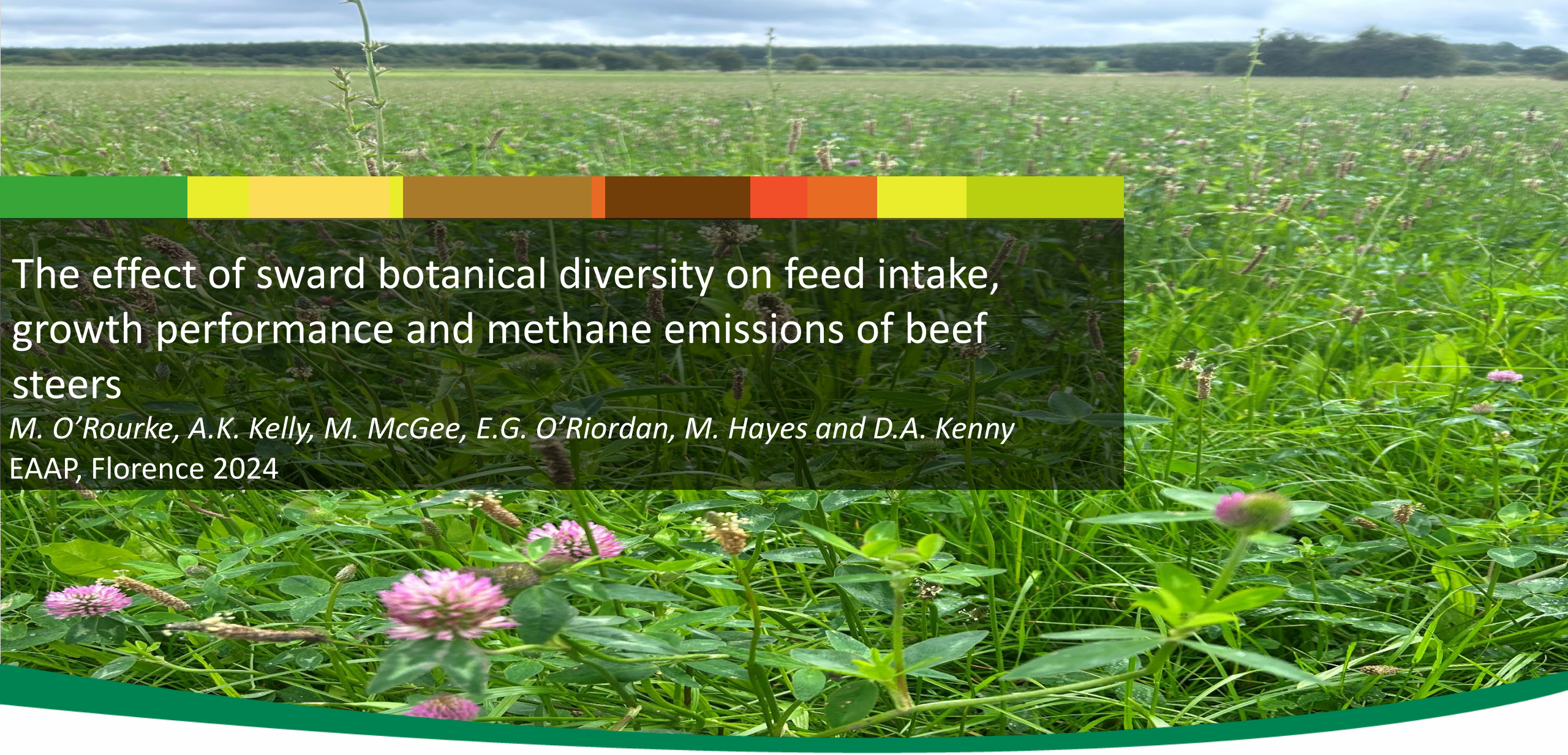

The effect of sward botanical diversity on feed intake, growth performance and methane emissions of beef steers

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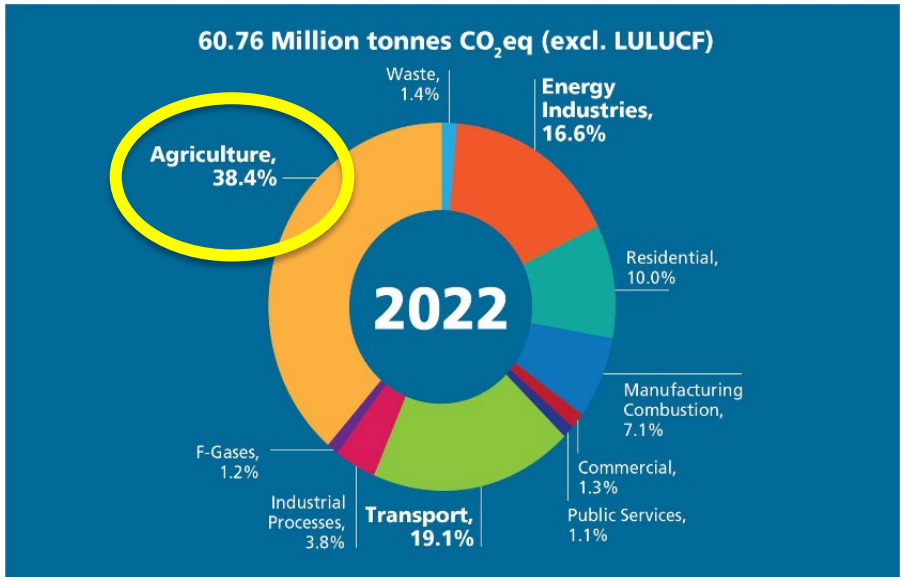
Beef production in Ireland

- Irish temperate climate facilitates a **pasture based system** – long grass growing season
- **Grazed pasture:** cheapest feed resource available to cattle (Finneran et al., 2012)
- Seasonal grass-based systems prevail

Key objective: maximise beef production from **grazed pasture**

Challenges:

- Low farm profitability
- Increasing legislation to reduce the environmental impacts of agriculture (CH_4, N)



- Low cost productive pastures comprises perennial ryegrass and nitrogen-fixing white clover
- Increasing interest in **multispecies swards (MSS)**

➢ Further enhance animal growth and performance?

➢ Potential to reduce CH_4 emissions (via condensed tannins)?

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Perennial ryegrass-white clover (PRG-WC) vs. Multispecies swards (MSS)

Multispecies sward (MSS): botanically diverse sward consisting of **grass (perennial ryegrass), legumes (white clover and red clover)** and **herbs (plantain and chicory)**.

- Increased **feed intake** in dairy cows offered **MSS** vs. PRG swards (McCarthy et al., 2023, Roca-Fernandez et al., 2016)
- Increased **animal performance** in beef cattle offered **PRG/WC** vs. PRG (O'Riordan et al., 1996) and in sheep offered **PRG/WC** and **MSS** vs. PRG (Grace et al., 2018)
- Reduction in **CH_4 emissions** from **legume** and **herbs** containing condensed tannins (Roldan et al., 2022, Jafari et al., 2019, Totty et al., 2013)

What have additional species to PRG & WC i.e. red clover, plantain and chicory to offer in terms of beef cattle intake, growth and CH_4?

No literature on this.

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Objectives:

- Investigate the effect of offering **PRG/WC** vs. **MSS** on feed intake, enteric methane emissions and growth performance in late-maturing beef steers

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Materials & Methods – Experimental design

Experimental Design:
Charolais crossbred steers (n=44)

Body weight (BW): 398 (SD=28.1) kg
Age:
390 (SD=19.5) days

44 'spring-born' CHX steers

PRG/WC: Perennial ryegrass (L. perenne), white clover (T. repens)

MSS: Perennial ryegass (*L.perenne*), white clover (*T. repens*), red clover (*T. pratense*), plantain (*P. lanceolata*) and chicory (*C. intybus*)

Grazing season:

Cut & Carry period (114 Days)

April | May | June | July | August | September | October

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Materials & methods:

- Fresh forage, **MSS** and **PRG/WC**, harvested **once daily** (PGSH 5cm, PGHM 2,300kg (**MSS**) 2,000kg (**PRG/WC**) DM/ha)
- Animals were fed **3x daily**, *ad libitum*: 0700h, 1100h and 1600h
- Refusals weighed and discarded **daily**

Animal measurements:

- Feed intake measured daily via Calan gates
- Enteric CH_4 emissions measured daily using C-Lock GreenFeed
- Animals weighed fortnightly, before feeding

Pasture sampling:

- **Daily** forage sampling (1100h): DM determination, chemical analysis
- Botanical composition separation **weekly** (1100h): DM determination, chemical analysis
- Refusal botanical composition **3x week**: DM determination, chemical analysis

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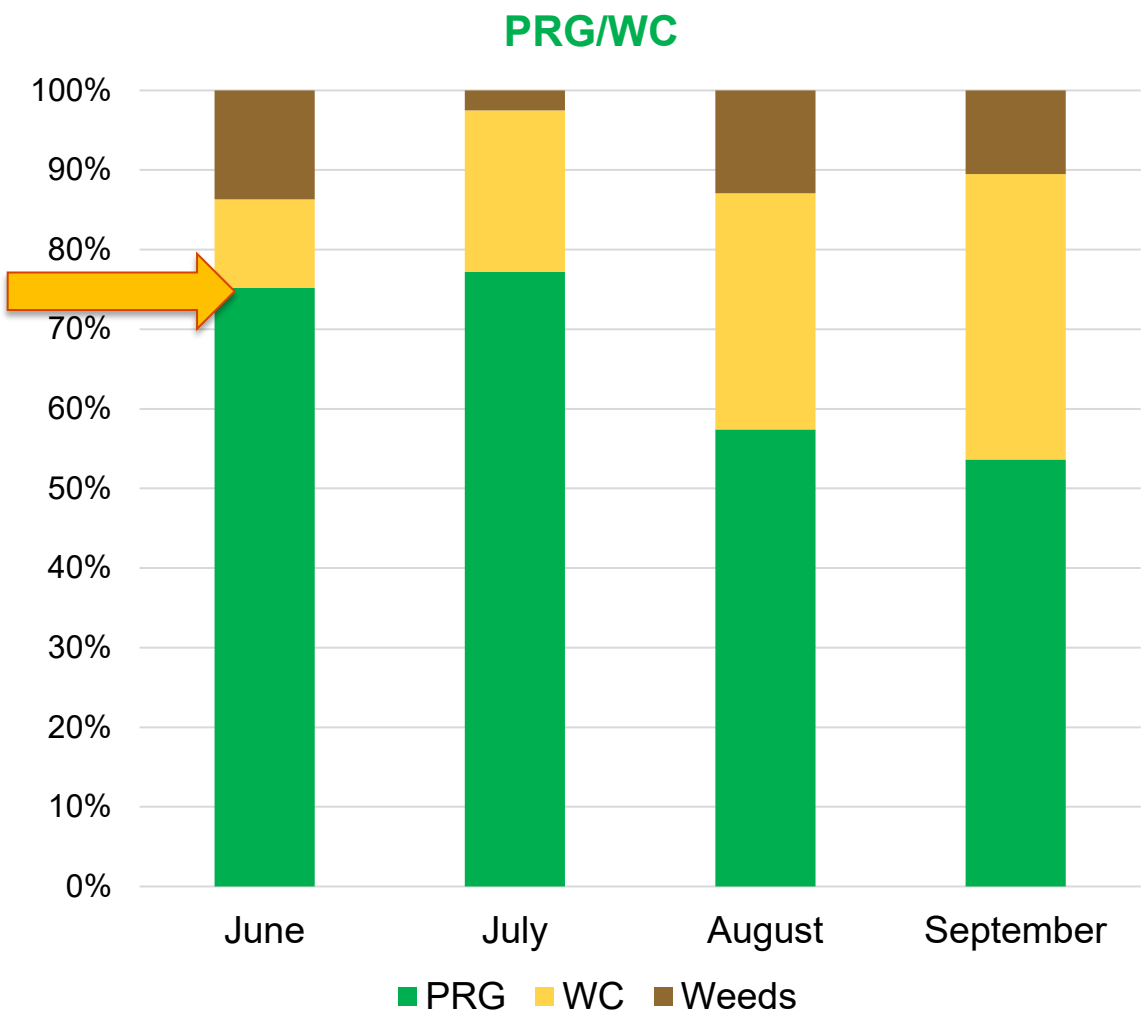
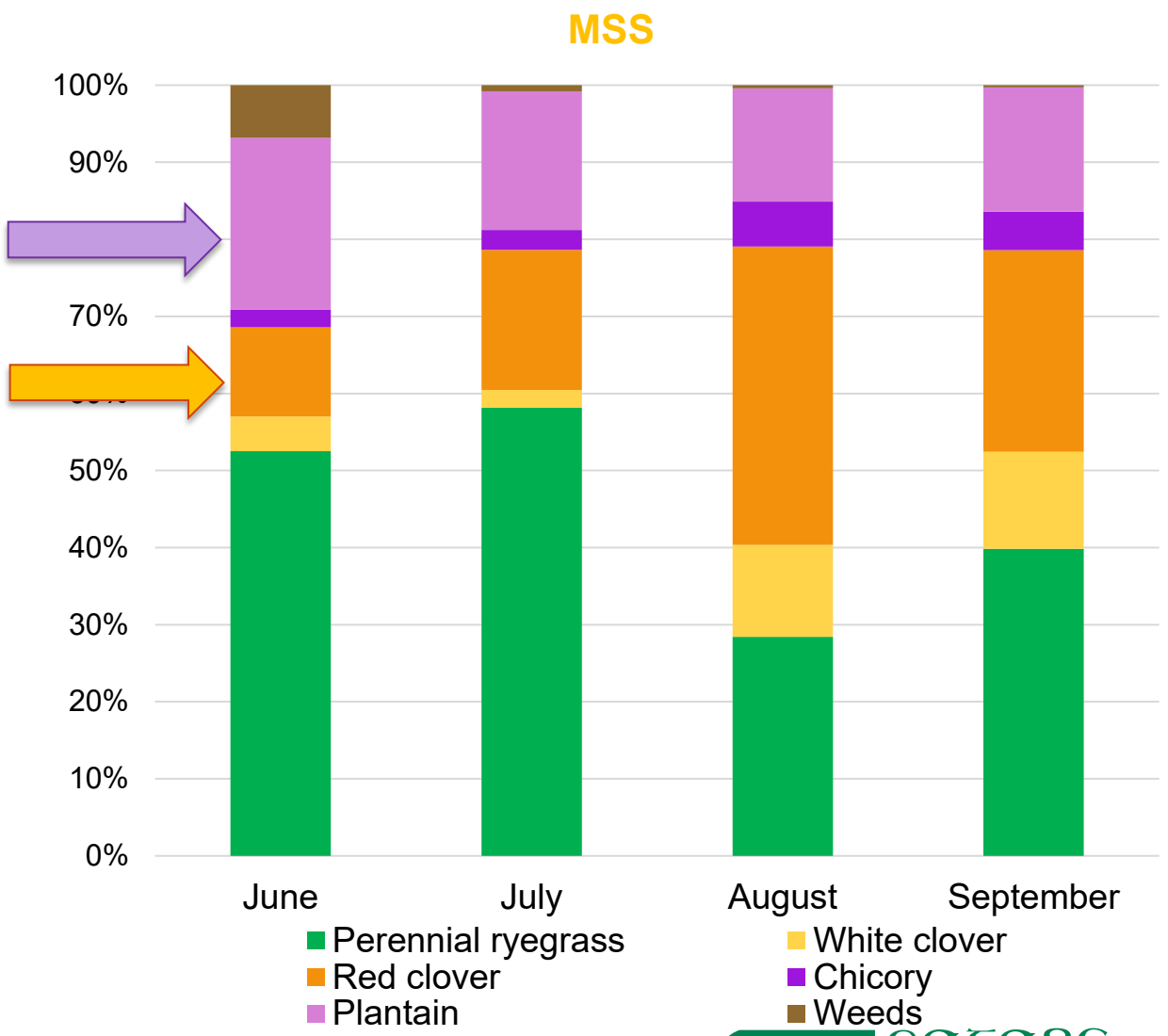
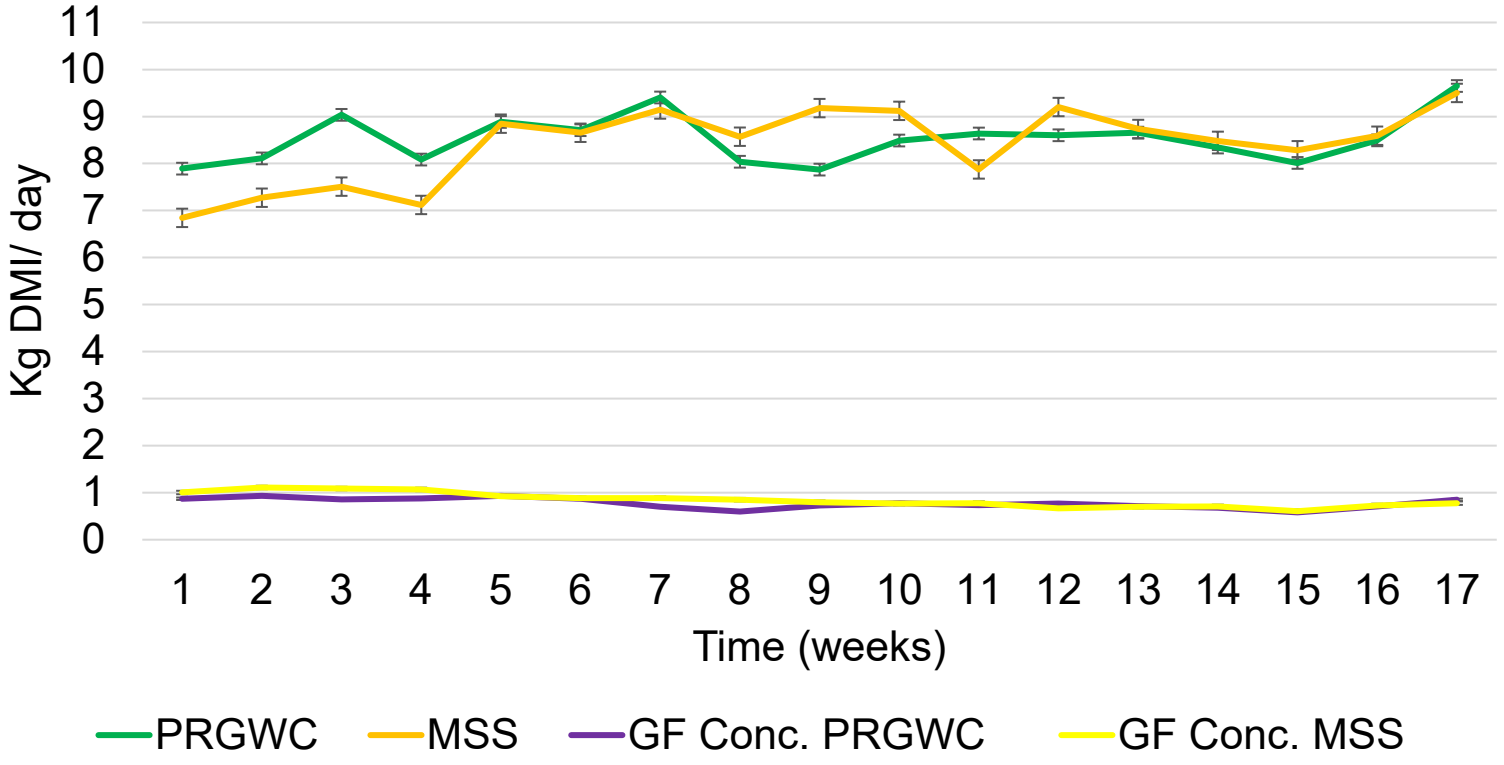
Results:

Botanical composition of forage offered



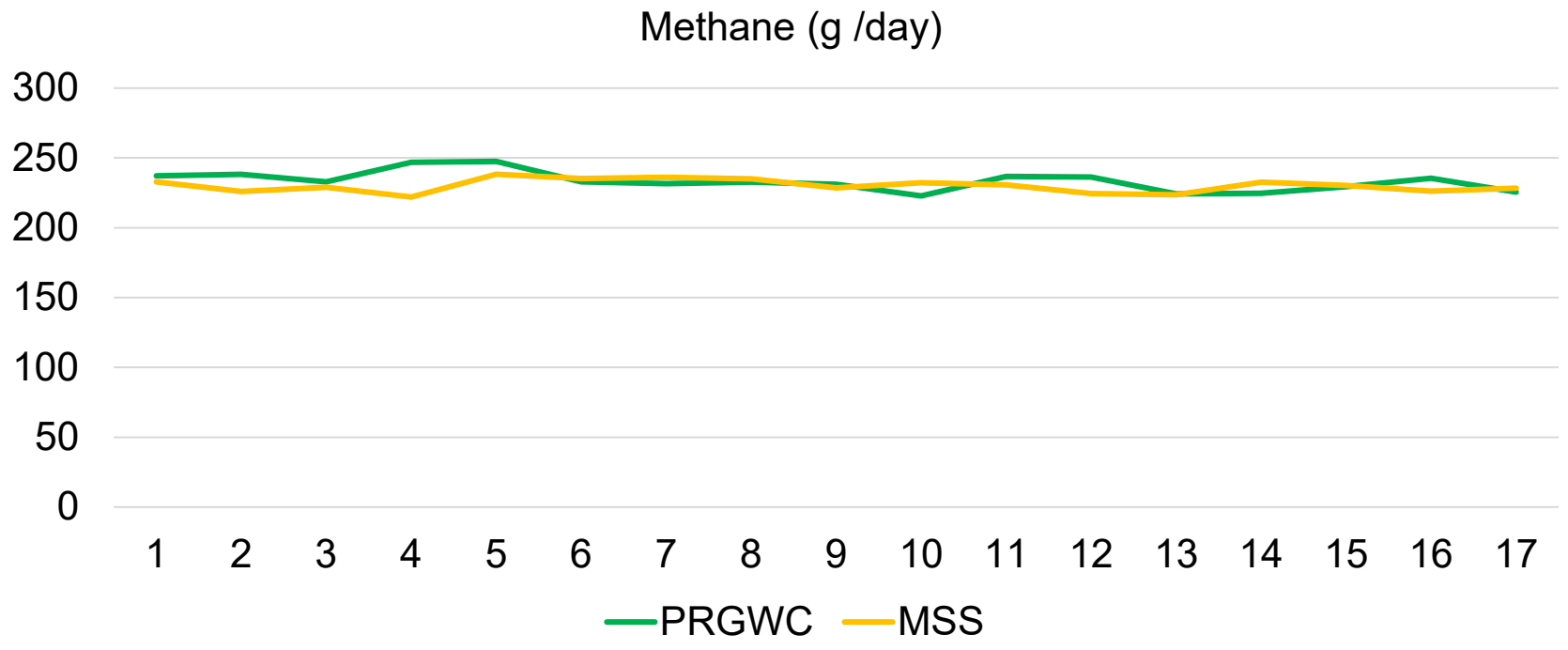


Results: Feed Intake



	Treatment			P-value
	PRGWC	MSS	s.e.m.	
Forage DMI (kg DM /day):	8.52	8.41	0.0871	0.2368
Mean GreenFeed Concentrate Intake (kg DM /day):	0.77	0.84	-	-

Results: Enteric methane (CH_4) emissions:



Traits	Treatment Group PRGWC	MSS	s.e.m.	P-value
DME (g/d)	233.49	231.16	6.028	0.7007
MY, (g/kg Forage DMI)	27.4039	27.52	0.701	0.8638
MADG (g/kg ADG)	206.95	207.63	8.511	0.9367
MI (g/kg)	0.4697	0.48	0.0106	0.434

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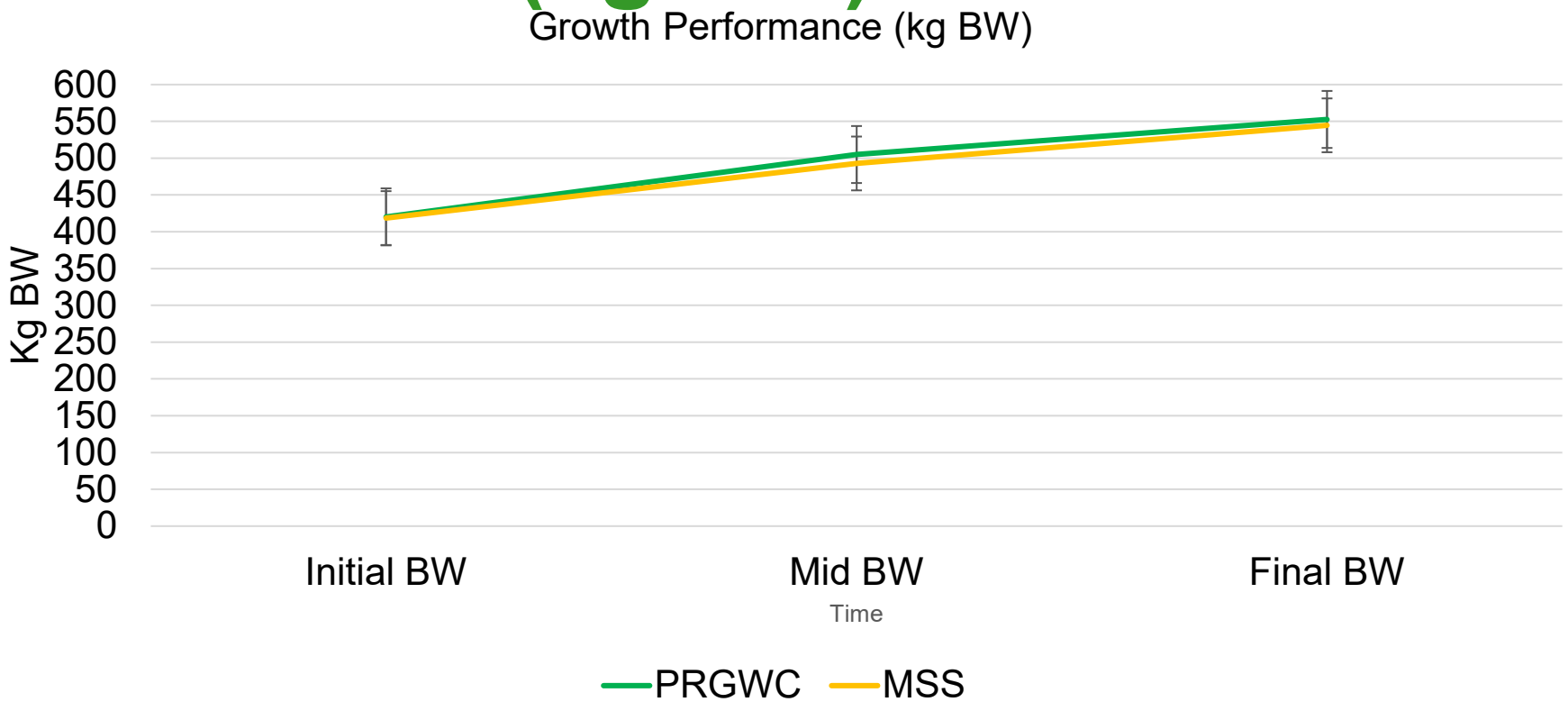
Results: Growth (kg BW)



	Treatment			P-value
	PRGWC	MSS	s.e.m.	
No. of animals	22	22	-	-
Initial BW (kg)	420.42	418.6	3.577	0.6134
Final BW (kg)	552.63	544.63	4.923	0.1121
ADG (kg)	1.14	1.12	0.0324	0.6172

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Conclusions:

- **No difference** in feed intake, enteric methane emissions or growth performance in beef steers offered **PRG/WC** **vs.** **MSS**
- **No benefit** of including red clover, plantain and chicory in this study

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Future work:

Zero-grazing study:

- Condensed tannin extractions from each species: anti-methanogenic potential
- Analyse blood metabolite profile of cattle (glucose, NEFA, BHB, total protein, urea, triglycerides)
- VFA, lactic acid, NH_3 extractions and analysis from rumen digesta harvested from cattle in this experiment

Silage study:

- Analyse the feed intake, enteric methane emissions and growth performance data from cattle offered **ensiled** PRG/WC and MSS

Anthelmintic study:

- Investigate the potential anthelmintic benefit of condensed tannins in cattle infected with gastrointestinal nematodes

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Thank you

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