White clover: Improving Nitrogen use efficiency

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Overview

- Introduction – new challenges
- White clover – performance results (herbage and animal)
- White clover – Nitrogen (N) use efficiency
- Establishing white clover on farms
- Take home messages

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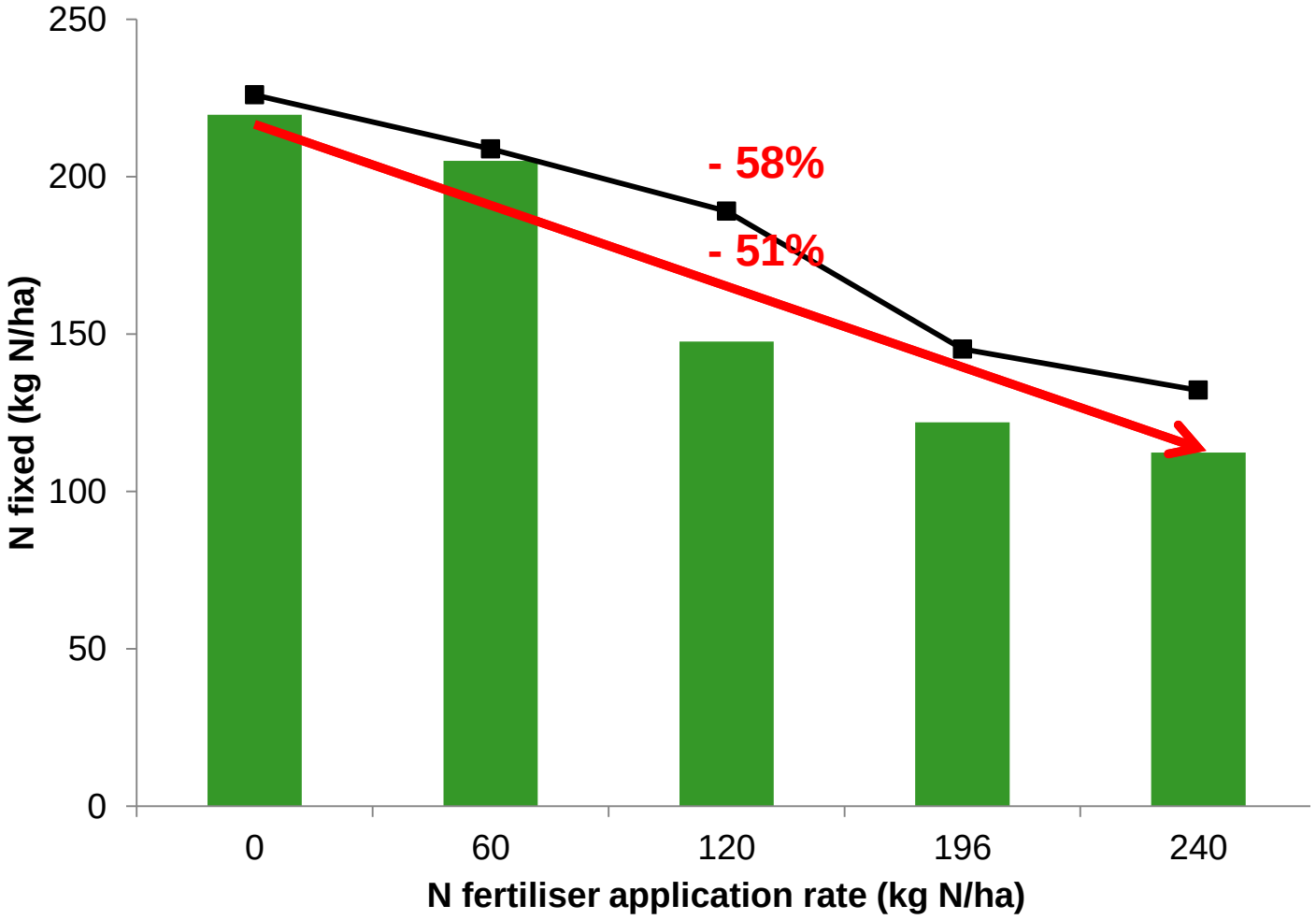
Why white clover?

- Business as usual is not an option for the future

- Nitrates Derogation
  - Grass seed mixtures must contain clover
- Nitrogen source
  - Biological N fixation - 0 – 170 kg N/ha
- Animal and system performance
  - Industry economic gain - €60 million/year

- Sward white clover content is key (target 20%)

Relationship between fertiliser N, white clover content and BNF



Enriquez-Hidalgo et al., 2016

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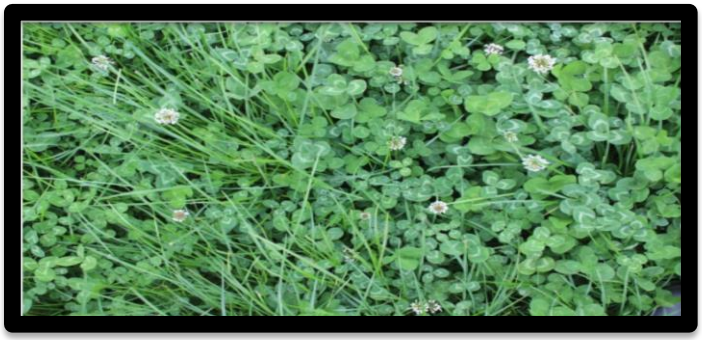
White clover & managing N fertiliser

White clover content	Visual assessment	Fertiliser management
5%		N fertiliser after each grazing event (up to max allowed under Nitrates e.g. 250 kg N/ha)
25%		N fertiliser in spring, reduce N fertiliser to ¾ or ½ rate from May onwards
50%		N fertiliser in spring, reduce N fertiliser to ½ rate or less from May onwards

White clover farm systems research

- Moorepark experiment (2013 – 2016)
  - Grass only 250 kg N/ha/year
  - Grass + white clover 250 kg N/ha/year
  - Grass + white clover 150 kg N/ha/year
  - Stocking rate - 2.74 LU/ha (20 cows per treatment)

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Benefits of white clover

Moorepark Experiment (2013 – 2016)	Grass-only 250 kg N/ha	Grass-clover 250 kg N/ha	Grass-clover 150 kg N/ha
Milk yield (kg/cow)	6,108	6,498	6,466
Milk solid yield (kg/cow)	460	496 **+ 7.5%**	493
Herbage production (t DM/ha)	13.6	14.0	13.6
Sward white clover content (%)	-	23	27

+ 11.0%

+ 7.7%

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Moorepark Exp. - N use efficiency

	Gr250[1]	Cl250	Cl150
Milk solids yield (kg MS/ha)	1,261[a]	1,373[b]	1,337[b]
Fertiliser applied (kg N/ha)	229	232	156
Total N input (kg N/ha)	**249[a]**	**250[a]**	**175[b]**

[1]Gr250 = Grass-only 250 kg N/ha; Cl250 = Grass-clover 250 kg N/ha; CL150 = Grass-clover 150 kg N/ha

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On-farm white clover study

- Evaluate white clover on commercial dairy farms
- Diverse geographical locations and soil types
- Clover over-sown on farms in 2016
  - Immediately after grazing
  - Over a 4 week period on each farm
  - Clover stitched in

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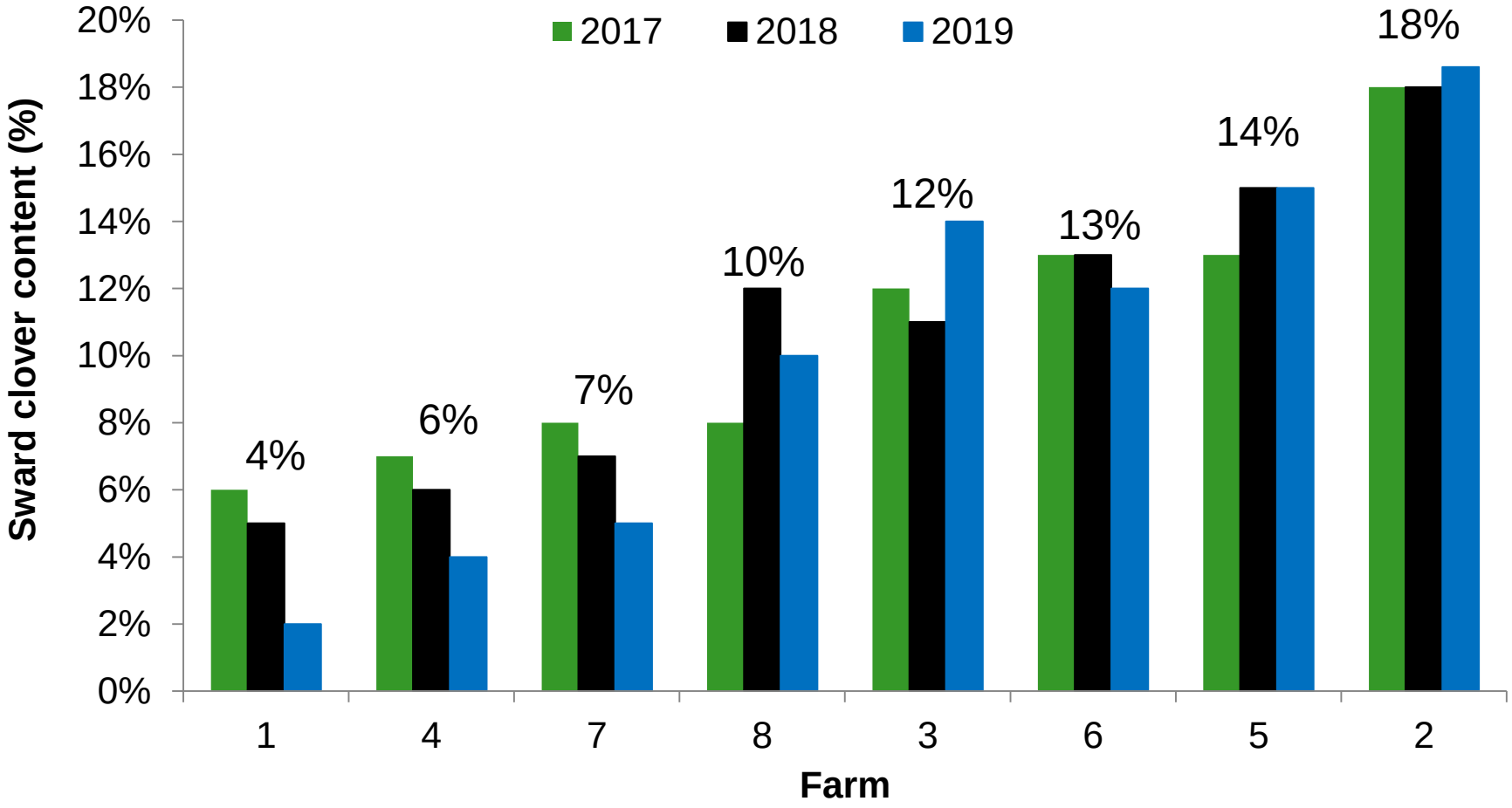
Average on-farm sward clover content: 2017-2019



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How to establish a white clover sward?

- Can be established using two methods
  - Direct reseeding or Over-sowing

- **April/May** - best time - adequate soil moisture
- Grazing management post-sowing is critical

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Management for white clover to work

- Currently – 18% of farms capable of establishing clover
  - Only 18% dairy farms at optimum soil fertility

- Spring N (Enriquez-Hidalgo et al., 2014; Laidlaw 1980)
- Early spring grazing (Woodfield and Clark, 2009; Burdon, 1983)
- Appropriate covers (Harris and Clark, 1996, Woodfield and Clark, 2009)
- Residuals (Harris and Clark, 1996, Woodfield and Clark, 2009)
- Reduced summer N (Ledgard et al., 2001; Enriquez-Hidalgo et al., 2016)
- Close high white clover content paddocks late (Black et al., 2009)

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Take home messages

- White Clover: major opportunity to improve efficiency of grazing
  - 7% to 11% increase in animal performance
  - Reduce N fertiliser use
  - Increase N-use efficiency

- White clover can be successfully over-sown on-farms
  - Improvement need in soil fertility
  - Timing and management are key

- Business as usual is not an option!!

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Thank you!

Questions?

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