Session 8 Animal genetic resources

Differences in feed balance and feed efficiency between an old native and a modern dairy cattle breed

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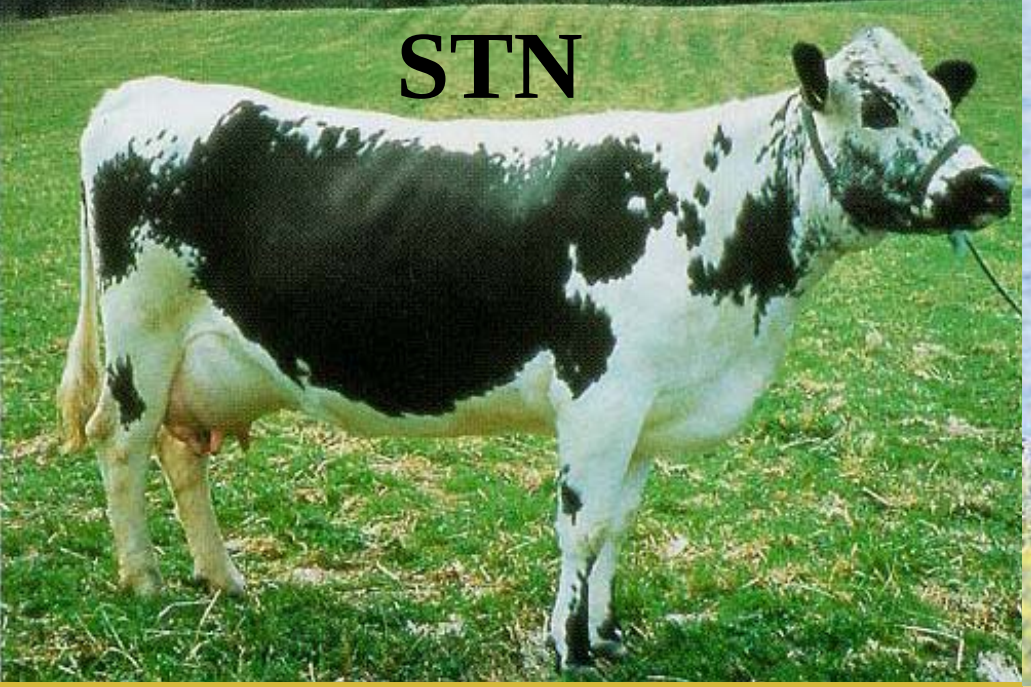
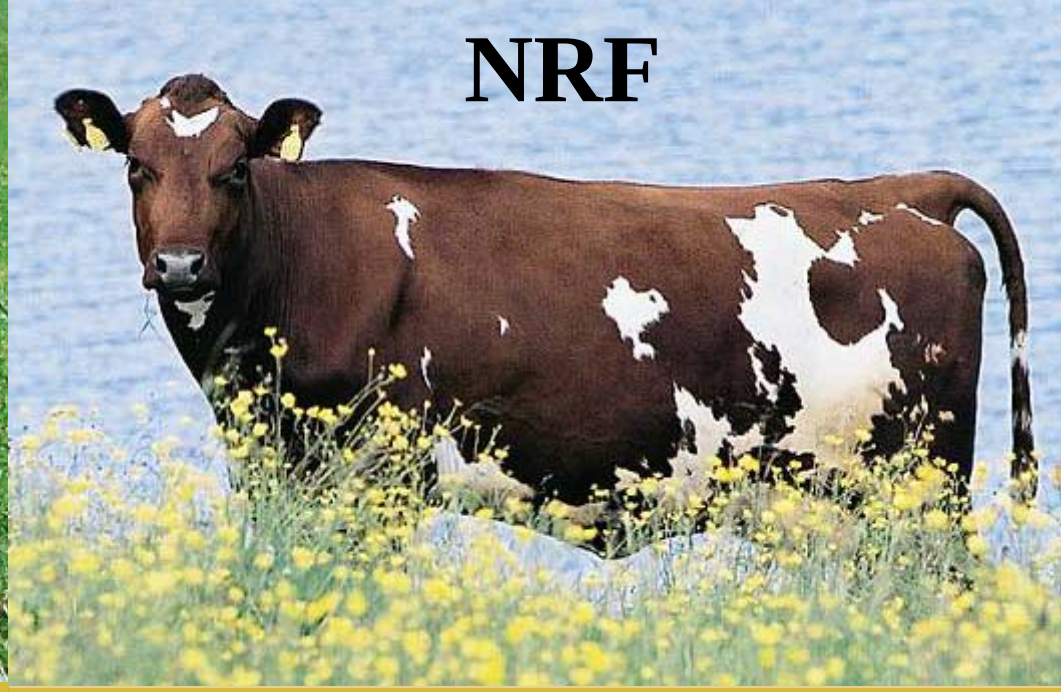
STN



- Blacksided trønderfe and nordlandsfe (STN)
- 800 cows
- 4 000 kg milk/year
- 4,2 % fat, 3,3 % protein
- Breeding work focusing on production, inbreeding and type.

NRF

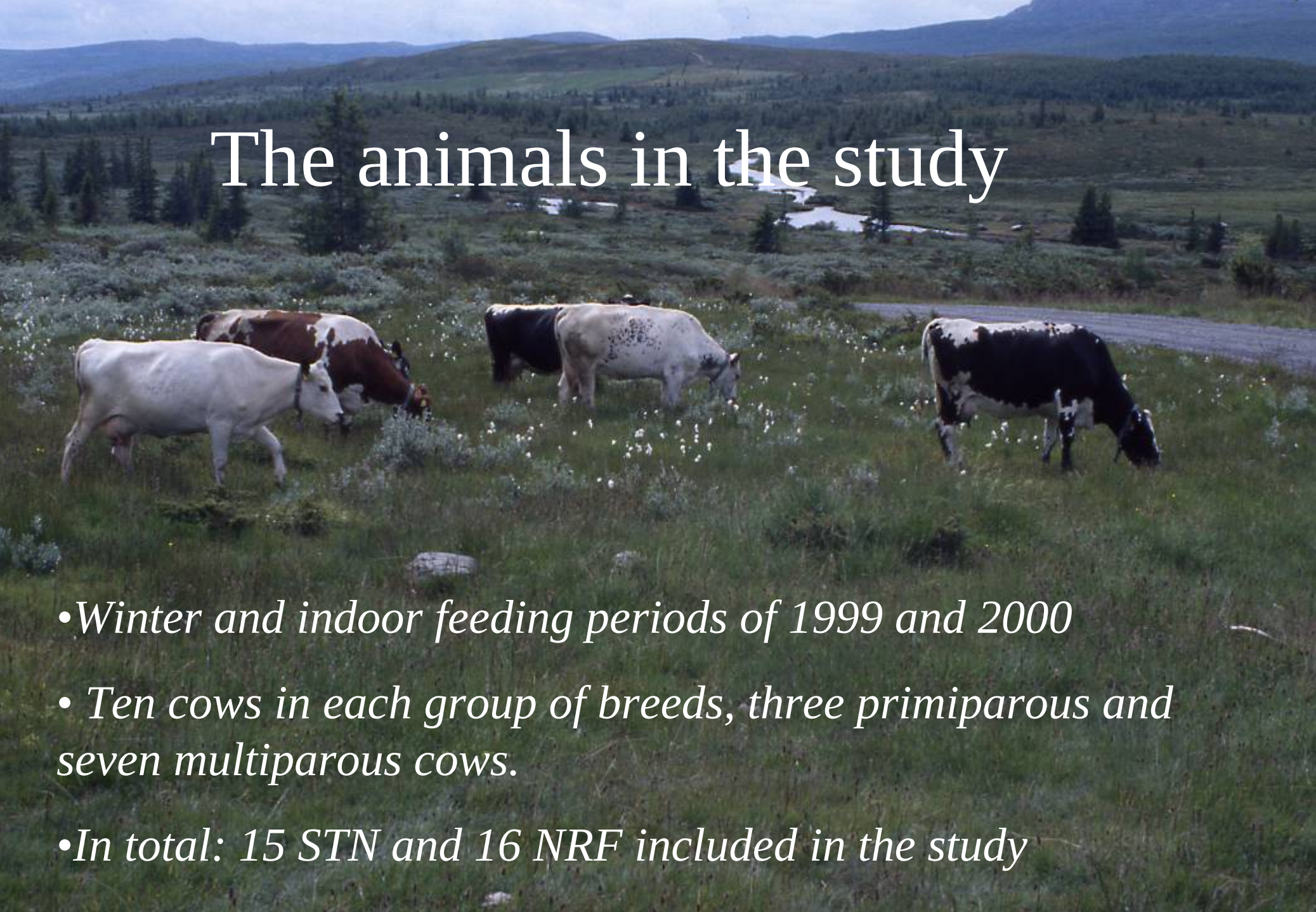


- Norwegian Red (NRF)
- 277 000 cows
- 6 200 kg milk/year
- 4,2 % fat, 3,2 % protein
- Broad breeding goal, including health and fertility. Progeny tested bulls, large daughter groups (250).

Development in production

	1953		2003	
	Kg milk per year	Fat %	Kg milk per year	Fat %
STN	2 600	4,1	4 000	4,2
NRF	3 600	3,9	6 300	4,2

The animals in the study



- *Winter and indoor feeding periods of 1999 and 2000*
- *Ten cows in each group of breeds, three primiparous and seven multiparous cows.*
- *In total: 15 STN and 16 NRF included in the study*

Choice of feeding system

- Perfect setting: Total mixed ration ☺

- Common system in feed studies and relevant for practical farming conditions: Grass silage ad lib and restricted amount of concentrates according to production level. – this practice was chosen for the study

Level of feed concentration

- ***Goal:*** *The same level of feed concentration and nutrition level according to live weight and level of production*

- STN: 3 739 kg milk/yr 442 kg live weight

- NRF: 6 725 kg milk/yr 543 kg live weight

Level of concentrates

STN

65 % of NRFs production level

80 % of NRFs live weight

Milk production requires 2/3 of utilized energy, maintenance requires 1/3 (Korver 1988):

→ *STN was given 60 % of NRFs level of concentrates*

The recordings

- During the whole lactation period, 10 months
- Milk level and milk quality (every week)
- Live weight and body condition score (every month)
- Roughage intake and feed quality (every week)

The model

$$y_{ijklmn} = \mu + BREED + AGE_j + TEST\ MONTH_k + LACTATION\ MONTH_l + BREED * LACTMONTH_{il} + cow_m(breed_i) + e_{ijklmn}$$

Results – production and live weight

Trait	Breed	age	Test month	Lact month	Breed* Lact month	Cow	STN	NRF
ME intake (MJ/day)	**	**	**	**	**	**	102	162
ECM (kg/day)	**	**	**	**	-	**	11.8	22.8
Milk fat (%)	-	-	**	**	-	**	4.36	4.25
Milk protein (%)	**	-	**	**	-	**	3.40	3.17
Live weight, kg	**	**	**	**	-	**	444	567
Body condition score	-	-	**	*	**	**	2.76	2.58

Measures of energy balance

1. *Gross energy balance =*

   Energy in feed intake – energy in milk

2. *Net energy balance =*

   Energy in feed intake + energy from body tissue loss – (energy in milk + energy for body tissue gain +energy for maintenance)

Measures of energy efficiency

1. *Gross energy efficiency =*

   Energy in milk/energy in feed

2. *Net energy efficiency =*

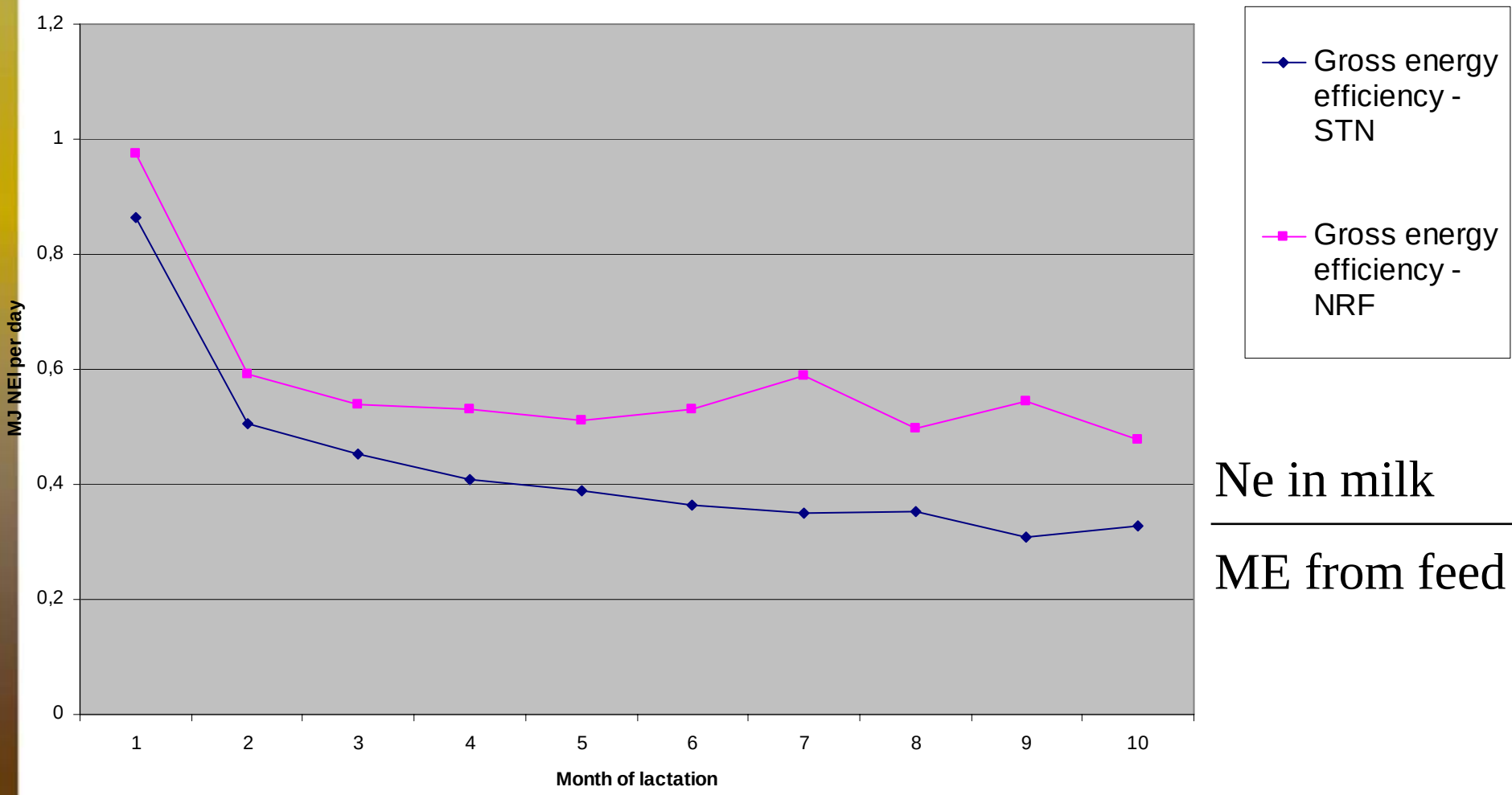
   energy in milk + energy for body tissue gain + energy for maintenance/

   (energy in feed + energy from body tissue loss)

Results energy utilization

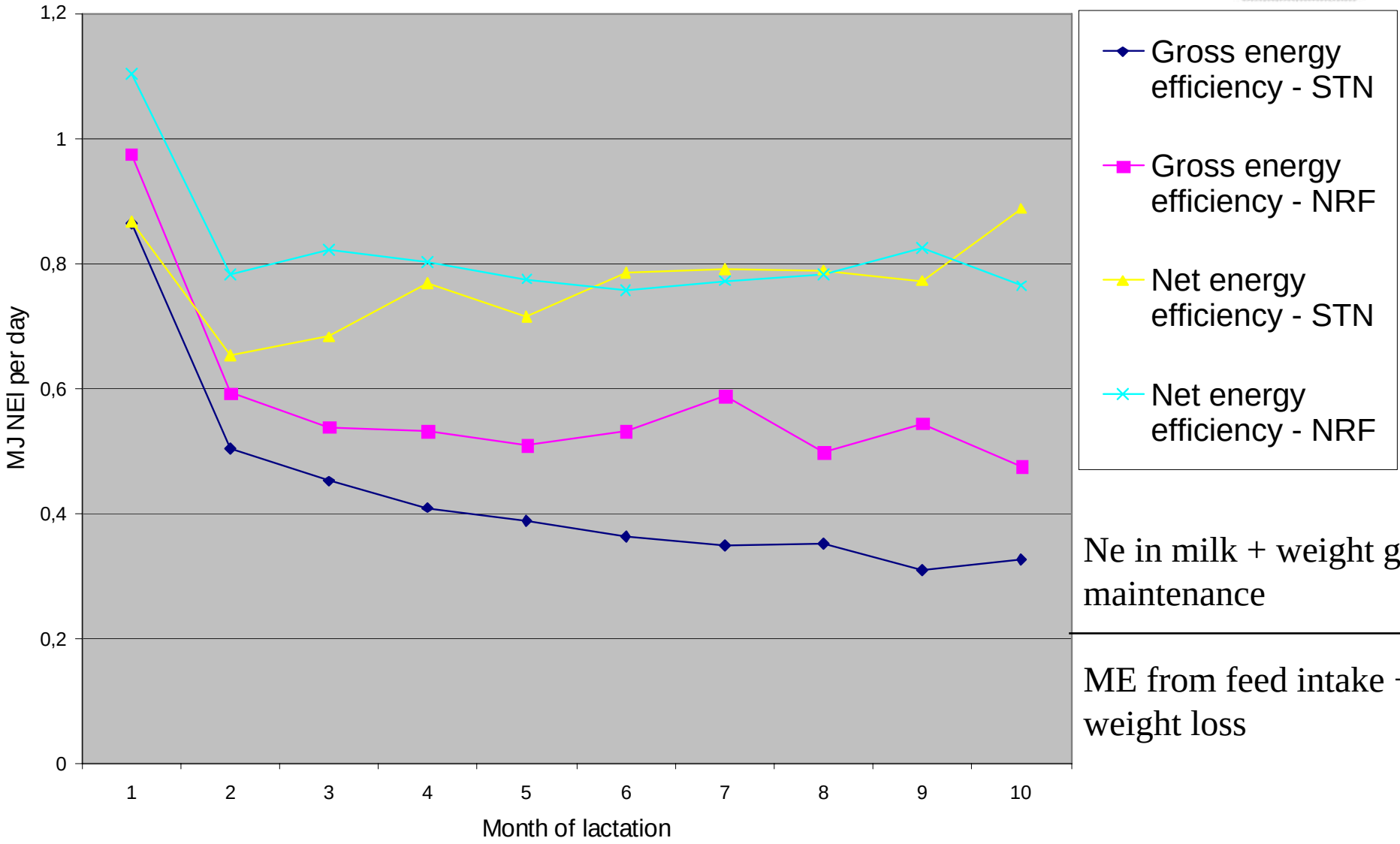
Trait	Bre-ed	Age	Test month	Lact month	Breed* Lact month	Cow	STN	NRF
Gross energy balance	**	**	**	**	**	**	17.5	3.4
Net energy balance	*	-	**	-	-	-	-14	-33
Gross energy efficiency	**	-	**	**	**	**	0.43	0.58
Net energy efficiency	-	-	**	-	-	*	0.77	0.82

Differences in gross energy efficiency



$$\frac{\text{Ne in milk}}{\text{ME from feed intake}}$$

No differences in net energy efficiency



Ne in milk + weight gain + maintenance

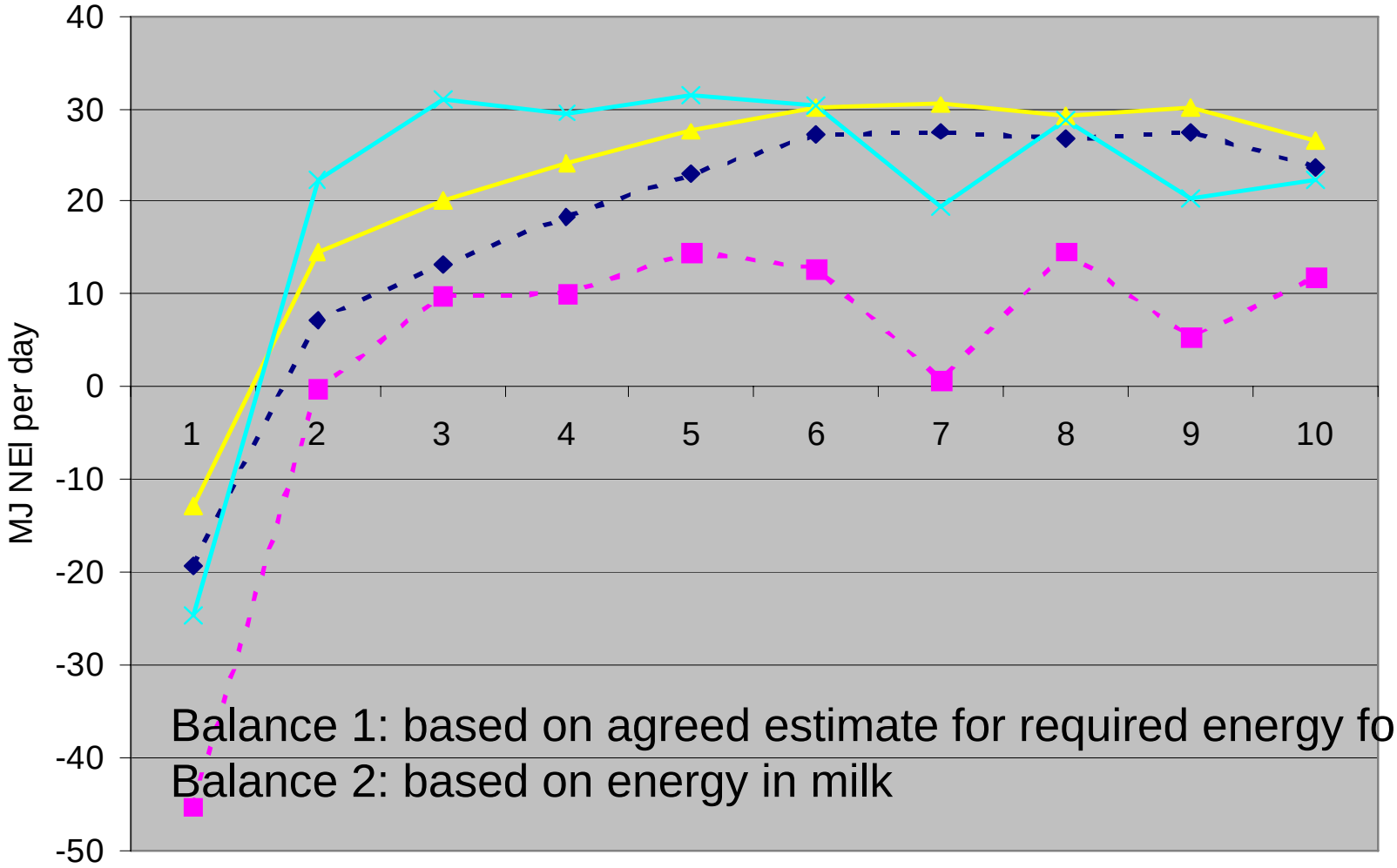
ME from feed intake + weight loss

Sources of error

- Gross measures:
  - Do not take into account maintenance and live weight change
- Net measures:
  - Change in live weight =

    gain or loss of fat
  - Agreed estimations on energy requirements for maintenance and production

Problems with agreed estimations on energy requirements for production?



Balance 1: based on agreed estimate for required energy for milk production

Balance 2: based on energy in milk

Conclusion I

- *NRF: higher feed intake and milk production than STN*
- *STN: higher content of milk protein than NRF.*
- *No differences in content of milk fat.*

Conclusion II

- NRF had poorer energy balance than STN
- No breed differences in net energy efficiency
- Agreed estimations on energy requirements for production might cause problems when comparing breeds