



Managing grass-clover swards

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Soil Fertility Conference

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Why white clover?

The benefits of clover can be broken into 2 main categories:

1. Animal

2. Sward

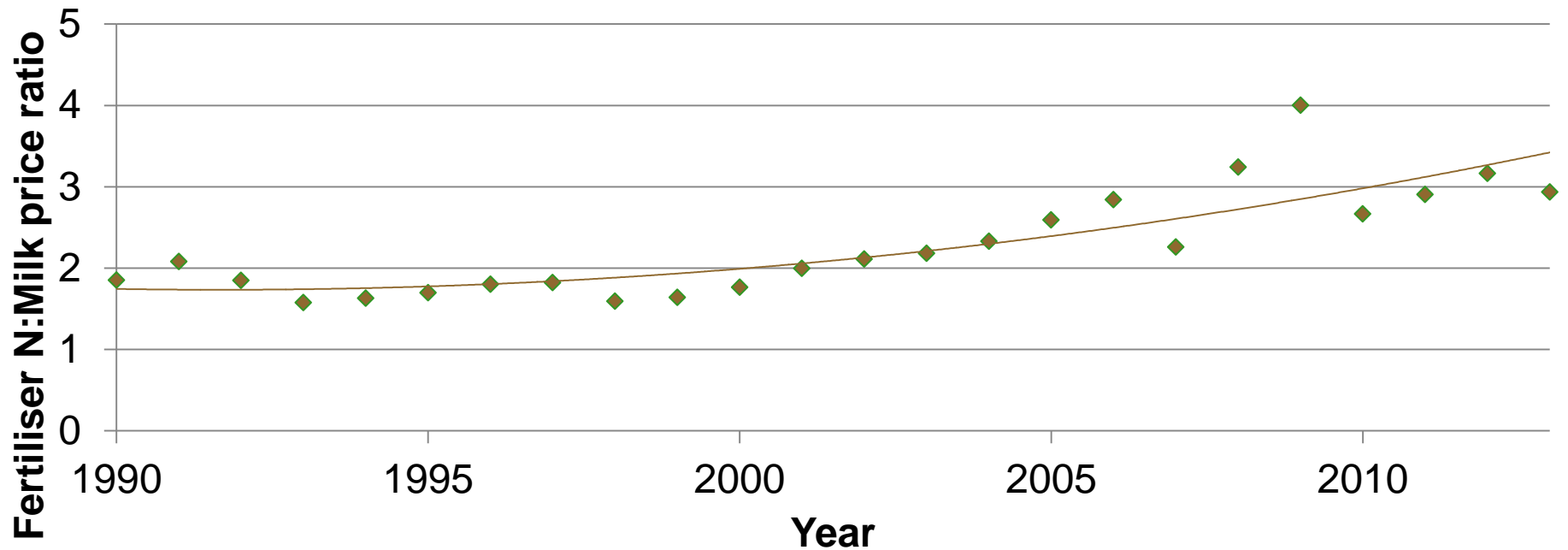
- ↑ Dry matter intake
- ↑ Feed quality
- ↑ Animal performance
- ↑ Herbage growth
- ↓ Nitrogen use



Why white clover?

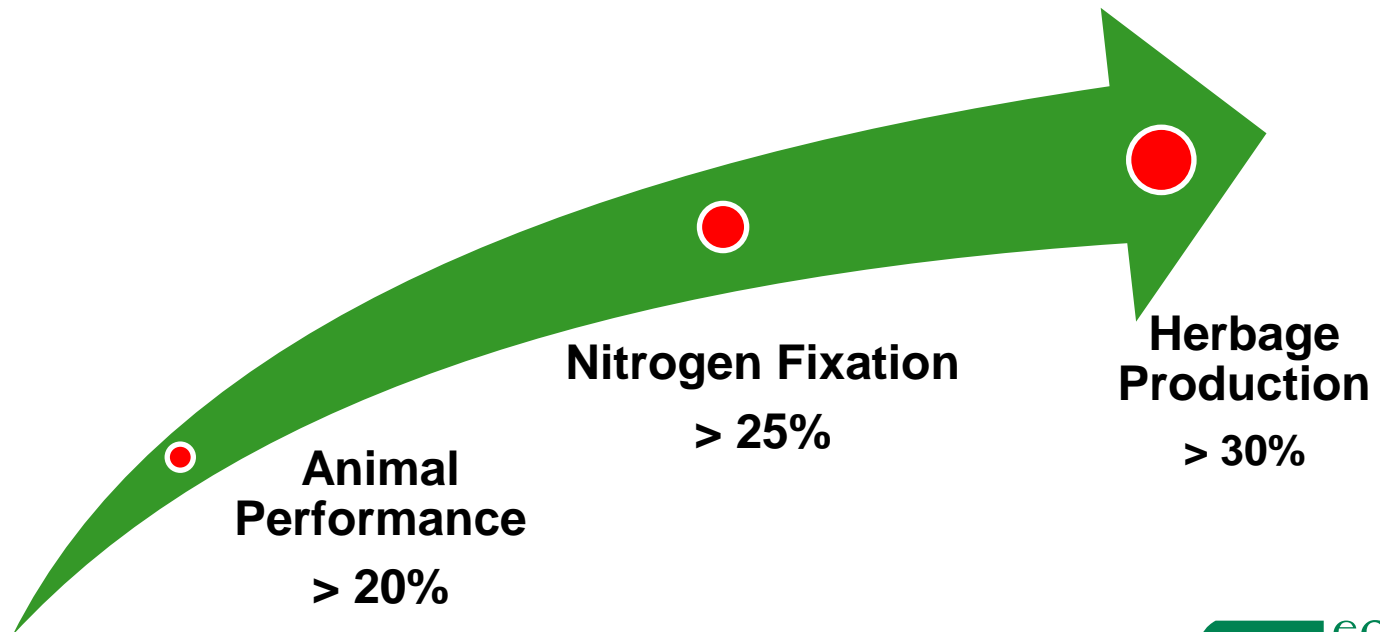
- Little or no clover in majority of Irish grass swards
- Renewed interest in the use of white clover
 - Higher cost of fertiliser

Fertiliser N:Milk price ratio

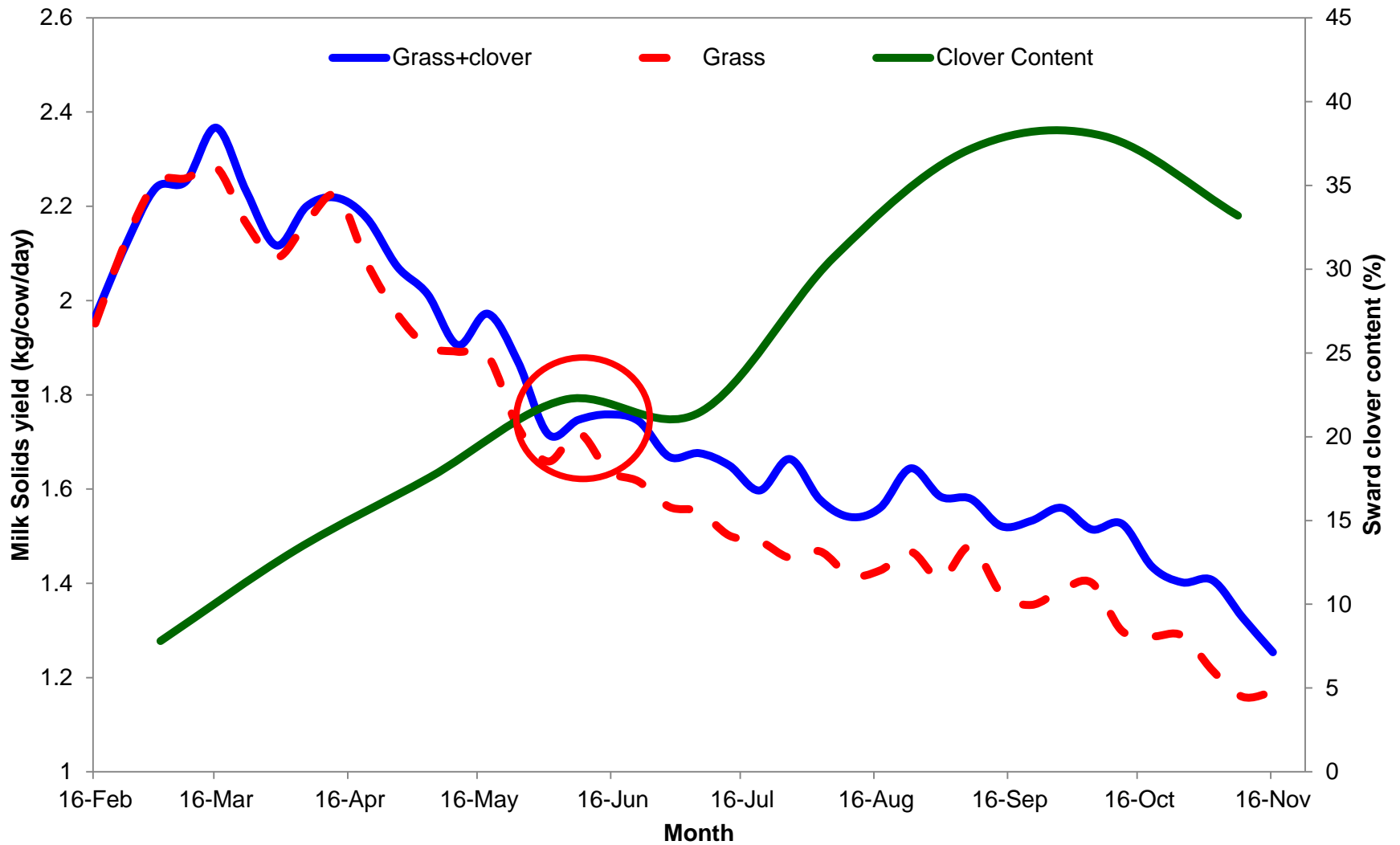


What do we want – best of both worlds

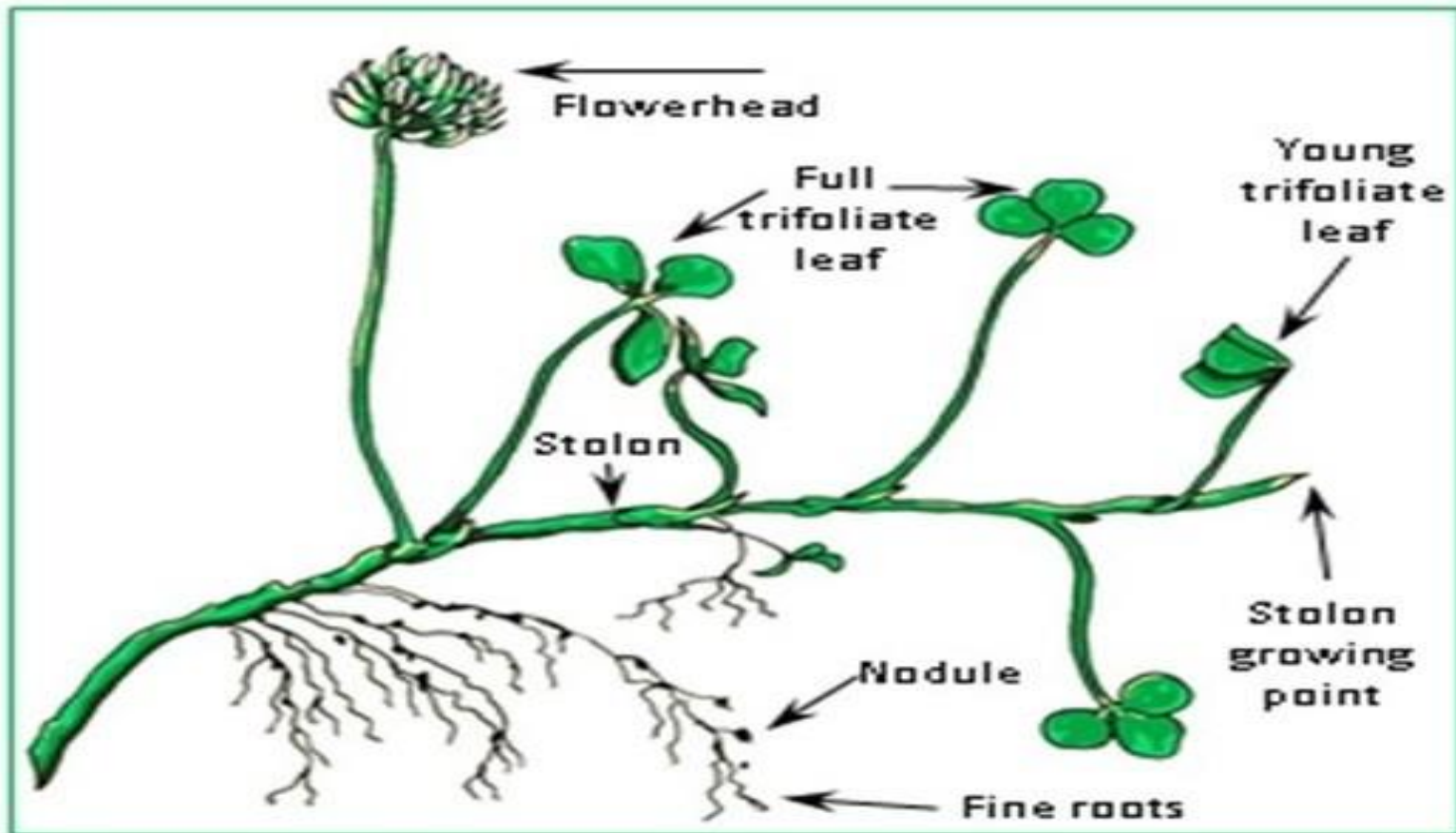
- Increased outputs from reduced inputs
 - Economically and environmental sustainable
- How much clover do you need?



Increased animal performance



The white clover plant



Sward white clover content



Autumn: 52% white clover

Sward white clover content



Summer: 26% white clover

Sward white clover content



Autumn: 52% white clover

Nitrogen Fertiliser



- Nitrogen kills clover
- It is generally accepted that the application of N fertiliser results in a reduction in sward clover content (Reid 1970; Frame & Newbould 1986; Davies 1992; Enriquez-Hidalgo 2014).



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Effect of high rates of nitrogen fertiliser on white clover growth, morphology, and nitrogen fixation activity in grazed dairy pasture in northern New Zealand

White clover or nitrogen fertiliser for dairying?

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119

Nitrogen fertiliser effects on white clover in dairy pastures

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What is actually happening?

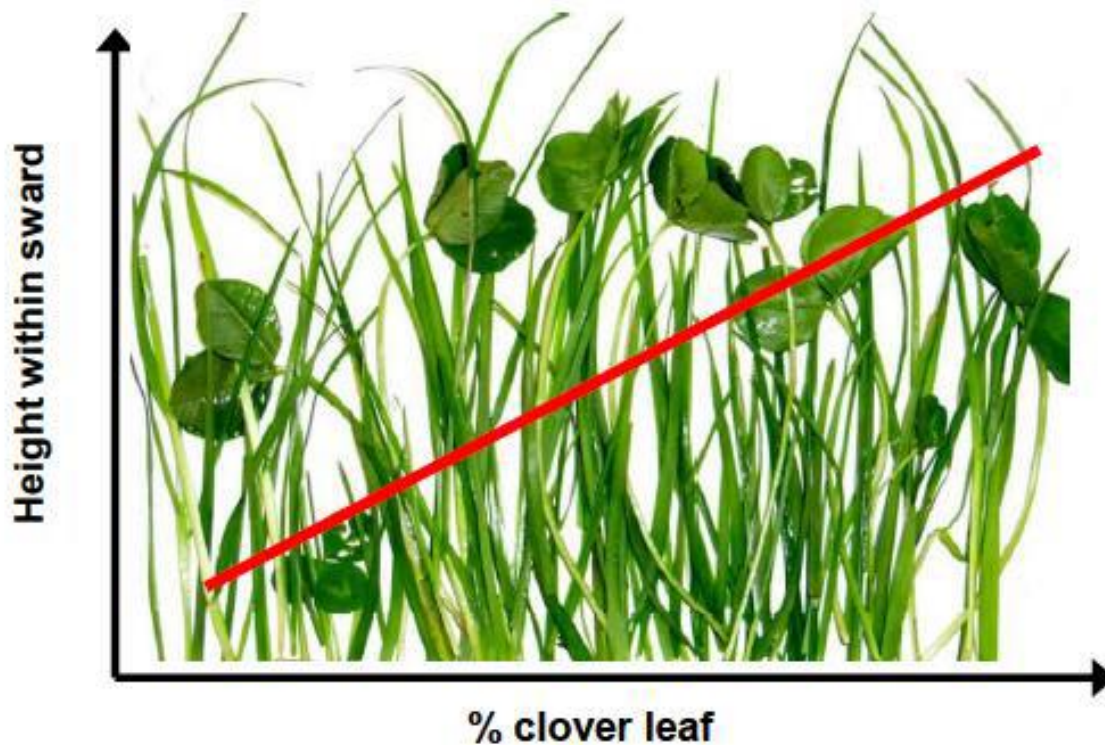
- White clover can utilise N fertiliser similar to grass – much slower uptake (Ledgard & Saunders 1982)
- Uneven uptake of N fertiliser – accelerating grass growth rates



- Leading to taller plants and increased competition for light, water and nutrients
 - Shading

What is actually happening?

- Overall herbage yield can increase
 - Masks a reduction in clover yield





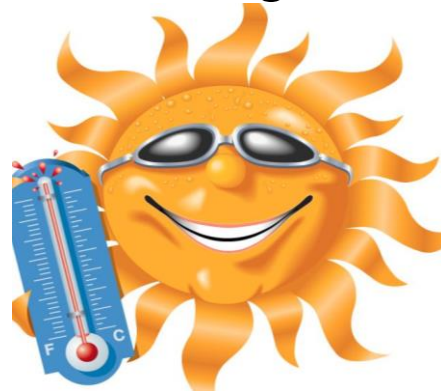
Michael Egan, Soil Fertility Conference, Kilkenny 17th October

How do we promote clover growth?

- What dose white clover need for growth and persistence?

- Fertile soils

- Soil temperature $> 8^{\circ}\text{C}$
- Sunlight



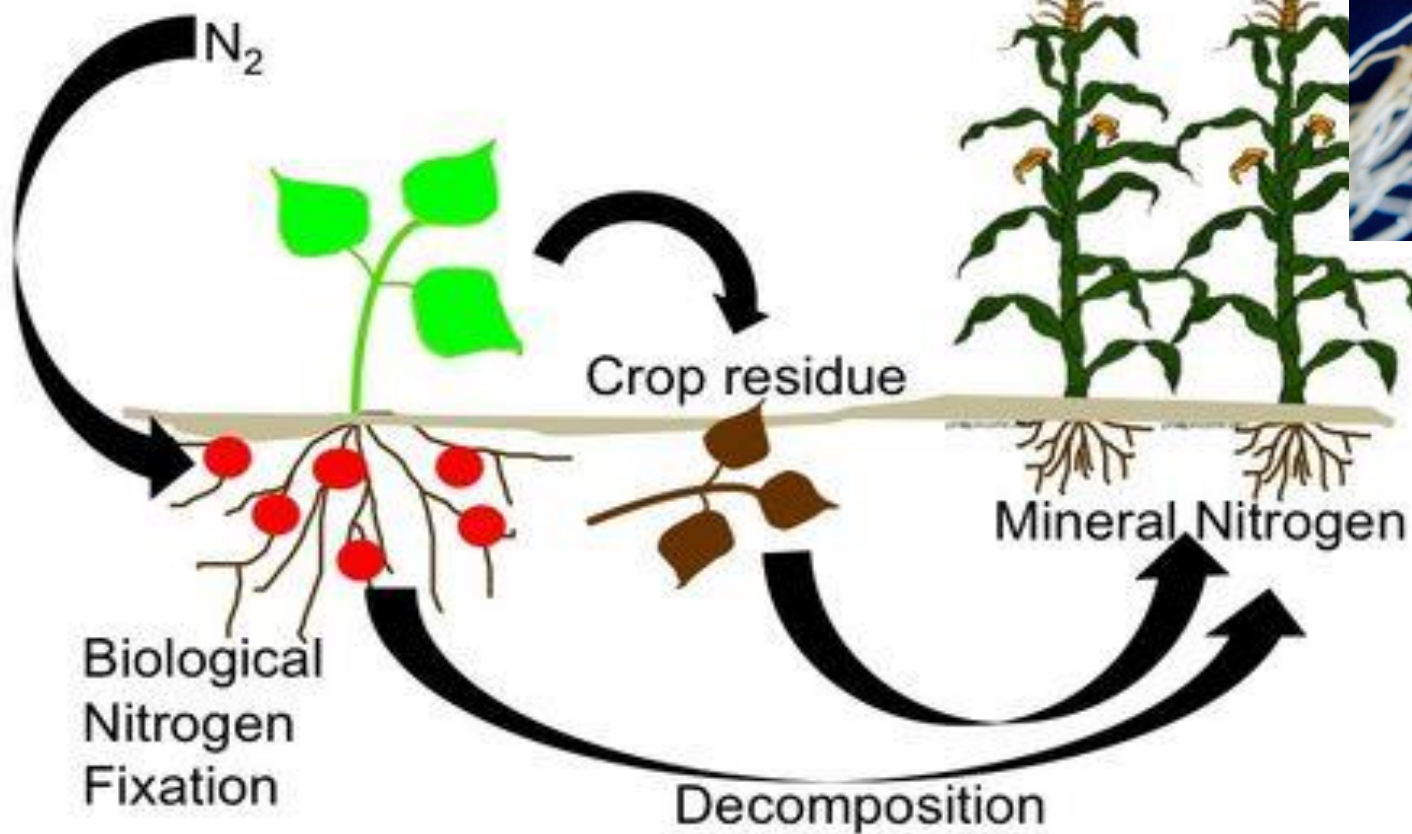
- Good grassland management promotes clover growth

- Graze to 4 cm
- Frequent grazing – 18 – 21 day rotation mid-season
- 1200 – 1500 kg DM/ha pre grazing herbage mass



Nitrogen Fixation

Legume based cropping system



Nitrogen Fixation

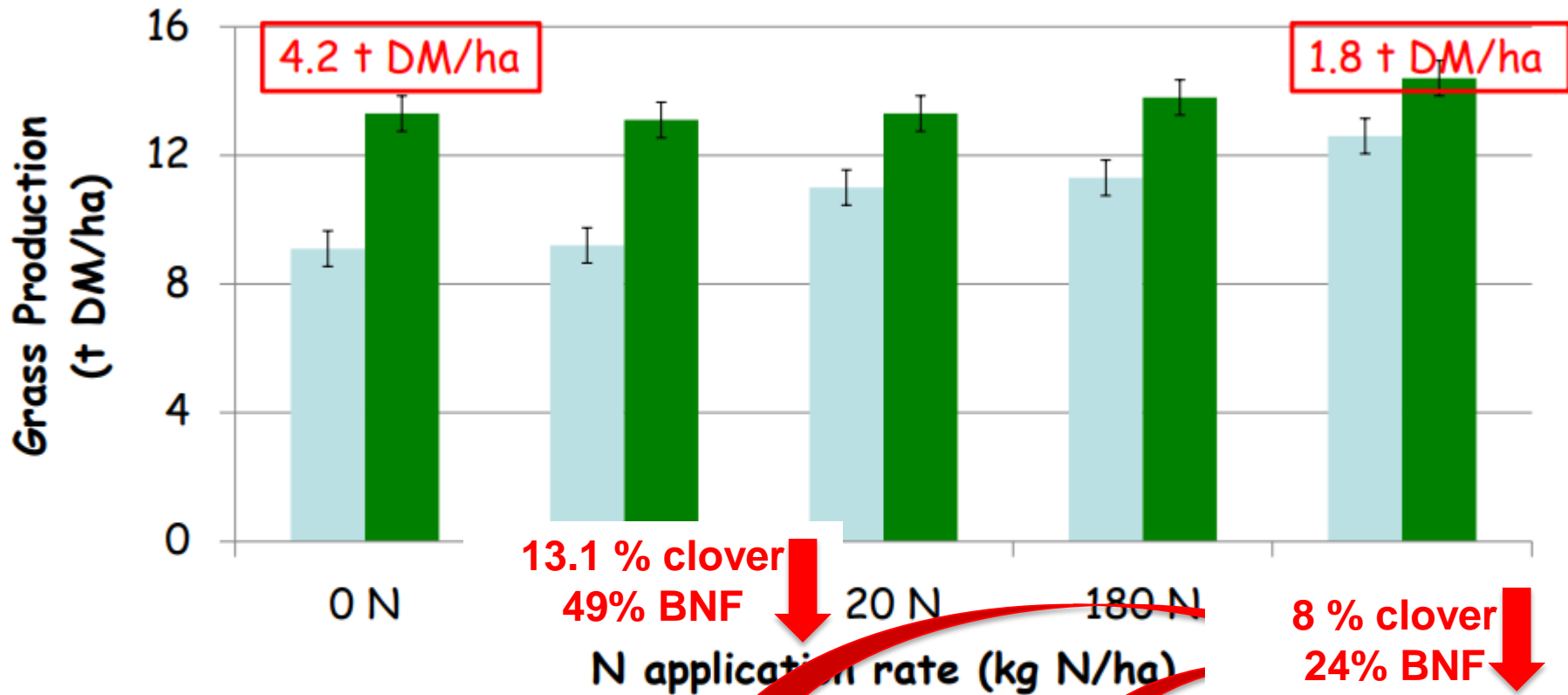
- Clover can fix between 10 to 185 kg N/ha/yr
 - Average sward clover content > 20% - peak 45%
- Symbiotic relationship between clover and rhizobia
 - They benefit each other – nothing for nothing in this world
- Each 1 g of N fixed requires 6 g of Carbon
 - BNF very energy demanding
- Swards reliant solely on BNF are N deficient

N fertiliser application and sward type

Grass production - 4 year average

Grass only

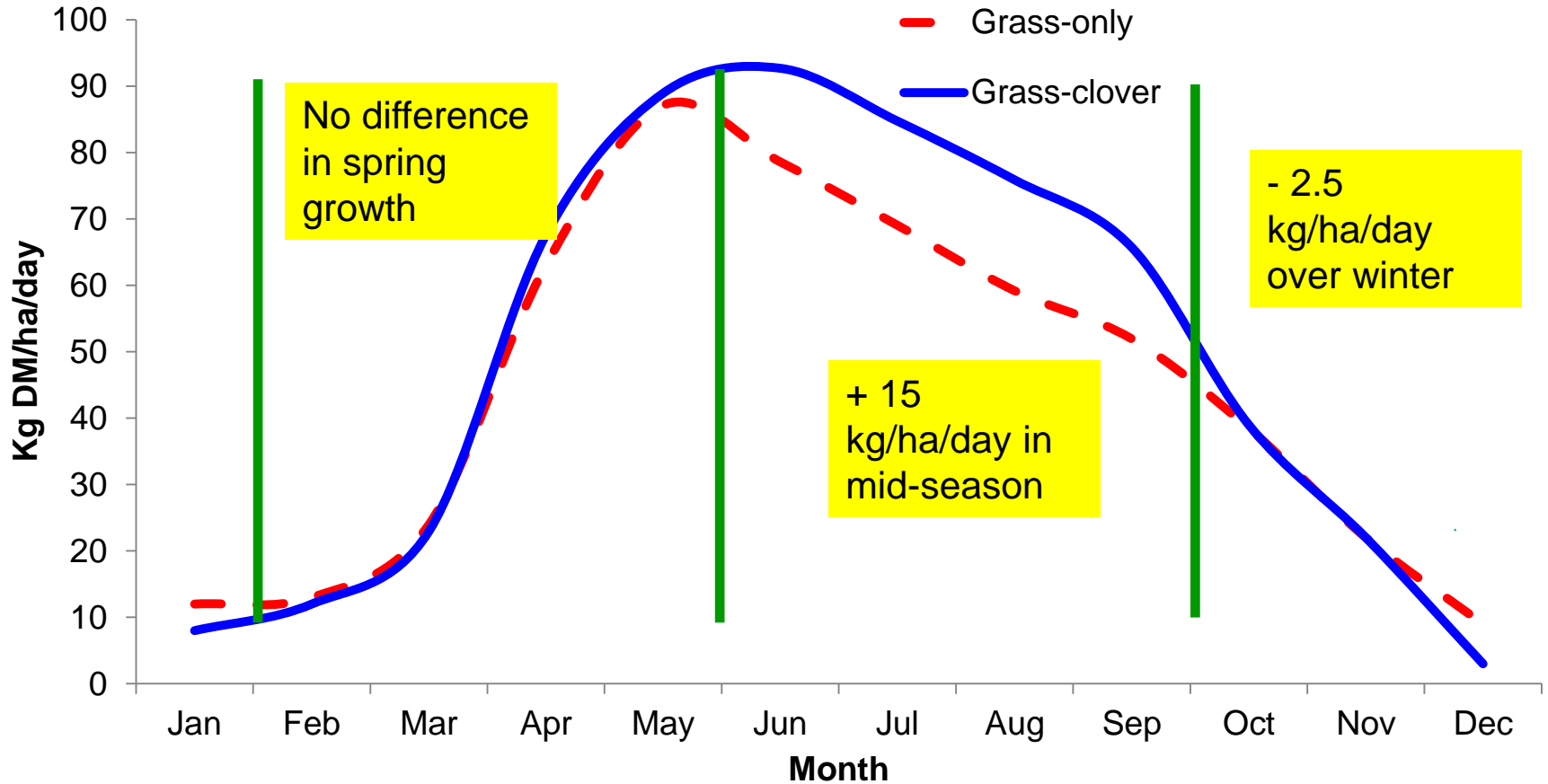
Grass clover



	0 N	60 N	120 N	180 N	240 N
Clover content (%)	31.6	29.2	26.4	20.3	18.5
N fixation (kg N/ha; 2011 - 2013) ¹	220	205	148	122	112

¹ Calculated using the N difference method, Enriquez-Hidalgo *et al.*, Grass Forage Science, 2016

Moorepark & Clonakilty Research



	Grass	Grass+clover	% Difference
Pasture DM production (t DM/ha)	15.4	16.5	↑ 7 %
Sward clover content (%)	-	27	
Clover DM yield (kg DM/ha)	-	4.5	

Where to now?

- White clover has a huge role to play in Irish Agriculture
 - Production
 - Cost
 - Environmental
- Grass and clover swards need Nitrogen
 - How much?
 - When?



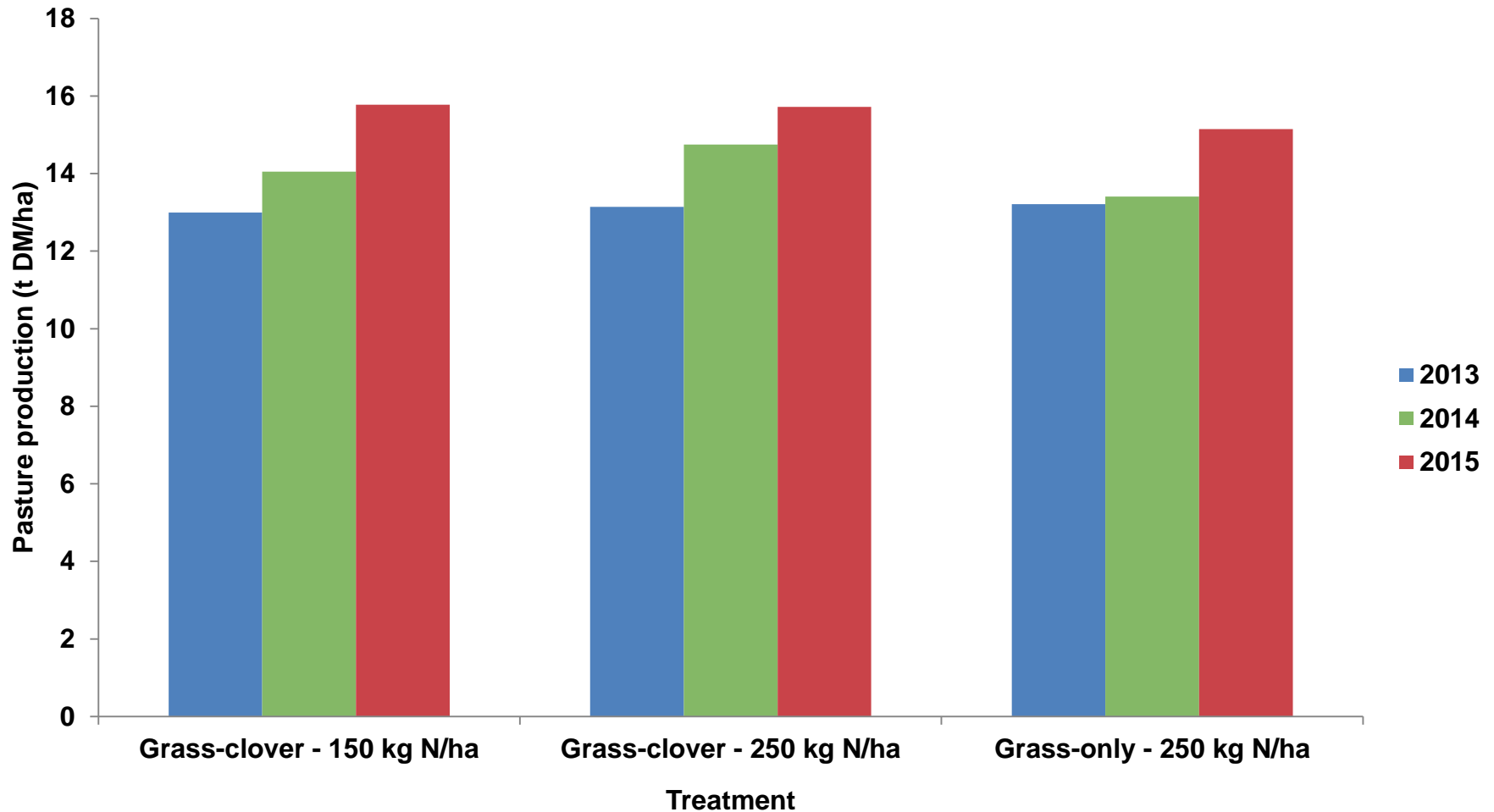
Strategic use on Nitrogen

- N fixed from clover may not be sufficient for intensive production systems
- However, including clover under high levels of N reduced BNF
- Clover can contribute to intensive milk production systems (2.75 cows/ha) receiving 120 – 150 kg N/ha/yr
- 70% applied by mid-May

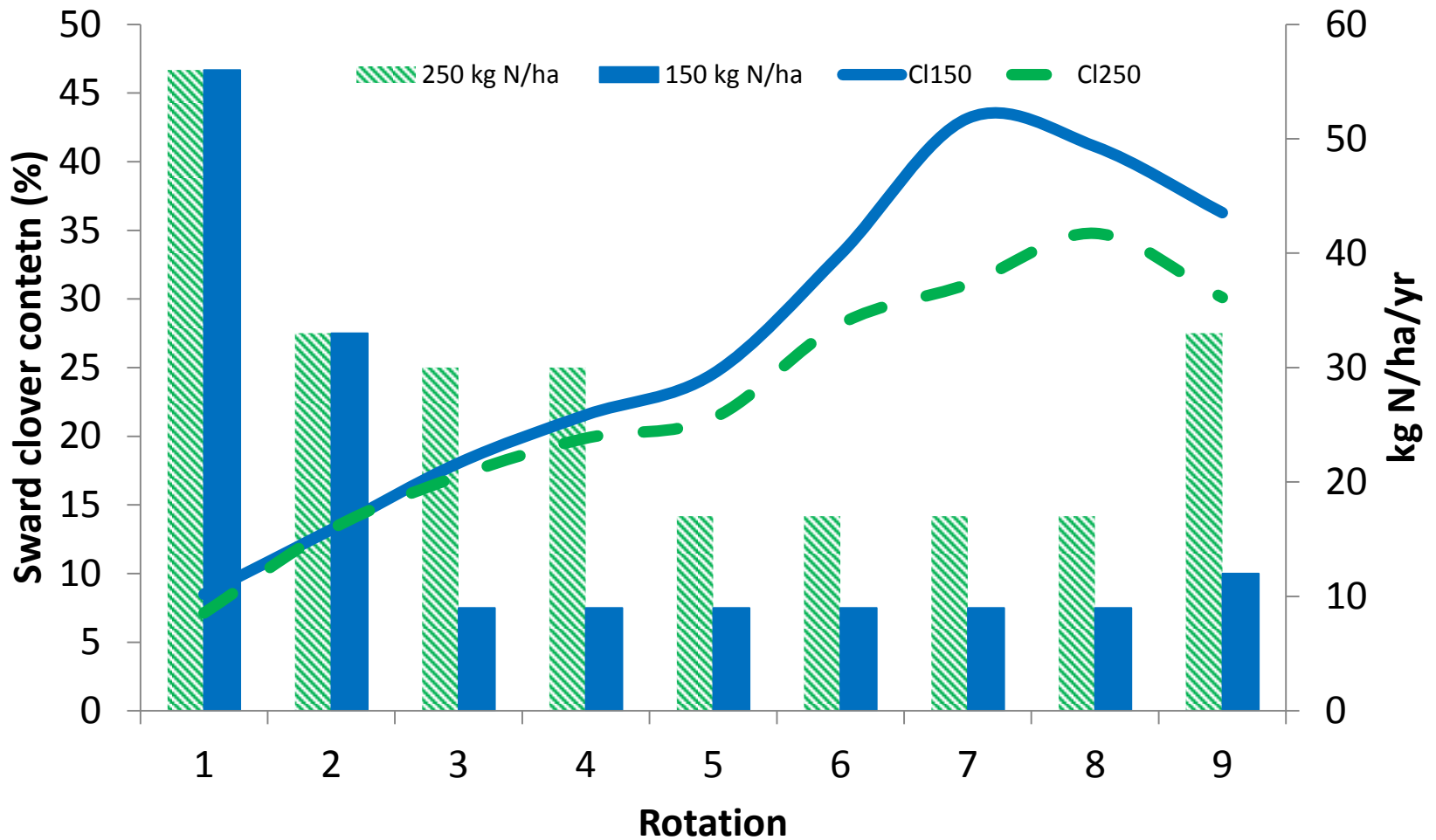


Reduced nitrogen use

Grass-clover 150 kg N/ha = 14.4 t DM/ha vs. Grass-only 250 kg N/ha = 14.5 t DM/ha



Fertiliser application



Take home

- Nitrogen doesn't kill clover
 - It can lead to a reduction in sward clover content
- Clover utilises N similar to grass
- BNF is highly energy demanding on the plant
- Improved grazing management can somewhat negate the negative effect of N on clover

Conclusion

- Clover has a significant role in Irish Agriculture
- Including clover in grass swards
 - Strategically reduce Nitrogen fertiliser across the year
 - Apply 120 to 150 kg N/ha
- Improved grazing and Nitrogen management to maintain sufficient sward clover content



**Thank you for your
attention**