EXPLORING NUTRITION AND NUTRIENTS

THE IMPORTANCE TO IRISH AGRICULTURE OF THEIR EFFECTIVE USE AND MANAGEMENT

FERTILISERS

https://www.tfi.org/GlobalFertilizerDay

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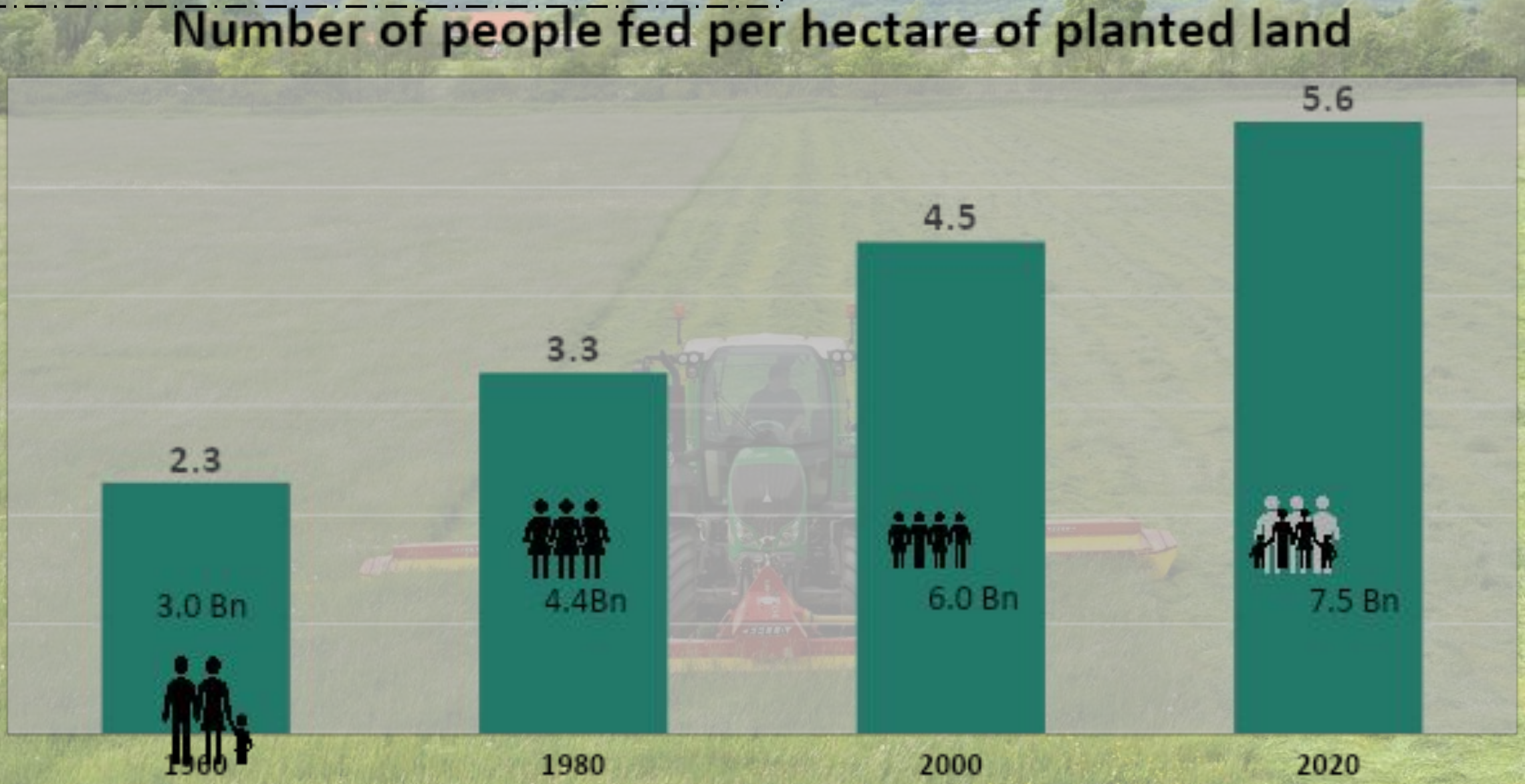
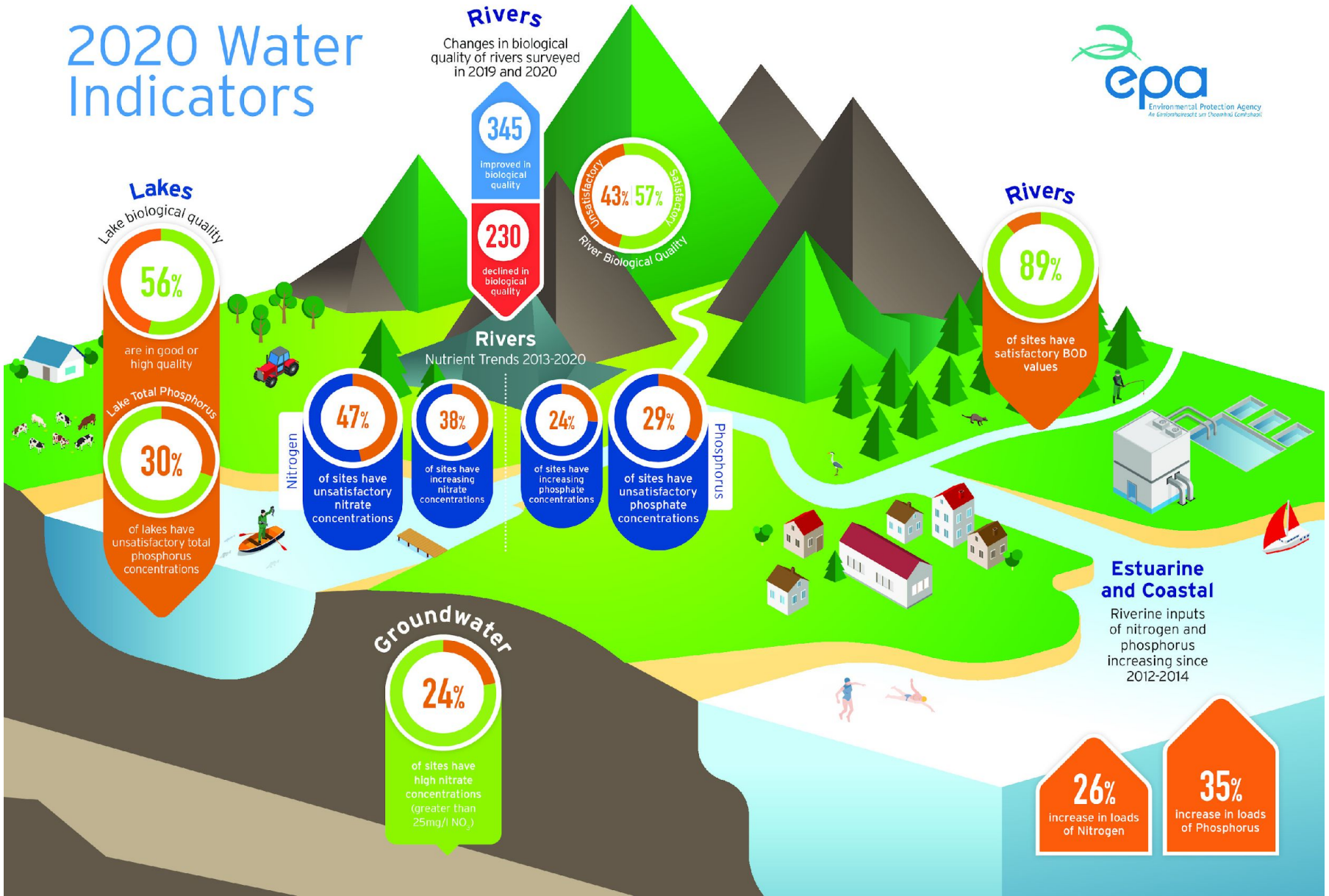
LO 3.3.2 1
CCT: Sustainability & Food Production



LO 3.3.2 1
CCT: Sustainability & Policy and Economics

LO 2.3 a
CCT: Sustainability & Environment



Highlights:

- 47% of sites have unsatisfactory nitrate concentrations
- 38% of sites have increasing nitrate concentrations
- 24% of sites have increasing phosphate concentrations
- 29% of sites have unsatisfactory phosphate concentrations

CCT: Sustainability

https://www.tfi.org/GlobalFertilizerDay

POLICY CHANGES

– Nitrates Action Plan

- Outlines farm level Nitrogen and Phosphorus allowance (kg/ha) to ensure responsible use

– EU Green Deal

- **2030** - Reduce net greenhouse gas emissions by at least 55% (relative to 1990 levels)
- **50%** reduction in the use of chemical pesticides by 2030
- **50%** reduction in nutrient losses while ensuring no deterioration on soil fertility
- **20%** reduction in fertiliser use by 2030
- **25%** of total farmland to be farmed organically by 2030

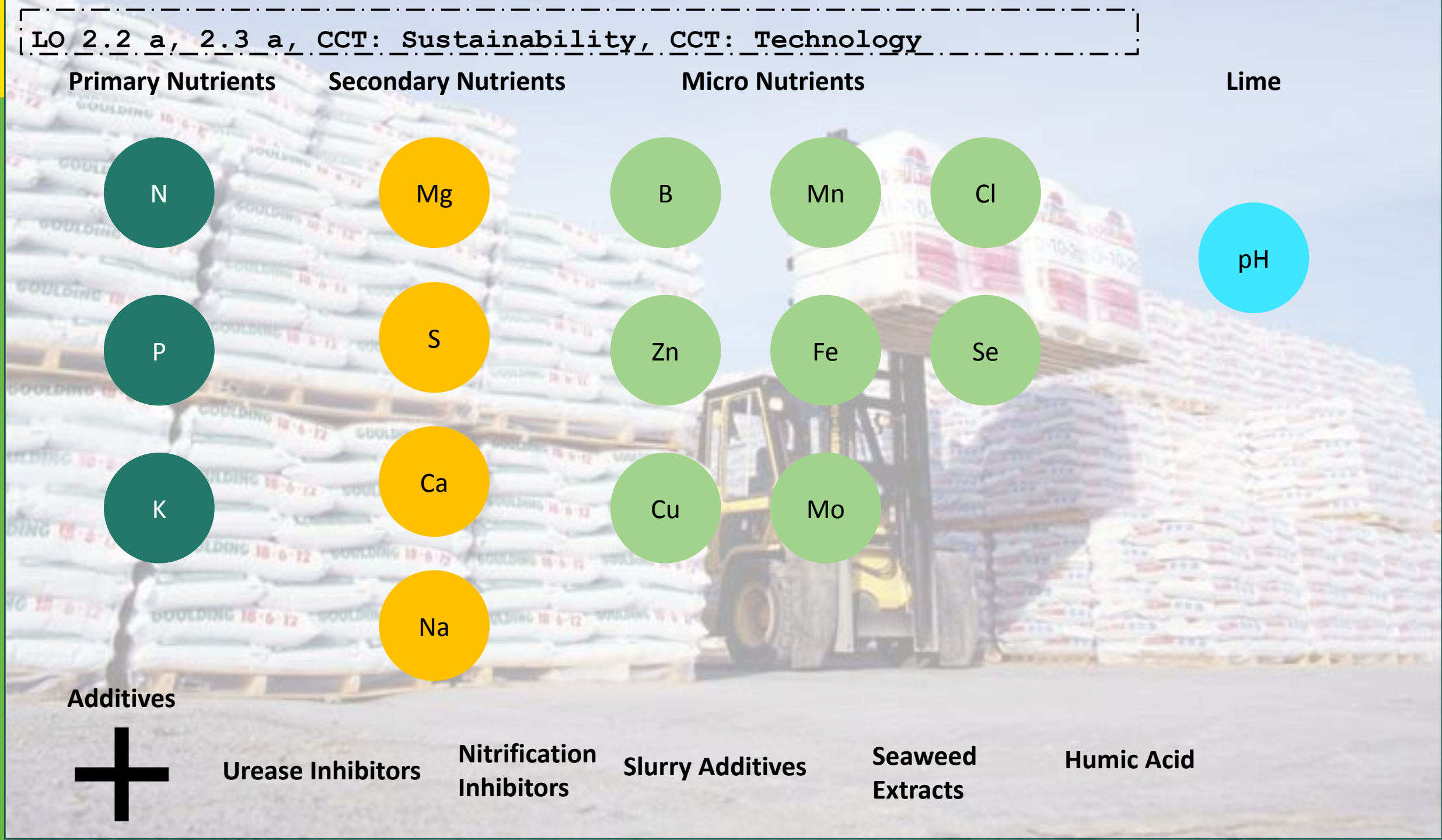
– AgClimatise

- Reduce nitrogen usage to 325,000 tonnes
- Convert all Urea to Protected Urea
- Convert 50% of CAN use to Protected Urea
- Increase Nitrogen use efficiency (NUE)
- Extend Grazing into “shoulders of year” – Spring & Autumn grazing management
- Use of Clover in swards
- LESS equipment use & slurry amendments
- Carbon sequestration of farms

– Food Vision 2030

- Increase agri-food exports by 50% to 2030

LO 2.2 a, 2.3 a, CCT: Sustainability, CCT: Technology

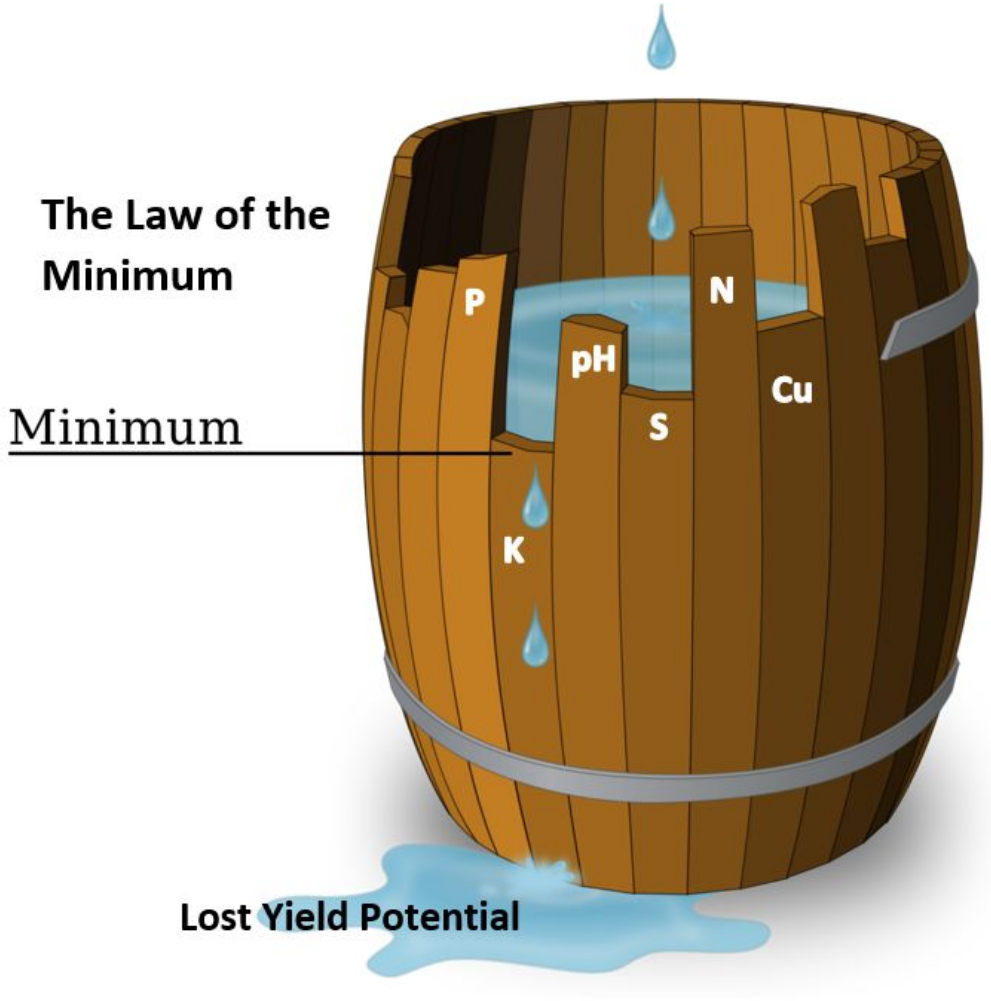


- World Demand:
  - Nitrogen – 110MT
  - Phosphorus – 50MT
  - Potassium – 40MT
- Ireland Usage:
  - Nitrogen – 380KT
  - Phosphorus – 45kt
  - Potassium – 120kt

LO 2.2 a, 2.3 a

LIEBIG'S LAW OF THE MINIMUM

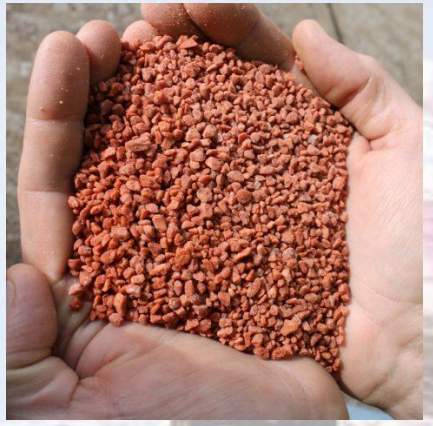
- Liebig's Law states that growth is dictated not by total resources available, but by the scarcest resource (The limiting factor)
- Aim to optimise nutrition in the soil and plant
- Increase efficiency of nutrients to reduce dependency



LO 2.2 a, 2.3 a

Fertilisers






1 Tonne of 18:6:12

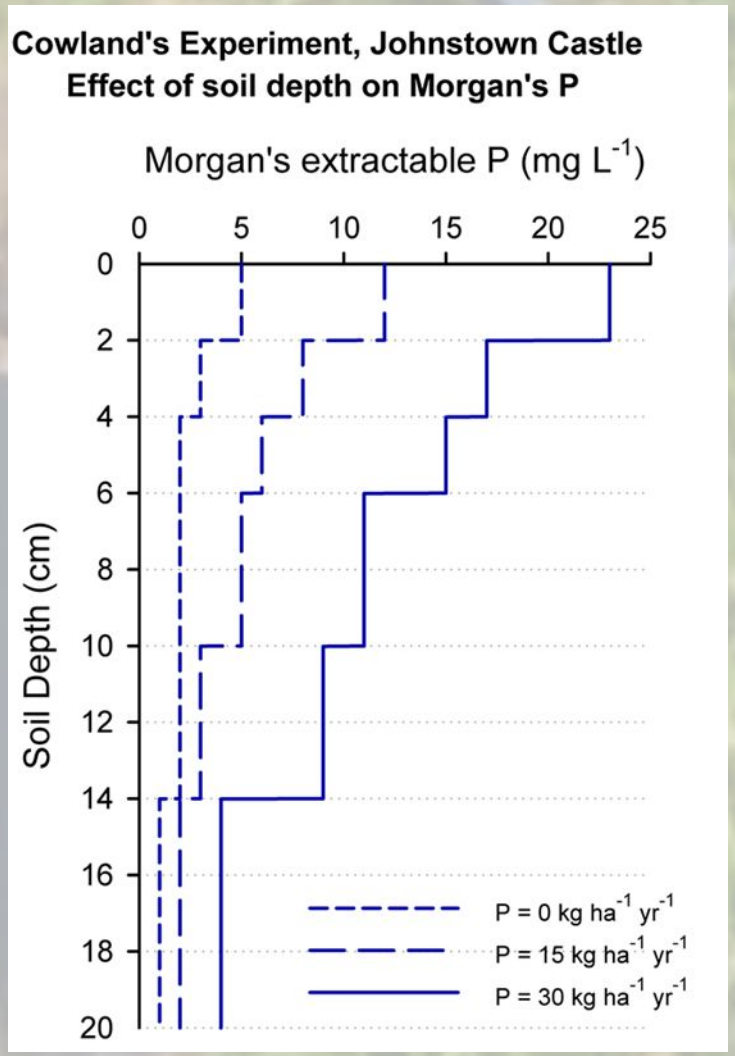
460 kg of CAN = 27 * 0.46 = 12.5:0:0
300 kg of DAP = 18:20 * 0.30 = 5.5:6:0
240 kg of MOP = 50 * 0.24 = 0:0:12
Total = 18:6:12

- Gouldings offer bespoke fertiliser grades to match individual crop and soil requirements

LO 2.2 a, 2.3 a,
CCT: Policy and Economics

SOIL SAMPLE

- Soil test
  - pH
  - Phosphorus
  - Potassium
  - (Magnesium)
  - Trace Elements
- Cost
  - €15 - €100+ per sample
  - €0.95 per hectare per year
- Sampling procedure is critical



LO 2.2 a, 2.3 a

SOIL SAMPLE RESULTS

Soil Index	Description	Soil Type P (mg/litre)		Soil Type K (mg/litre)
		Grassland	Other crops	
1	Very low	0 - 3.0	0 - 3.0	0 – 50
2	Low	3.1 - 5.0	3.1 - 6.0	51 – 100
3	Medium	5.1 - 8.0	6.1 – 10	101 - 150
4	High	≥8.1	≥10	≥151

LO 2.2 a, 2.3 a

Sample Ref NUMBER 3 **Date Received** 25/11/2019 (Date Issued: 27/11/2019)

Sample No IR004830/03

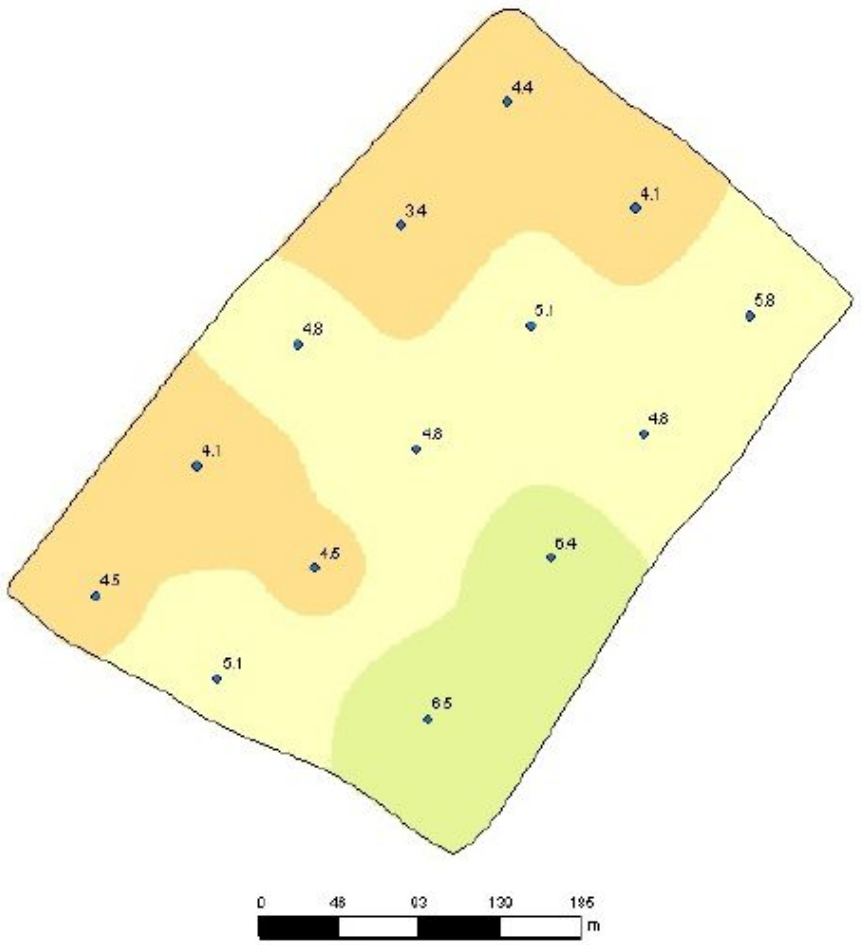
Crop BARLEY (WINTER)

Analysis	Result	Guideline	Interpretation	Comments
pH	7.4	6.5	Medium	Adequate level.
Phosphorus Irish (ppm)	9.1			**(Index 3)** 25 kg/ha (20 units/acre) Phosphorus (P).
Potassium Irish (units)	108			**(Index 3)** 85 kg/ha (68 units/acre) Potassium (K).
Magnesium Irish (ppm)	153	101	High	**(Index 4)** Adequate level.
Calcium (ppm)	2660	1600	Medium	Adequate level.
Sulphur (ppm)	2	10	Very Low	CONSIDER TREATMENT.
Manganese (ppm)	193	90	Medium	Adequate level.
Copper (ppm)	6.0	4.1	Medium	Adequate level.
Boron (ppm)	2.30	1.60	Medium	No problem on this crop. Other crops may be affected.
Zinc (ppm)	4.1	4.1	Medium	Adequate level.
Molybdenum (ppm)	0.14	0.30	Low	Low priority on this crop. Other crops may be affected.
Iron (ppm)	614	50	Medium	Adequate level.
Sodium (ppm)	23	90	Very Low	Not a problem for this crop.
C.E.C. (meq/100g)	15.1	15.0	Medium	Cation Exchange Capacity indicates a soil with a good nutrient holding ability.

Additional Comments

Phosphorus and Potassium have been analysed by the Morgan's method as specified by the Nitrates Directive and the REPS Regulations. Fertiliser applications must take into consideration any nutrients supplied by the use of organic manures. Phosphorus and Potassium have been analysed by the Morgan's method as specified by the Nitrates Directive and the REPS Regulations. Fertiliser applications must take into consideration any nutrients supplied by the use of organic manures.

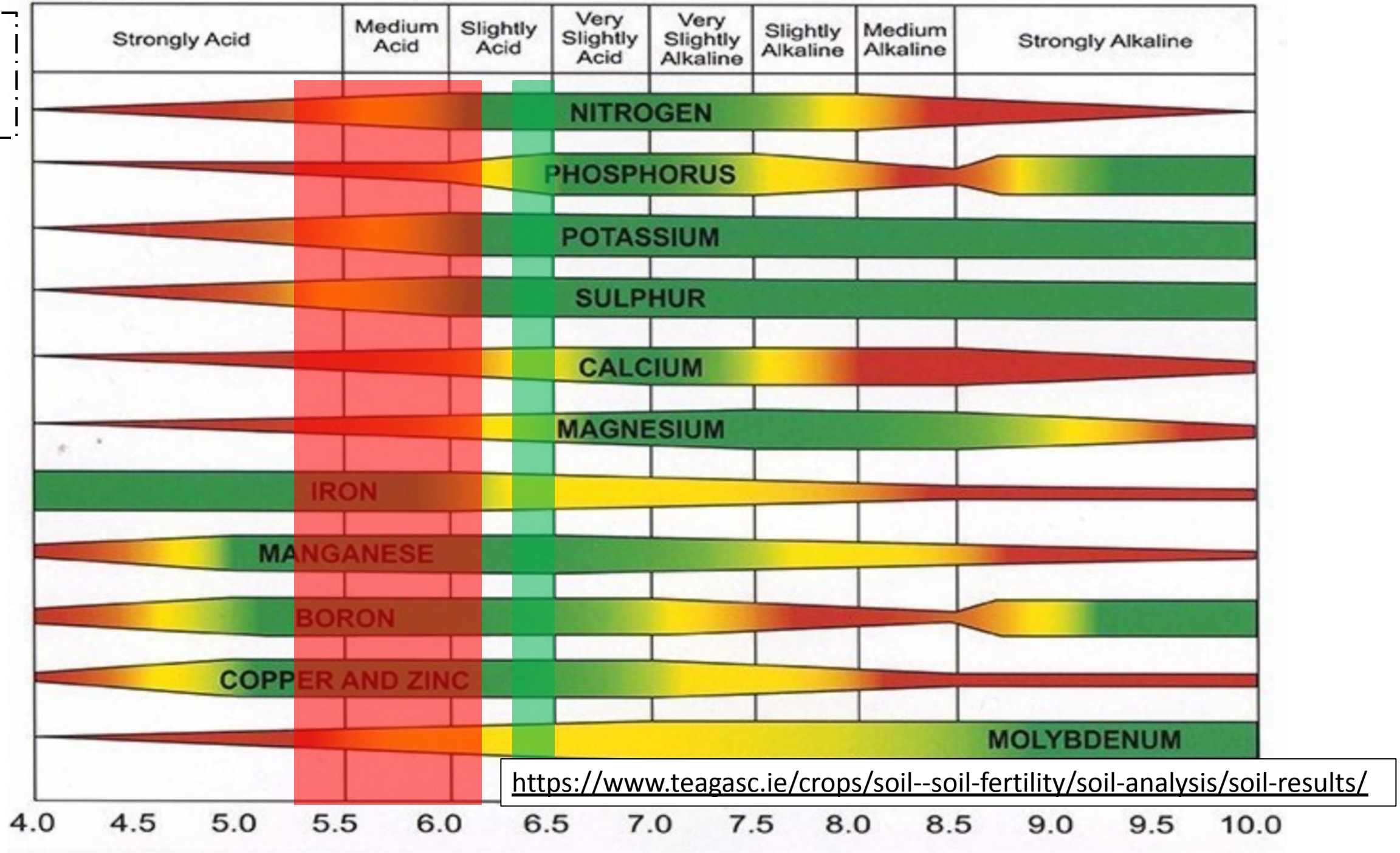
Soil Test Phosphorus



Boundary Area: 12.85 (ha)
Min: 3.4 (mg/l)
Avg: 5.0 (mg/l)
Max: 6.5 (mg/l)
Sample Depth: 0 (cm) - 15 (cm)
Start Date: 07/10/2015
End Date: 07/10/2015

mg/l		%
	1-	0.00
	1+	0.00
	2-	35.76
	2+	47.63
	3-	16.58
	3+	0.00
	4	0.00
	P Unspecified	
	Field Boundary	

LO 2.2 a



https://www.teagasc.ie/crops/soil--soil-fertility/soil-analysis/soil-results/

SOURCE: https://www.emporiumhydroponics.com/what-is-ph-1-to-14

LO 2.2 a, 2.2.1 b

EFFECT OF SOIL PH ON NUTRIENT AVAILABILITY

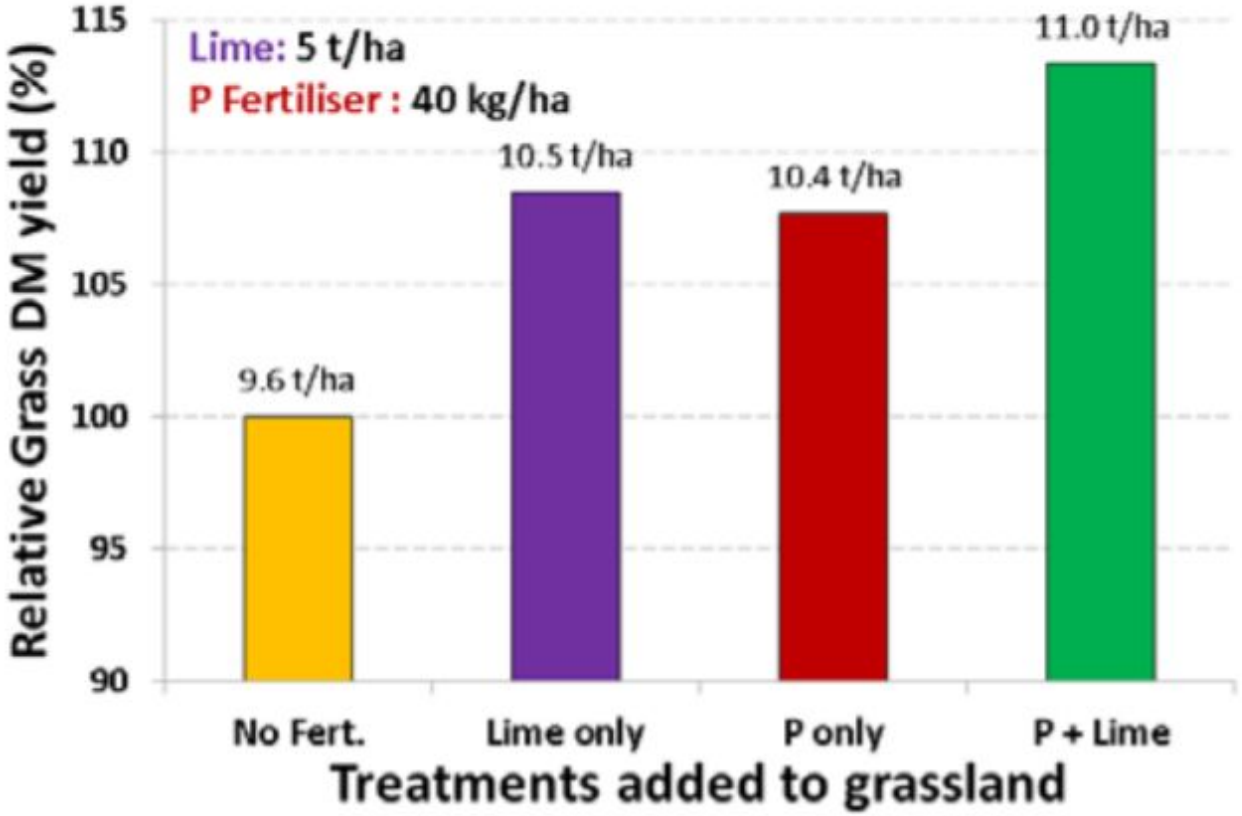


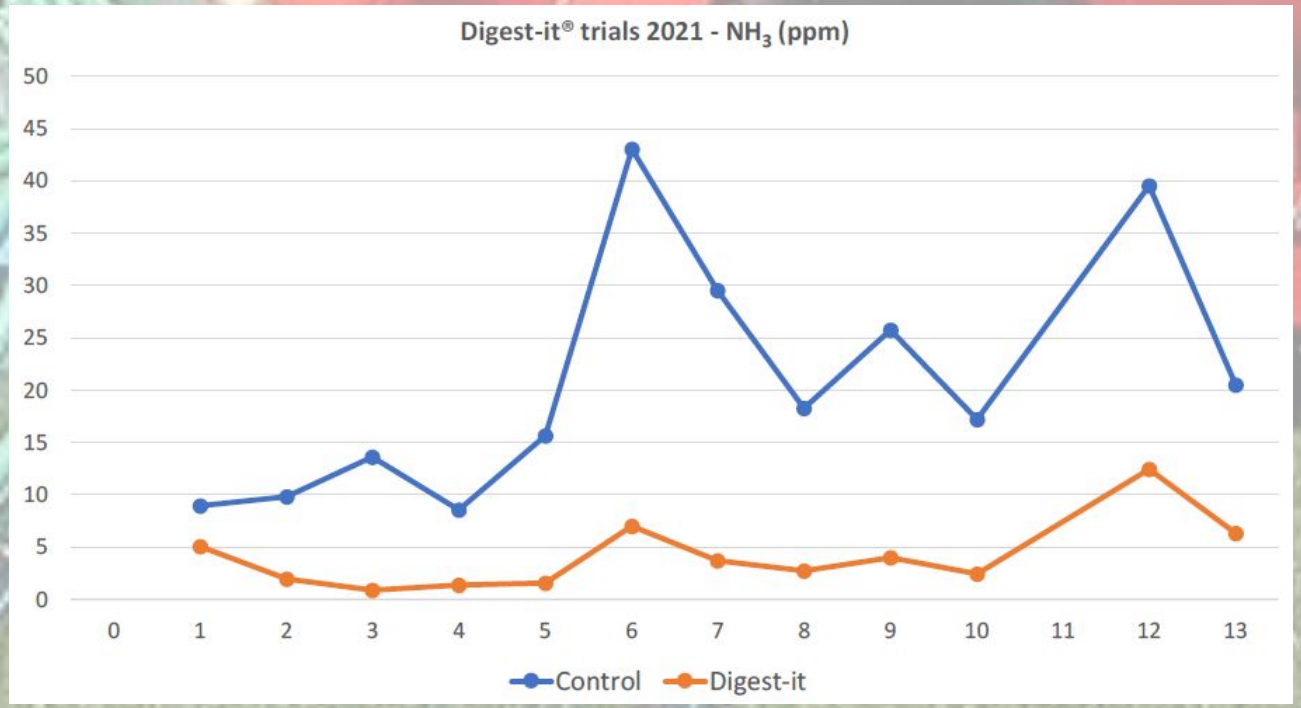
Figure 2. Relative grass DM yield response in grassland treated with Lime (5 t/ha of lime), P fertiliser (40 kg/ha of P), and P + Lime over a full growing season

Ref: Wall, D; Sheil, T; Lalor, S; Plunkett, M, 2015

LO 2.3 a

SLURRY/ORGANIC MANURES

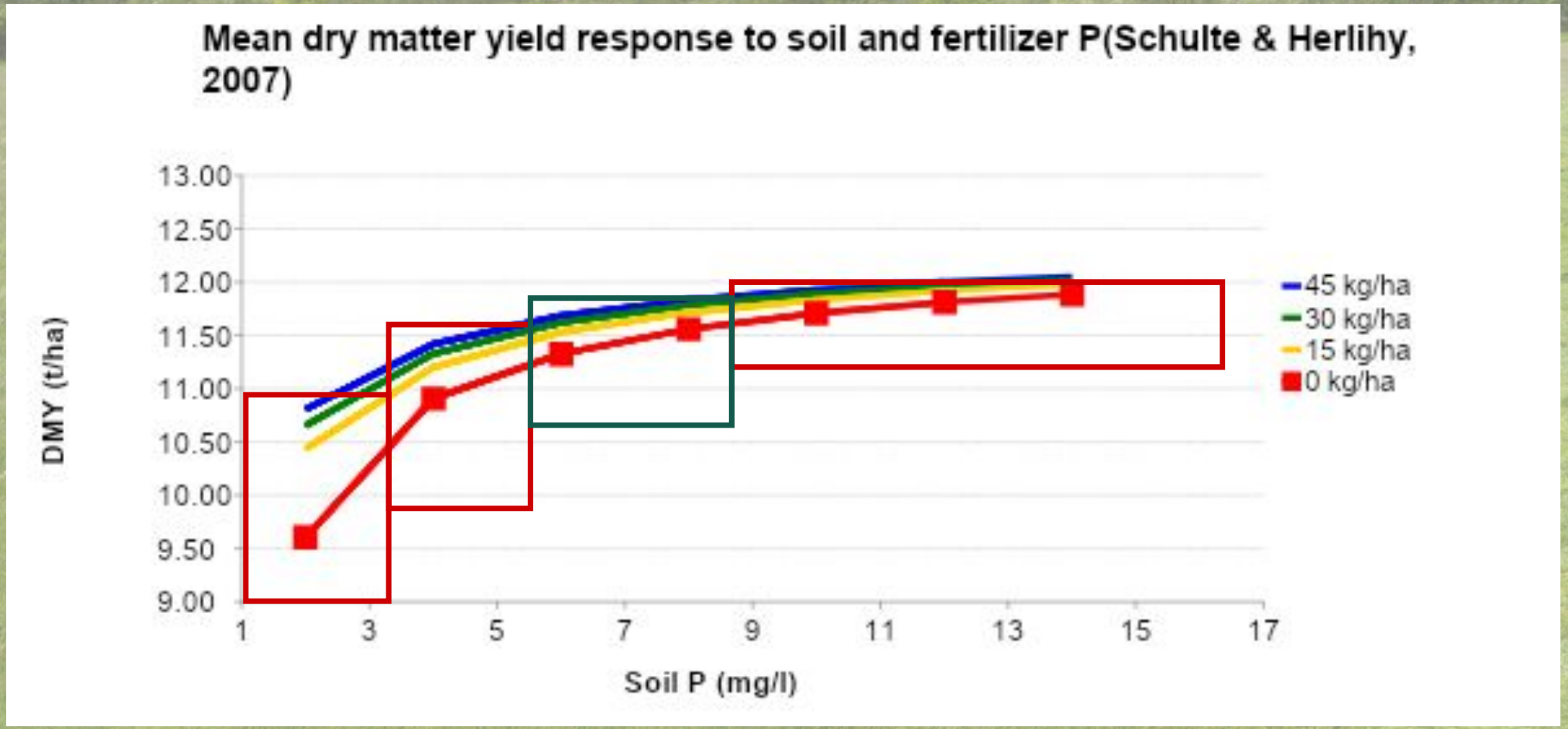
Per units/1,000 gals	N	P	K
Cattle Slurry	9	5	32
Pig Slurry	19	7	20
Farmyard Manure	3	2	12
Poultry Litter	28	12	36



Slurry enhancers in market offer increased nutrient availability & reduced environmental impact

LO 2.2 a

EFFECT OF SOIL PHOSPHORUS ON YIELD



EFFECT OF SOIL POTASSIUM ON YIELD

Spring Barley:

- **Difference of 2.3t/ha or €345/ha**
- **Average farm size 60ha = €20,700**

Grass:

- **1.5t DM/ha response, €270/ha**
- **Return on average dairy farm ~ €15,400**

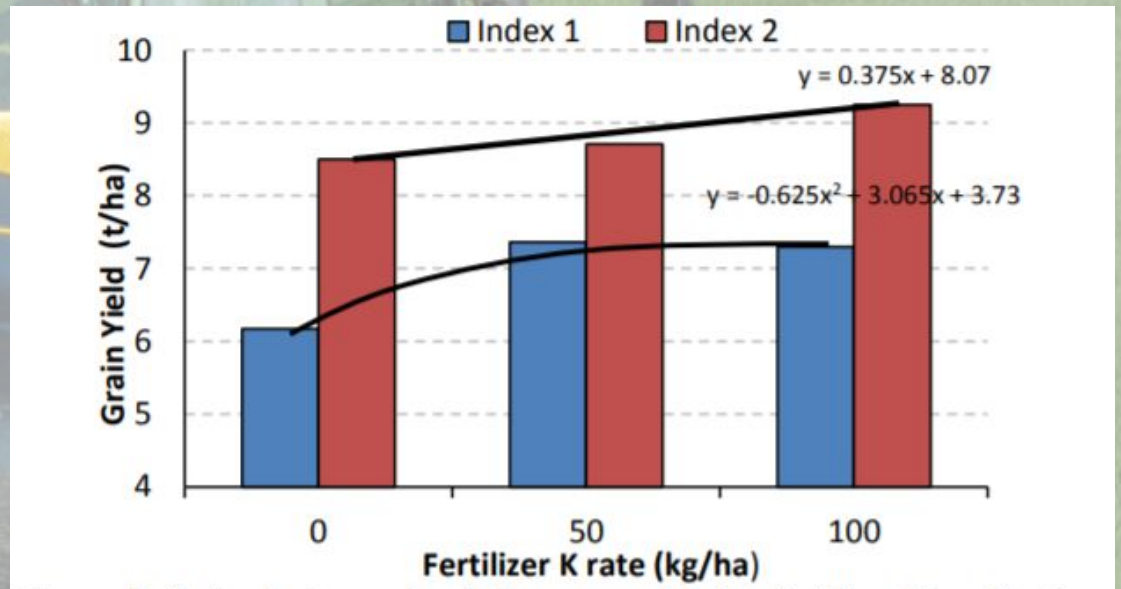


Figure 1. Spring barley grain yield response (t/ha) to fertilizer K application rate (kg/ha) for K Index 1 & K Index 2 soils at Oak Park, Co Carlow in 2015.

Ref: Plunkett, M; Bourke, M; Forrestal, P; Wall, D; 2016

LO 2.2.3 a

NITROGEN FERTILISERS IN THE SOIL

N_2O gas

Ammonia gas

Urease

UREA + NBPT

Urea-N

Ammonium-N

Nitrate-N

- ve

NH_4^+

Nitrification

NO_3^-

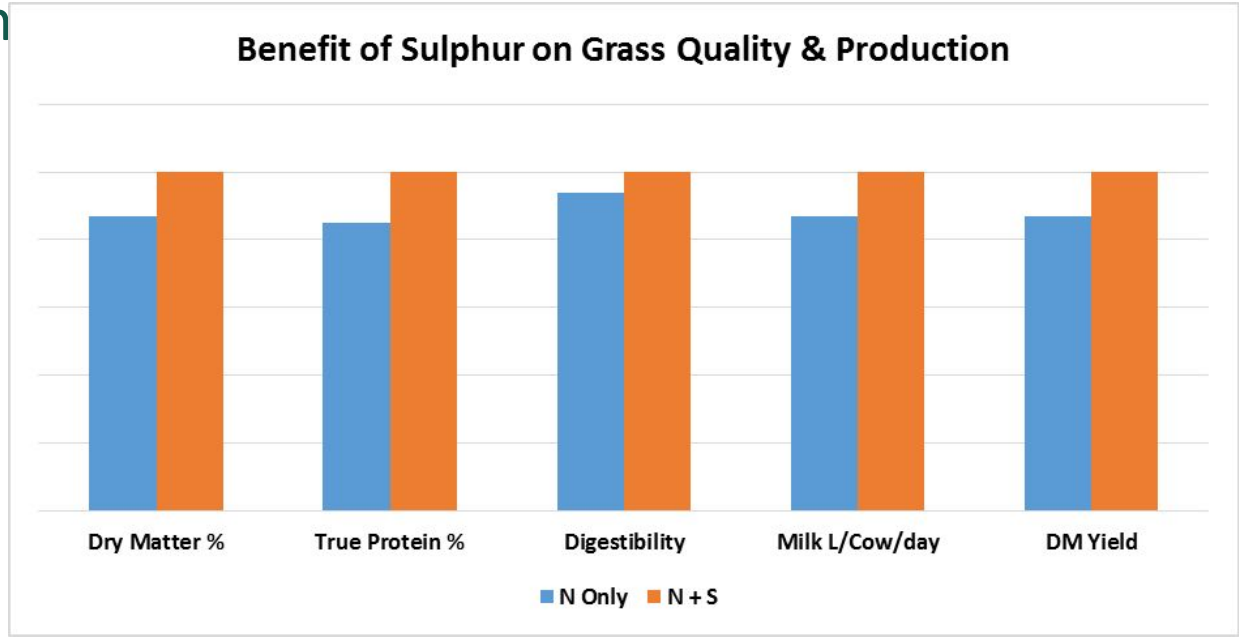
Bacteria

Leaching

LO 2.2 a

BENEFITS OF SULPHUR

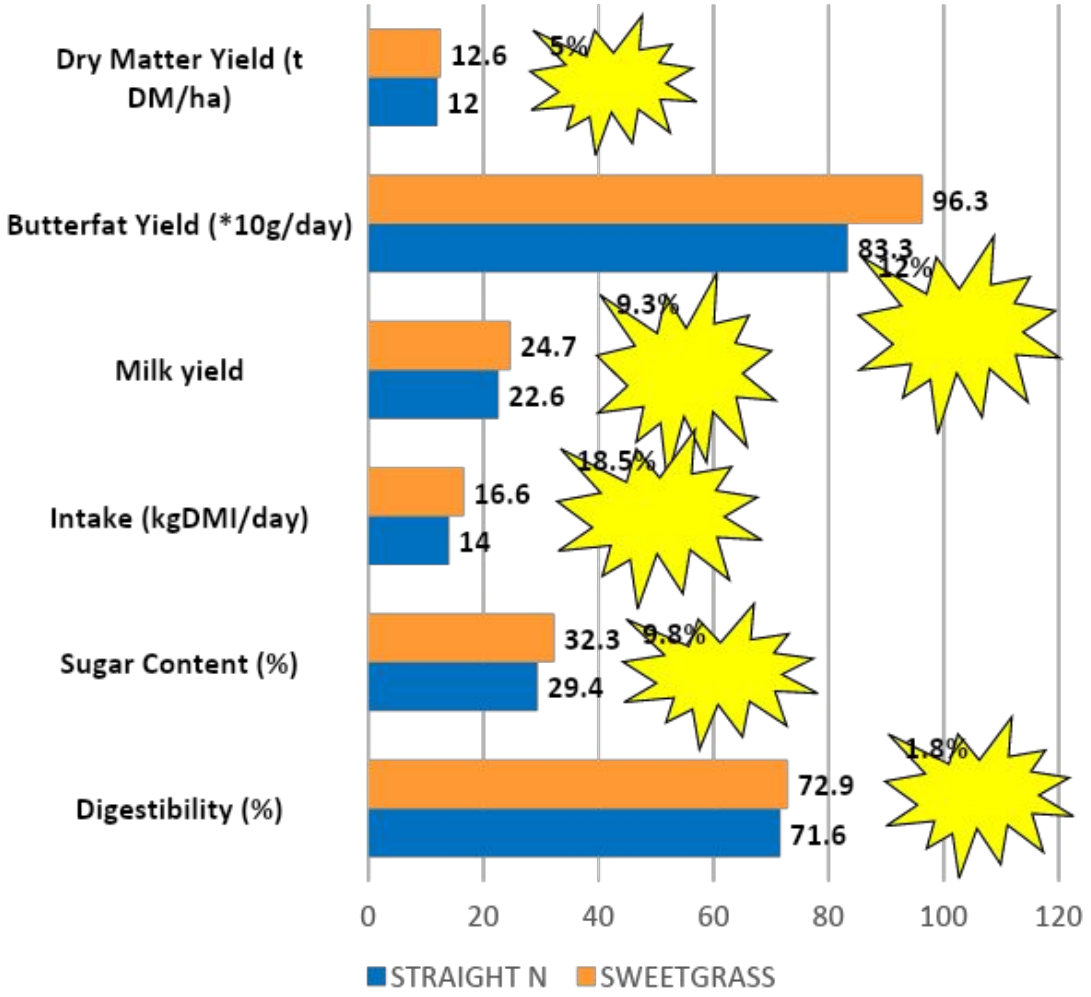
- 3.3t DM/ha over 3 cuts = €825/ha
- 2t yield increase in grazed grass in Clonakilty = 2t/ha = €500/ha
- 4% increase in DMD = 14.4% in milk yield = €238/cow/year @ 30c/l
  - 100 Cow benefit - €23,800
- Input of €6/ha of sulphur has the potential to prevent yield losses worth up to €100.



Ref: Rothamsted Research
Ref: Teagasc Clonakilty
Ref: John Bailey, Afbi, 2015
Ref: Bouchard & Conrad, 1973

LO 2.2 a

BENEFITS OF SODIUM

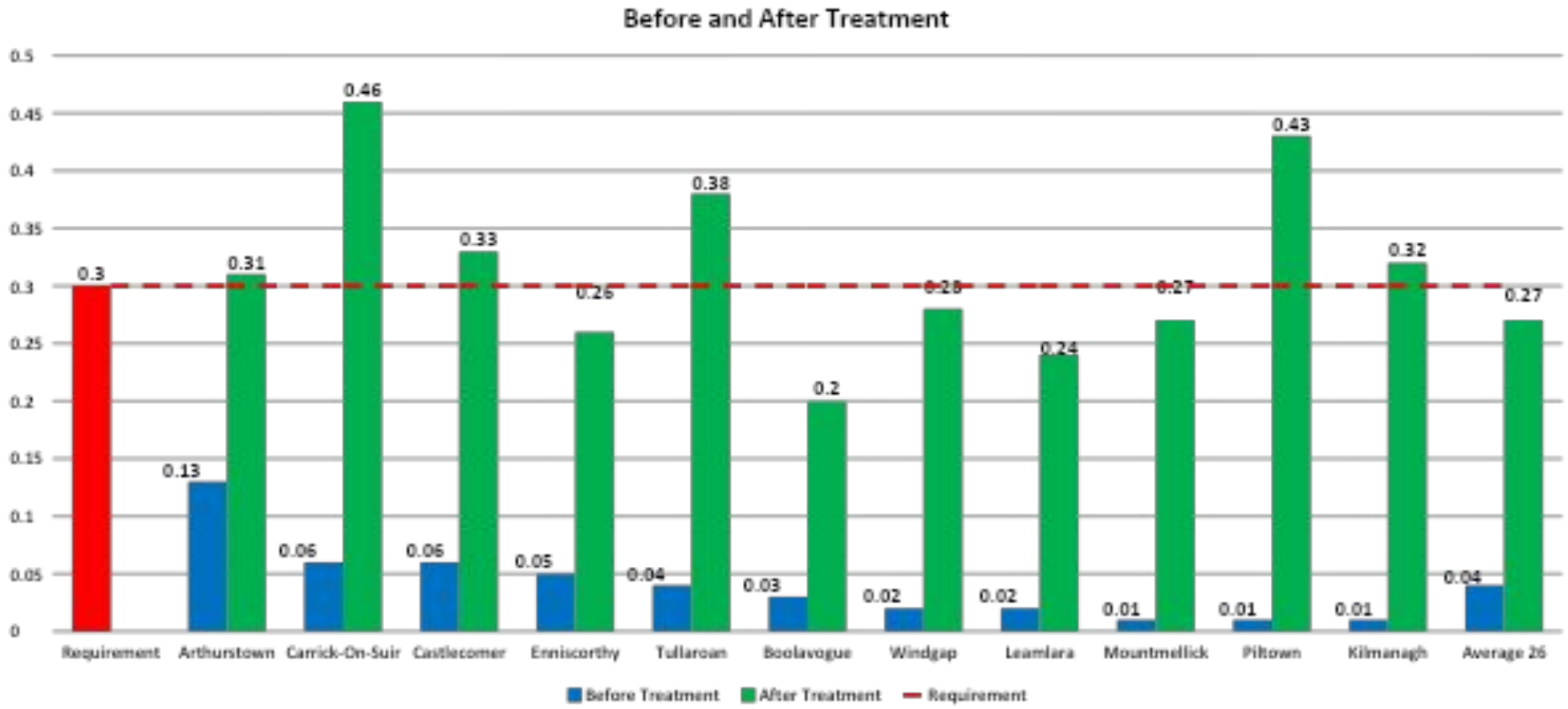


- 0.6t/ha DM Yield
  - €108/ha
  - €6,156 average
- Milk Yield
  - 506L per cow
  - @30c/l (€150/cow)
- Intake
  - Increase utilisation by 1t/ha
  - €250/ha
  - €14,250 average farm benefit

Ref: Chiy & Phillips, 1991
Ref: Gordon, et al

LO 2.2 a

SELENIUM



LO 2.3 a

THE IMPORTANCE OF EFFECTIVE USE AND MANAGEMENT OF NUTRIENTS TO IRISH AGRICULTURE

- Safeguard our rivers, lakes and streams
- Production of clean/safe food
- Sustain a new generation of family farmers/land custodians
- Reduce our carbon footprint per unit of production
- Avoid Carbon leakage
- Achieve Food Vision 2030 Export Targets

LINKS

- Fertilizer Association of Ireland
- Teagasc Soil Analysis
- Goulding Fertilisers
- Origin Fertiliser UK
- Potash Development Association
- The Fertiliser Institute