Nutrient Management for Sustainable Grass Silage Production

Soil Fertility Conference 2015 – 23rd Oct 2015

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Presentation Outline

1. Introduction
2. Improve Manure K & P Distribution
3. Prevent Sulphur (S) Deficiency
4. Optimise Nitrogen (N) Inputs
5. Conclusions – ‘Take-Home Messages’

1. Introduction

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1. Introduction

- **High-yielding, high quality grass swards are vitally important for the future growth of the intensive bovine livestock industry in Ireland**
- **For example, ‘Food Harvest 2020’ and ‘Going-for-Growth’ for the Dairy sector will require more cost-effective production of high quality forage to help drive improvements in milk volume and quality (milk solids)**
- **To achieve this, BEST USE must be made of Soil, Manure and Fertiliser nutrients to optimise grass production!**

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1. Introduction

- Grass silage is a valuable resource worth up to €150/t DM as ruminant feed
- Well managed grassland can produce in excess of 16 t DM/ha
- On many farms, less than half this level of production is being achieved – in part because of poor nutrient management!
- Poor nutrient management not only curtails grass production, it also jeopardizes animal health and performance and is damaging to the environment

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2. Improve Manure K and P Distribution

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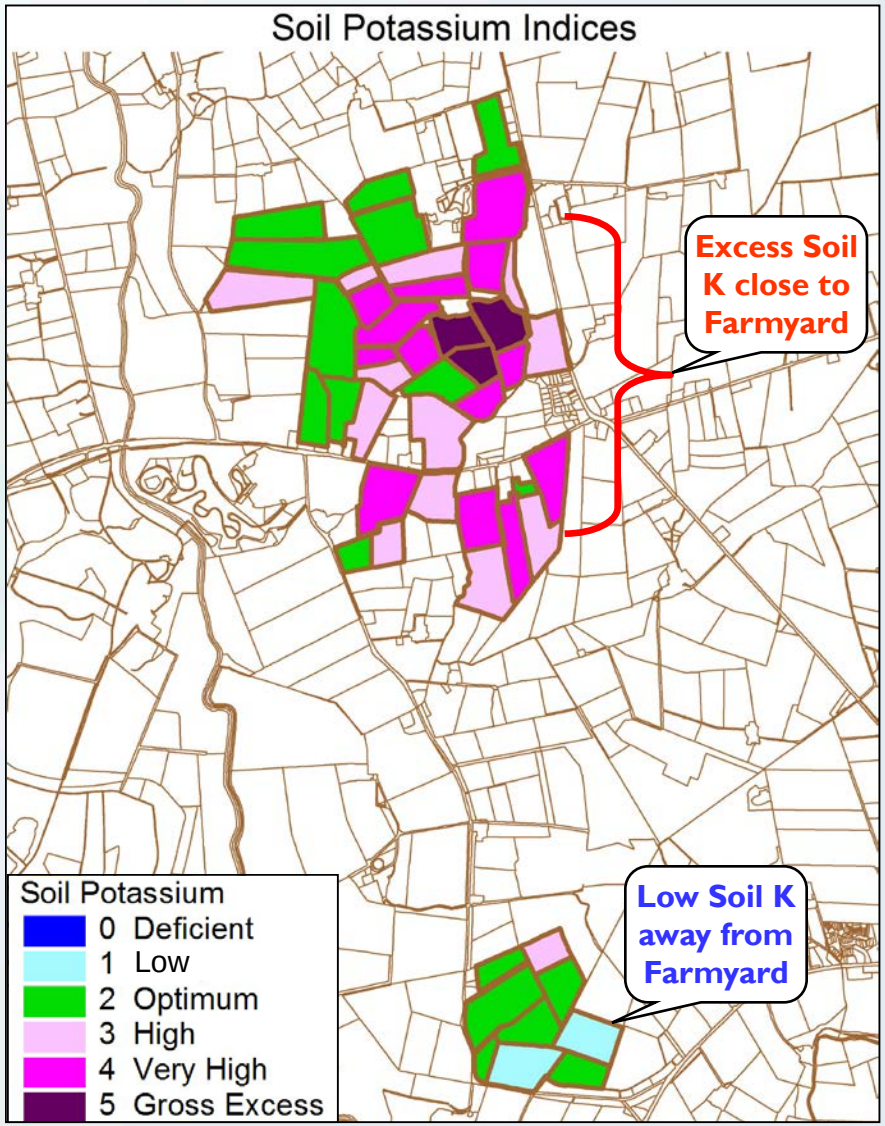
Poor K distribution detrimental to animal health and yield

- **Fields and land parcels closest to farmyards tend to have the highest soil K indices, and are often well over-supplied with these nutrients**
- **Excessive K concentrations in grass and forage (> 3.5% DM) heighten risks of milk fever and grass tetany**

- **In contrast, more distant land parcels often have lower K levels, and may lose up to 25% DM yield because of K deficiency**

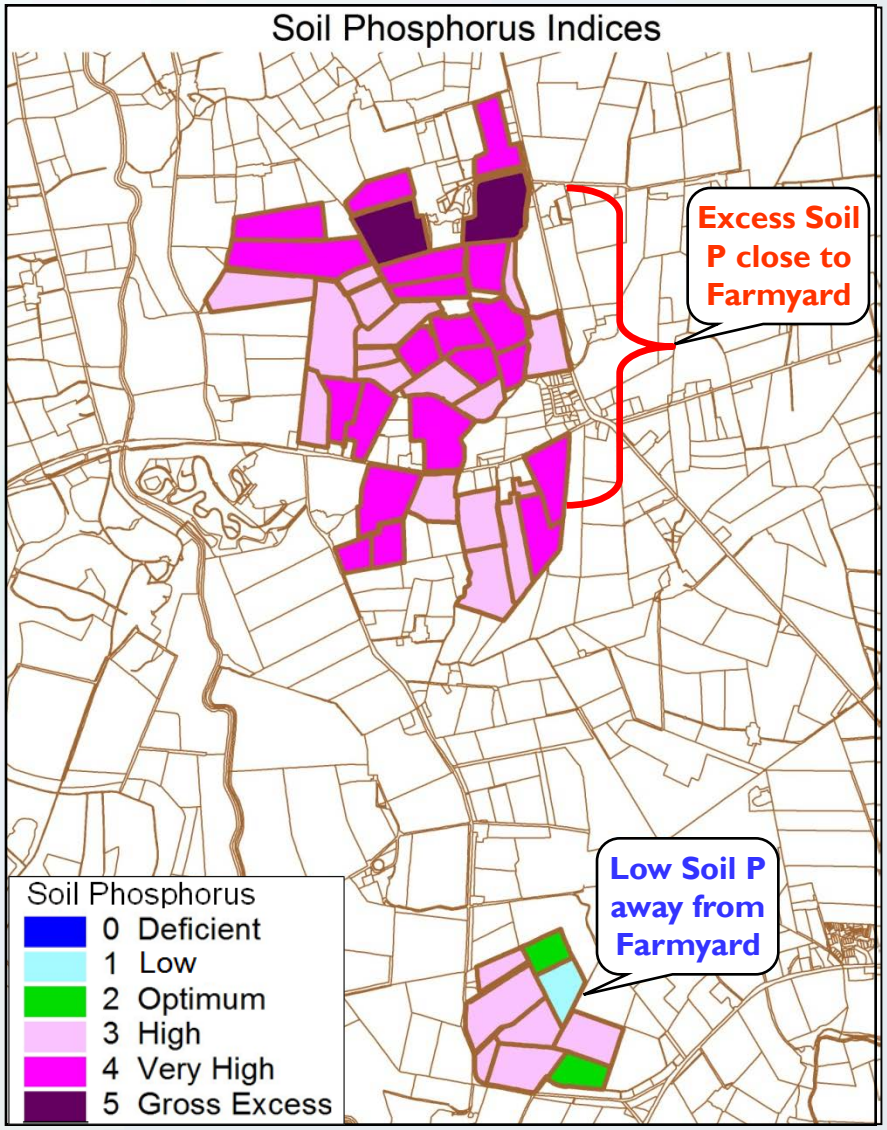


2. Improve Manure K and P Distribution

Poor P distribution detrimental to water quality and yield

- Fields and land parcels closest to farmyards also tend to have the highest soil P indices, and are often well over-supplied with these nutrients - grazed fields included
- Soil Olsen-P indices 4 and 5 are equivalent to Morgan's P of 14 -31 mg P/l (Index 4 and above)
- Above P index 3 significant risk of P loss to water

- In contrast, more distant fields and land parcels often have lower P levels where swards may become P deficient and lose up to 20% yield



2. Improve Manure K and P Distribution

Ways of improving manure distribution

- **Soil testing is ESSENTIAL to show which fields are under-supplied (Index 0 & 1) or over-supplied (> Index 2) with P and K**
- **Manures should then be targeted at (suitable) fields with lowest P and K indices, and the remaining NK requirement of crops met using zero-P fertiliser (N & NK)**
- **Rates and types of manure (*and fertiliser*) applied to each field should be recorded at the time of application by the farmer or the contractor – this is VERY IMPORTANT**
- **Innovative IT (Smart phone) technologies need to be developed to make recording easy and to automatically link the recorded information to on-line decision support tools**

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3. Prevent Sulphur (S) Deficiency

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S deficiency a wide-spread problem on grassland

- **Out of 67 dairy farms (> 300 silage fields) surveyed in NI, 49 farms had silage swards testing S deficient between 2004 and 2006**
- **While sands, shallow soils and sandy loams with low organic matter levels are generally most prone to S deficiency, S deficient swards are now occurring on all main soil types, including heavier textured clays and clay loams**

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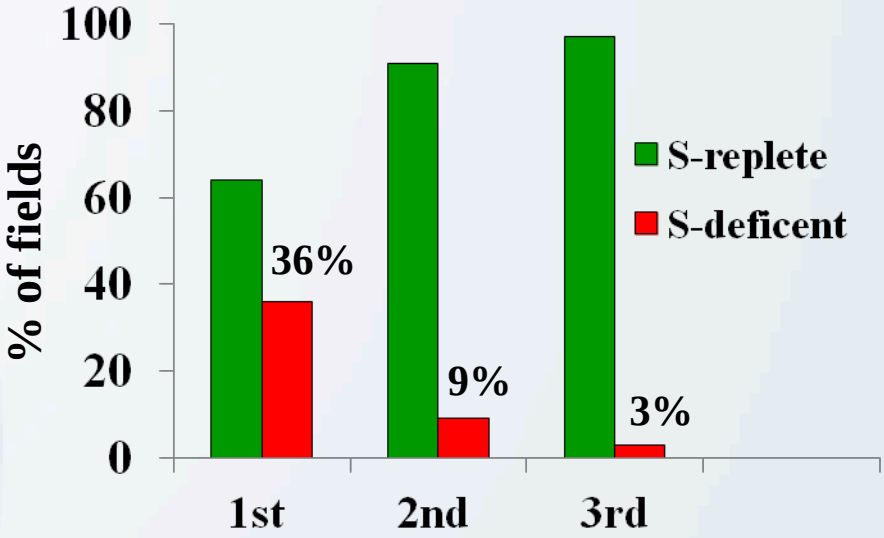
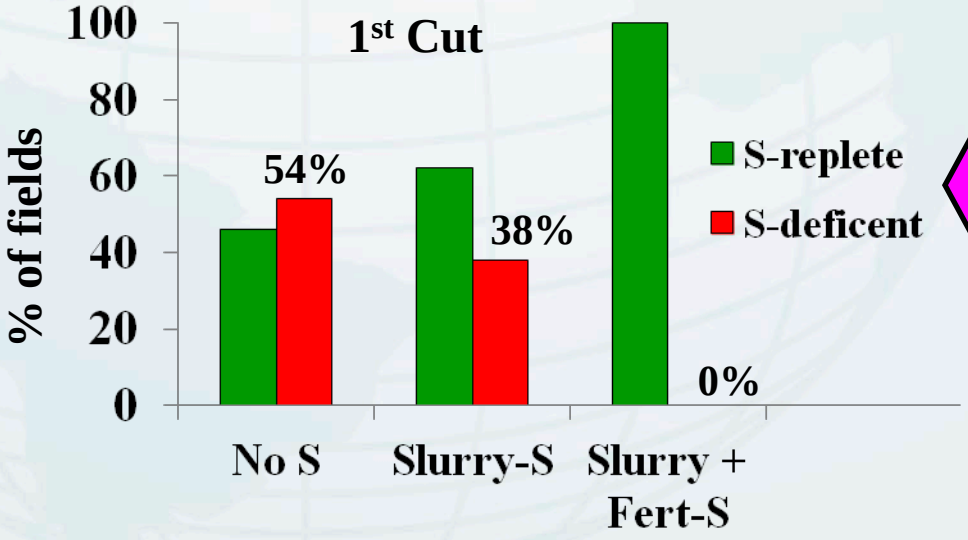
3. Prevent Sulphur (S) Deficiency

S deficiency a 1st cut problem even when manures applied

- Out of 320 - 1st cut swards, 36% were S-deficient and had lost up to 20% of potential DM yield
- Out of 286 - 2nd cut swards, only 9% were S deficient
- Out of 86 - 3rd cut swards, only 3% were S deficient





- 54% of swards receiving no slurry or fert' S were S-deficient
- 38% of swards receiving slurry but no fert' S were S deficient
- 100% of swards receiving slurry plus fert' S were S-replete

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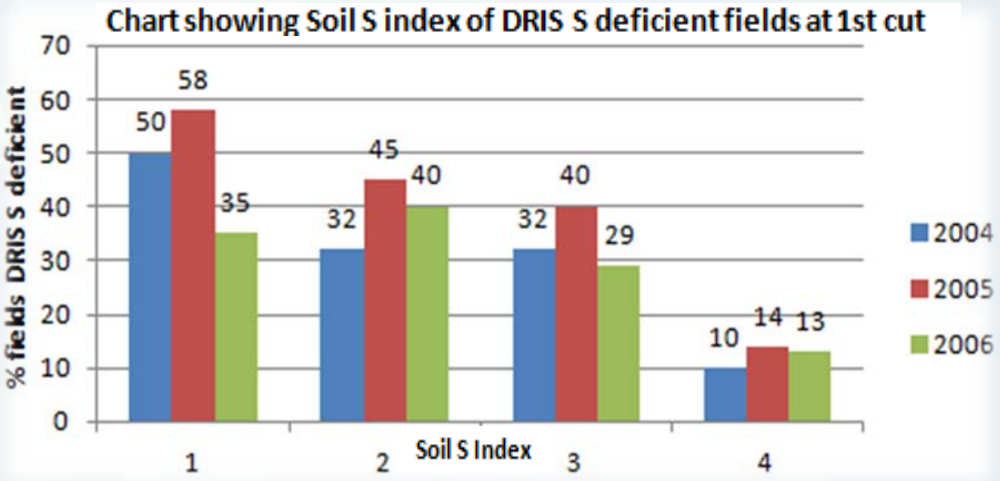
3. Prevent Sulphur (S) Deficiency

Ways of preventing S deficiency in silage swards

- **Soil testing is not reliable – herbage testing is better!**
- **25 kg SO_3/ha should be applied routinely to ALL silage swards in spring - even where slurry has been applied**



- **This moderate dressing of S, which costs an extra €6/ha should not be detrimental to livestock and has the potential to prevent yield losses worth up to €100/ha**
- **S-containing fertilisers should also be applied routinely for 2nd and 3rd cut silage crops on land receiving little or no slurry or where soils are shallow or sandy in texture**

4. Optimise Nitrogen Inputs

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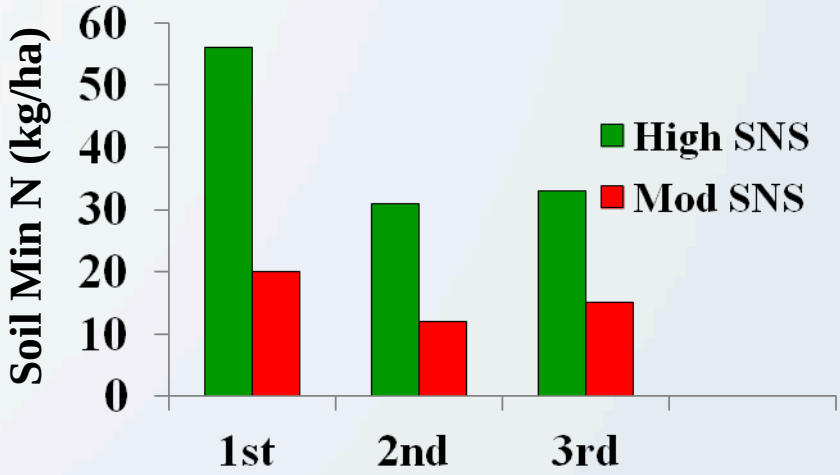
The 'Art' of Nitrogen management – 'Getting it Right'!

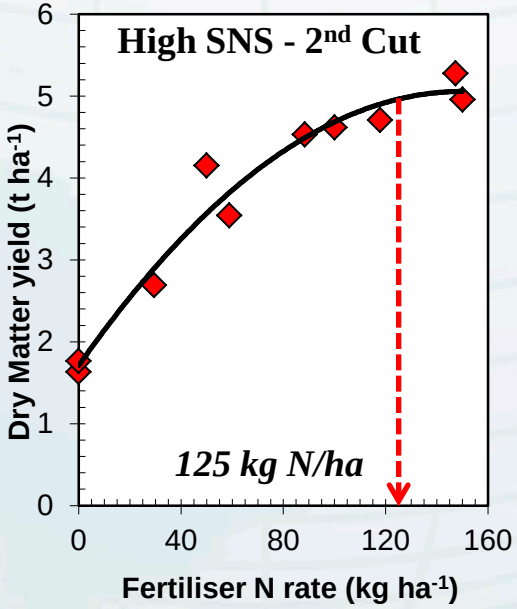
- **Optimising N inputs as fertiliser and manure is essential to maximize forage yield and maintain optimal protein contents (14% in herbage DM)**
- **On highly stocked grassland receiving regular slurry applications (High SNS), soils can release substantial amounts of mineral N particularly in spring (> 50 kg N/ha), and hence care is needed not to over-supply N for 1st cut silage crops**
- **By comparison, lower stocked grassland receiving less organic manure (Mod SNS), releases less mineral N from soil, and hence there is a risk that too little N may be applied, particularly for 2nd and 3rd cut silage crops**

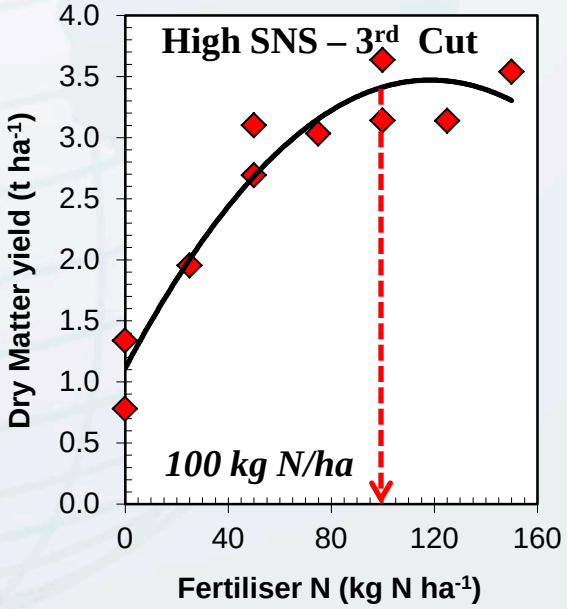


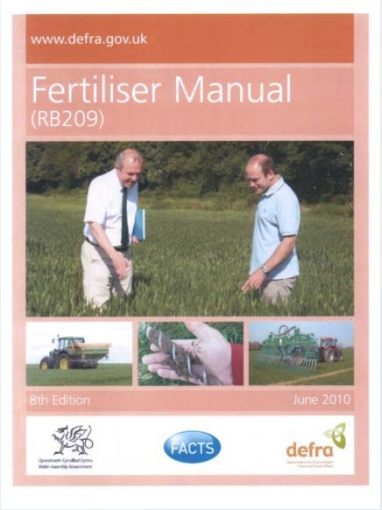
4. Optimise Nitrogen Inputs

Higher N recommendations for 2nd and 3rd cuts

Harvest	Grassland of high SNS		Grassland of moderate SNS	
	New NI Rec's	RB209 Rec's	New NI Rec's	RB209 Rec's
	(kg N ha^{-1})		(kg N ha^{-1})	
1st cut	115	120	140	150
2nd cut	125	100	120	100
3rd cut	100	80	110	80
Totals	340	300	370	330







- Field trials indicate higher rates of N needed to optimise DM yield than recommended in RB209

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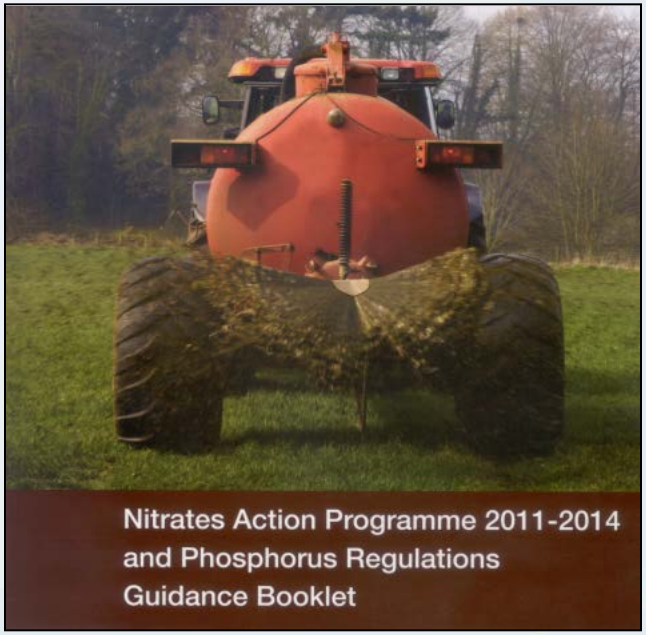
4. Optimise Nitrogen Inputs

Adapt recommendations according to local conditions

- **Nitrogen recommendations, are simply ‘recommendations’ – and should be adapted based on farmer knowledge of sward production potential and environmental conditions**
- **Where higher than previously used rates of N are found to improve grass production and quality, care should be taken that the average rate of N applied to the farm grassland area (cut and grazed) does not exceed the limit specified in the regional Nitrates Action Programme (NAP)**



5. Conclusions – ‘Take-Home Messages’

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5. Conclusions – 'Take-Home Messages'

1) **Soil-testing is Essential if high yields of grass are to be produced Economically at LOW Environmental Impact**

2) **Better distribution of Manure is needed to reduce excessive levels of K and P on land closest to farmyards, and minimise the potential for animal health and water quality problems, whilst at the same time improving the productivity of more distant fields with low levels of soil fertility**

3) **Sulphur deficiency, once considered a problem for 2nd and 3rd cut silage crops, is now manifesting at 1st cut, and is best addressed by routinely applying S-containing fertilisers to ALL silage ground in spring, even if organic manures are being applied**

4) **Research has indicated that 1st cut silage may be over-supplied with N on highly stocked land where there is a continuous history of manure application, whereas 2nd and 3rd cut crops may respond to higher rates of N than typically applied – However, N recommendations are just '*recommendations*' and should be adapted to suite local conditions**

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THANK YOU FOR LISTENING
Any Questions?