

Milking Efficiency on Irish dairy farms



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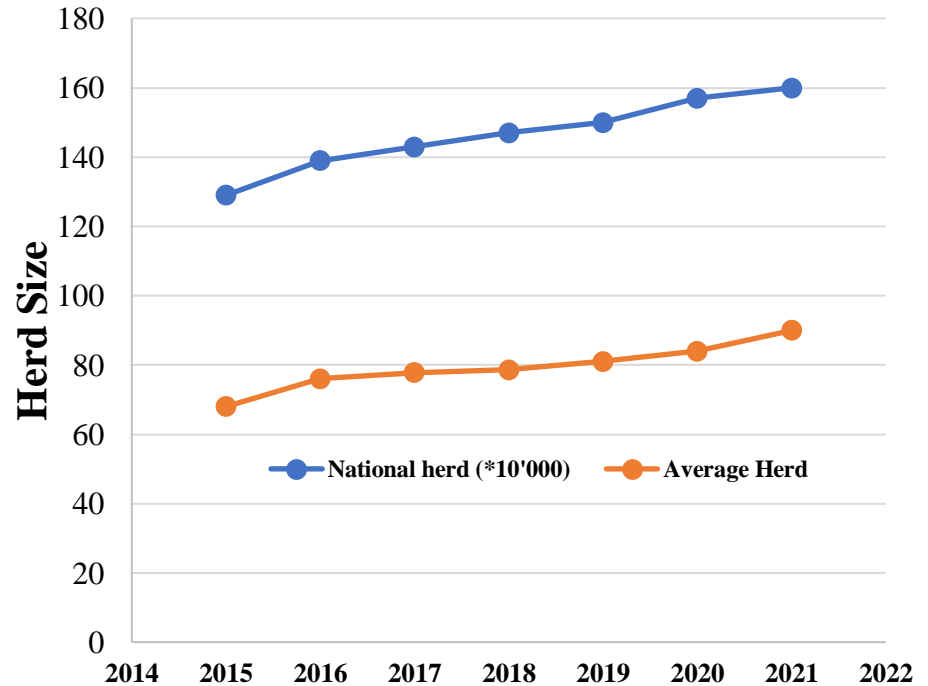
Why is Milking Efficiency Important?

- Milking times influence work rotas and the length of the working day
- Long working days are not attractive to young people looking to start a career in farming (successors or new entrants)
- Efficient milking systems consume less labour
- Efficient milking promotes high quality milk



Introduction

- The average dairy herd size in excess of 90 cows in 2022- an increase of 32% since 2015
- Many farmers are milking with unsuitable parlours
- Need to gather knowledge regarding the current milking performance of Irish dairy farms



Research Objective

Document milking efficiency on Irish Dairy farms to understand the effect of:

1. Seasonality
2. Management
3. Infrastructure
4. Automation

Milking efficiency will be evaluated through 3 KPIs

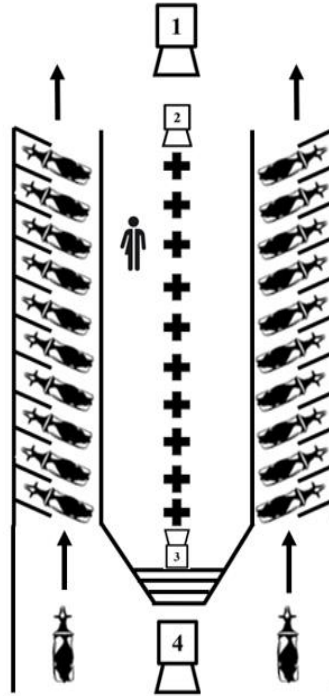
- Cows/hr
- Cows/op/hr
- Litres/hr



Data Collection

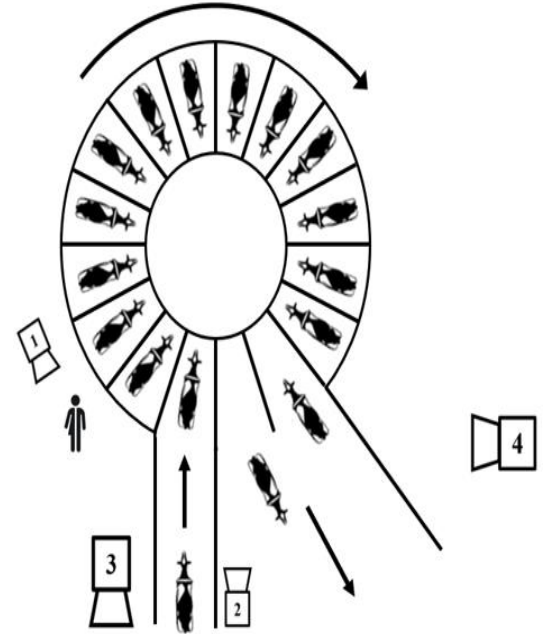


Herringbone



Cameras

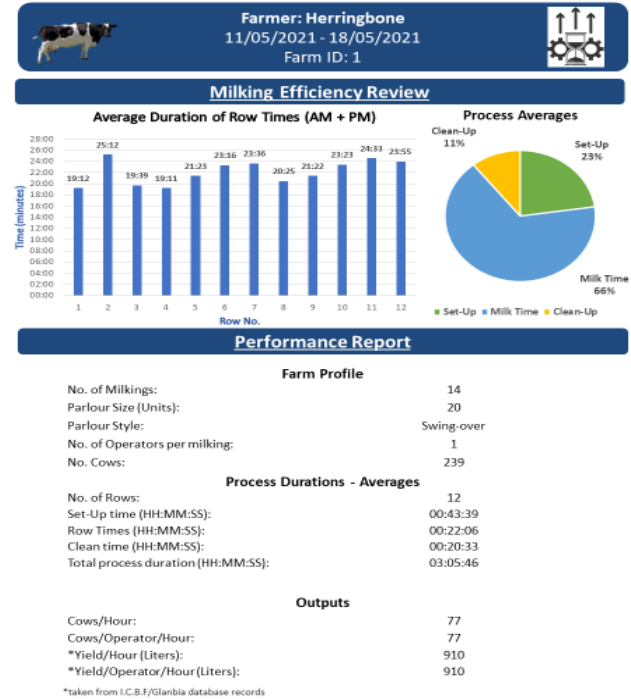
Rotary



Data Processing

Milking Efficiency KPIs

- $$\text{Cows/hr} = \frac{\text{No. milking cows}}{\text{Total process time (hrs)}}$$
- $$\text{Cows/op/hr} = \frac{\text{Cows/hr}}{\text{No. of Operators}}$$
- $$\text{Liters/hr} = \frac{\text{Avg yield per milking}}{\text{Total process time (hrs)}}$$



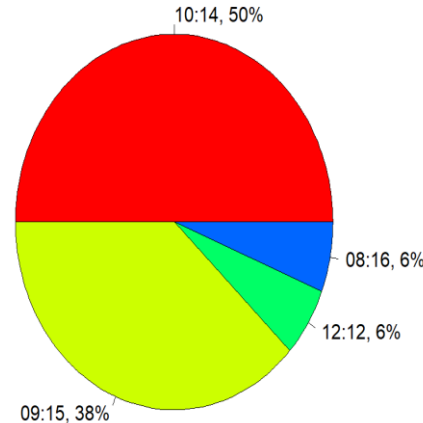
Results – Farm Characteristics

Management

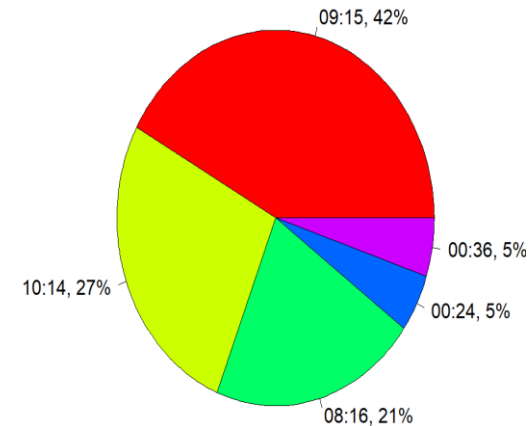
	Herringbone	Rotary
Herd Size	180	425
System Size	20	50
Batches	10	10
Operators	1	1.5
AM- Start (hh:mm)	06:46	06:18
AM - Stop (hh:mm)	08:39	08:49
AM - Duration (Mins)	121.5	163
PM - Start (hh:mm)	16:18	15:17
PM - Stop (hh:mm)	17:59	17:38
PM - Duration (Mins)	103.6	146.3

Milking Intervals

Herringbone

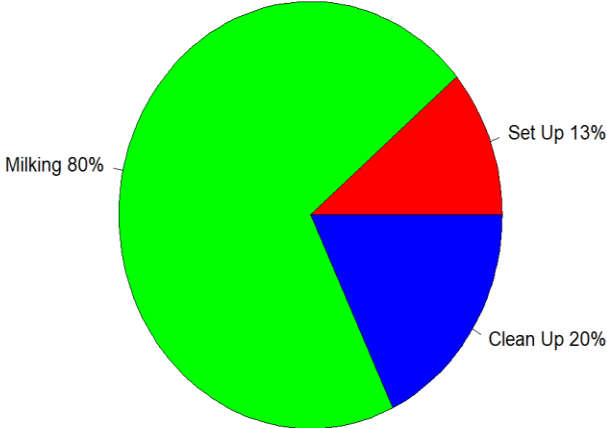


Rotary



Results – Process times

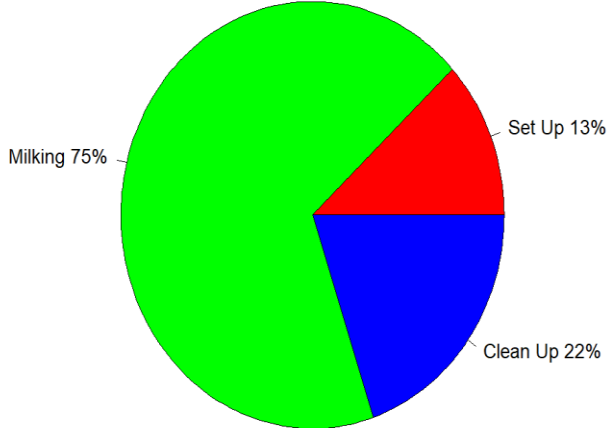
Herringbone



Process (mins)

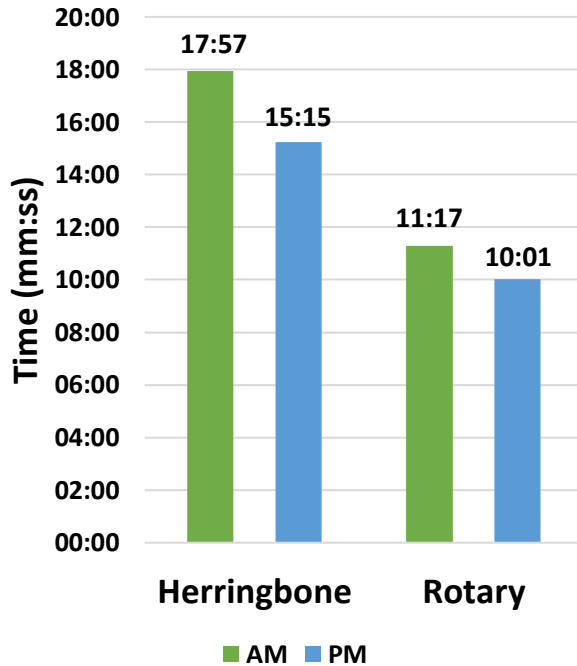
Set-Up	13.2
Milk time	86.7
Clean up	21.9
Total	109

Rotary



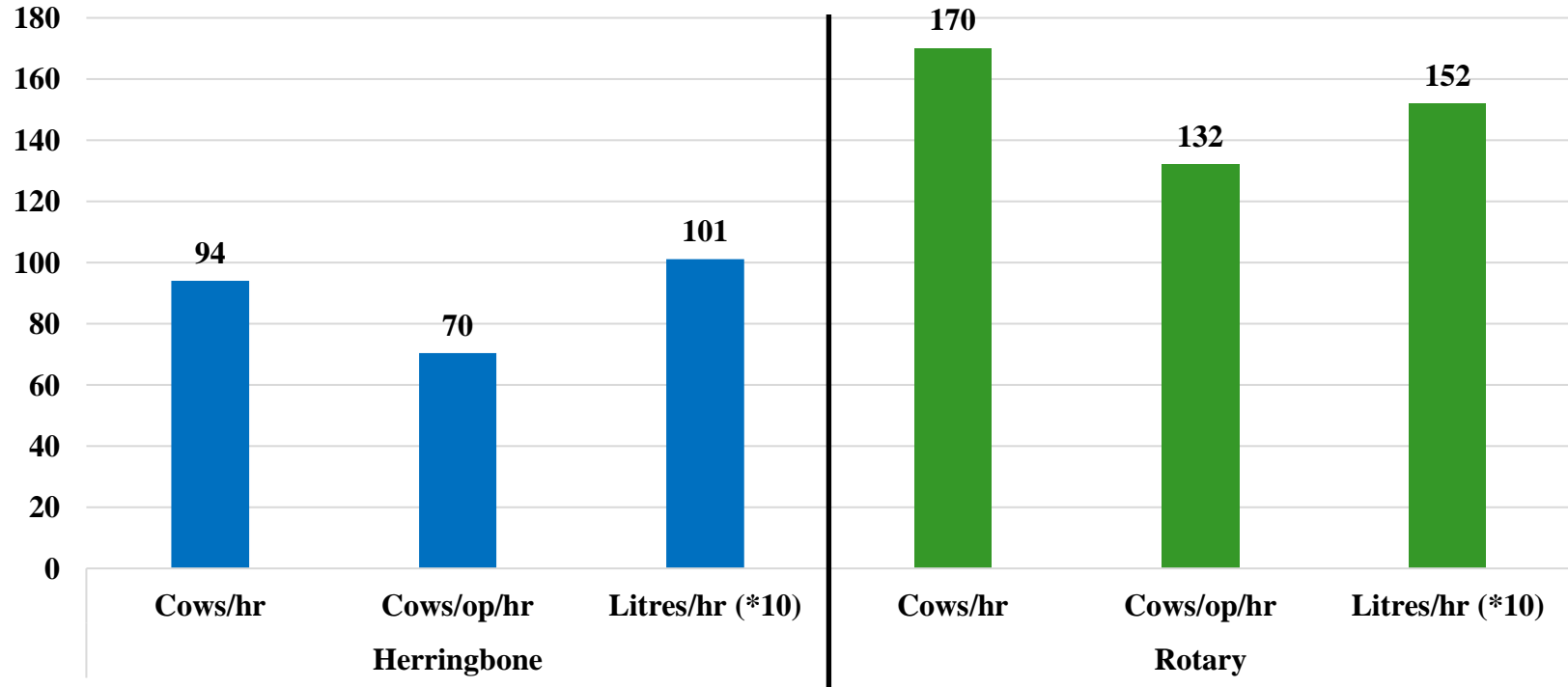
Set-Up	20.4
Milk time	116.1
Clean up	33.8
Total	155

Batch times (mm:ss)



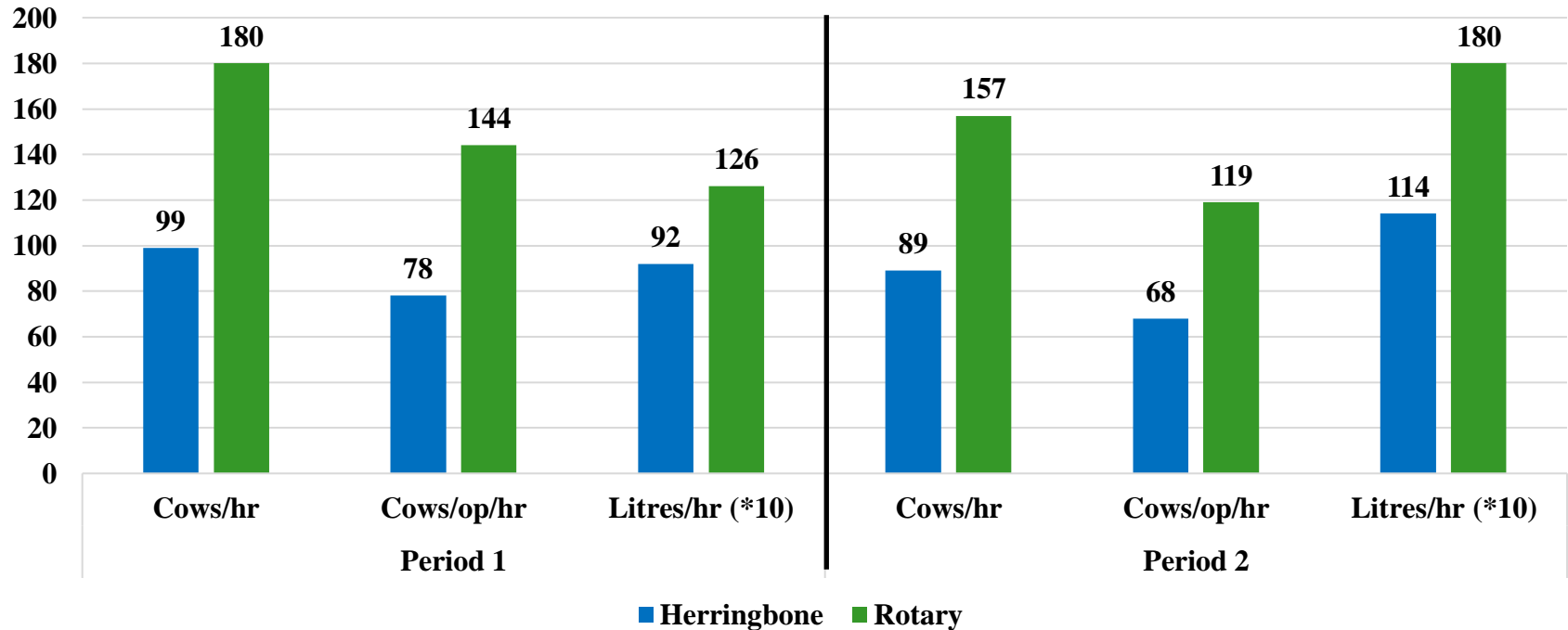
Results – Milking Efficiency

Milking Efficiency KPIs



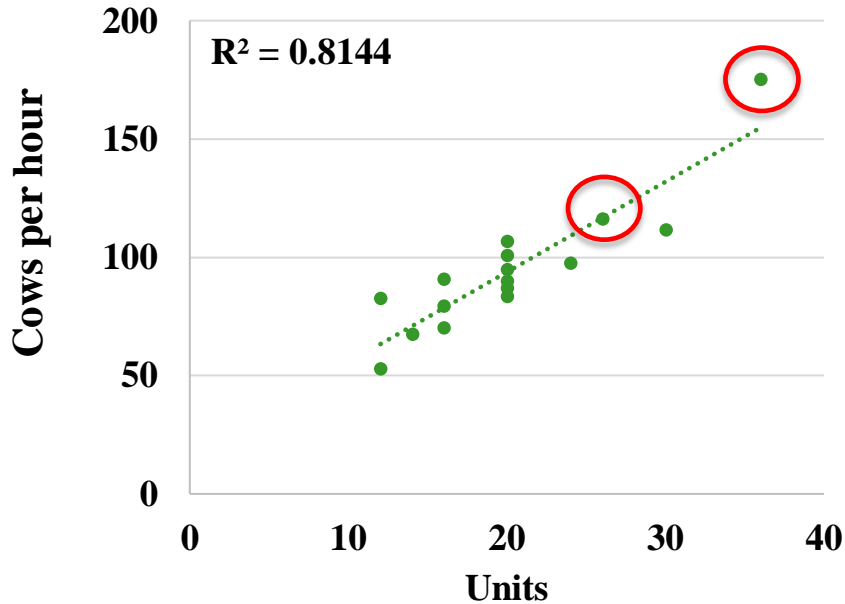
Results – Milking Efficiency & Seasonality

Milking Efficiency KPIs – Period Effect

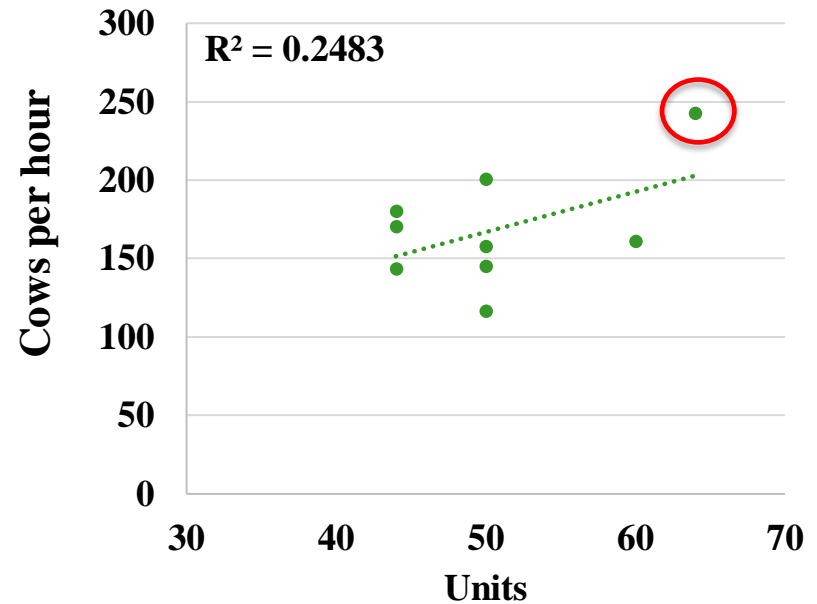


Does more units = higher system efficiency?

Herringbone

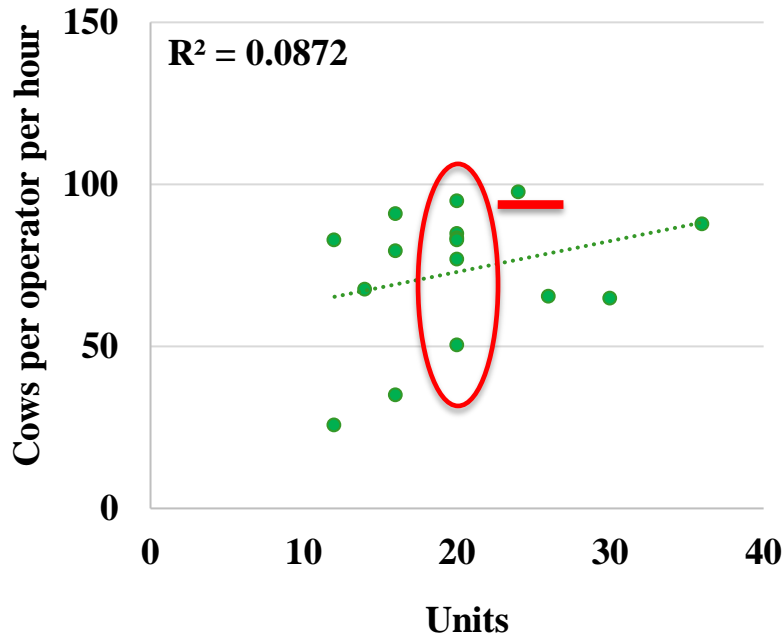


Rotary

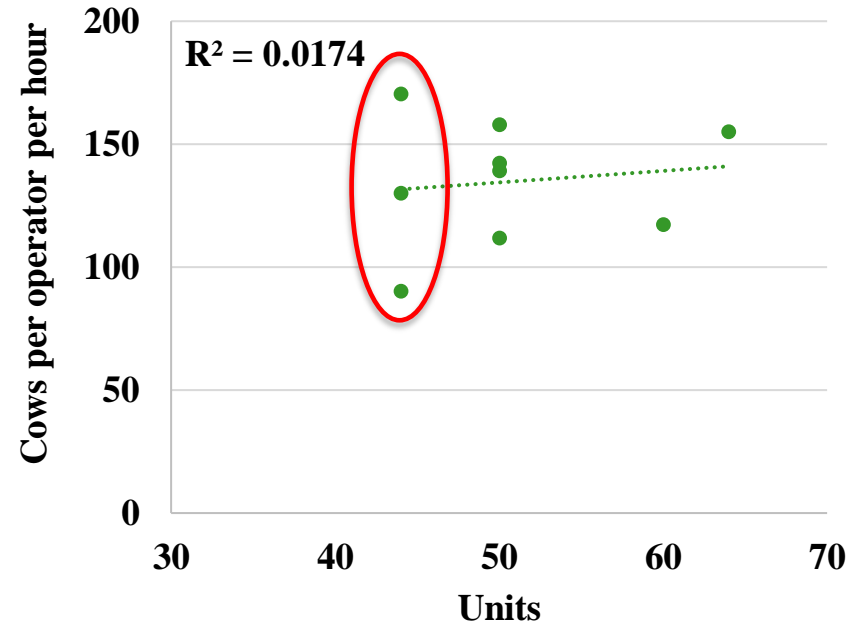


Results – Milking Efficiency & Management

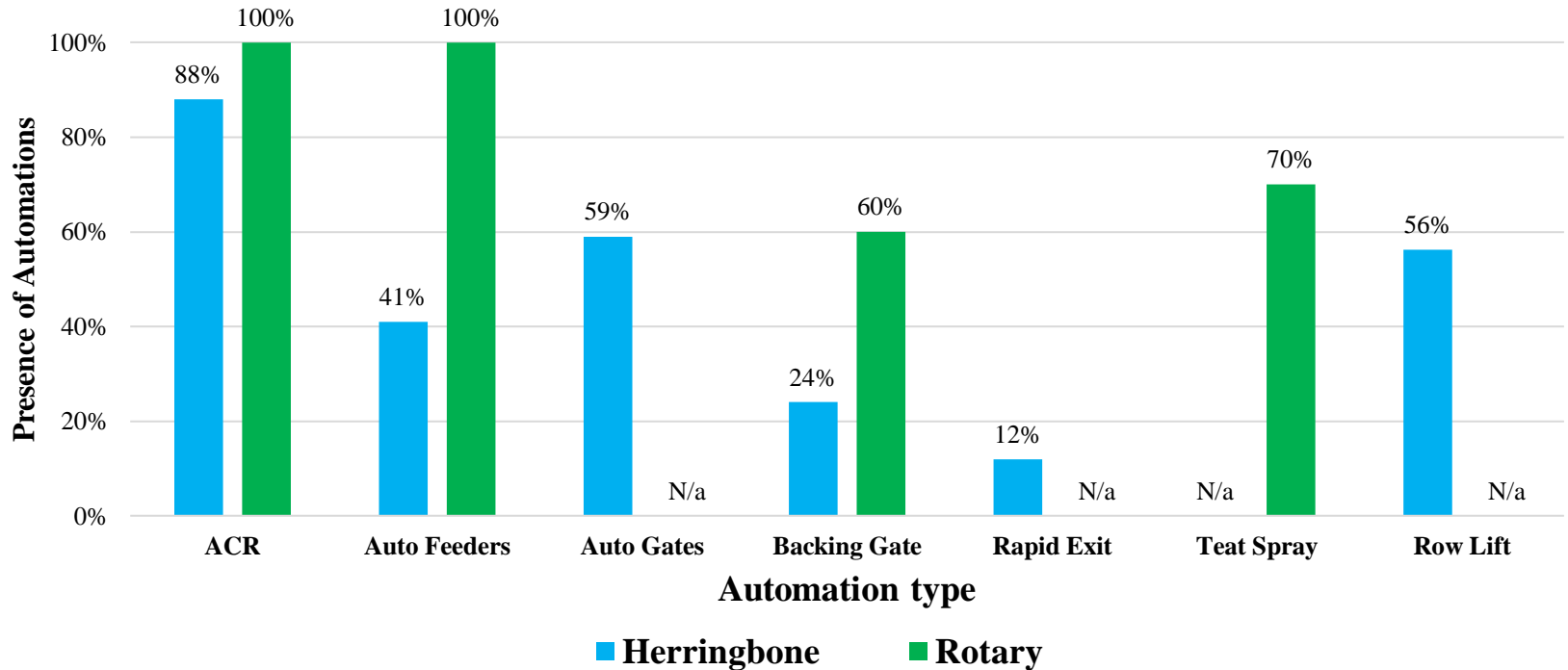
Herringbone



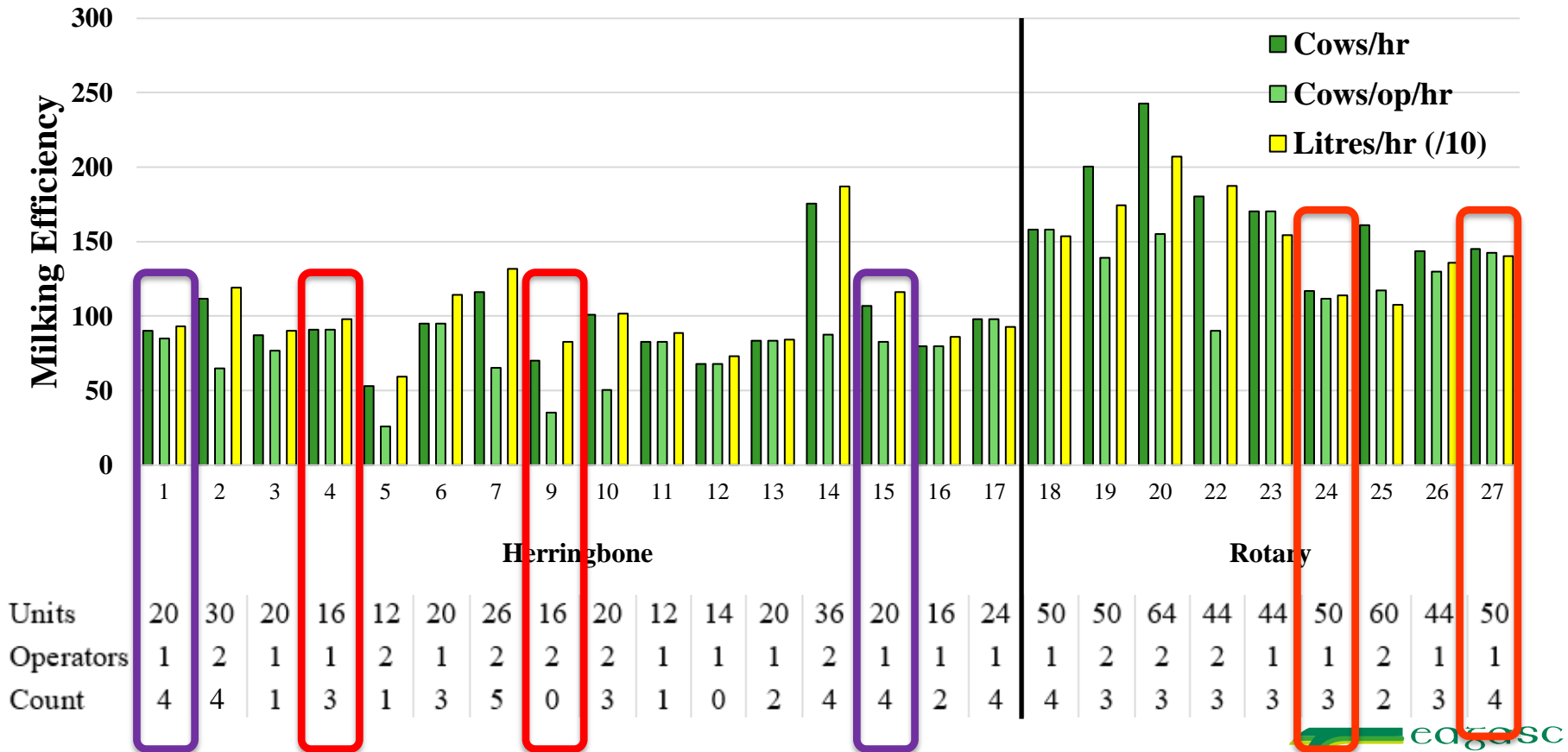
Rotary



Results – Automation frequency



Results – Milking efficiency values vs A.I.M



Results – A.I.M Correlations

Herringbone

	Cows/hr	Cows/op/hr	Litres/hr	Batches	Units	Operators	Herd	Count	Row Time
Cows/hr	1.00	0.41	0.98	0.21	0.89	0.28	0.76	0.69	0.19
Cows/op/hr	0.41	1.00	0.36	0.08	0.31	-0.74	0.19	0.40	0.21
Litres/hr	0.98	0.36	1.00	0.15	0.84	0.32	0.70	0.66	0.14
Batches	0.21	0.08	0.15	1.00	0.13	0.03	0.63	0.32	0.07
Units	0.89	0.31	0.84	0.13	1.00	0.32	0.84	0.66	0.54
Operators	0.28	-0.74	0.32	0.03	0.32	1.00	0.34	0.15	-0.05
Herd	0.76	0.19	0.70	0.63	0.84	0.34	1.00	0.69	0.46
Count	0.69	0.40	0.66	0.32	0.66	0.15	0.69	1.00	0.40
Row Time	0.19	0.21	0.14	0.07	0.54	-0.05	0.46	0.40	1.00

Results – A.I.M Correlations

Rotary

	Cows/hr	Cows/op/hr	Litres/hr	Batches	Units	Operators	Herd	Count	Go-Around	Speed	Rot time
Cows/hr	1.00	0.30	0.85	0.64	0.50	0.64	0.91	-0.35	0.85	-0.84	-0.53
Cows/op/hr	0.30	1.00	0.21	0.06	0.13	-0.53	0.17	-0.63	0.34	-0.39	-0.31
Litres/hr	0.85	0.21	1.00	0.46	0.10	0.54	0.73	-0.54	0.52	-0.60	-0.61
Batches	0.64	0.06	0.46	1.00	0.18	0.56	0.84	-0.26	0.66	-0.41	-0.31
Units	0.50	0.13	0.10	0.18	1.00	0.32	0.53	0.45	0.73	-0.43	0.32
Operators	0.64	-0.53	0.54	0.56	0.32	1.00	0.66	0.18	0.46	-0.47	-0.26
Herd	0.91	0.17	0.73	0.84	0.53	0.66	1.00	-0.20	0.90	-0.65	-0.31
Count	-0.35	-0.63	-0.54	-0.26	0.45	0.18	-0.20	1.00	-0.07	0.35	0.74
Go-Around	0.85	0.34	0.52	0.66	0.73	0.46	0.90	-0.07	1.00	-0.71	-0.21
Speed	-0.84	-0.39	-0.60	-0.41	-0.43	-0.47	-0.65	0.35	-0.71	1.00	0.72
Rot time	-0.53	-0.31	-0.61	-0.31	0.32	-0.26	-0.31	0.74	-0.21	0.72	1.00

Conclusion & Summary

This results of this study conclude that milking efficiency is influenced by...

Seasonality

- **Herringbone** – Cows/hr, cows/op/hr greatest in Period 1, Litres/hr in Period 2
- **Rotary** – Cows/hr, cows/op/hr greatest in Period 1, Litres/hr in Period 2

Management

- **Herringbone** – Cows/op/hr peaked 98
- **Rotary** – Cows/op/hr peaked at 170

Infrastructure

- **Herringbone** – Cows/hr values increased with parlour size
- **Rotary** – Cows/hr values increased with parlour size

Automation

- **Herringbone** – More automations, higher milking efficiency
- **Rotary** - Highly automated by design

Further analysis

- Low level data will yield further insights – e.g. variations in operator performance
- Statistical analysis of data – e.g. high efficiency farms have more automation
- Identify infrastructure factors associated with efficiency - e.g. factors affecting cow-flow
- Modelling of process will yield tools to evaluate automation – e.g. cost vs benefit of automation

Thank You

