7th European Conference on Precision Livestock Farming (EC-PLF)

15-18 September 2015
Milan, ITALY
Milk Production, Cow Traffic and Milking Duration at Different Milking Frequencies in an Automated Milking System Integrated with Grazing

C. Foley¹, J. Shortall¹ and B.O’Brien¹

¹Animal & Grassland Research and Innovation Centre, Teagasc, Moorepark, Fermoy, Co. Cork, Ireland
What is Automatic Milking Integrated with Grazing?

Picture Reference:
http://www.fullwood.com/c/automation-robotic-milking

Picture Reference:
http://www.automaticmilking.nl/
Cows voluntarily leaving the paddock, when grass is eaten.

They pass through the milking yard before progressing to new grass = key motivator.
3-Way (ABC) Grazing

Section A
00:00 – 08:00

Section B
08:00 – 16:00

Section C
16:00 – 00:00
Comparison of 2 systems of pasture allocation on milking intervals and total daily milk yield of dairy cows in a pasture-based automatic milking system

N. A. Lyons, K. L. Kerrisk, and S. C. Garcia
Dairy Science Group, Faculty of Veterinary Science, The University of Sydney, Camden (2570), NSW, Australia

3-Way Grazing

- 31% reduced milking interval
- 40% greater milking frequency
- 20% greater daily milk production
- Greater utilization levels of the AMS milking units throughout the day.
Milking Yard Layout

OUTER YARD

B - OUT
B - IN
C - IN

A - IN
A - OUT

BYPASS LANE

C - OUT

Automatic Milking Unit

Water

1

2
Milking Yard Layout

Pre Selection Gate

Automatic Milking Unit

B - OUT

A - IN

A - OUT

B - IN

C - IN

OUTER YARD

BYPASS LANE

C - OUT

Water
Milking Yard Layout

Pre Selection Gate

Automatic Milking Unit

OUTER YARD

BYPASS LANE
Milking Yard Layout

Post Selection Gate
Milking Yard Layout

Post Selection Gate

B - OUT

B - IN

C - IN

A - IN

A - OUT

OUTER YARD

BYPASS LANE

Automatic Milking Unit
Strip-Grazing

1. Quantify grass in a Ha – ideal 1500 kg DM/ha (Herbage Mass)

2. Determine the demand of the herd:

   \[20 \text{ kg DM/cow/day} \times 70 \text{ cows} = 1400 \text{ kg DM / 3 blocks} = 467 \text{ kg DM}\]

3. Allocate the correct area for the herd to graze:

   Block A = \(\frac{467 \text{ kg DM}}{1500 \text{ kg DM/ha}}\) = \(0.31 \text{ ha}\)
Why Grazing?

- A strong relationship between costs of production and proportion of grass in the cow’s diet

  - Fulkerson *et al.* (2005) - the accurate allocation of pasture to milking cows on a daily basis resulted in a 10% increase in milk production

  - Dillon *et al.*, 2005 - the average cost of milk production is reduced by 1 cent/litre for every 2.5% increase in the grazed grass in the cow’s diet

  - Dillon (2011) profit per hectare is increased by €160 for each additional tonne in grass utilized within dairy systems
Automatic Milking - EU & Ireland

- As observed across the EC dairy sector there is increasing use of automatic milking (AM) in Ireland in recent years.
- In many EU countries AM usage has been associated with a decrease in grazing.
- In Ireland the majority of milk production is from spring calving herds on a seasonal grass based system.
- Therefore if AM is to work in Ireland it would have to be integrated with an intensive grazing based system so that the established economic benefits of grazing could be maintained.
Previous Research - Grazing & AMS

- Reduced milking frequency and milk yield and increased milking interval with an AMS in a pasture system compared to an indoor system (Garcia and Fulkerson, 2005)

- Reduced milking frequency has both negative effects, decreased milk yield, and positive effects, enhanced fertility (Stelwagen, K. et al. 2013)
Objective

To assess the effects of reducing milking permission and subsequent milking frequency on milk production and cow traffic in mid lactation
MATERIALS AND METHODS
Herd

• Number of Cows:
  – 70 Milking on the AMS
  – 62 of these on experimental trial

• Multiparous & Mixed Breed Cows
  – Holstein x Friesian
  – Jersey
  – Jersey x Friesian
  – Norwegian Red Cross
Experimental Design

Pre-trial (Calving to 30\textsuperscript{th} of April)
- Milking permission 3 times per day

Adjustment (1\textsuperscript{st} to 11\textsuperscript{th} May)
- Cows randomly assigned into two groups
- Balanced for breed, parity, days in milk, previous 25 days milk yield and milking frequency
- Average days in milk (DIM) was 67±20 days
- Treatments = milking permission 2 vs 3 times per day

Trial (12\textsuperscript{th} May to 3\textsuperscript{rd} August)
- 12 weeks
- Concentrate
  - 0.5 kg per cow
  - Fixed feeding routine independent of milk yield
- **Deficit of grass availability** concentrate was elevated during weeks 1 (2 kg), 2 (2 kg) and 3 (0.7 kg).
Milking Permission
Treatment Start

Milking Permission
Treatment End

Milking Permission 2 v 3 Times/Day

Time Period

Milking Frequency Cow / Day
The effect of milking permission treatments was analysed on the dependant variables:

1. milking frequency/cow/day
2. milking interval/cow/visit
3. milk yield/cow/visit
4. milk yield/cow/day
5. milk duration/cow/visit
6. milk duration/cow/day
7. return time/cow/visit
8. wait time/cow/day

The statistical model used was a repeated measures ANOVA in SAS (PROC MIXED) and Tukey’s post-hoc analysis.
RESULTS
Grass management

• Pre-grazing available herbage mass was **1,516±294 kg DM/ha**
  - A – 1,541±313 kg DM/ha
  - B – 1,496±271 kg DM/ha
  - C – 1,510±297 kg DM/ha

• Daily grass DM allowance per cow was **23.5±6.4 kg**
  - A – 7.1±3.5 kg
  - B – 7.8±2.6 kg
  - C – 8.8±3.6 kg

• Daily estimated grass DM intake per cow was **19.3±5.2 kg**
  - A – 5.8±2.9 kg,
  - B – 6.3±2.2 kg
  - C – 7.2±3.0 kg

• The average post grazing height was **5.4 cm**
  - A – 5.4±1.2 cm
  - B – 5.4±1.1 cm
  - C – 5.4±1.2 cm
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Conclusions

Automatic Milking, Mid-Lactation in a Seasonal Grazing System:

• ↓Milking permission = ↓Milking frequency

• ↓Milking frequency
  – No effect on milk production or cow traffic
  – Significantly shorter return time
  – Significantly reduced waiting time for milking
Acknowledgements

Dr. Bernadette O’Brien (co-ordinator of Autograssmilk)
John Shortall (PhD student)
James Daunt (Technician)
Numerous work experience & undergraduate students
Farm staff at the Teagasc Dairygold Research Farm
Fullwood
Thank You For Your Attention