Using Soil Tests for Soil Fertility Management

Mark Plunkett, Soil & Plant Nutrition Specialist, Johnstown Castle, Co. Wexford

Overview

Soil Testing and soil fertility levels

Managing soil fertility – 5 Simple steps

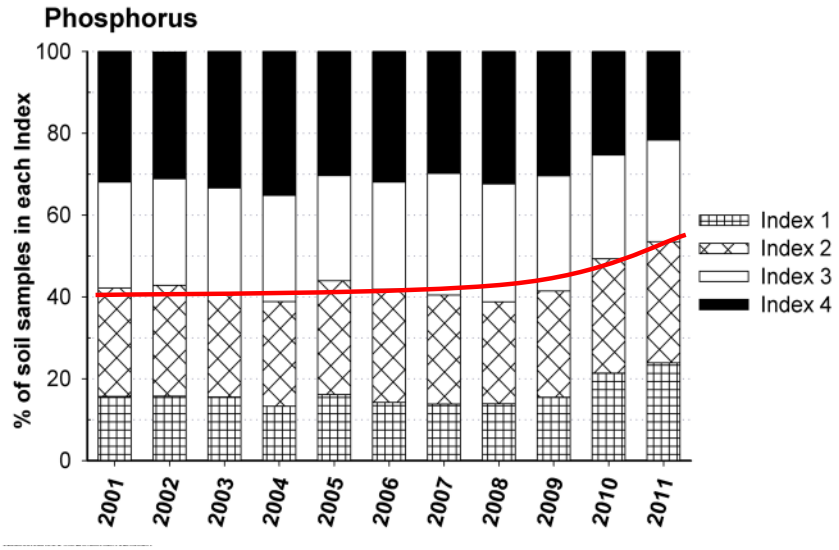
The Irish Agriculture and Food Development Authority

Soil Testing

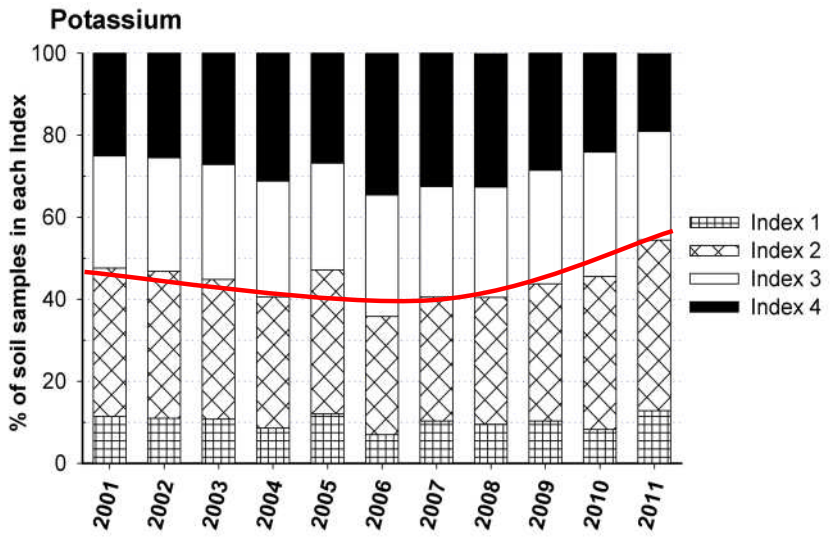
- Soil analysis measures plant available nutrients
- Establish soil nutrient levels
- Ensures correct nutrient supply & reduces risk to the environment
- Regular Soil analysis essential part of good nutrient management

You wouldn't feed animals without looking at their condition, so why do it to your soils.

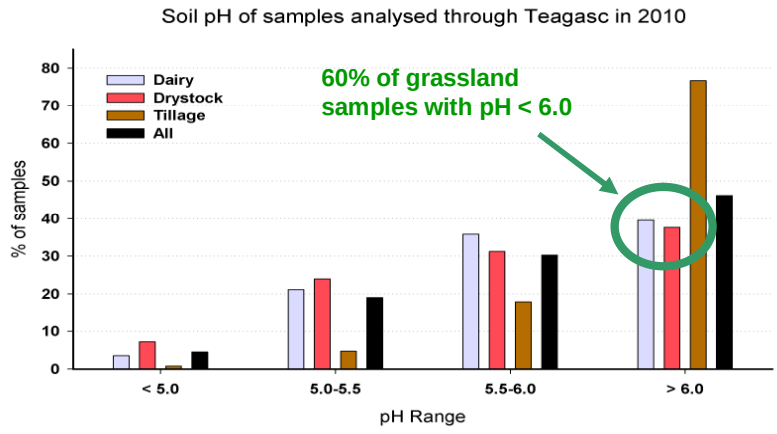
Soil P Trends



Soil K Trends



Soil pH in 2010



5 Steps to Soil Fertility Management

1. Soil Analysis Results
2. Apply lime to achieve target soil pH
3. Aim for soil Index 3 in all fields
4. Use organic manures efficiently
5. Ensure a balanced nutrient supply

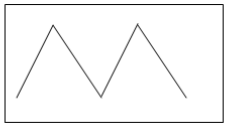




Step 1 – Soil Analysis Results

Establish farm soil fertility levels

>50% of samples with low P and K – you need to know which ones are low or high!



Small annual cost – 0.50c/ac

Take a good soil sample

1. *Sampling area 2 to 4 ha*
2. *Representative sample*

Step 1 – Soil Analysis Results

Establish farm soil fertility levels

>50% of samples with low P and K – you need to know which ones are low or high!

Small annual cost – 0.50c/ac

Take a good soil sample

1. *Sampling area 2 to 4 ha*
2. *Representative sample*
3. *Sampling time*

Step 1 – Soil Analysis Results

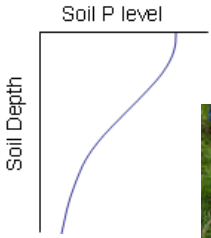
Establish farm soil fertility levels

>50% of samples with low P and K – you need to know which ones are low or high!

Small annual cost – 0.50c/ac

Take a good soil sample

1. *Sampling area 2 to 4 ha*
2. *Representative sample*
3. *Sampling time*
4. *Sampling depth*



Step 1 – Soil Analysis Results

Establish farm soil fertility levels

>50% of samples with low P and K – you need to know which ones are low or high!

Small annual cost – 0.50c/ac

Take a good soil sample

1. *Sampling area 2 to 4 ha*
2. *Representative sample*
3. *Sampling time*
4. *Sampling depth*

Monitor soil fertility levels over time & adjust applications were required

Step 2 – Maintain Correct Soil pH

Benefits of correct soil pH

- Increase availability of soil and applied nutrients
- Essential for cereals / more productive grasses

Aim to maintain soil pH in optimum range

Crop	Optimum Soil pH
Beet, Beans, Peas, OSR	7.0
Cereals & Maize	6.5
Grassland	6.3
Grassland (high Mo)	6.2
Potatoes	6.0

Liming Advice

Grassland

- >7.5t/ha → split
  - apply 7.5 t/ha now
  - remainder in 2 yrs
- High Mo soils
  - Maintain <pH 6.2
  - Reduce app. by 5t/ha

Tillage Soils

- Lime to the most sensitive crop in rotation
- Apply after harvest to stubble
- Low Soil Mg select Mg lime

Liming Advice

Timing

- Apply lime at convenient time
- Best to apply 2 yrs in advance of sensitive crops
- Ideally apply in Sept / Oct

Check soil Mg levels & select suitable lime source

- Avoid Mg lime where soil high in Mg

Step 3 – Soil P & K Index 3

Soil test results show plant available P & K in mg/l

Aim for soil Index 3 – *Optimum soil Index*

Soil Index	Response to fertilisers	P (mg/l)		K (mg/l)	Mg (mg/l)
		Grass	Tillage		
1	Definite	0 - 3.0	0 - 3.0	0 - 50	0 - 25
2	Likely	3.1 - 5.0	3.1 - 6.0	51 - 100	25 - 50
3	Unlikely	5.1 - 8.0	6.1 - 10.0	101 - 150	51 - 100
4	None	>8.0	>10.0	>150	>100

Effects of low soil fertility

Grassland Farms

Very Low P soils
- 1.5 t DM/ha

Very Low K soils
- 1 to 3 t DM/ha (G Silage)

Tillage Farms

Very low P soils
- 0.55 t/ha (S. Barley – Irl)
- 2.75 t/ha (S. Barley – RB209)

Very low K soils
- 2.35 t/ha (W. Wheat – RB209)

Low K soils
- 0.40 t/ha (S. Barley – Irl)

Indicators

Loss of rye grasses / clovers

Increased reseeding costs

Reduced early grass prod

Reduced tillering

Reduced rooting

Reduced grain yield

Lower grain quality

The Irish Agriculture and Food Development Authority

P & K Advice

Index 4

- Soil P & K reserves ***High***
- Omit P until re-test / Omit K for 1 yr & revert to Index 3 advice

Index 3

- Soil P & K reserves ***Medium***
- Replace P & K off takes
- Aim to maintain soil fertility

P & K Advice

Index 2

- Soil P & K reserves ***Low***
- Replace P & K off takes
- Apply additional P or K to build soil fertility

Index 1

- Soil P & K reserves ***Very Low***
- Replace P & K off takes
- Apply additional P or K to build soil fertility

P and K Removals

Spring Barley @ 7.5t/ha

7.5t/ha
(Grain & Straw)

P → 28kg/ha P → 23 units/ac

K → 86kg/ha K → 69 units/ac

Replace P & K off takes to maintain soil fertility

13-6-20

Step 4 - Organic Manures

Valuable sources of N, P K & other nutrients

Determine the nutrient content

- Lab analysis
- Quick tests – Slurry hydrometer / Agros N meter / etc…

	Dry Matter %	units/1,000gal		
		N	P	K
Cattle slurry	7%	6	5	39
½ slurry + ½ soiled water	4%	5	4	23
Soiled wat		4		5

N P K **6 - 5 - 39** 50 kg

N P K **5- 4 - 23** 50 kg

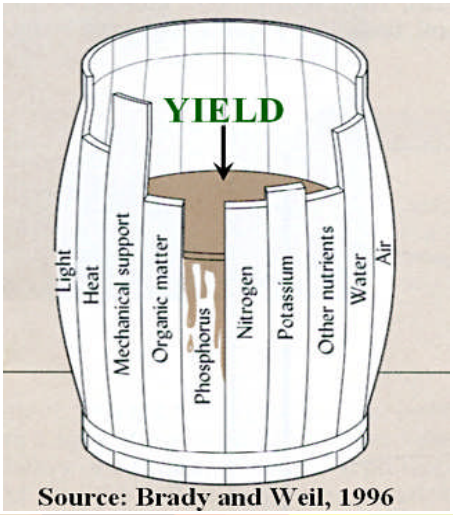
N P K **4 – 0.7 - 5** 50 kg

Step 4 – Organic Fertiliser Management

- Identify low P & K fertility fields
- Determine nutrient content
- Agitate well to reduce nutrient variability
- Apply evenly / correct rate
- Apply under suitable conditions to maximise N recovery
- Incorporate to reduce N losses
- Reduce bag fertiliser appropriately

Step 5 – Nutrient Balance

- Nutrient in shortest supply limits yield
- Ensure a balanced nutrient supply
- Select most suitable fertiliser to balance crop nutrient requirements



Source: Brady and Weil, 1996

Spring Barley 7.5 t/ha

			K			
		Index	1	2	3	4
		Advice (kg/ha)	115	100	85	0
P	1	49	2.3	2.0	1.7	P
	2	39	2.9	2.6	2.2	P
	3	29	4.0	3.4	2.9	P
	4	0	K	K	K	-

Options

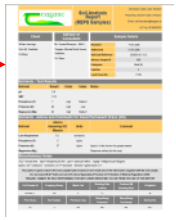
Index 1 P K – 3 bags/ac 12-8-20 + 2,000gal/ac Pig Slurry
Index 2 P K - 3.4 bags/ac 11-9-22
Index 3 P K – 3.8 bags/ac 13-6-20

18-6-12 or 10-10-20 not always ideal.

1:2 product plus MOP.

Select most suitable fertiliser
Deliver crop N, P & K requirements
3 bags 'v' 3 - 4 bags

In Summary



Thank You For Your Attention

The Irish Agriculture and Food Development Authority