Soil Fertility Conference
Clover Production and Nitrogen Use

Michael Egan
04th March 2024

Teagasc
Agriculture and Food Development Authority

Why white clover?

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

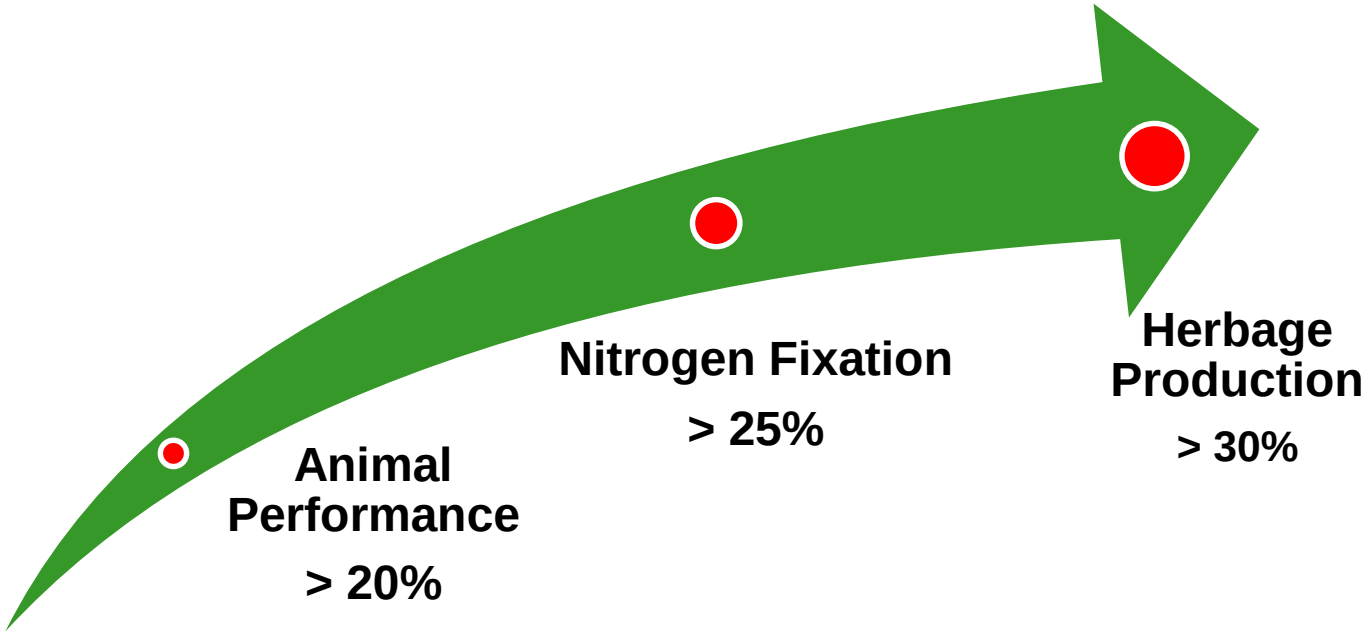
1. **Animal**
2. **Sward**

- **Dry matter intake**
- **Feed quality**
- **Animal performance**
- **Herbage growth**
- **Nitrogen use**
- **Farm gate N surplus**

teagasc
Agriculture and Food Development Authority

What do we want – best of both worlds

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



Clover150 on farm study

Year	Avg clover %	Avg area %	Annual tonnage	N (kg N/ha)	NUE%	N Surplus (kg N/ha)
2020	<10%	10%	**14.4**	232	31%	194
2021	12%	45%	**14.5**	195	31%	180
2022	18%	61%	**13.2**	159	39%	139
2023	23%	65%	**13.0**	151	36%	140

Establishing Blueprint

- Put a plan in place – multiyear approach
- Select paddocks that are best suited
  - Soil fertility/ryegrass content/weed content
- Multi-year approach
  - Year 1 – reseed 10%, over-sow 15%
  - Year 2 – reseed 10%, over-sow 15%
  - Year 3 – reseed 10%, over-sow 15%
  - Year 4 – reseed 10%, over-sow 15% - on-going

teagasc
Agriculture and Food Development Authority

White Clover Development

- Rosette phase
- Expansion phase

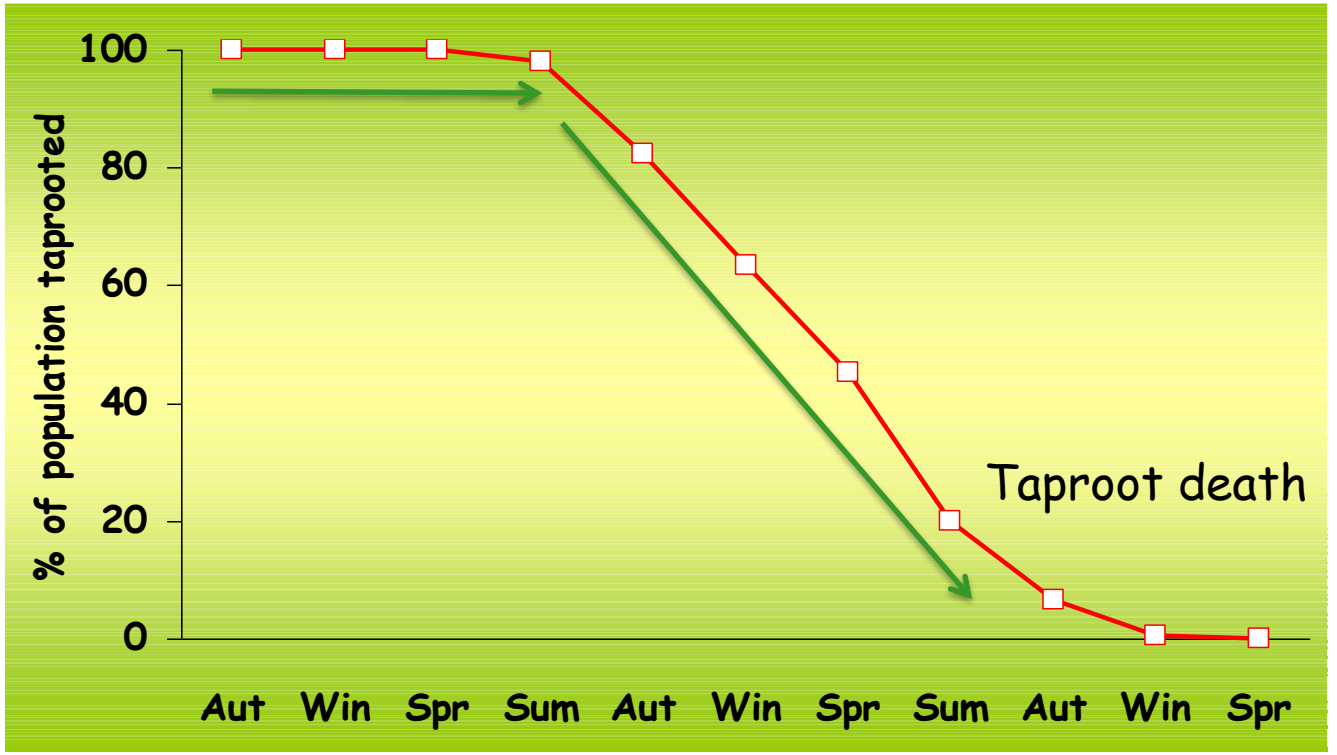
} Both taproots

Taproot death

- Clonal phase
  - (nodal roots, normal growth form)

teagasc
Agriculture and Food Development Authority

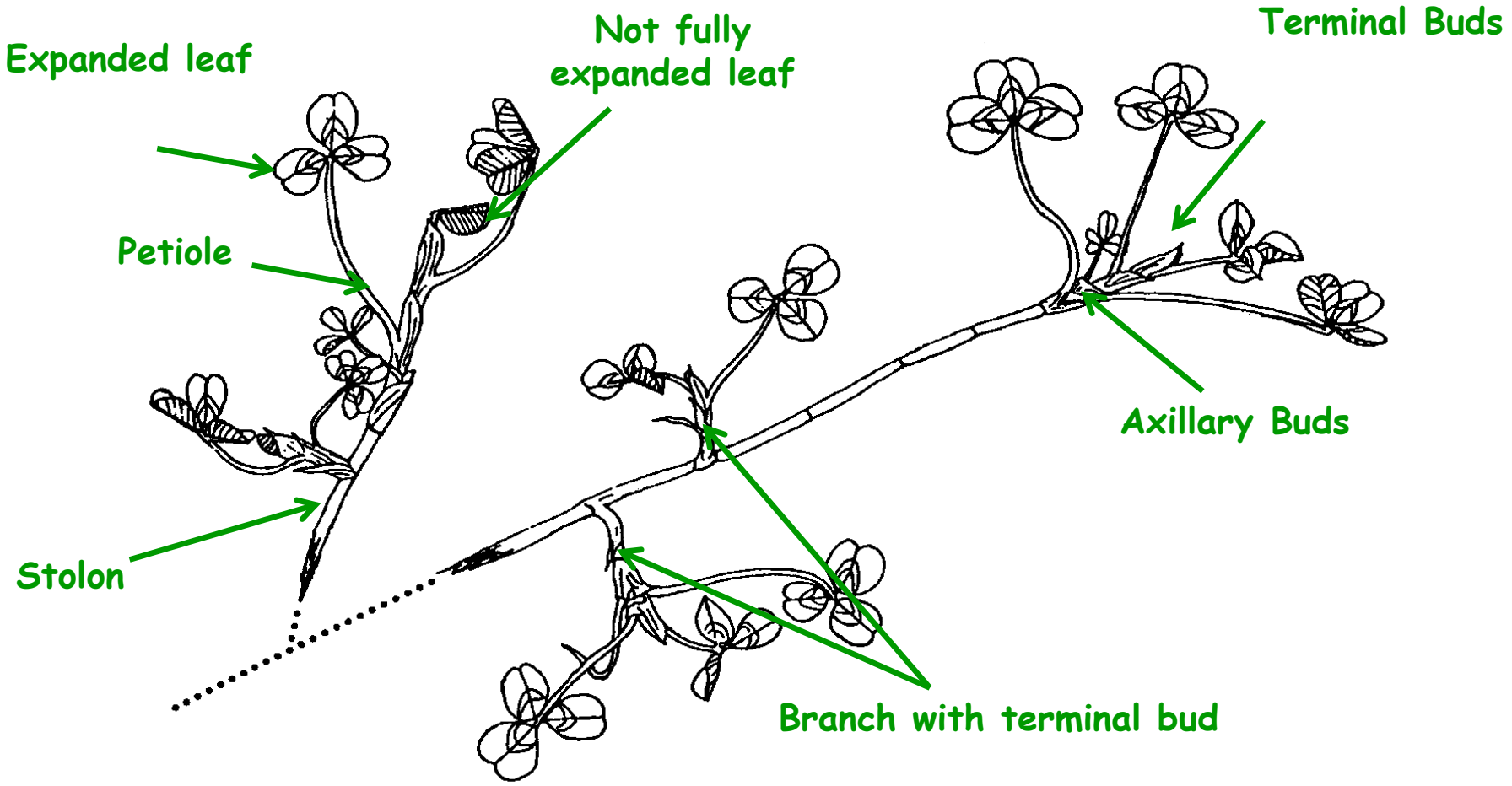
Taproot death & plant break up



- About 8-12 months after sowing - taproots begin dying .
- By 2.5 years all taproots are dead.
- Population in transition.
- Clover 'decline'

teagasc
Agriculture and Food Development Authority

Clover Plant



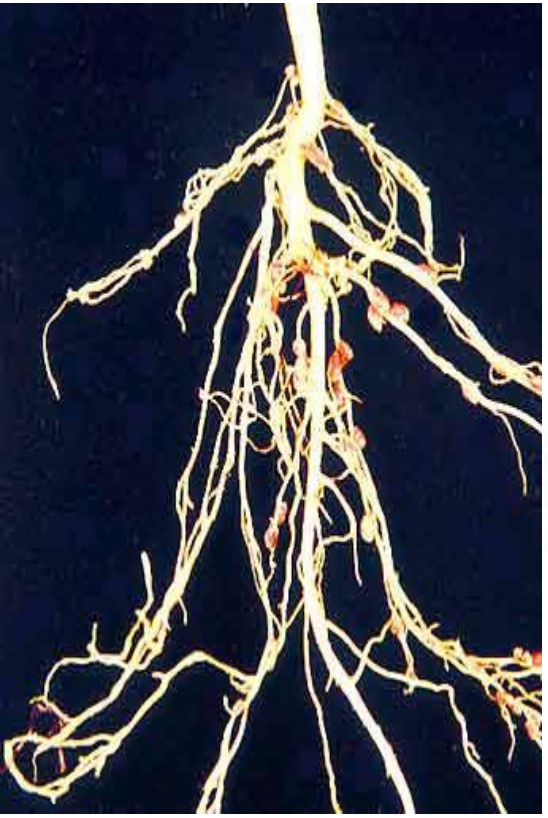
teagasc
Agriculture and Food Development Authority

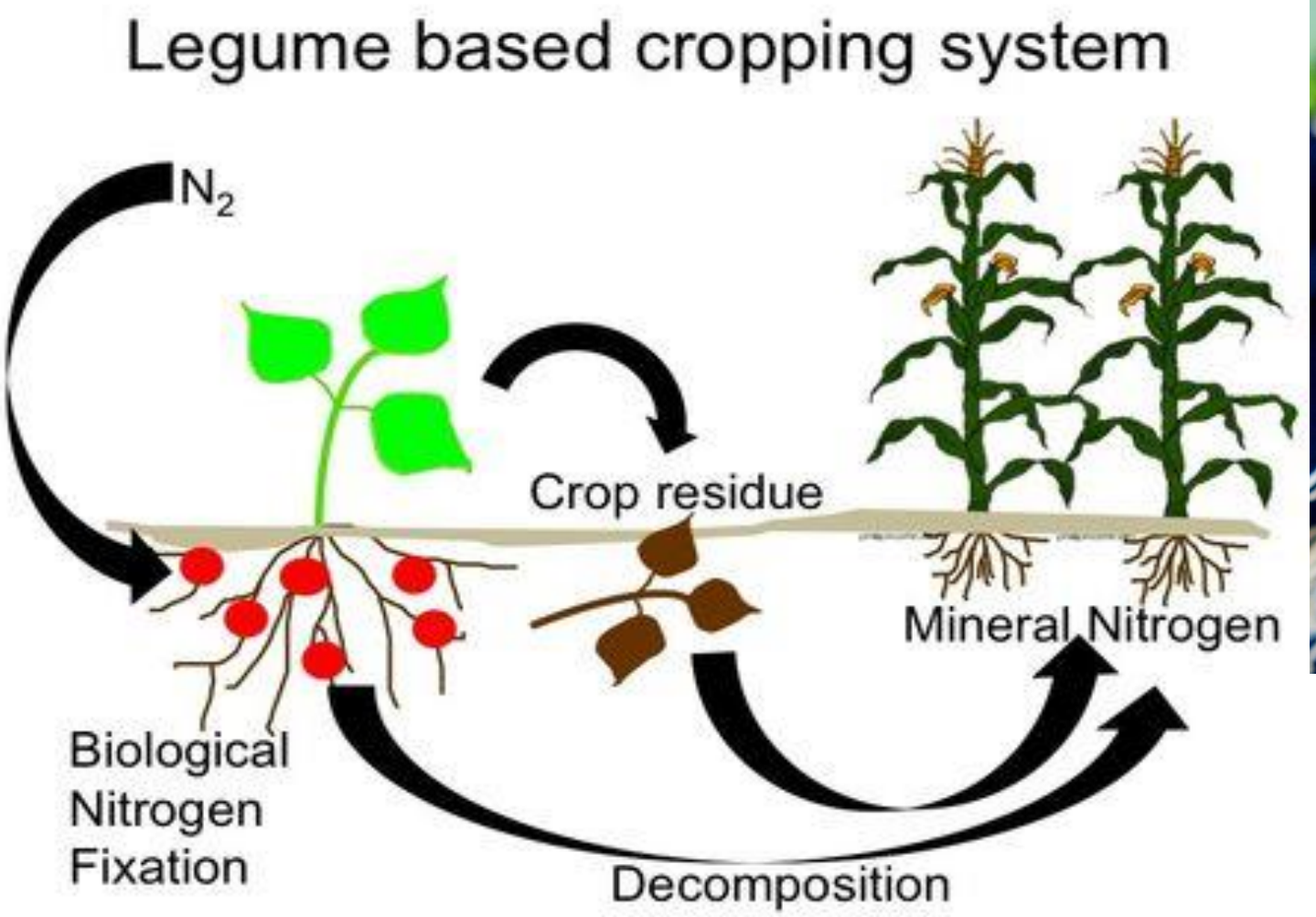
How do we promote clover growth?

- What dose white clover need for growth and persistence?
- Fertile soils
- Soil temperature > 8° C
- Sunlight

- Good grassland management promotes clover growth

Nitrogen Fixation



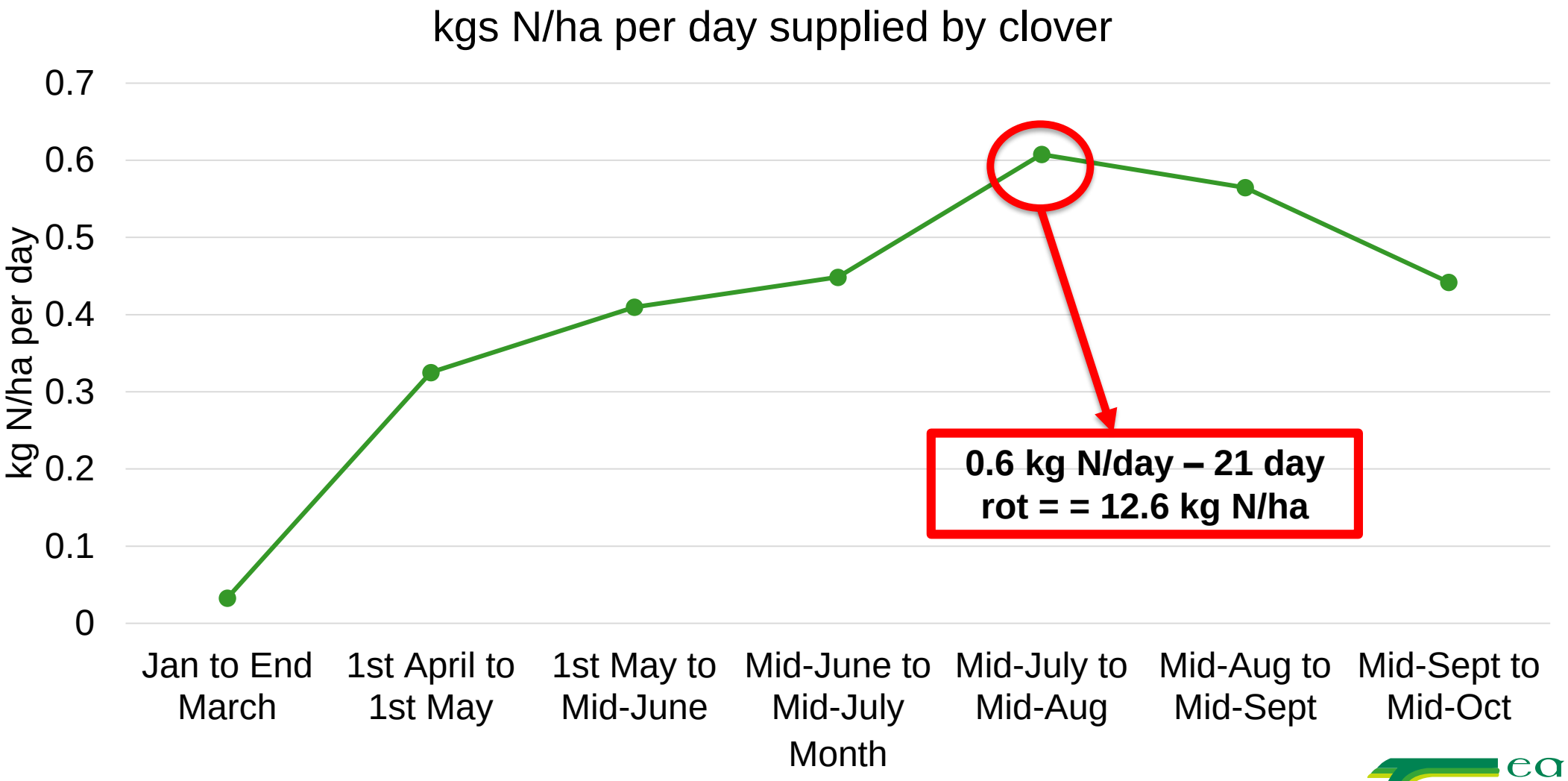


teagasc
Agriculture and Food Development Authority

Nitrogen Fixation

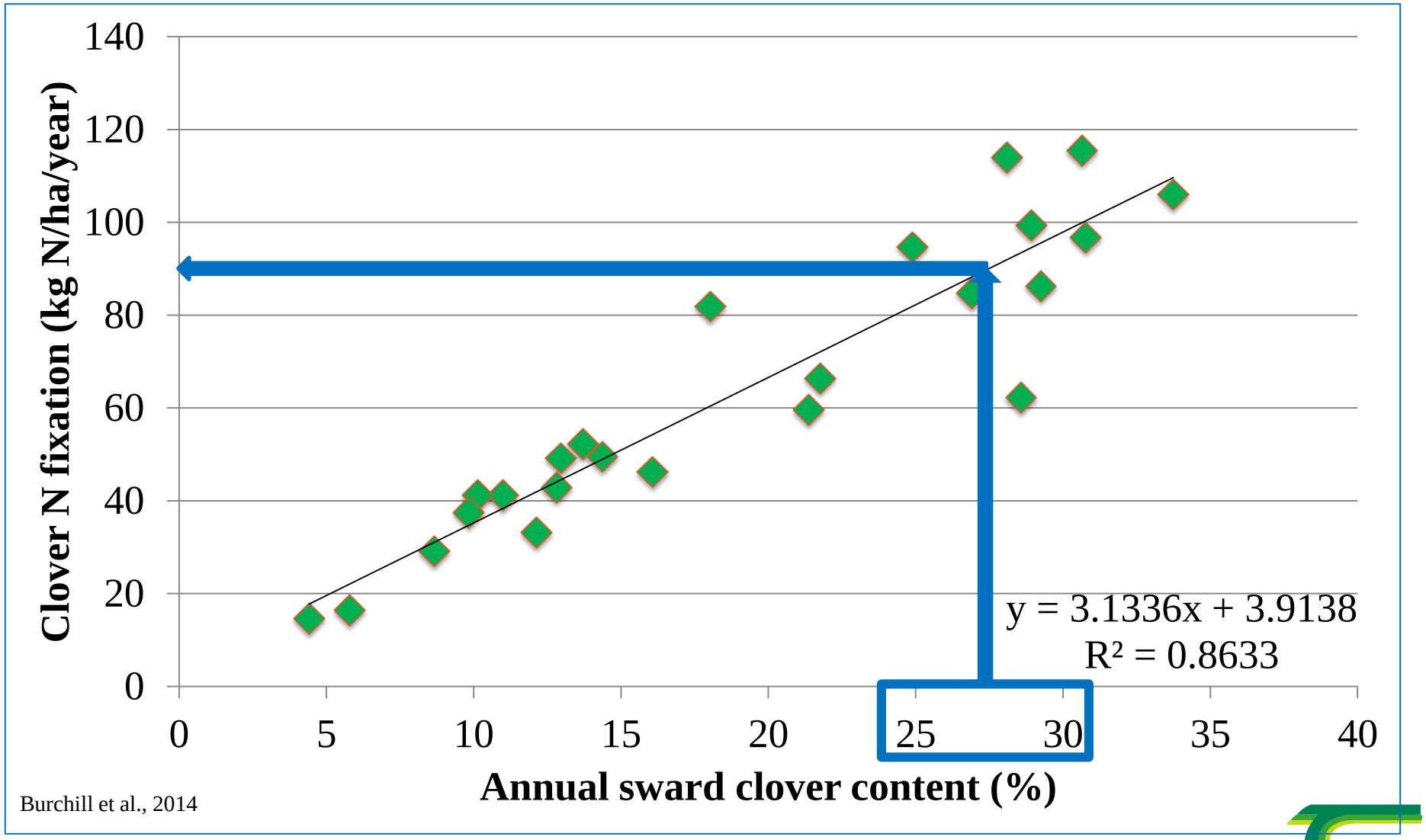
- Clover can fix between 10 to 185 kg N/ha/yr
  - Average sward clover content > 20% - peak 45%
- Symbiotic relationship between clover and rhizobia
  - They benefit each other – nothing for nothing in this world
- Each 1 g of N fixed requires 6 g of Carbon
  - BNF very energy demanding

When does clover supply N?



teagasc
Agriculture and Food Development Authority

Importance of sward clover content



Burchill et al., 2014

teagasc
Agriculture and Food Development Authority

Targeted reductions in N fertiliser

Clover %	N fertiliser (kg N/ha)	DM Yield (t DM/ha)
0%	180	12.6
5%	130	10.5
10-15%	161	12.4
21 - 30%	130	12.9

teagasc
Agriculture and Food Development Authority

Nitrogen strategy for clover %

April Clover content (%)	Feb	Mar	April	May (2 rot)	June (2 rot)	July (2 rot)	Aug	Sept	Total
	Chemical Fertiliser (kg N/ha)								
Grass sward	24	36	20	32	28	28	21	23	212
5%	20	35	20	20	20	20	20	20	175
10%	20	35	20	15	15	10	15	20	150
15%	20	35	20	15	10	*SW	10	20	130
20%	20	35	20	15	SW	SW	SW	15	105

- *Soiled water used whenever zero chemical N application
- +25kg organic N applied

Michael Egan, Teagasc Moorepark

Teagasc
Agriculture and Food Development Authority

Red clover

Pros

- ✓ High BNF (>200 kg N/ha)
- ✓ High DM production (>15 t DM/ha)
- ✓ High intake potential
- ✓ High animal performance

Cons

- × Grazing
- × Poor persistence (3-4 years)
- × 4-year break
- × Difficult to ensile

teagasc
Agriculture and Food Development Authority

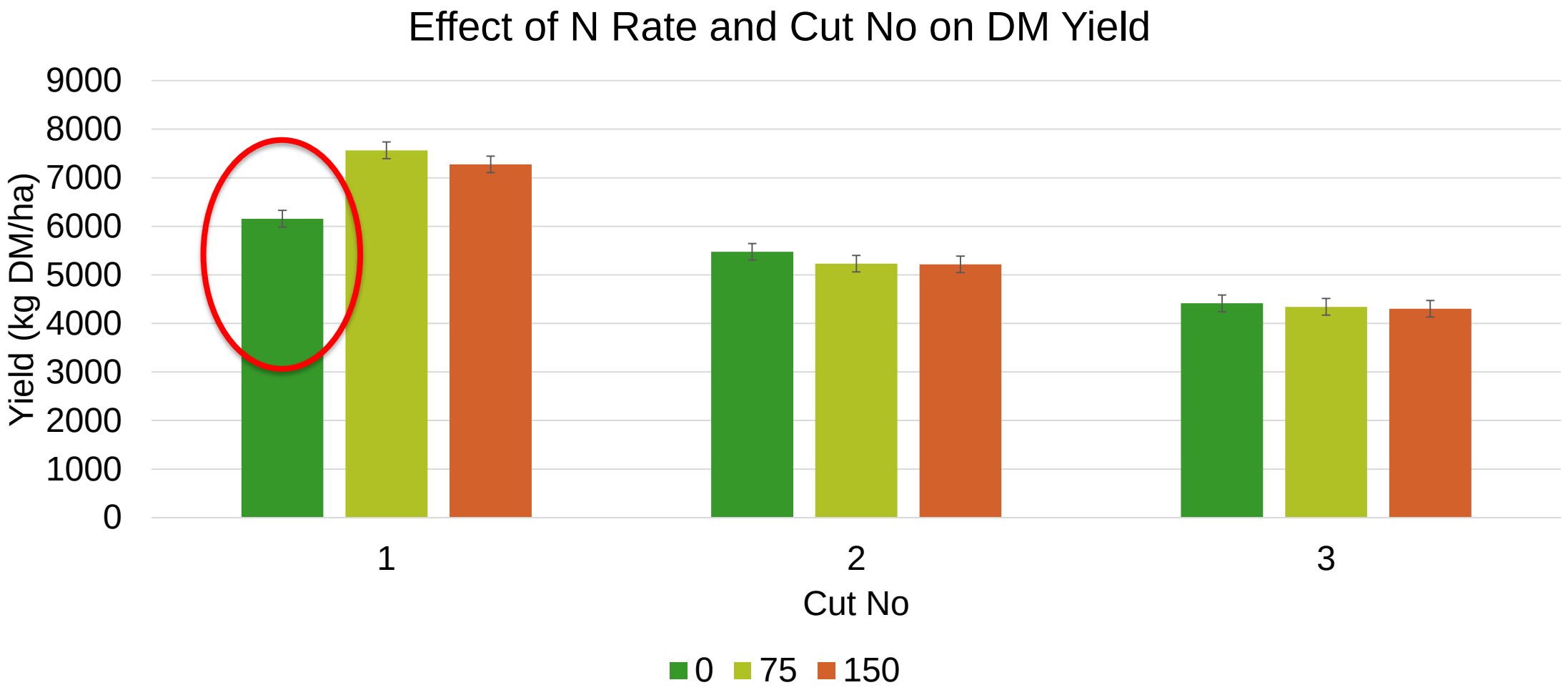
Growth habit of red clover

Red clover

White clover

teagasc
Agriculture and Food Development Authority

Impact on N fertiliser and Silage cut



teagasc
Agriculture and Food Development Authority

Conclusion

- Clover has a significant role in Irish Agriculture
- Soil fertility vital in establishing and maintaining clover
- Improved grazing and Nitrogen management to maintain sufficient sward clover content
- Strategically reduce Nitrogen fertiliser across the year
- Red clover key role in silage swards

teagasc
Agriculture and Food Development Authority