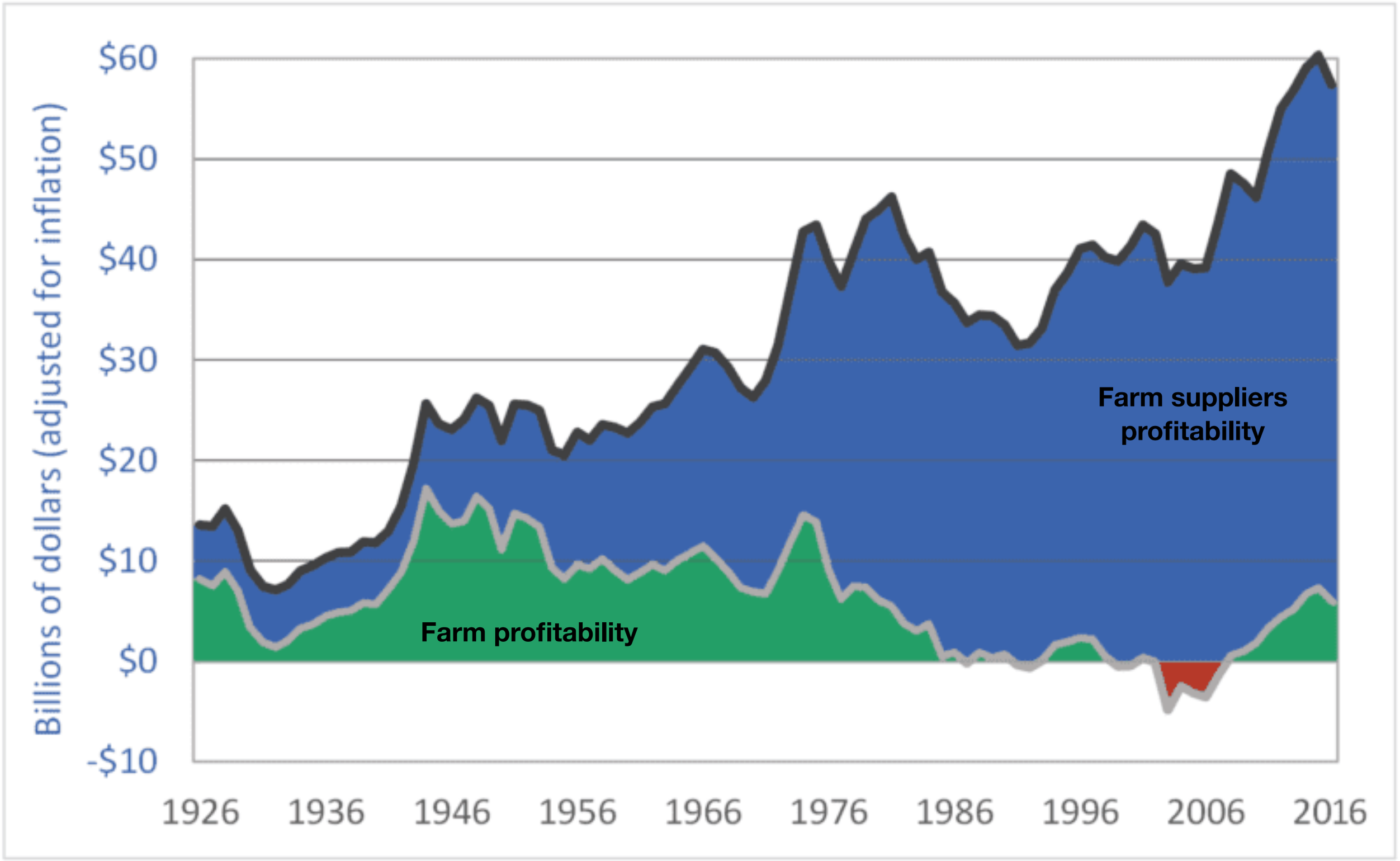
Diversity in the flerd


WHO
WHAT
WHERE
WHEN
WHY
HOW
QUESTIONS
ANSWERS

Section 3

“In practice”

Canadian farm profitability



Biology trumps chemistry!

Blackgrass UK
Competition can reduce yield by up to 70%

Control of blackgrass in 2006 £32 per Ha 99% control
Control of blackgrass in 2022 £146 per Ha 54% control

Political resistance

Insects do NOT compete with humans for food!

Insects only feed upon food that is considered unfit, nutritionally poor, dead or dying.

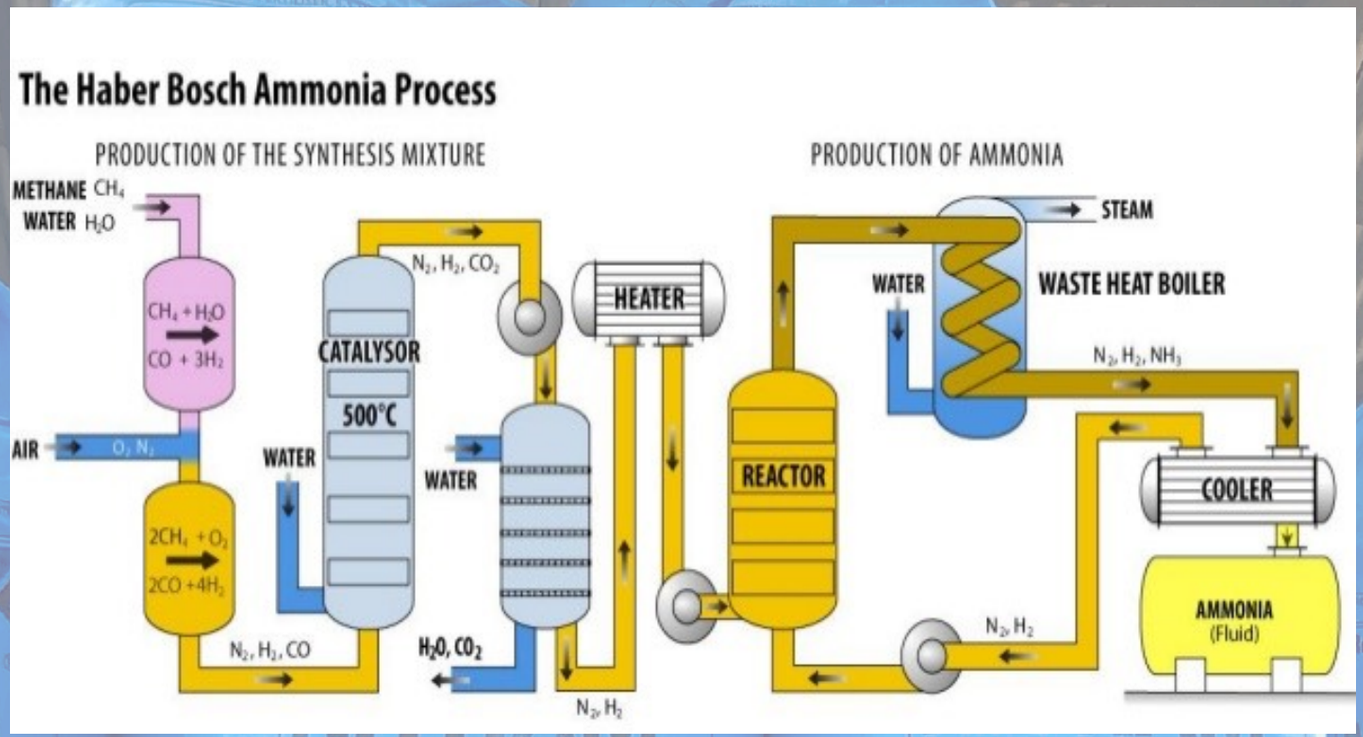
"Insects are nature's garbage collectors and diseases are her cleanup crew"
William Albrecht


Are you a more-on?


The pest colonisation of a vacuum
CH01-2A
Amistar
Amistar
Amistar
Mistik
2015
48

The Dutch Saying: "Fertiliser Is Good For The Father And Bad For The Sons"

Nitrogen - How many plants are deficient of N in a natural environment?



Same result - just a different scale!

Nutrition as salts and therefore all soluble!

Replacing death with life!

Regenerative fruit, salad and vegetable production
For a more sustainable future
For increasing profits
For improving produce quality and storability

Keep harvesting the suns energy to feed the soil life


Maize growing with
zero artificial inputs?

Compaction

Road building, stabilise the soil to allow road to go down hard, deep ripping to remove all natural structure

Soil microbes in healthy soils weight of 5 cows per hectare!
In order of preference for food
1.Amino acid root exudates
2.Dead plant roots
3.Crop residues
4.Organic Matter, reducing the quantity and quality and ultimately soil health

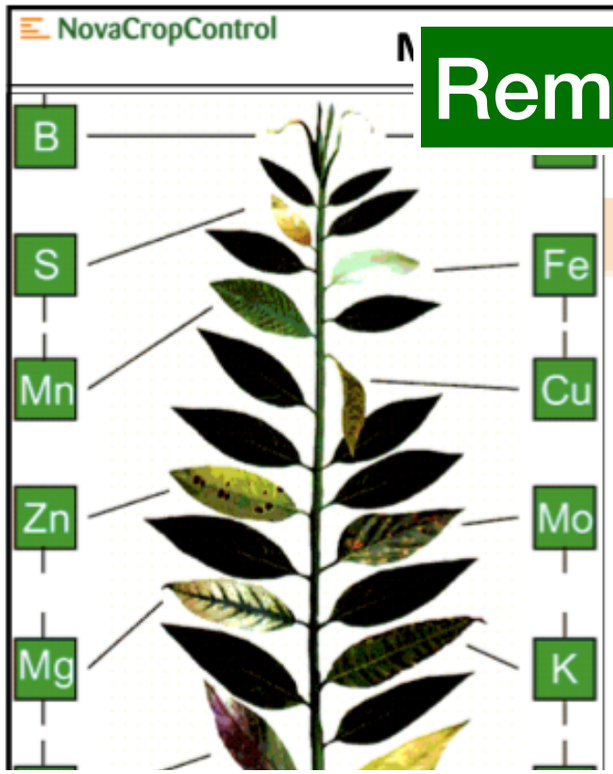
Rip and drip


living roots only


Rip + living roots


Rip, drip + living roots

Removal/reduction of synthetic fertilisers



Deficiency appears first in older leaves

- Nitrogen (N)
- Potassium (K)
- Magnesium (Mg)
- Phosphorous (P)

Medium immobile minerals:

- Sulphur (S)
- Iron (Fe)
- Manganese (Mn)
- Zinc (Zn)
- Copper (Cu)
- Molybdenum (Mo)

immobile minerals:

Deficiency appears first in young parts

- Calcium (Ca)
- Boron (B)


W T & S Davies
Townsend Farm
Brampton Abbotts
Ross-on-Wye

Sustainable Soil Management
Solutions for Eco-nomically Sustainable Farming

SSM Soil Advisor — Ian Robertson — 07970 286420
Facts Fertiliser Advisor — Ian Robertson — 01653/12

Sample No: Q23800
LAB No: 93737
Sample DATE: 43909
Report DATE: 2/18/21

Field ID: ZONE 1 — 1 Ha — CROP SOWN: — No Crop Given

An ideal soil structure (Bd) 1.5 — Soil test is assumed to be carried out for soil at — General plough depth

Active pH 7.10 — A neutral soil. Very good crop responses.
Buffer pH 7.20
Active Carbon 2-3% 2.12
Organic Matter Min >3% 3.00
Organic Carbon Ideal >5% 1.76
Min required OM for structural integrity 3

Total Exchangable Capacity (TEC) — 6 = small, 30 = large. 15 viewed as average — Result 6.64

Sand % 71 — Silt % 13 — Clay % 16 — Sandy Loam

Soil management recommendations
Consider benefits of Elemental sulphur
only apply crop req: K — 417.0 kg/ha K2O Found
0.0 kg/ha recommended - Apply solubilising bacteria

Foliar management recommendations
visually assess for foliar deficiency symptoms
apply foliar Magnesium
apply foliar phosphate

Sum: pH, Calcium, Magnesium, Potash, Sodium, Phosphates

Removal/reduction of fungicides

A heathy plant with the correct nutrition will be far better suited to resist pest and disease attack

	%	2,7	2
pH		5,8	1
		6,0	2
EC	mS/cm	7,2	1
	mS/cm	8,5	2
K - Potassium	ppm	2107	1
	ppm	1320	2
Ca - Calcium	ppm	755	1
	ppm	4398	2
K / Ca		2,79	1
		0,30	2
Mg - Magnesium	ppm	111	1
	ppm	202	2
Na - Sodium	ppm	179	1
	ppm	165	2
NH4 - Ammonium	ppm	175	1
	ppm	97	2
NO3 - Nitrate	ppm	<20	1
	ppm	<20	2
N in Nitrate	ppm	<5	1
	pp		
N - Total Nitrogen	pp		
	pp		
Cl - Chloride	pp		
	pp		
S - Sulfur	pp		
	pp		
P - Phosphorus	ppm	505	
	ppm	126	2
Si - Silica	ppm	4,0	1
	ppm	17,5	2
Fe - Iron	ppm	2,33	1
	ppm	5,24	2
Mn - Manganese	ppm	6,10	1
	ppm	27,66	2
Zn - Zinc	ppm	3,65	1
	ppm	4,63	2

	RATIOS 1:1	Target level	Found	Structural comments	Plant health comments
Calcium	Ca : Mg	4.52	5.7	Dispersible soil structure. Soil slumping.	A Ca:Mg balanced soil, but assess sufficiency. Increase solution magnesium.
Magnesium	Mg: K	2.50	2.25		
Potassium	K : Mg	1.30	1.44	consider foliar Mg	Avoid excess potash.
Potassium	K : Na	6.51	11.73	Sodium levels OK	limited issues from Na.

Electrical Conductivity & Total Desolvable Salts		Sodium Adsorption Ratio		Estimated Sodium Potential (ESP)
EC/EDS	N/A	Guide <4	0.06	Guide result <6 — 0.51
Magnesium	118.0 ppm Mag	Soil magnesium is above min ppm guide.		OK

				Biological Treatment
Phosphorus	7.66	%5-8	Improve soil biology - apply (phospate solubilising bacteria)	Yes Beneficial
C:P ratio	36.0	40to1	Humus would be benificial	YES
pH	7.10		A bacterial predomed environment	
Organic Carbon	1.76 %		Build Organic Carbon	

Predicted availability of trace elements			Found	Guides	Soil Treatments	Foliar treatment
Boron	B	mg/l	0.70	1.0-3.4	Apply Granular Boron	High Boron demanding crops only
Iron	Fe	mg/l	344.00	18 - 189	Apply products that create new roots	
Manganese	Mn	mg/l	124.00	18 -70		
Copper	Cu	mg/l	2.90	2.5 - 7	Consider maintenance levels of copper	

Brassicae/pulse/ dower respond to Mo

47.4	4	Phosphorus	0	0	
180	2-	Potassium	0	0	
118	3	Magnesium	0	0	
		Calcium		0	
UK phosphate is via the Olsen method		Organic Matter	3		
15	standard UK K:Mg Ratio OK	Standard testing method for Southern Ireland			

Modified Morgan	mg/l	Index
Phosphorus	0	0
Potassium	0	0
Magnesium	0	0
Organic Matter	0	
Standard testing method for Europe		

This report is based on the soil sample as received, and labelled by the sender. The company will not be responsible for any errors in sampling or labelling.

Who’s growing veg?

Proof ?

Soil building and resilience in a vegetable rotation


WHO
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WHERE
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Section 4

“Estonia?”

What have you got?

Field ID:	MAEMOISA K	1 Ha	CROP SOWN:	No Crop Given

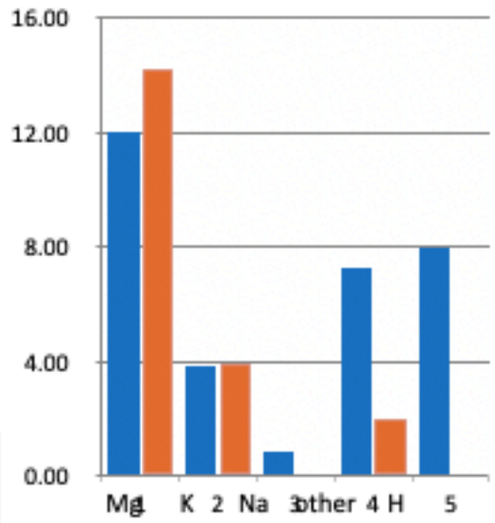
An Ideal soil structure (Bd)	1.5	Soil test is assumed to be carried out for soil at	General plough depth

Active pH	7.70	pH is restricting nutrient availability.	Total Exchangable Capacity (TEC)	6 = small, 30 = large. 15 viewed as average	Result 10.04	Sand % 71	Silt % 16	Clay % 13
A slightly basic soil. Moderate crop responses.						Sandy Loam		
& Cl Buffer pH	7.40					Stone content % if known		
Active Carbon mg & %	594	2.77%	Co2 Burst	0	Co2 Burst Index	0	Dry BD	1.165
Organic Matter	Min >3%	3.90					Field Bulk density if known	
OM Organic Carbon	ideal >5%	2.29	C:N ratio	10.96	Guide	24	Estimated NR	46 kg of NR from OM
Min required OM for structural integrity		3					T/C/ha Target	98 Found 45 T/C/Ha

	Soil management recommendations	Foliar management recommendations
pH		
Calcium		
Magnesium	Reduce Soil magnesium levels	
Potash	357.5 Kg/ha K20 Found	
Sodium		
Phosphates		
Sulphates		

Reported as kilograms/hectare - elemental (kg/ha)

Major Elements in Elemental form	CROP AVAILABLE NUTRIENTS kg/ha DESIRED	kg/ha Found	Difference	TOTAL IN SOIL Reserves ELEMENTAL kg/ha	% Base Cation Saturation Ratios (BCSR) DESIRED	FOUND
Calcium Ca ++	2662	3122	460	5196	68.00	79.75
Magnesium Mg ++	282	335	53	2645	12.00	14.25
Potassium K +	293	298	5	1337	3.83	3.90
Sodium Na +	40	4	-36	60	0.89	0.09
Other elements	7%	2.00		Minor Importance	7.28	2.00
Hydrogen	8%				8	0
Sulphate (S03)	67	43.85	-23	251		
Phosphate (P205)	96	97	2	924		

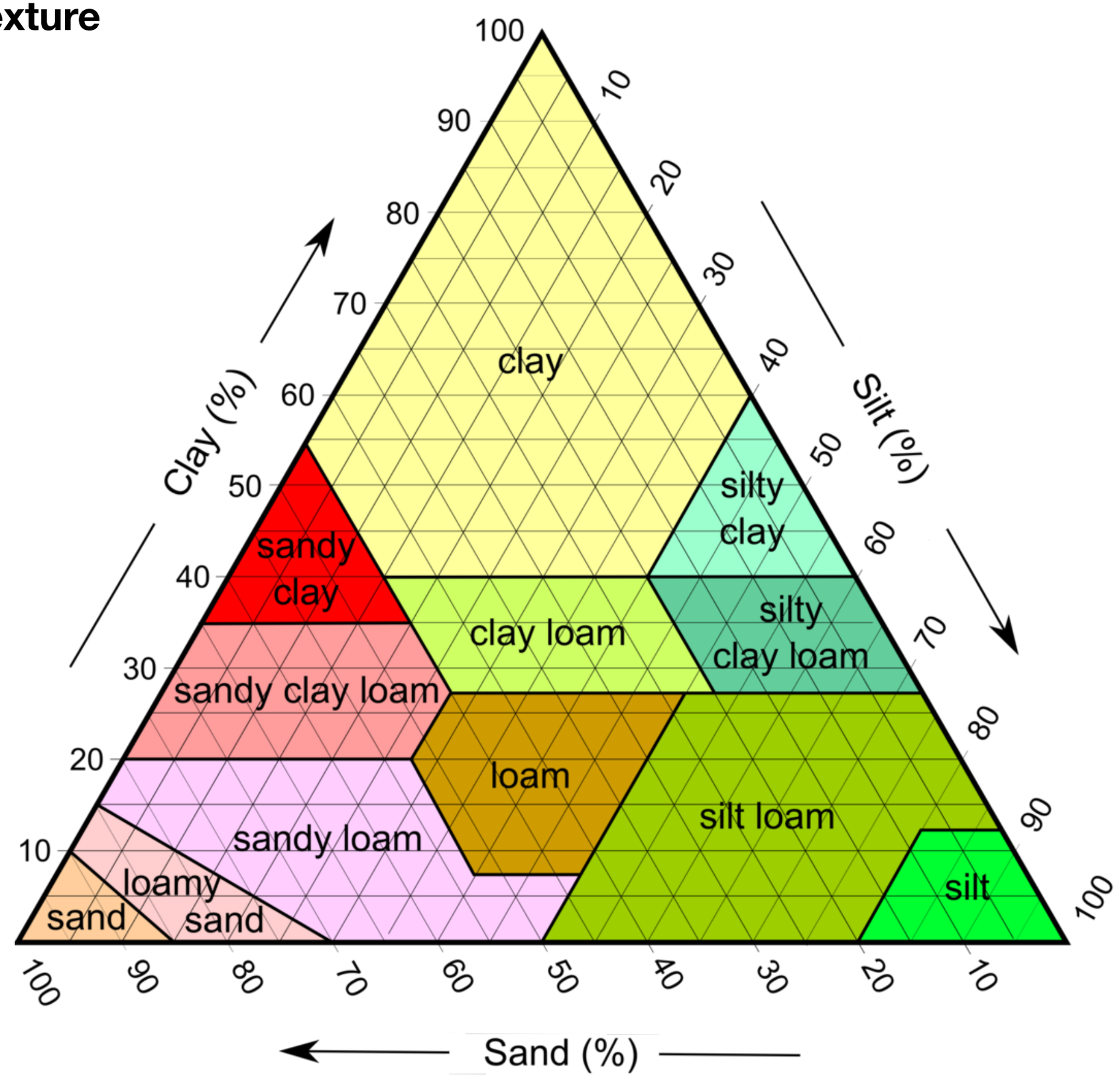


Mg SP 14.25 (<15)

General comment on Structure

	RATIOS : 1	Target level	Found	Structural comments	Plant health comments
Calcium	Ca : Mg	5.67	2.0		
Magnesium	Mg: K	3.13	1.98		
Potassium	K : Mg	0.32	0.51		
Potassium	K : Na	4.31	22.19		

Soil Texture



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	A slightly basic soil. Moderate crop responses.		
& Cl Buffer pH	7.40		

Sand %	Silt %	Clay %
71	16	13

Sandy Loam

Stone content % if known

Active Carbon mg & %	594	2.77%	Co2 Burst	0	Co2 Burst Index 0
Organic Matter	Min >3%	3.90			
OM Organic Carbon	ideal >5%	2.29	C:N ratio	10.96	Guide 24
Min required OM for structural integrity		3			

Dry BD 1.165

Field Bulk density if known

Estimated NR	46	kg of NR from OM	
T/C/ha Target	98	Found	45 T/C/Ha

	Soil management recommendations	Foliar management recommendations
pH		
Calcium		
Magnesium	Reduce Soil magnesium levels	
Potash	357.5 Kg/ha K20 Found	
Sodium		
Phosphates		
Sulphates		

Reported as kilograms/hectare - elemental (kg/ha)

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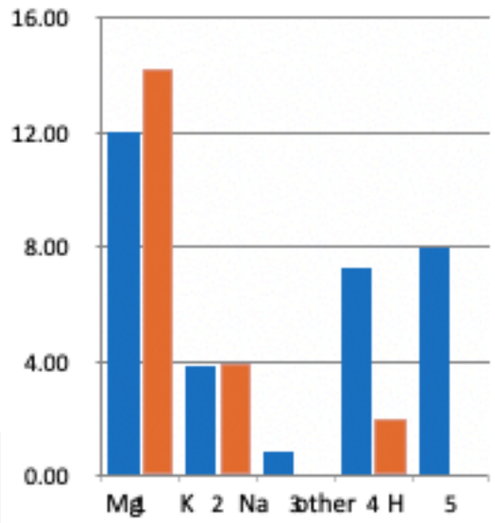

General comment on Structure

Mg SP 14.25 (<15)

	RATIOS : 1	Target level	Found	Structural comments	Plant health comments
Calcium	Ca : Mg	5.67	2.0		
Magnesium	Mg: K	3.13	1.98		
Potassium	K : Mg	0.32	0.51		
Potassium	K : Na	4.31	22.19		

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Organic Matter	Min >3%	3.90				Field Bulk density if known	
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Phosphates		
Sulphates		

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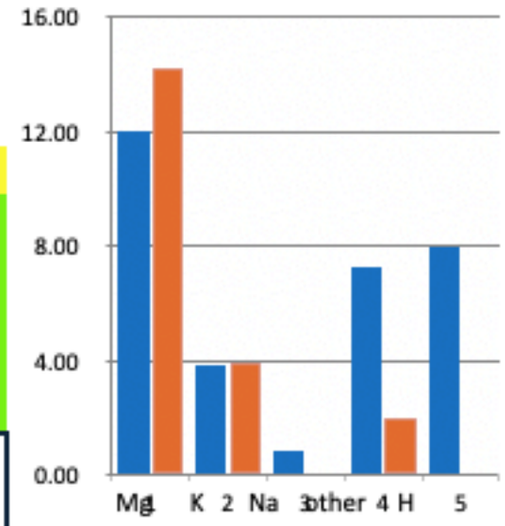

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Magnesium	Mg: K	3.13	1.98
Potassium	K : Mg	0.32	0.51
Element Potassium	K : Na	4.31	22.19

Structural comments

Plant health comments

What have you got?

				Biological Treatment
	Phosphorus	4.21	% 5-8	
iolog	C:P ratio	48.3	40to1	
	pH	7.70		
	Organic Carbon	2.29 %		

Predicted availability of trace elements			Found	Guides	Soil Treatments	Foliar treatment
Boron	B	mg/l	1.10	1.2-2.4		
Iron	Fe	mg/l	130.00	18 - 189		
Manganese	Mn	mg/l	105.00	18 -70		
Copper	Cu	mg/l	0.00	2.5 - 7		
Zinc	Zn	mg/l	0.00	4 - 10.		
Chlorine	Cl	mg/l	6.00	9-20.		
Iodine	I	mg/l	0.00	1		
Molybdenum	Mo	mg/l	0.50	0.5-0.7		
Cobalt	Co	mg/l	0.50	0.5-2.		

Elen

Standard UK index to ISO/IEC 17025-2005				Morgan / Reams		Modified Morgan		
mg/l	Index	Buffer pH	7.4	Index	Mg/l		mg/l	Index
25.4	2	Phosphorus		0	0	Phosphorus	0	0
159	2-	Potassium		0	0	Potassium	0	0
161	3	Magnesium		0	0	Magnesium	0	0
		Calcium			0			
UK phosphate is via the Olsen method		Organic Matter		3.9		Organic Matter	0	
1.0	standard UK K:Mg Ratio OK	Standard testing method for Southern Ireland				Standard testing method for Europe		

x Fig

Nature - the interface of environments


WHO
WHAT
WHERE
WHEN
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Thank you

COME AND VISIT!