The benefits of getting Soil Fertility Right

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Irish Grassland Association
Dairy Conference
Clonmel Park Hotel
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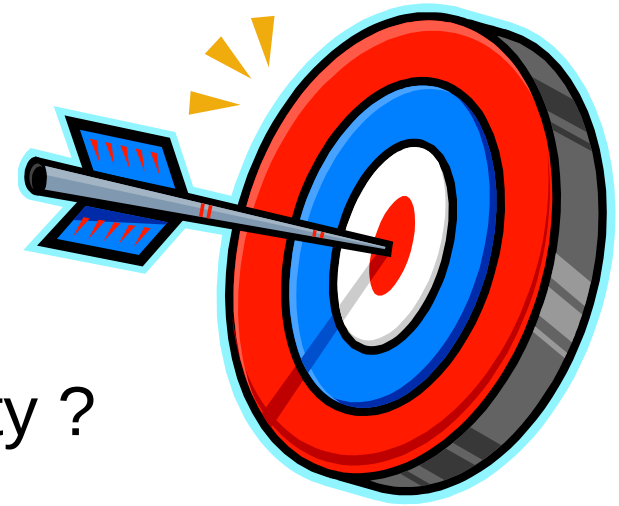
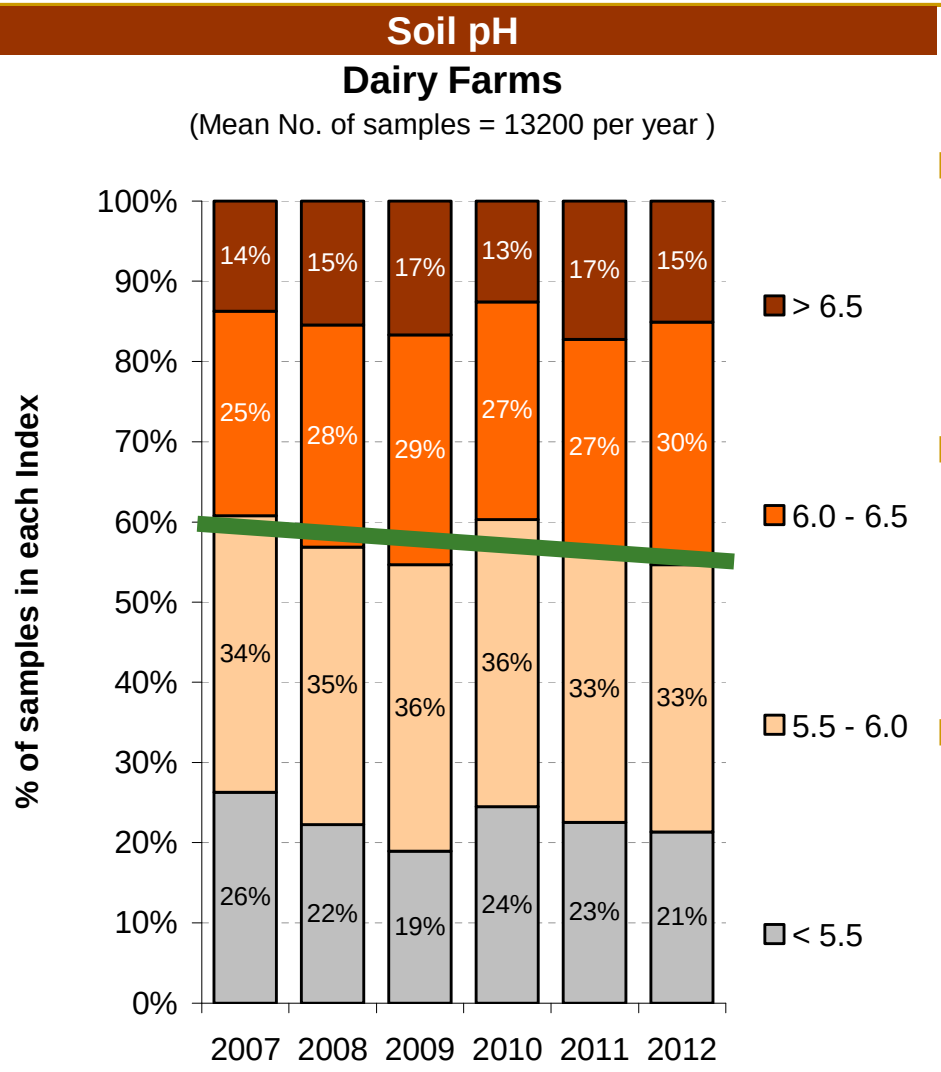
Teagasc
Agriculture and Food Development Authority

Outline – Key Questions

- What's happening to soil fertility ?
- What steps can be followed to manage it ?
- What are the benefits ?
  - Is there a return on investment to managing / improving fertility ?
- What Targets can be set for soil fertility ?

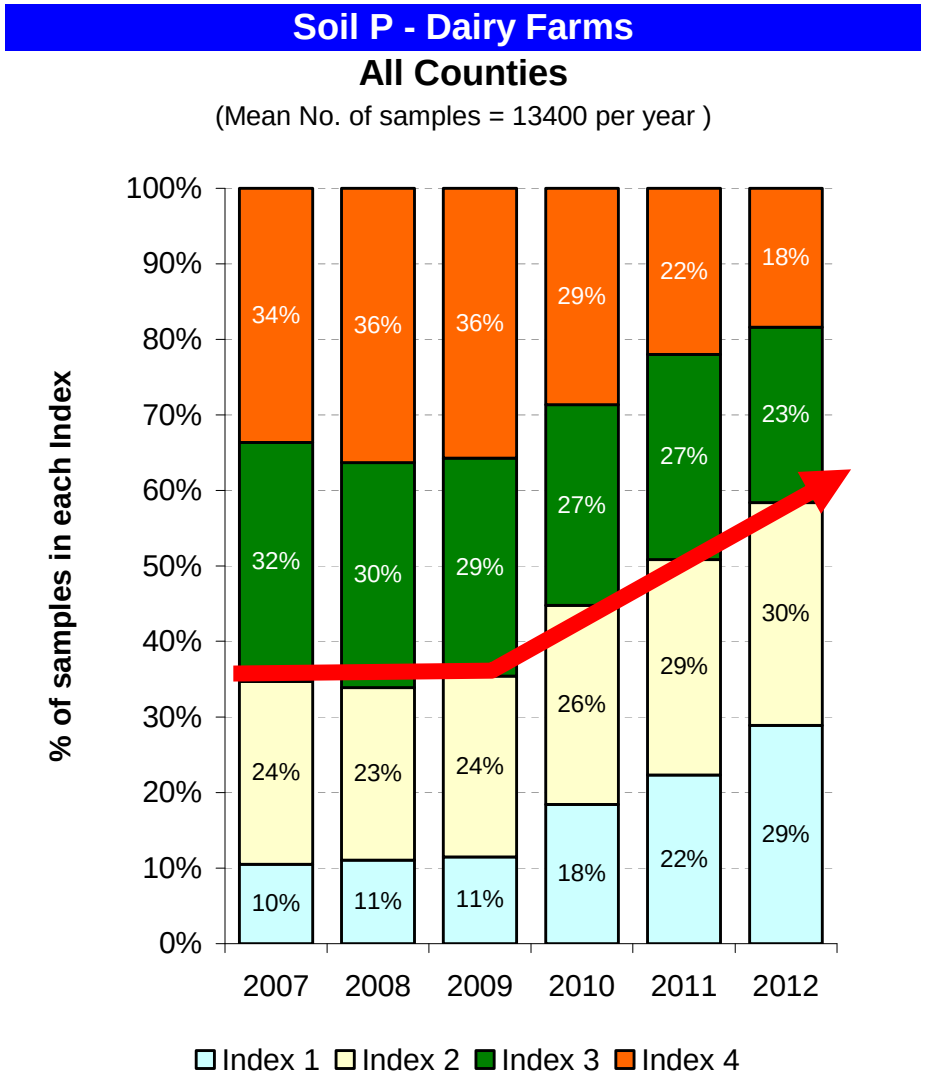


Soil pH – Grassland soils



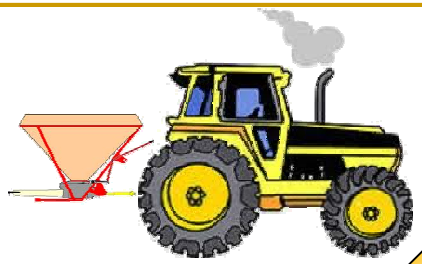
- Grassland target = 6.2-6.3
- 60% of grassland soils with pH < 6.0
- Liming is very important

Soil Test P & K – National



- Potassium (K) shows similar trend
- What does this mean for you?
  - 25 % of soils are in Index 3
  - If you don't soil test, you don't know what you are dealing with
  - Are your soil fertility levels declining as well?

Steps to Soil Fertility Management

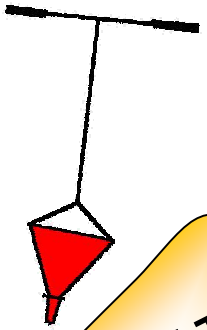


Index	Description
1	Very Low
2	Low
3	Target
4	High

5) Balance

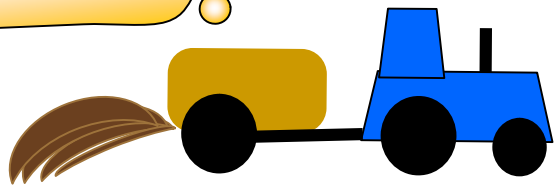
3) Index 3

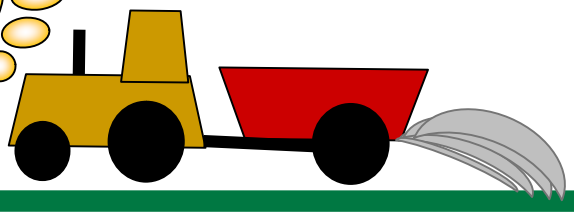
4) Slurry



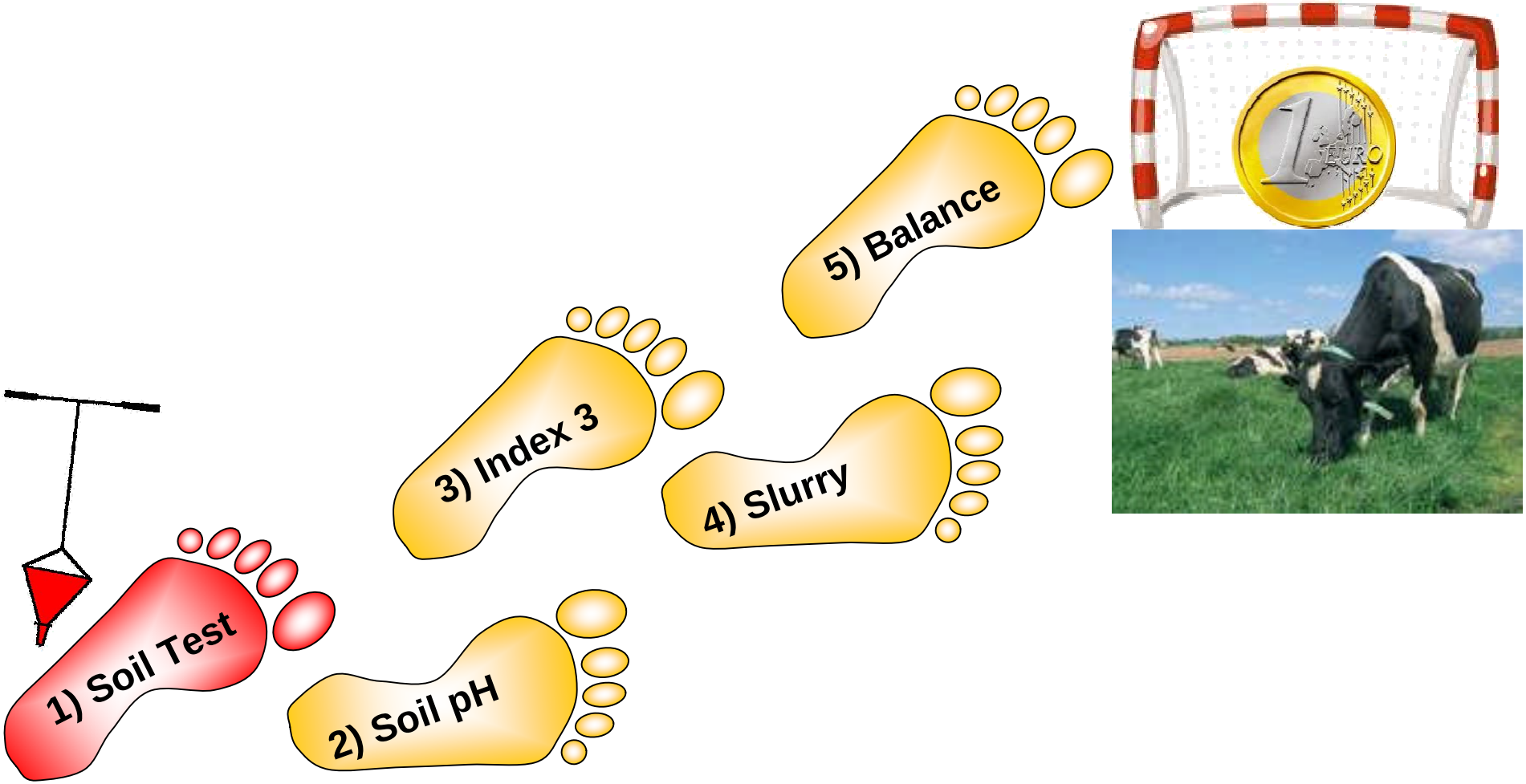
1) Soil Test

2) Soil pH





Steps to Soil Fertility Management



Soil Testing – Why?

- Indicator of background soil fertility levels
  - Soil pH and Lime requirement
  - P & K
  - Mg and trace elements
- Tool to help plan nutrient applications
  - Fertilizer
  - Slurry / FYM
- Monitor change in soil fertility levels overtime
  - Adjust fertilizer / manure management practices
- Derogation requirement

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Recent Survey –

Only 41% of samples are used for fertilizer planning
Mainly used only for cross-compliance

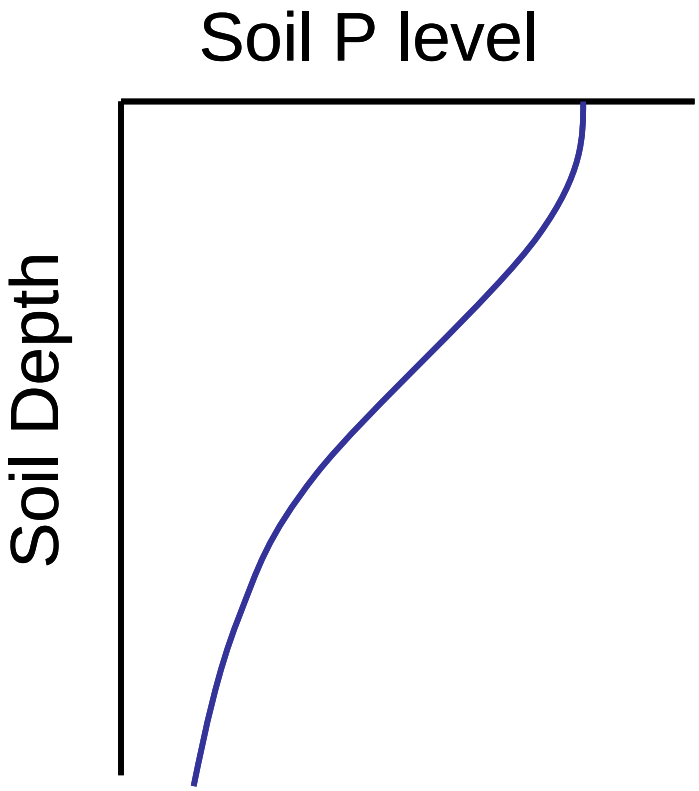
Soil Test for yourself
- Not for the Inspector !!!!!

Soil Testing – How?

- Area: one sample per 2-4 ha (5 ha with derogation)
  - Soil type; slope; cropping history; drainage; experience
  - Practical management units

- Sampling pattern:
  - Representative sample from entire field
  - Avoid unusual spots
    (Gates, Feeders, ditches,
    dung/urine patches, FYM heaps)

- Depth
  - Full 10 cm depth is critical



Soil Testing – When?

- How often:
  - Every 3-5 years (4 years if in derogation)

Fertilizer P & K

3-6 months

- Timing:
  - For comparison, sample at same of year
  - Avoid extremes (Very dry / waterlogged)

Slurry / FYM

3-6 months

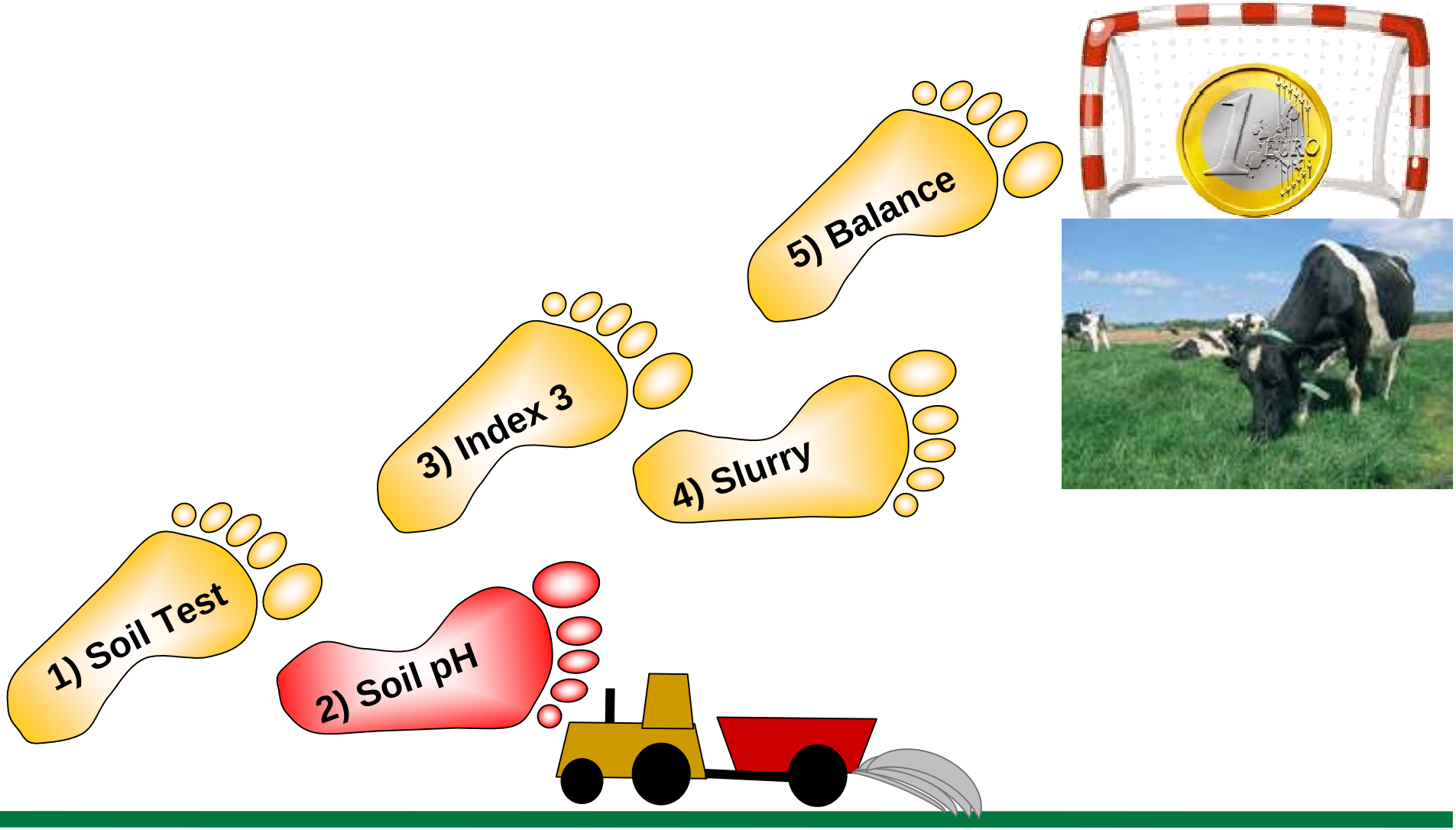
  - Late Autumn / Early Spring ideal
    - Results ready for fertilizer planning for the coming year

Lime

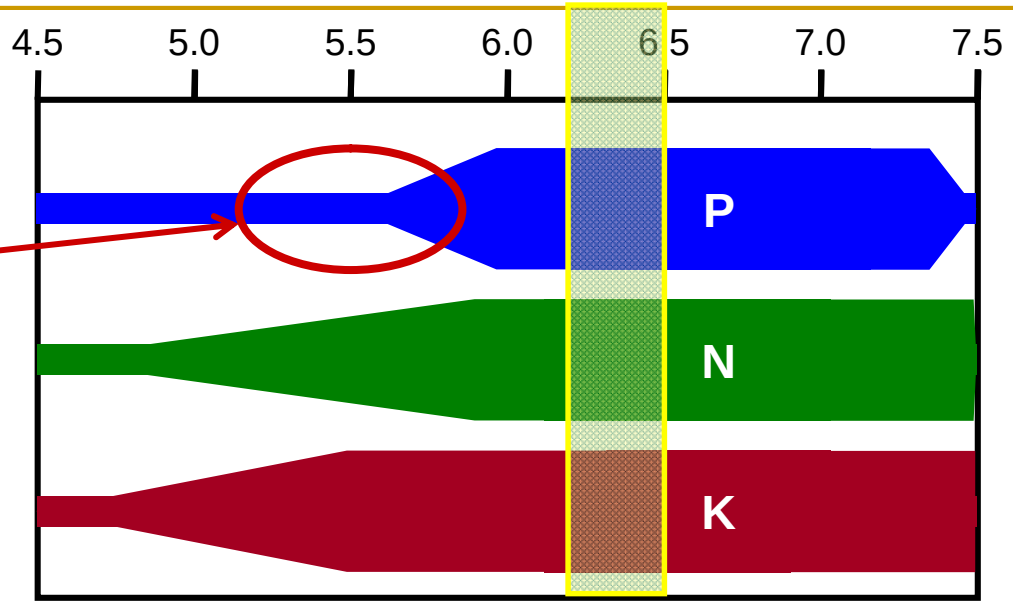
2 years

(for accurate soil pH)

Steps to Soil Fertility Management



Soil pH and Liming



- Soil P reserve less available
- Fertilizers less available

- Optimum pH for grassland = 6.2 - 6.3
  - Maximum nutrient release from soils
  - Soil biological activity
- 60% of grassland soil < 6.0
- Response to fertilizer P on acid soils ????

Priority

Lime requirements

- Advice is to apply lime in a 3-5 year cycle
  - Grassland typically requires between 0.5 - 1 t/ha/yr

- Exceptions
  - High Mo soils and grassland → don't exceed pH 6.2
    - Lime requirements reduced by 5 t/ha
  - Where advice is > 7.5 t/ha
    - Split application
    - 7.5 t/ha now
    - Remainder after 2 years
    - Precaution to reduce risk of trace element problems

Steps to Soil Fertility Management

Index	Description
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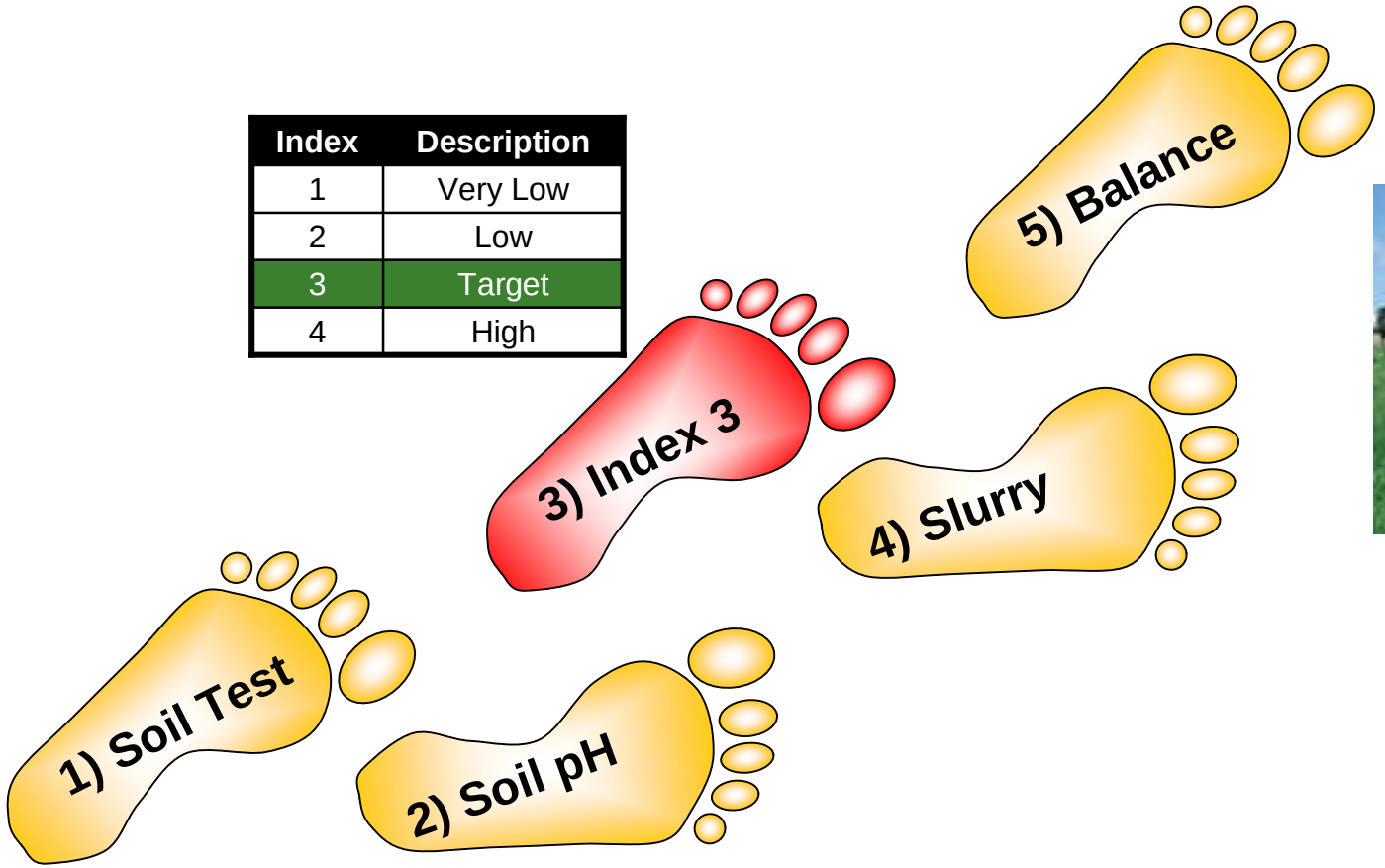
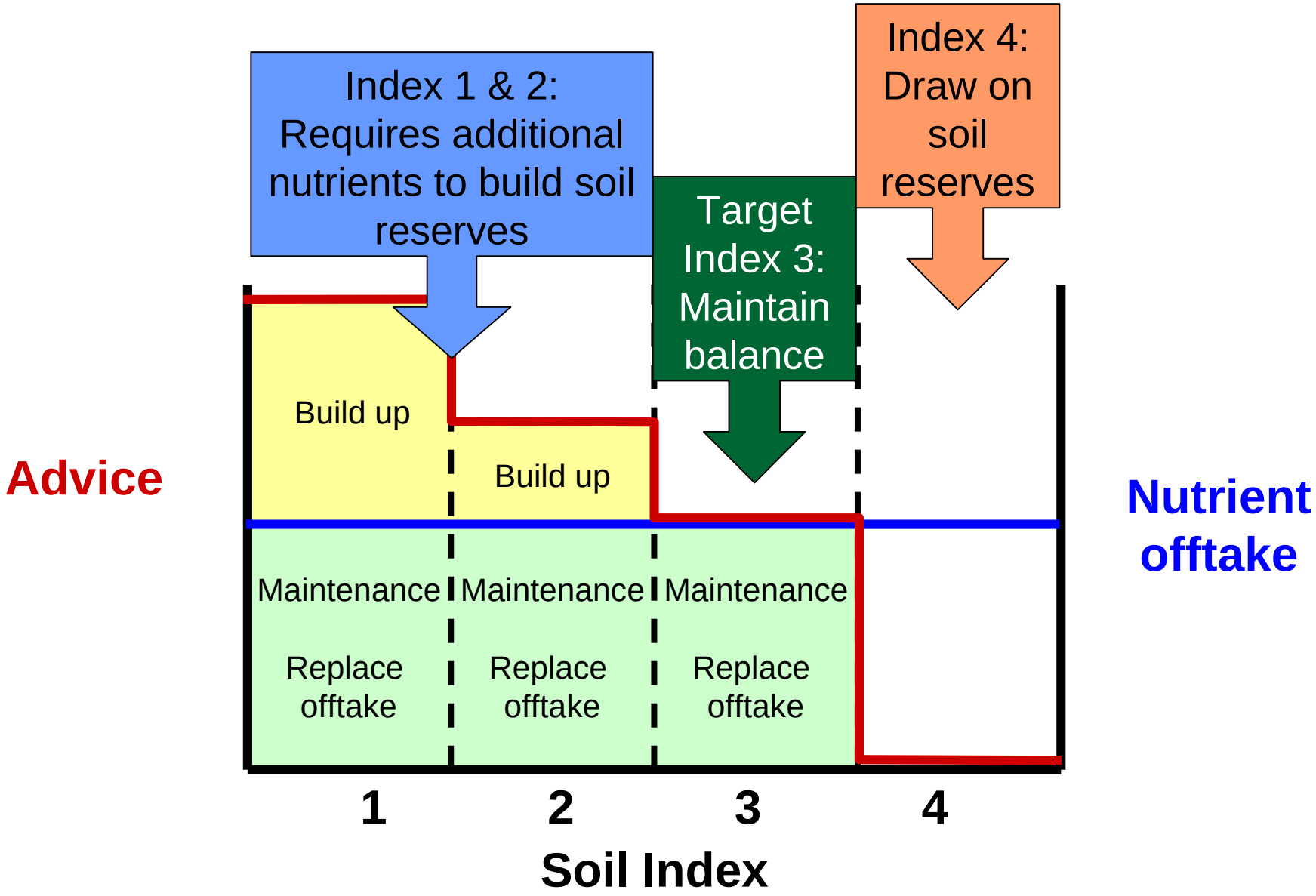


P & K

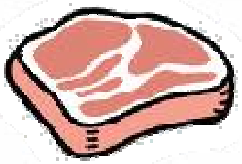
- Convert test result into soil Index
- Target = All soils in Index 3 for P and K !
  - Only ~ 25% at present

Soil Index	Description	Soil test P (mg L^{-1})	Soil test K (mg L^{-1})
1	Very low	0 – 3.0	0 – 50
2	Low	3.1 – 5.0	51 – 100
3	Medium	5.1 – 8.0	101 – 150
4	High	≥ 8.1	≥ 151

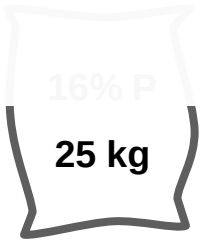
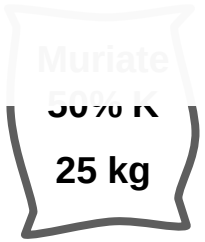
Soil Index & Advice



Maintenance rates – P & K offtakes

	P (kg)	K (kg)
Milk (1000 litres) 	0.9 - 1	1 - 1.5
Liveweight (100 kg) 	1	0.5 - 1
Silage (1 ton DM) 	3 - 4	25
Leaching (1000 mm rainfall)		~ 10

Soil P and K build up - Grassland

	P	K
Index 2	10 kg/ha (8 units/acre) 	30 kg/ha (24 units/acre) 
Index 1	20 kg/ha (16 units/acre) 	60 kg/ha (48 units/acre) 

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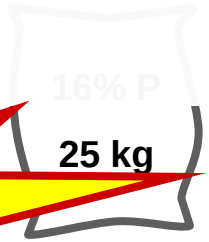
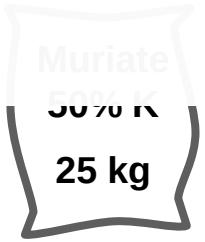
Index 2	10 kg/ha (8 units/acre) 	30 kg/ha (24 units/acre) 
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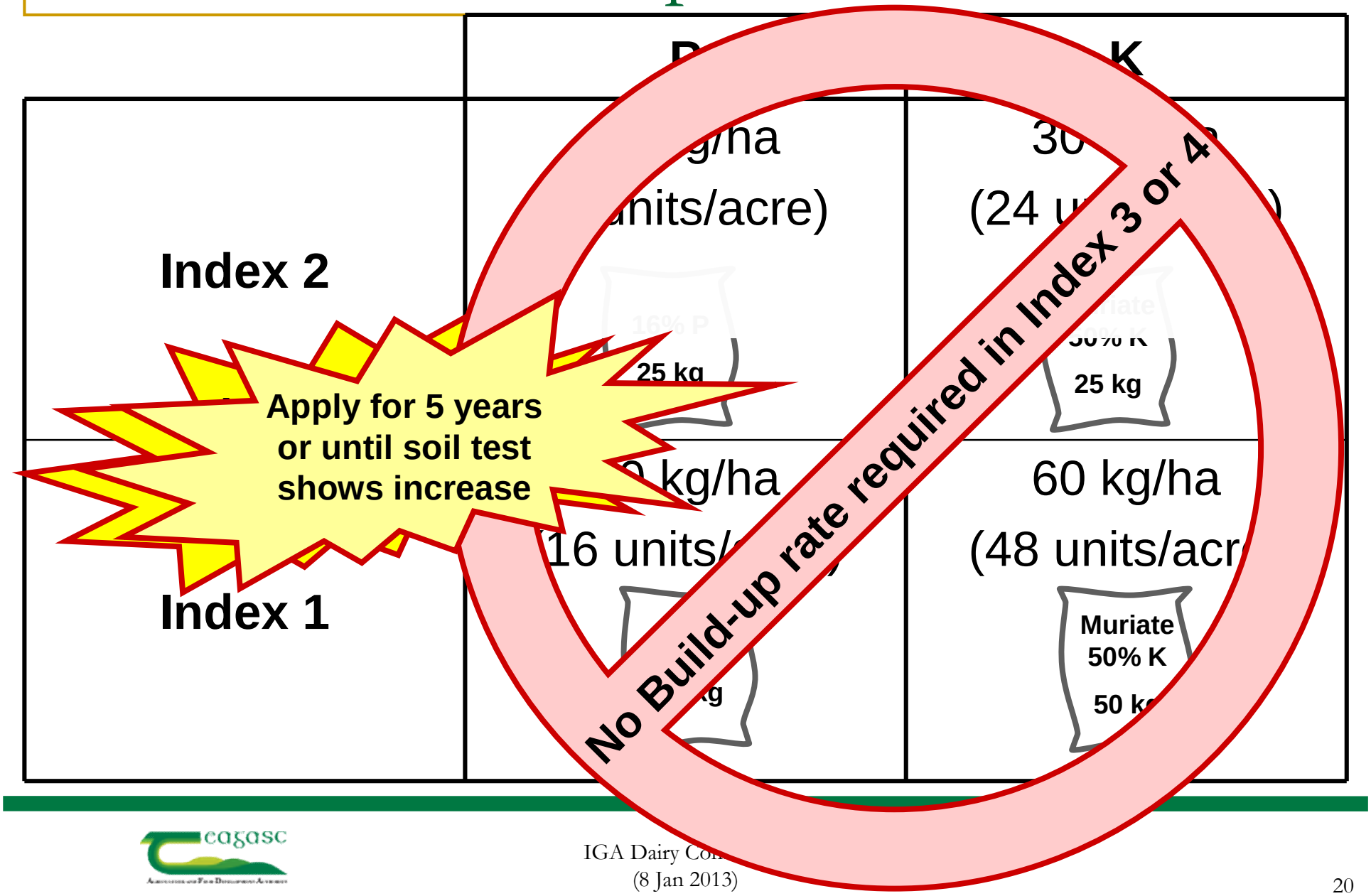
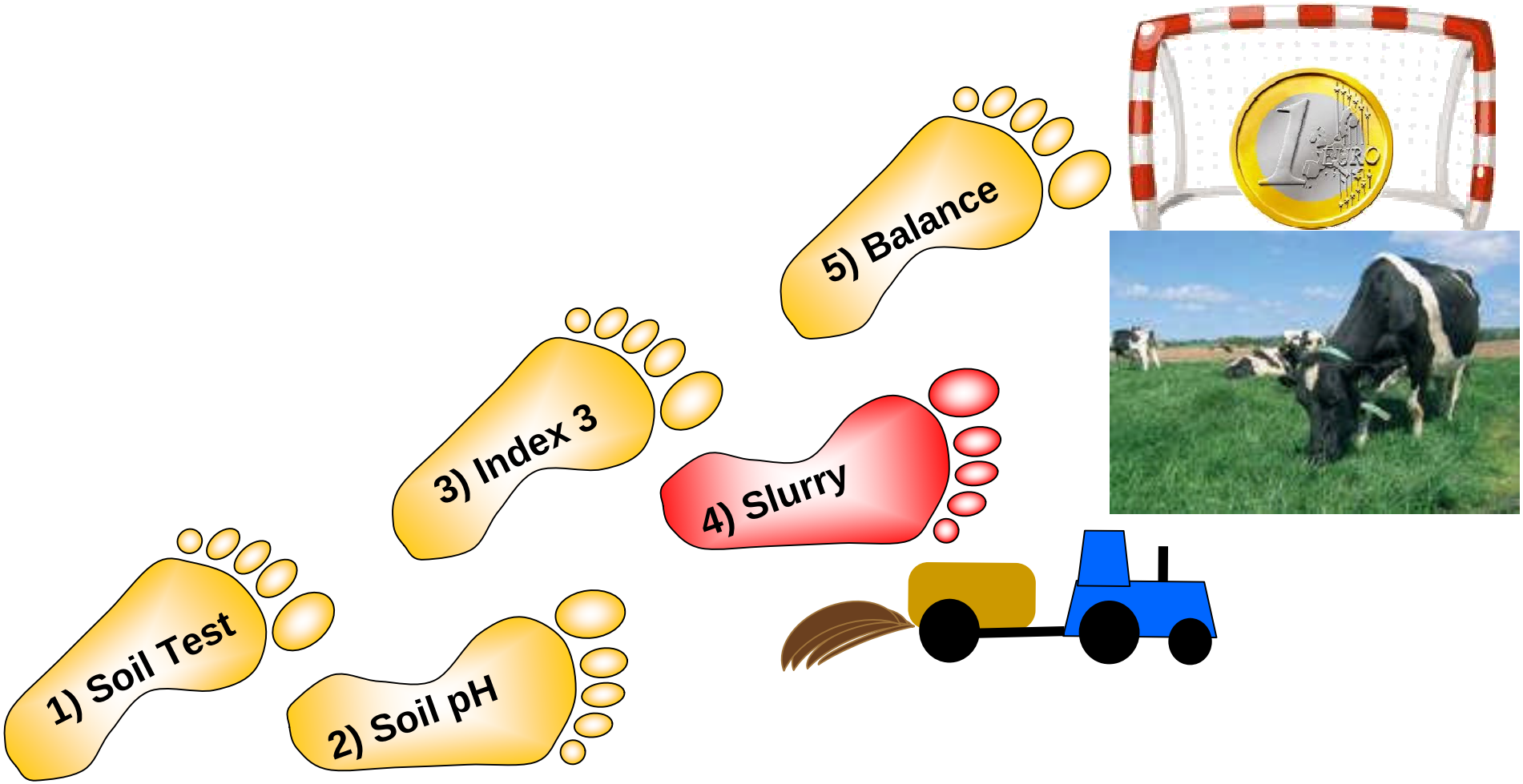
Apply build up + maintenance in Index 1 and 2

Soil P and K build up - Grassland



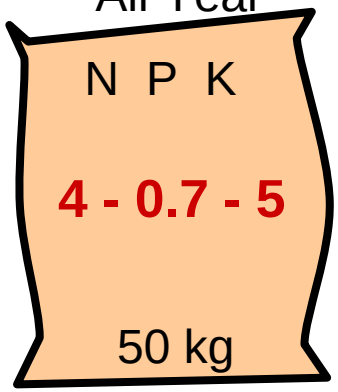
Steps to Soil Fertility Management



Slurry Value → 1000 gallons = ??

Soiled Water

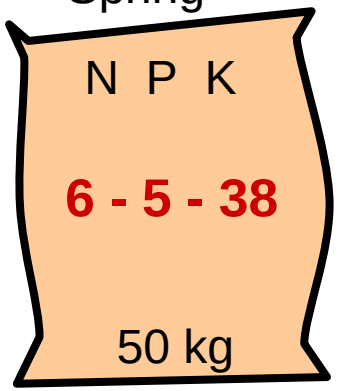
All Year



€ **5** / 1000 gals

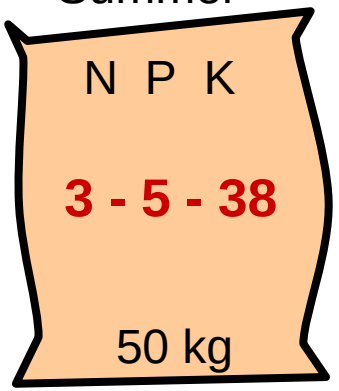
Cattle Slurry (Splashplate)

Spring



€ **24** / 1000 gals

Summer



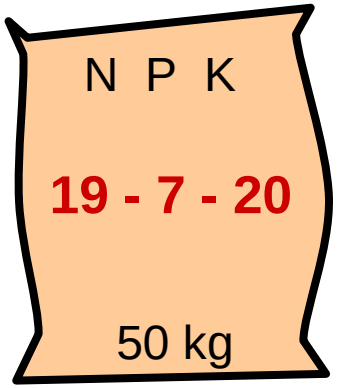
€ **26** / 1000 gals

Trailing Shoe

+ 3 units N / 1000 gallons

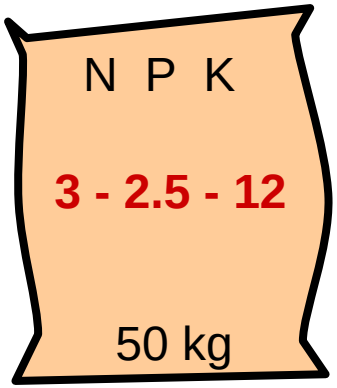
In spring or summer

Pig Slurry



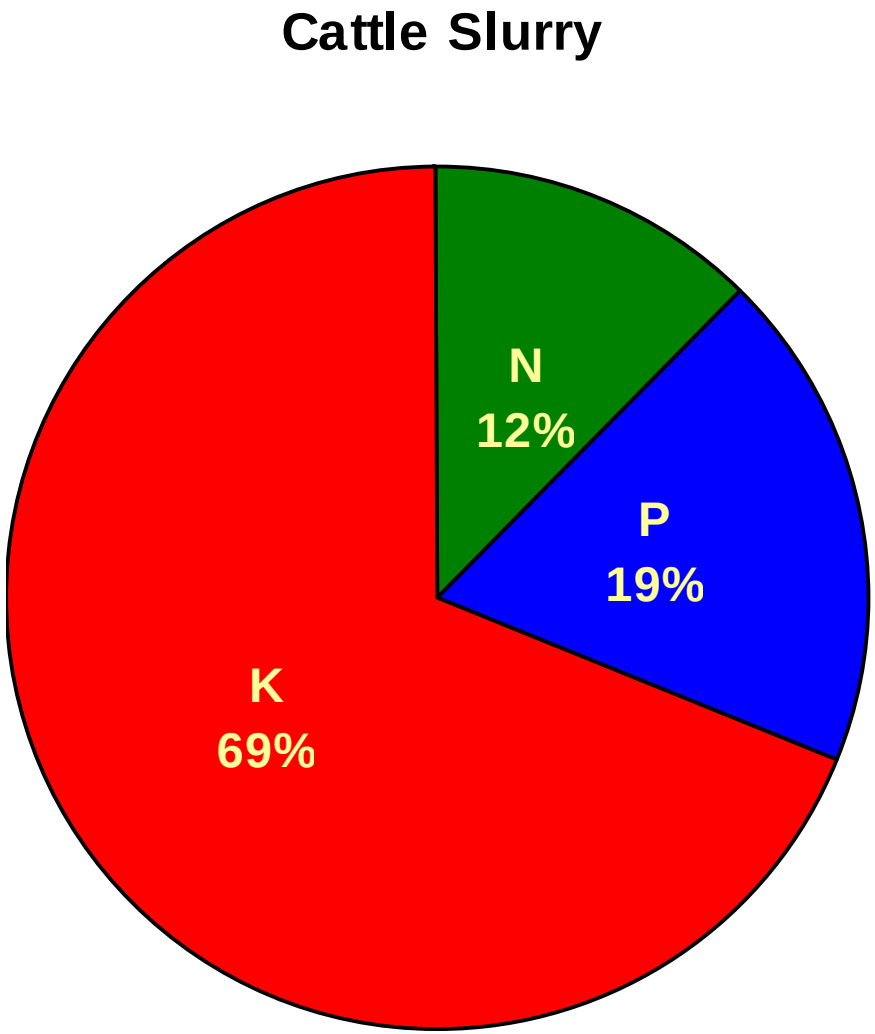
€ **28** / 1000 gals

FYM (1 ton)



€ **10** / ton

Contribution to Slurry Value

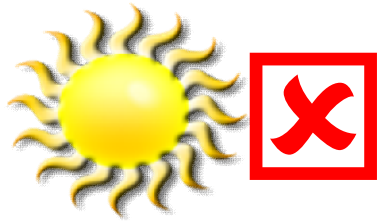


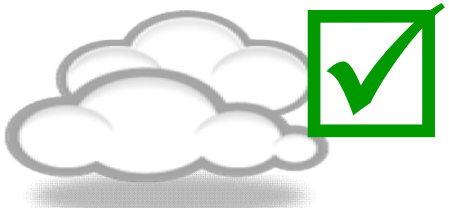
- Majority of the value is in P and K
  - Aim to get best use of both P and K in slurry
  - Timing or method
    - No effect on P and K
    - Big effect on N

Decisions with slurry

1. Where to spread
   - P & K requirements
   - Target fields with:
     - low soil P and K
     - High requirements (e.g. silage)

2. When to spread
   - Maximise N availability
   - Weather as important as season, but spring generally best
   - Trailing shoe / bandspreader will also increase N value





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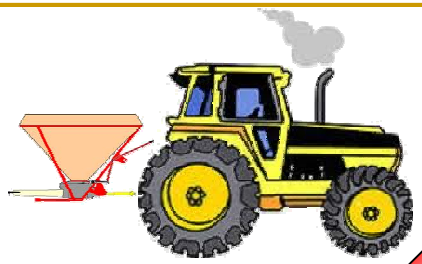


1) Soil Test

2) Soil pH

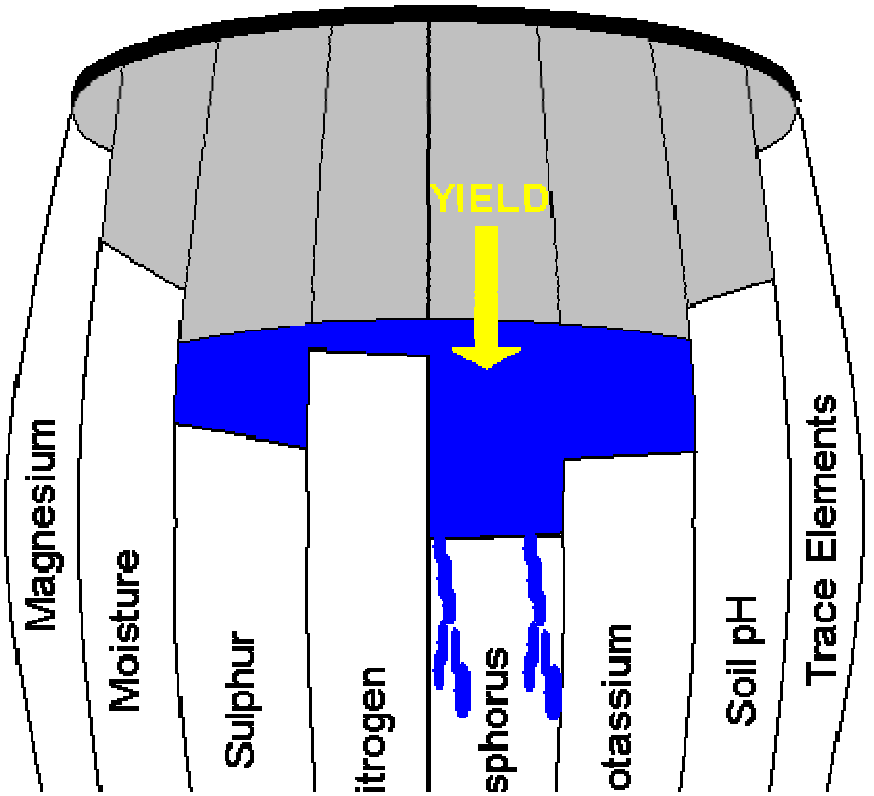
3) Index 3

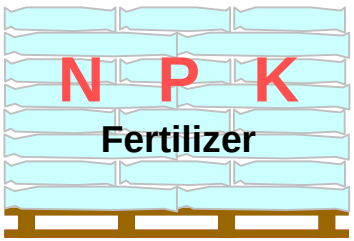
4) Slurry

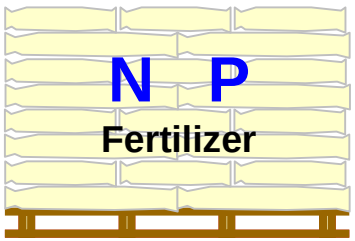
5) Balance

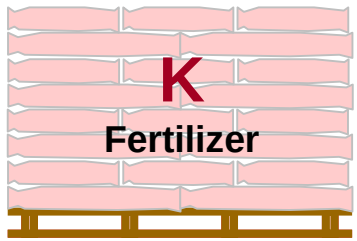
Nutrient Balance – What is the Weakest Link ?

- Nutrient in shortest supply limits determines yield
  - Especially true with P and K
- Fertilizer Planning
  - Soil tests & Cropping
  - Slurry & fertilizers
    - Straight K
    - N-P products
    - N-K products









Buy what you need
- Not what you're being sold !!

Return on investment

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Soil Testing – Cost / Benefit

- ~ 25% of soils are in Index 3
  - If no soil test and assume Index 3, then you are likely to be wrong in 75% of fields !!

- Cost
  - Consider relative to fertilizer cost?

= € 350-500 / tonne ???

Save Money in Index 4 - Dairy

- Example
  - Dairy – 2 cows / ha
  - Index 3 advice (grazing) = 14 kg/ha P & 30 kg/ha K
  - Cost of P and K = €58 /ha

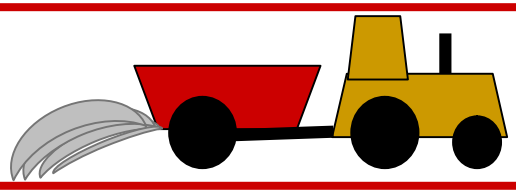
- Soil Test shows Index 4
  - Save €58 /ha/yr until drops to Index 3

Lost production in Index 1 & 2 - Dairy

- Production loss in Index 1 vs. Index 3
  - Approximately 1.5 t/ha/yr of grass DM
  - Worth €400 /ha/yr

- Additional P and K for build up = 20 kg/ha P & 60 kg/ha K
  - Additional Cost = €100 ha/yr until soil P / K increases
  - Long-term investment – benefits of increasing to Index 3

Soil pH needs to be right as well !



Soil Fertility Management Targets

- Have soil analysis for whole farm
- Soil pH between 6 and 6.5 in all fields
  - 6.0 – 6.2 where high Mo (grassland)
- P and K Index 3 in all fields
  - Index 4 is a resource → Exploit it
  - Index 1 & 2 should be increased to Index 3
- Optimise slurry first – then top up with fertilizer as required
- Nutrient inputs in proper balance
  - Fertilizer planning is key to this