*European Association for Animal Production*

*Uppsala, 5 –8th June 2005*

# Effect of milking frequency and nutritional level on milk production & quality and on cow reproductive performance

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# Potential benefits of OAD milking

- Increase labour productivity and reduce costs
- Permit the uptake of alternative employment or business interests
- Improved management of large herds
  - milking time, walking distance, fragmented farms
  - Better reproductive performance
- Ease of work
  - ergonomics and shorter time input to dairying operation

# Previous studies on OAD milking

- OAD cows produced less milk with higher fat and protein contents
- Claesson *et al*. (1959) (↓50%)
- Holmes *et al*. (1992) (↓35%, ↑ 0.3%, 0.15%);
- Cooper (2001) (↓ 30%);
- Tong *et al*. (2002) - OAD ↓ MS/cow by 27% (22% and 31% for Jerseys and Friesians)
- Remond *et al*. (2004) - OAD reduced milk yield by 30 % and increased fat and protein by 0.35 % and 0.21 % respectively
- Nutritional management consequences

# Objective

**To establish the effect of milking frequency (MF) at two different nutritional levels (NL) on cow production characteristics and on reproductive performance**

# Description of study

- 60 spring-calving Holstein-Freisian cows
- Treatments
  - twice a day milking (TAD) - high nutrition (TH); low nutrition (TL);
  - once a day milking (OAD) - high nutrition (OH); low nutrition (OL)
- Cows were placed on treatments from calving
- Nutritional level
  - High: Average post-grazing height = 75mm + concentrate offered = 420 kg/cow/lactation
  - Low: Average post-grazing height = 55mm + concentrate offered = 137 kg/cow/lactation
- TAD cows - am and pm. OAD cows - am only.
- Cows had an average milk yield of 6,234 kg in 2003. Cows had an average calving date of 11 March, 2004.

# Measurements

- **Milk production**
  - **yield (daily) and gross composition (weekly)**
- **Live weight and body condition score**
  - **weekly and fortnightly, respectively**
- **Milk quality**
  - **somatic cell count (weekly initially and subsequently fortnightly)**
  - **clinical mastitis incidence**
- **Reproductive performance**
  - **CLA (progesterone)**
  - **submission, conception and pregnancy rates**
- **Data analysed: PROC Mixed**

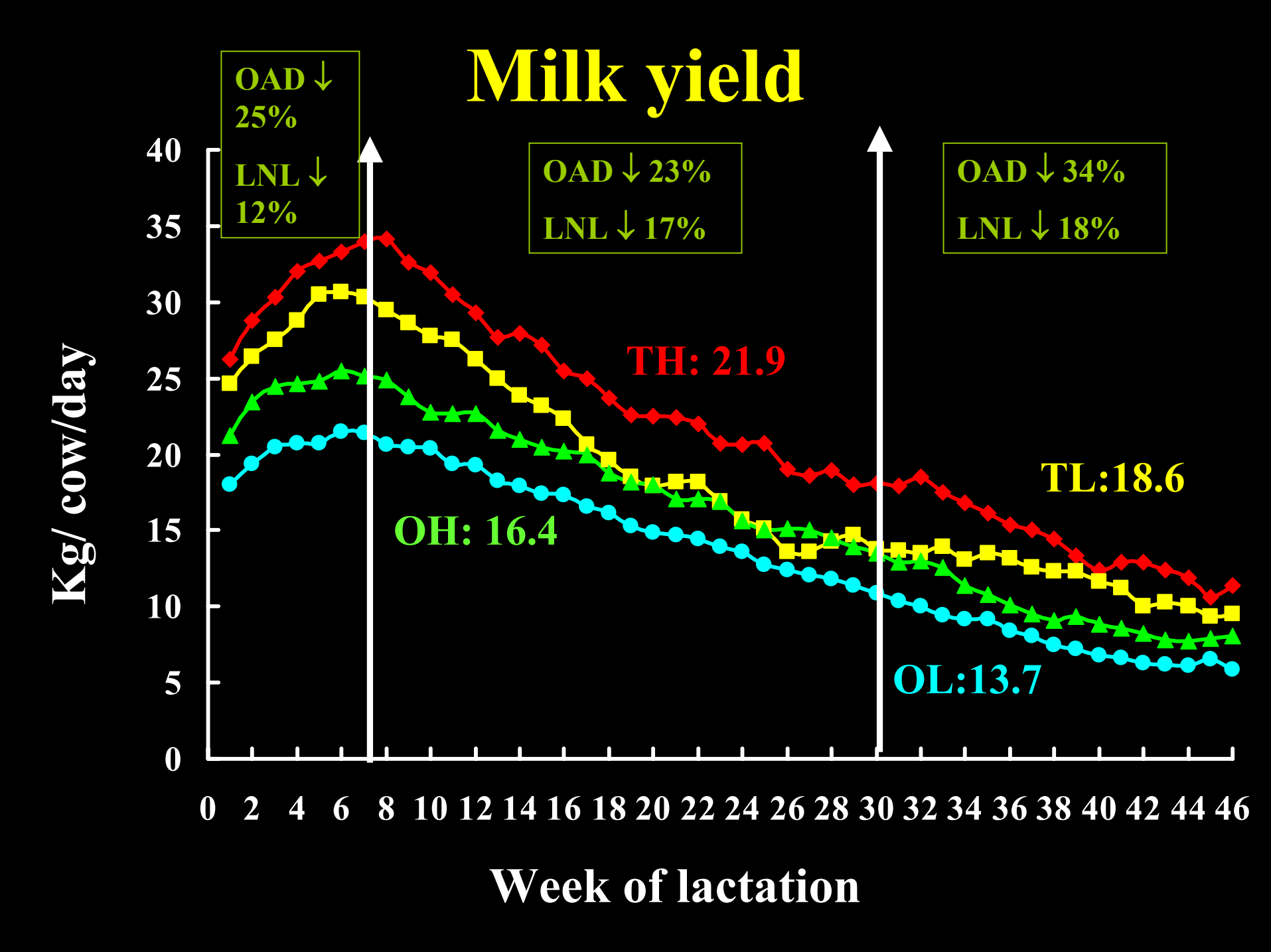
# Grass removed per cow during main grazing period (measured on group basis) (17 Apr to 2 Oct) (169 days)

| Treatment | TH | OH | TL | OL |
|---|---|---|---|---|
| Grass allowance (kg DM/cow/day) | 29.0 | 29.1 | 18.1 | 17.3 |
| Grass removed (kg DM/cow/day) | 19.7 | 19.0 | 15.4 | 14.9 |

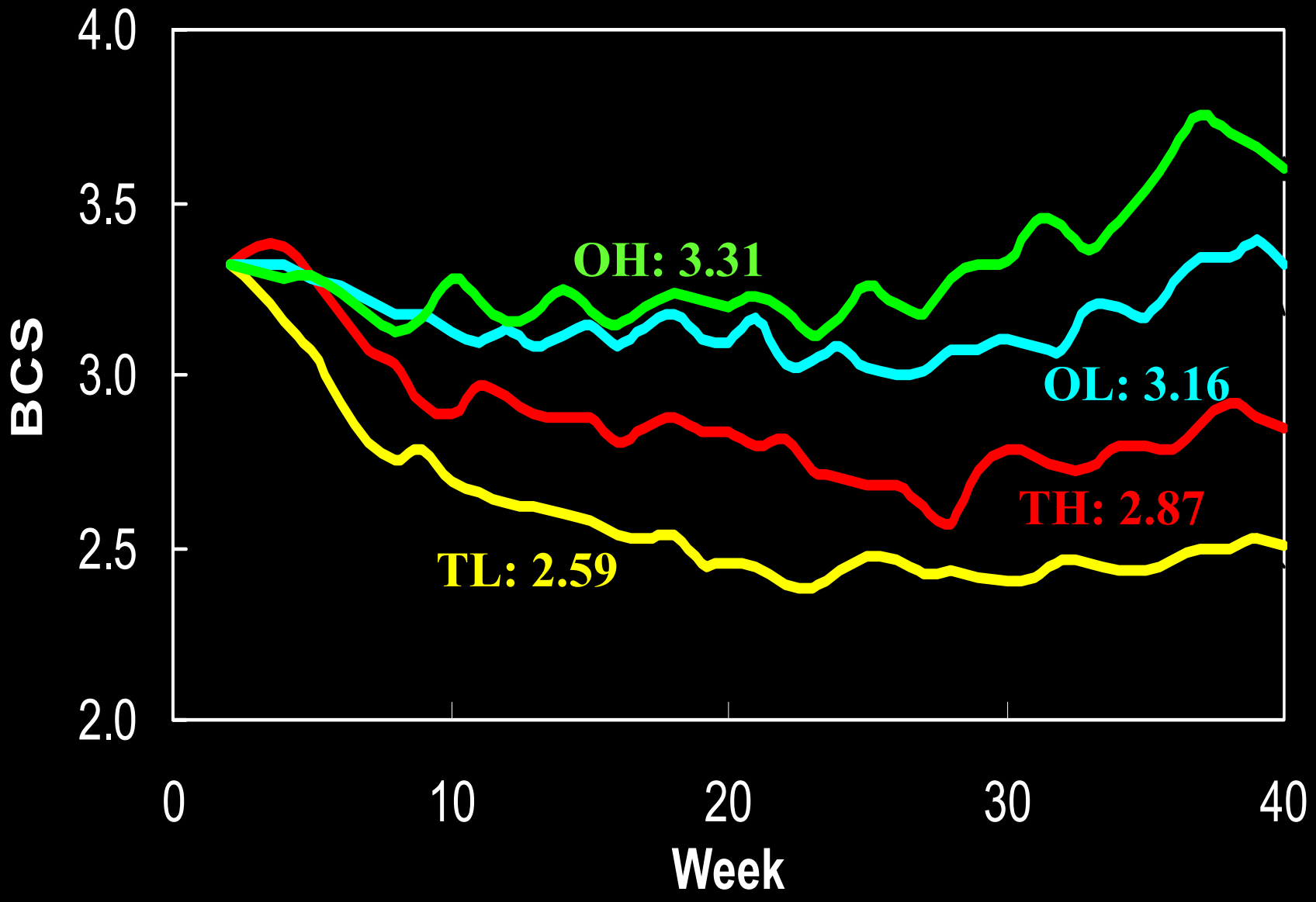
# Production Characteristics

| | Milking frequency | | Nutritional level | | sem | Sig. MF | Sig. NL |
|---|---|---|---|---|---|---|---|
| | TAD | OAD | High | Low | | | |
| Milk yield, kg/cow | 6013 | 4437 | 5669 | 4780 | 156.1 | *** | *** |
| MS, kg/cow | 437.0 | 351.1 | 428.8 | 359.4 | 11.50 | *** | *** |
| Fat, g/100g | 3.99 | 4.40 | 4.17 | 4.22 | 0.061 | *** | ns |
| Protein, g/100g | 3.29 | 3.53 | 3.46 | 3.36 | 0.029 | *** | * |
| Lactose, g/100g | 4.55 | 4.52 | 4.55 | 4.52 | 0.034 | ns | ns |
| LWT, kg | 627 | 678 | 680 | 624 | 10.9 | ** | *** |
| BCS | 2.73 | 3.49 | 3.31 | 2.92 | 0.076 | *** | *** |

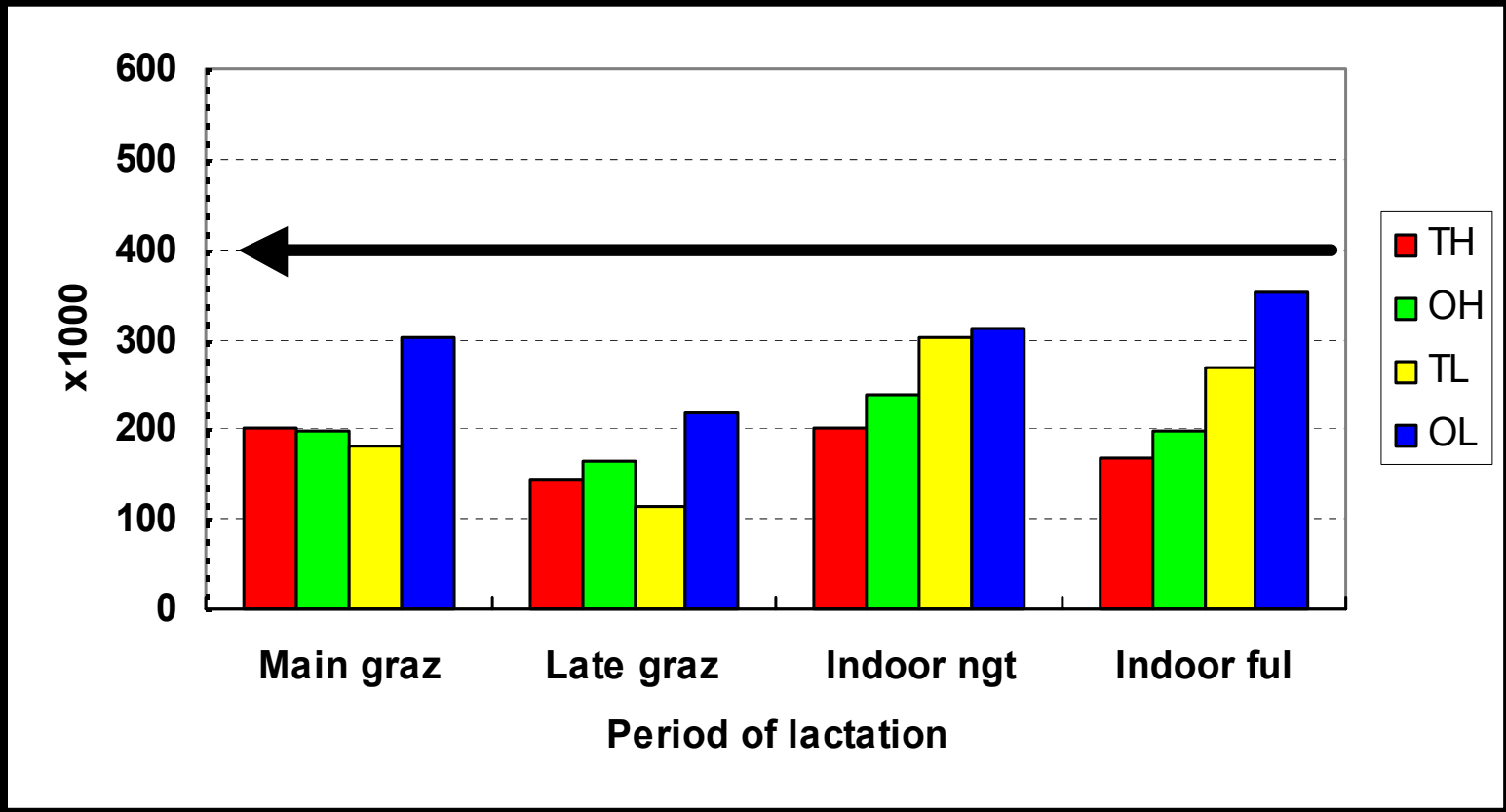
No interactions


Milk yield
OAD ↓ 25%
LNL ↓ 12%
OAD ↓ 23%
LNL ↓ 17%
OAD ↓ 34%
LNL ↓ 18%
TH: 21.9
TL:18.6
OH: 16.4
OL:13.7
Kg/ cow/day
0
5
10
15
20
25
30
35
40
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
Week of lactation

# Cow BCS



# SCC




| | OH | OL |
|---|---|---|
| Lactation av. | 192 | 338 |
| September | 235 | 284 |
| October | 193 | 324 |
| November | 234 | 329 |
| December | 259 | 299 |

**New infections: 19 in TAD cows, 18 in OAD cows**

# Reproductive performance indicators

| | Milking frequency | | Nutritional level | | sem | Sig. MF | Sig. NL |
|---|---|---|---|---|---|---|---|
| | TAD | OAD | High | Low | | | |
| CLA* (days) | 30.4 | 25.3 | 27.6 | 28.1 | 1.86 | + | ns |
| Cows with CLA pre MSD (%) | 60 | 87 | 73 | 73 | - | * | ns |
| Submission rate (21 d) (%) | 63 | 73 | 63 | 73 | - | ns | ns |
| First service conception rate (%) | 50 | 40 | 50 | 50 | - | ns | ns |
| Overall pregnancy rate (%) | 73 | 90 | 93 | 70 | - | + | * |

*CLA commencement of luteal activity

# Discussion

- **Although milk yield/cow was 26% lower with OAD milking compared to TAD milking**
  - **MS yield/cow was only 20% lower due to the higher concentration of constituents in that milk**
  - **Intake was reduced by 3-4% with OAD milking, but live-weight and BCS were increased**
- **While SCC was increased by OAD**
  - **SCC levels were considerably less than EU standard**
  - **mastitis infection levels were similar for TAD and OAD cows**
  - **NZ study also indicated higher SCC with OAD cows but no difference in incidence of infected quarters**
- **Beneficial impact of OAD on reproductive performance**
  - **Earlier onset of cyclicity in OAD cows - may be MF effect independent of energy balance**
  - **Improved pregnancy rate – may be linked to better BCS and energy balance**

# Conclusions

- Production: **Milk yield reduced by OAD milking and low nutritional level**
- OAD milking associated
  - Reduced yield
  - Increased concentrations of fat and protein
  - Improved live-weight and BCS
- Reproductive performance: potentially improved
- **Feasibility and merits of OAD milking – further lactation, first lactation cows**
- **OAD milking can provide an alternative management option on-farm**


Thank you