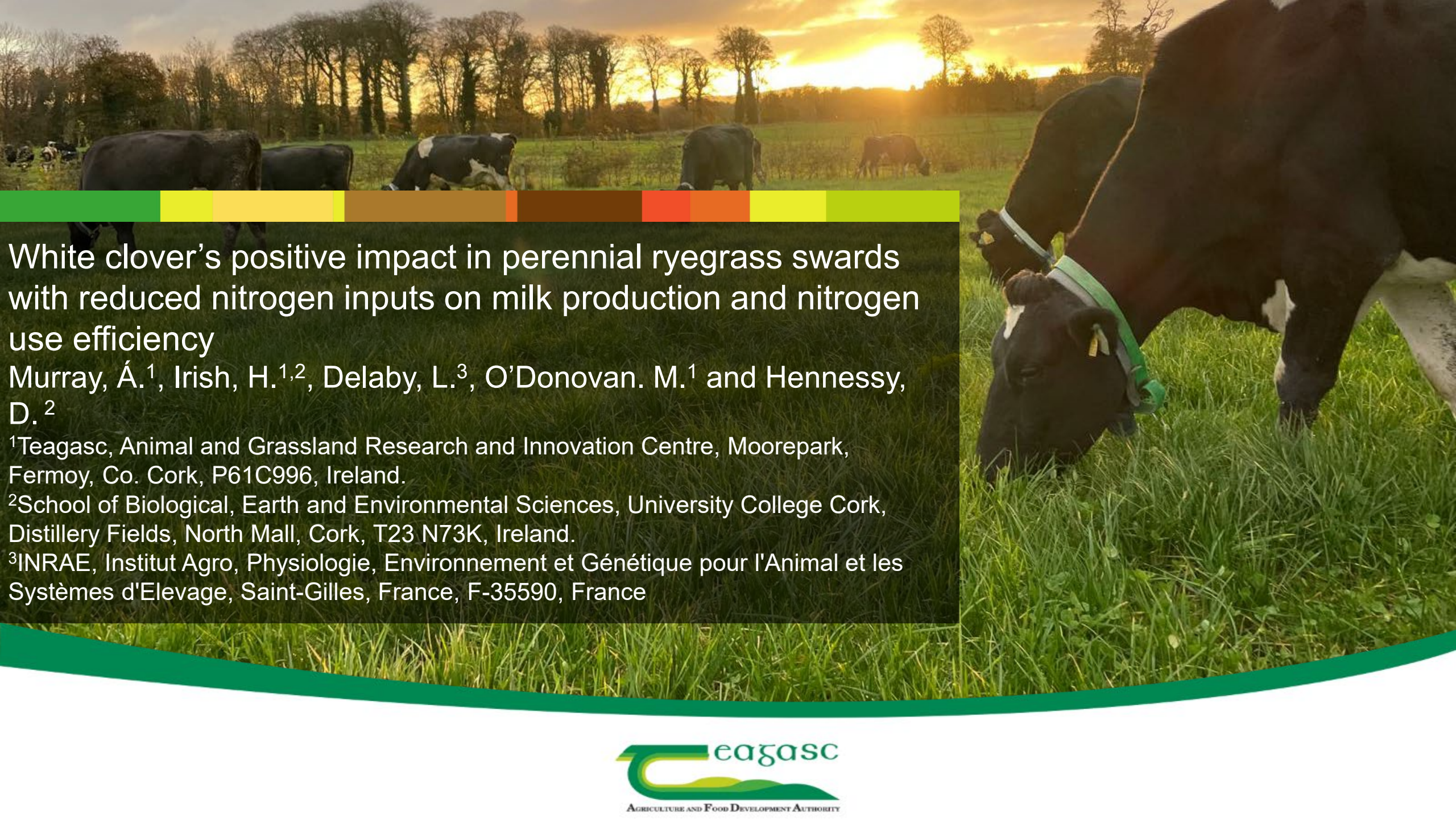




White clover's positive impact in perennial ryegrass swards with reduced nitrogen inputs on milk production and nitrogen use efficiency

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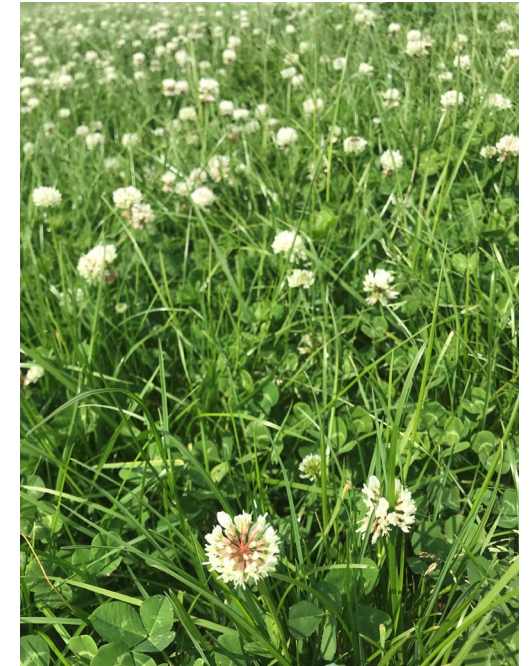
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White clover's role in grazing systems

- Nitrogen inputs in grazing systems are likely to be subject to stricter limitations
 - EU Nitrates Directive – maximum N fertiliser application rates of 212 kg N/ha in Ireland (Derogation)
- Renewed interest in the incorporation white clover in perennial ryegrass grazing systems
 - ↓ input costs
 - ↓ environmental impacts
 - ↑ profitability
 - ↑ farm gate nitrogen use efficiency



The Experiment

- Objective - to reduce chemical N fertiliser input to pasture-based milk production systems by incorporating white clover into grassland swards
- Established at Moorepark, Fermoy, Co. Cork in 2023
 - Grass-only receiving 200 kg N/ha (Gr200)
 - Grass-clover 150 kg N/ha (CI150)
 - Grass-clover 100 kg N/ha (CI100)
- 20 cows per treatment
 - blocked by parity, calving date, day 7/8 milk yield, breed, EBI
- Grazing platform
 - Stocked at 3.1 cows/ha on milking platform (2.39 cows/ha whole farm)
- Silage systems
 - Gr200 – Grass
 - CI150 – 50% grass area; 50% red clover
 - CI100 – 100% red clover



Grazing management rules

	Grass 200	Grass Clover 150	Grass Clover 100
Fertiliser	200	150	100
Post grazing sward height (cm)	4	4	4
Rotation length	Common	Common	Common
Target farm cover (mid-season) (kg DM/cow)	170	170	170
Target pre-graze HM (kg DM/ha)	1300-1500	1300-1500	1300-1500
Concentrate (kg/cow)	Common (~400)	Common (~400)	Common (~400)

- All fertiliser protected urea
- Slurry applied by LESS in spring
 - 60 – 70% of the area, including silage ground
- Soiled water – LESS – across grazing platform
- Weekly farm cover (twice weekly in periods of rapid grass growth)
- Pasture Base Ireland

Annual N fertiliser application strategy

Date (Rotation)	Grass 200 (kg N/ha)	Grass Clover 150 (kg N/ha)	Grass Clover 100 (kg N/ha)
February	28	28	28
Mid March	28	28	19
April (2 nd rotation)	20	20	19
May (3 rd rotation)	20	13	9
May (4 th rotation)	17	9	0
June (5 th rotation)	17	9	0
July (6 th rotation)	17	9	0
July (7 th rotation)	17	9	0
August (8 th rotation)	17	9	9
Mid September	19	16	16

The Measurements

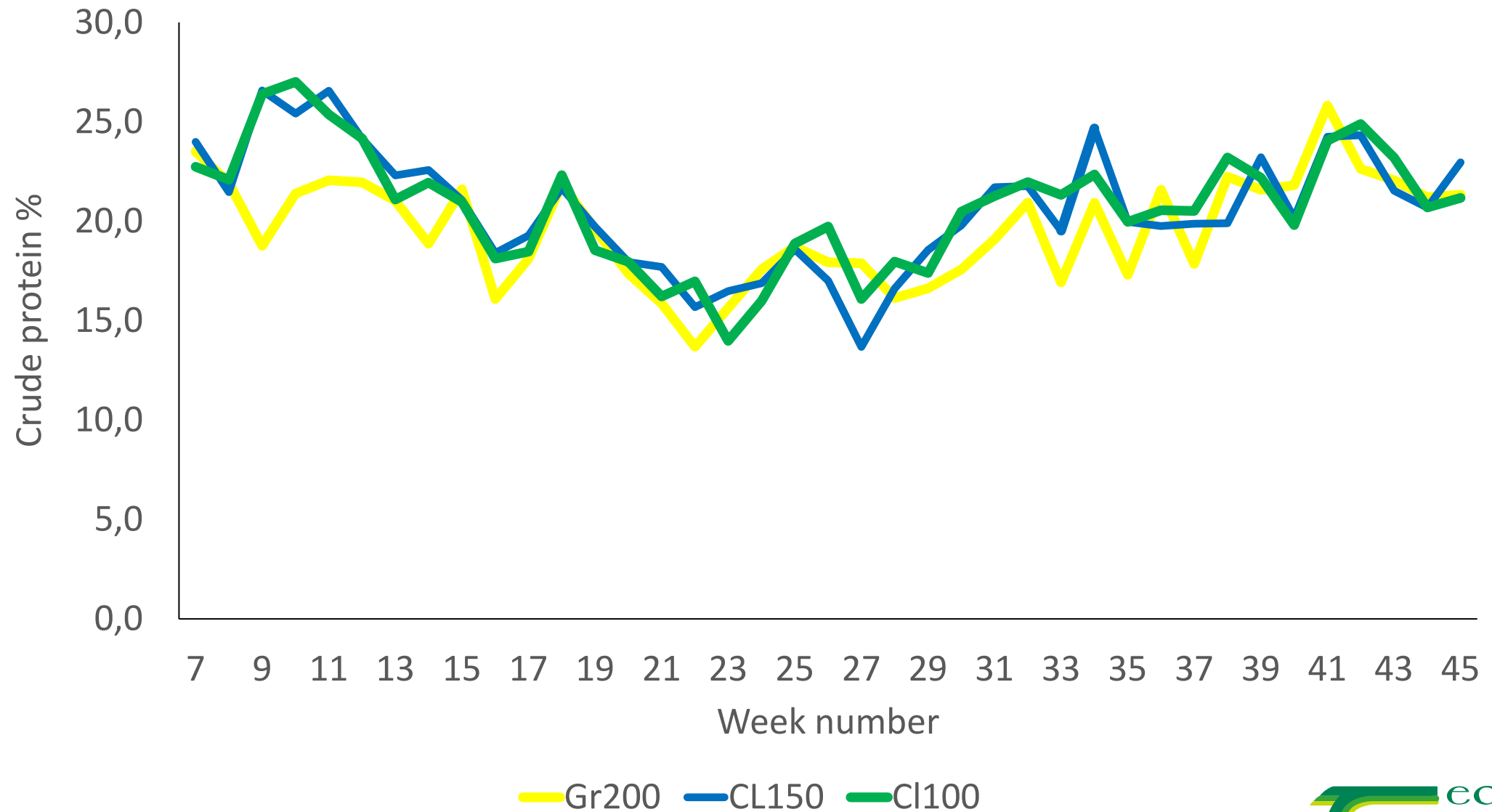
- Sward measurements
 - Pre-grazing herbage yield
 - Pre- and post-grazing heights
 - Herbage quality
 - White clover content – snip samples, DM basis
- Animal measurements
 - Milk yield
 - Milk constituents – fat, protein and lactose
 - Body weight and body condition score
- Nitrogen balance
 - Nitrogen use efficiency
 - Nitrogen surplus



Results – Herbage Production

	Gr200	CI150	CI100	SEM	Sward Type	N Rate
Pre-grazing yield (kg DM/ha)	1,599	1,422	1,498	76.1	NS	NS
Pre-grazing height (cm)	11.78	11.31	11.36	0.325	NS	NS
Post-grazing height (cm)	4.42	4.39	4.43	0.040	NS	NS
Clover content (%)	-	19.0	19.1	1.03	-	NS
Crude protein content (g/kg DM)	196 ^a	207 ^b	207 ^b	2.9	*	NS
Total annual DM production (kg DM/ha)	14,515	14,322	14,266	130.5	NS	NS

Herbage Crude Protein Content



Results – Milk Production

	Gr200	CI150	CI100	SEM	Sward Type	N Rate
Days in milk	287	290	288	3.5	0.652	0.855
Milk yield (kg/cow)	5,601	5,824	5,892	138.3	0.129	0.301
Milk solids yield (kg/cow)	480 ^a	511 ^b	518 ^b	11.9	0.023	0.072

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Milk solids yield (kg/cow)	480 ^a	511 ^b	518 ^b	11.9	0.023	0.072
Fat content (g/kg)	50.4	51.6	52.1	0.12	0.577	0.320
Protein content (g/kg)	36.3	36.9	36.5	0.05	0.713	0.540
Lactose content (g/kg)	47.1	47.1	46.8	0.02	0.501	0.751

Results – Nitrogen Balance

	Gr200	CI150	CI100
N Input (kg N)	241	192	140
N Output (kg N)	95	100	101



Results – Nitrogen Balance

	Gr200	CI150	CI100
N Input (kg N)	241	192	140
N Output (kg N)	95	100	101
N Surplus (kg N)	146	92	39
Farm gate NUE (%)	39	52	72



Take Home Message

- White clover in PRG swards had a significant positive affect on milk solids production (+35 kg/cow).
- Reducing N fertiliser rate from 200 to 150 or 100 kg N/ha with WC in the sward did not affect herbage production.
- Positive result for farmers
 - Reduced nitrogen surpluses
 - Increased profitability



Acknowledgments

- EAAP Scholarship
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