Economic optimization in practice with fluctuating milk prices

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Den Europæiske Landbrugsfond for Udvikling af Landdistrikterne:
Danmark og Europa investerer i landdistrikterne

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Background

- Prices on milk in Europe are much more volatile after end of milk quata and exporting countries are more dependent on decisions far away (e.g. China)
- Price on concentrates changes
- How to deal with these (big) changes in input (feed) and output (milk) when optimizing feed rations
- Input from earlier Workshop

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What is Economic Optimization ?

- Economic optimization vs. least cost formulation
- Goal: to achieve the economic optimum between input (feed) and output (milk & gain), i.e. optimum balance between concentrate and roughage
- Optimum: marginal income = marginal cost
- It leads to maximum ”milk minus feed”
- Normally concentrate is more expensive than roughage; in DK: 23 vs 15 øre/MJ
- Plenty of forage is necessary

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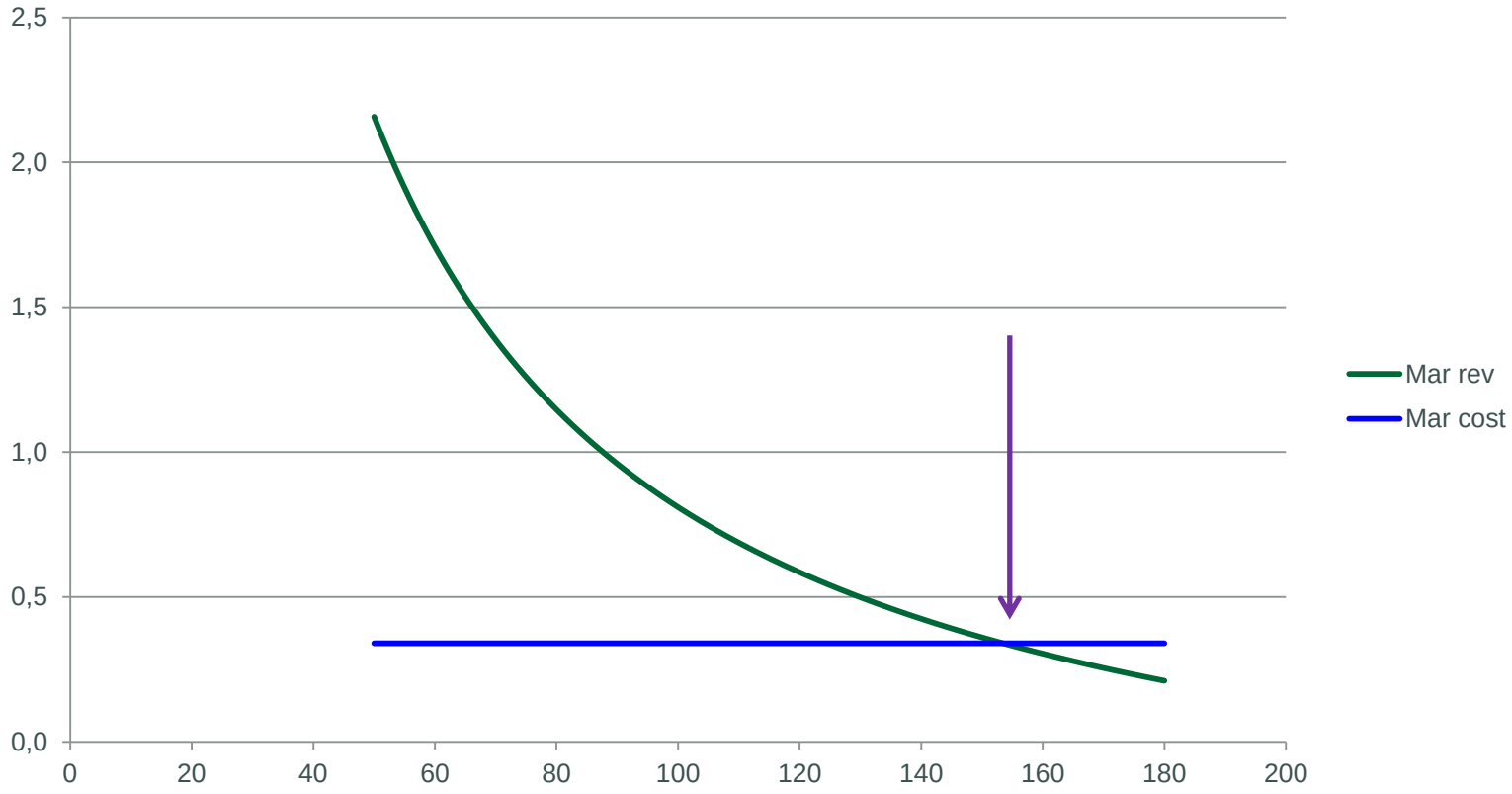
EOF: Marginal income = Marginal costs



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What is reality in DK today ?

- Conc-share:
  - 10% quantile: 28% conc – 72 % roughage
  - Median: 36% conc – 64 % roughage
  - 90% quantile: 44% conc – 56 % roughage

Inputs needed in the NorFor EOF calculations

- Prices
  - Milk
  - Gain
  - Roughage
  - Concentrate
- Replacement rate
- Roughage quality
- Response functions for milk & gain

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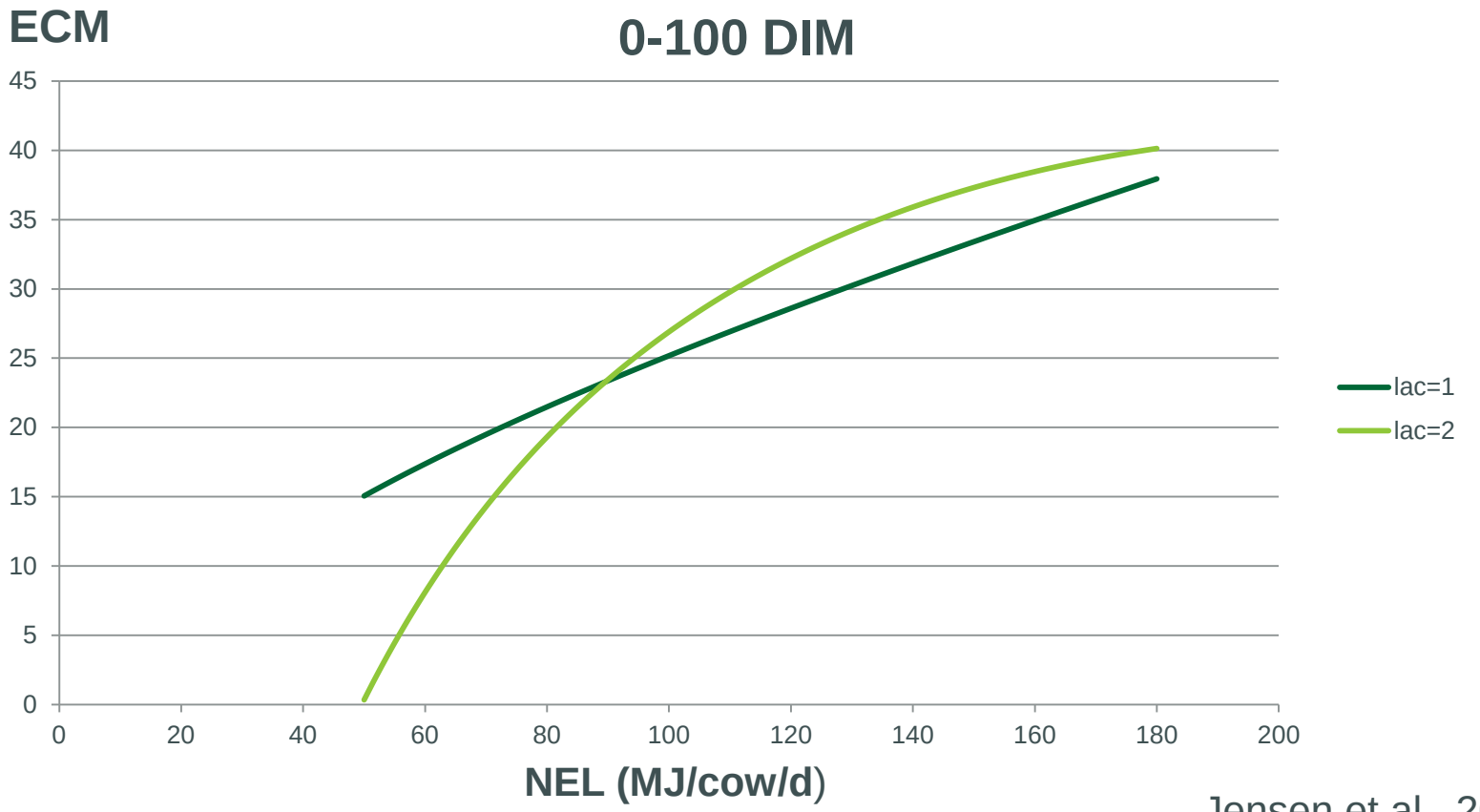
How do cows respond to more energy ?



Jensen et al., 2015

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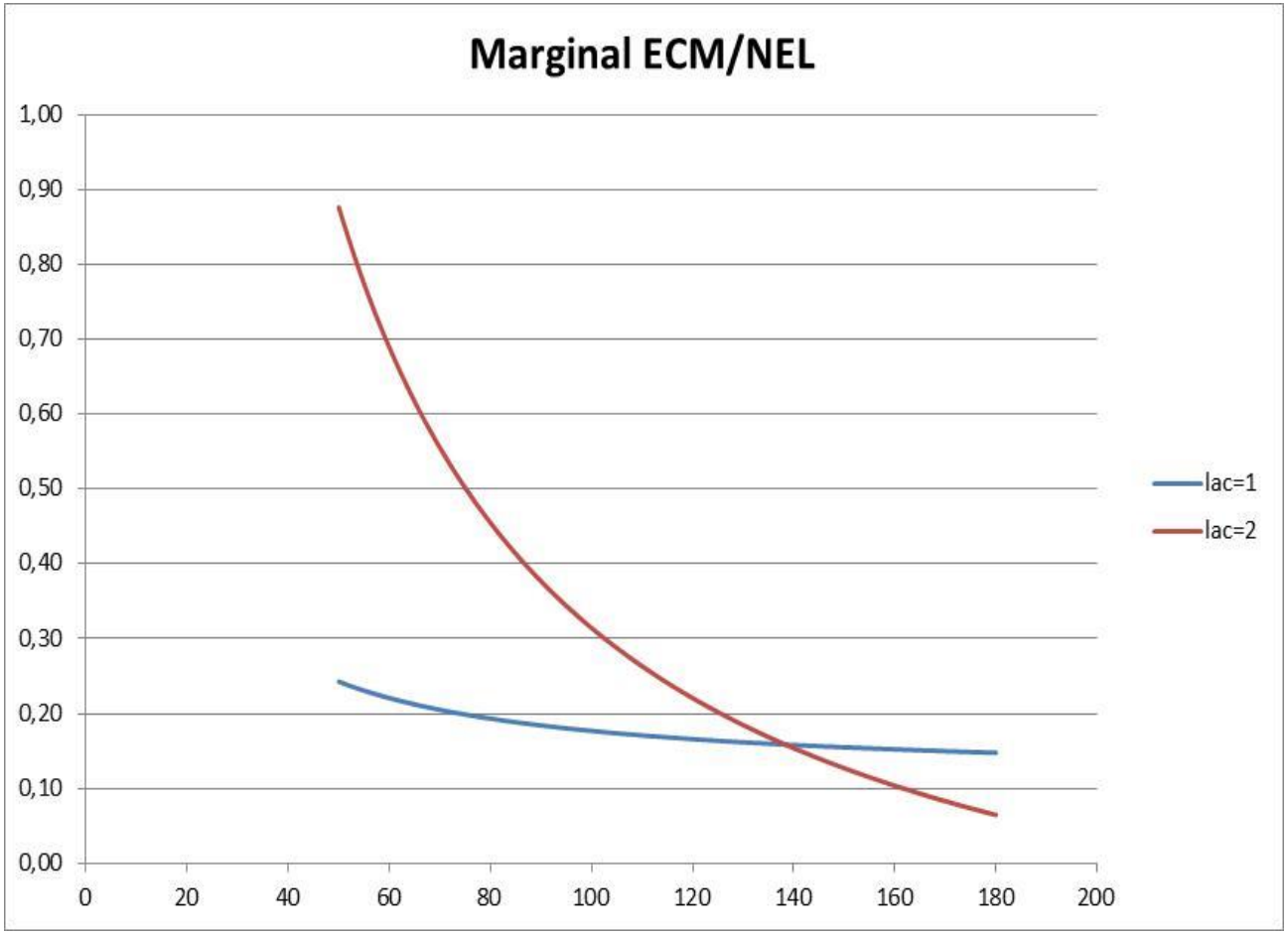
Marginal response



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Test of economic optimizations in two herds (LP & TJ)

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Test of EOF in practice – Herd_LP

- ~ 100 DH cows, TMR1
- Conventional dairy herd, 2 daily milkings
- ~12.000 kg ECM/cow/year
- Maize- & grass silage
- + four commodities: SBM, RSC, SBP & NaOH-wheat
- Daily registrations of feed + left overs + milk for calves

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Inputs used at herd_LP

- Prices
  - Milk: 2,4 dkr/kg
  - Gain: 18 dkr/kg
  - Roughage (16 øre/MJ)
  - Concentrate (27 øre/MJ)
- Replacement rate (40%)
- Roughage quality (6,5 MJ/kg DM)
- Response functions for milk & gain

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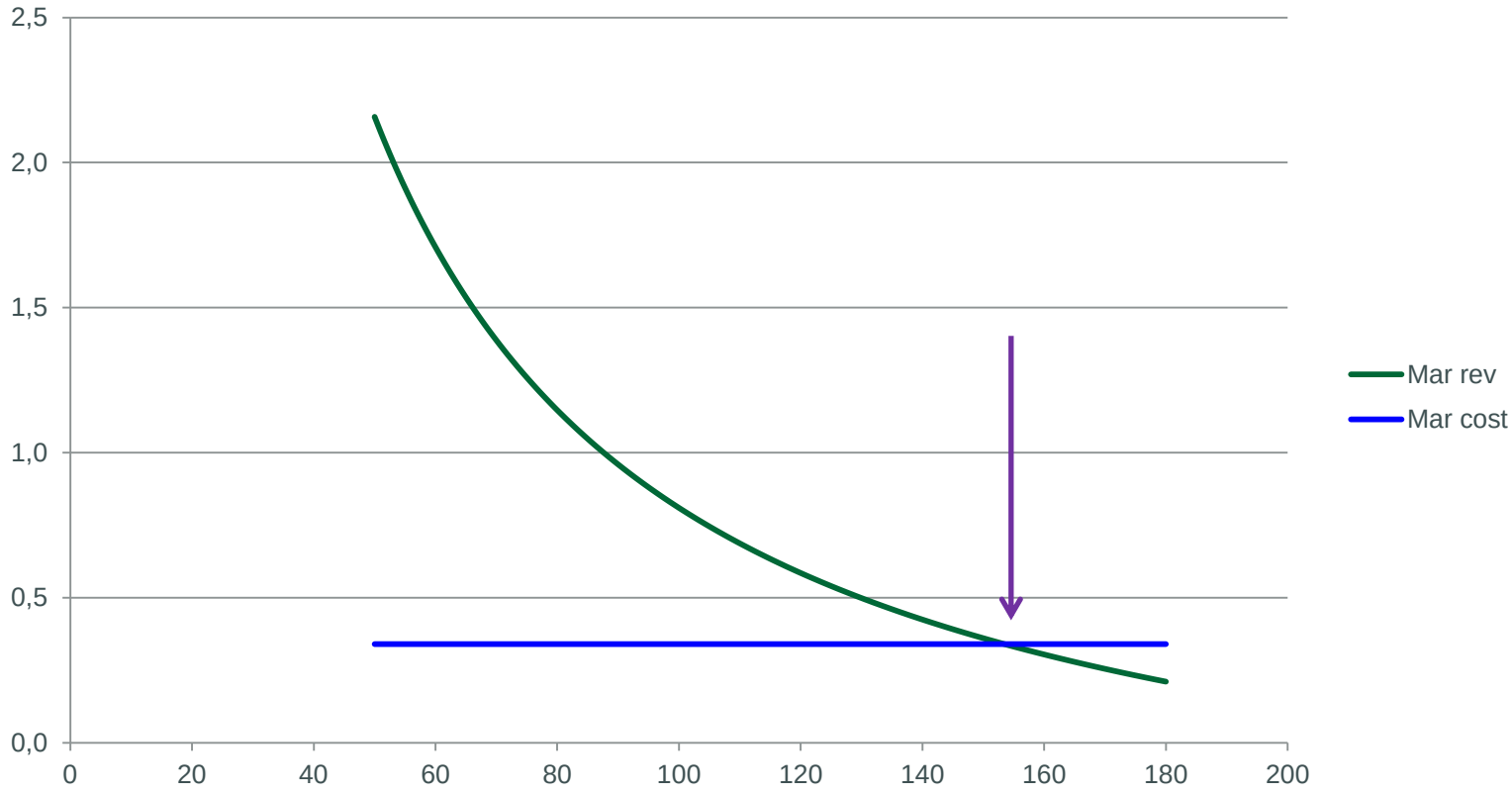
Economic optimum at 154 MJ



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What does the farmer want ?

- The actual energy level is around 158 MJ/older cow
- So NorFor EOF suggest to reduce/maintain feeding level
- The farmer is more interested to test if cows can increase milk yield!

Design & cows

	Period 0			Period 1			Period 2			Period 3			Period 4		
Parity	1	2	≥3	1	2	≥3	1	2	≥3	1	2	≥3	1	2	≥3
N cows	34	28	28	37	30	27	38	28	26	38	27	27	38	27	27
N cows	90			94			92			92			92		
DIM	144			146			143			158			174		

Feeding & nutrients

Feeding at the beginning/period 0

Feed (% of DM)	(% of DM)
Maize silage	30
2. cut grass silage	29
SBP	8
SBM	6
NaOH wheat	10
RSC	16

Nutrient		Period 0	Period 1	Period 2
Conc-share	% of DM	42	46	48
CP	g/kg DM	178	176	182
AAT	g/kg DM	103	104	108
PBV	g/kg DM	23	20	22
NEL	MJ/kg DM	6,53	6,53	6,55
Price	Øre/kg DM	152	154	158

Concentrate up by 2,5 kg/cow/d

		Period 0	Period 1	Period 2
DMI	kg/d	23,0	24,0	24,8
Energy intake	MJ NEL/d	150	157	162
Concentrate intake	kg DM/d	9,7	11,0	11,9
Δ Conc intake	kg DM/d	-	1,3	0,9

Concentrate up by 2,5 kg/cow/d

		Period 0	Period 1	Period 2
DMI	kg/d	23,0	24,0	24,8
Energy intake	MJ NEL/d	150	157	162
Concentrate intake	kg DM/d	9,7	11,0	11,9
Δ Conc intake	kg DM/d	-	1,3	0,9
Roughage intake	kg DM/d	13,3	13,0	12,9
Δ roughage intake	kg DM/d	-	-0,3	-0,1
Substitutionsrate		-	0,23	0,13
FV intake	FV	8,3	8,5	8,6
IC NorFor	FV	8,3	8,4	8,6

Herd LP – milk production

Milk delivered to dairy & calves

		Period		
		0	1	2
Milk production				
Milk	kg/dag	35,3	36,3	37,4
ECM	kg/dag	35,5	36,1	37,2
Milk content				
Fat	%	3,99	3,88	3,87
Protein	%	3,47	3,54	3,54

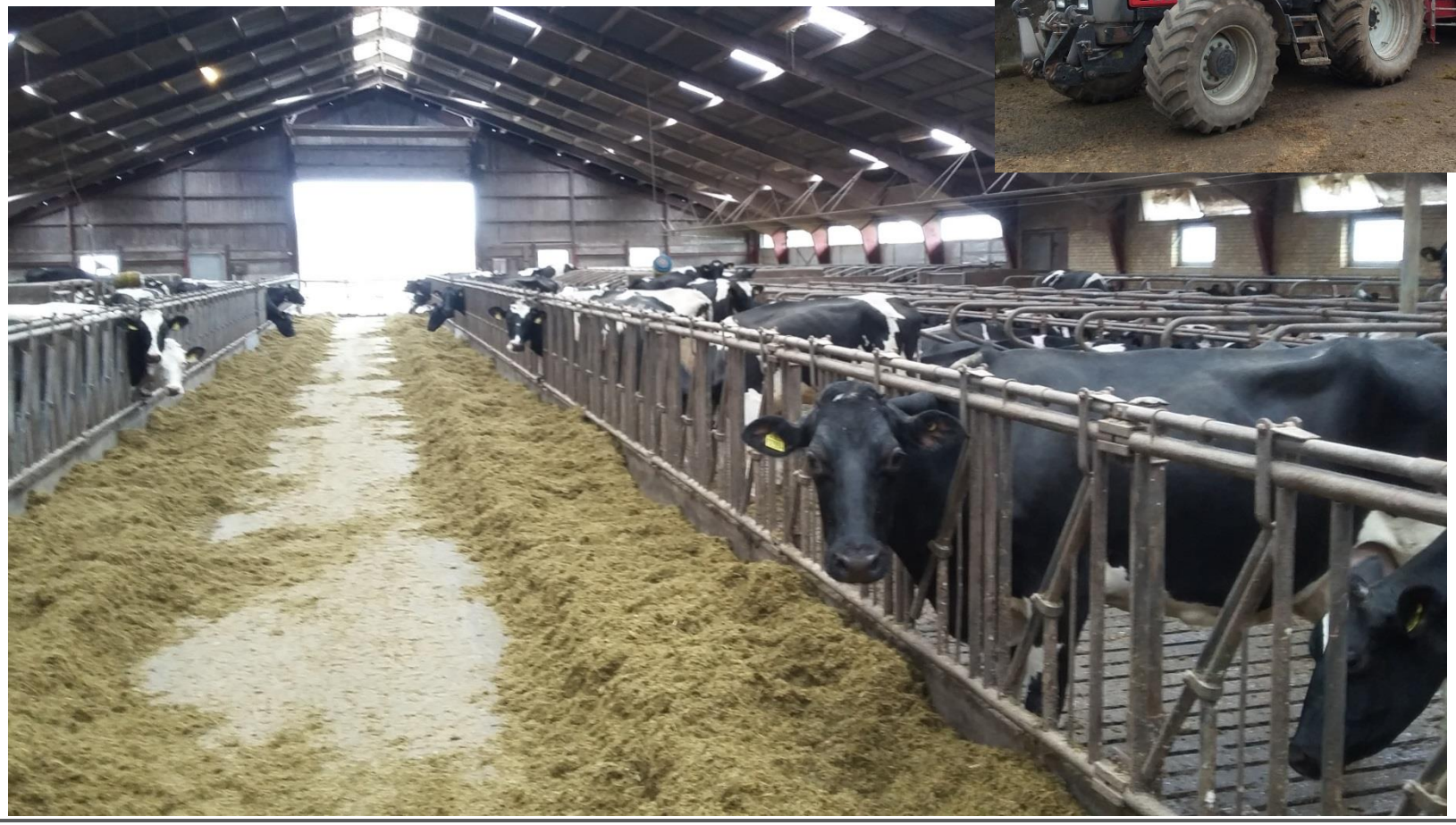
Milk minus feed – what happened ?

		Period		
		0	1	2
ECM (dairy + calves)	kg/d	35,5	36,1	37,1
DMI	kg/d	23,0	24,0	24,8
Energy intake	MJ NEL/d	150	157	162
Efficiency	kg ECM/kg TS	1,55	1,50	1,50

Milk minus feed – what happened ?

		Period		
		0	1	2
ECM (dairy + calves)	kg/d	35,5	36,1	37,1
DMI	kg/d	23,0	24,0	24,8
Energy intake	MJ NEL/d	150	157	162
Efficiency	kg ECM/kg TS	1,55	1,50	1,50
Feed costs				
Total pr cow	dkr/dag	34,9	36,9	39,2
Milk income				
Per kg ECM	dkr/kg ECM	2,18	2,18	2,18
Per cow	dkr/d	77,5	78,7	80,9
Milk minus feed				
Per cow	dkr/d	**42,6**	**41,8**	**41,7**

Herd TJ



Test of EOF in practice – Herd_TJ

- ~ 200 DH cows, TMR1
- Conventional dairy herd, 2 daily milkings
- ~11.000 kg ECM/cow/year
- Maize, grass & WCB silage
- Concentrates: SBM, RSC, SBP, molasses, sat. fat & own wheat+barley
- Daily registrations of feed + left overs + milk for calves

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Inputs used at herd_TJ

- Prices
  - Milk: 2,10 dkr/kg
  - Gain: 18 dkr/kg
  - Roughage (15 øre/MJ)
  - Concentrate (25 øre/MJ)
- EOF suggest 145 MJ/cow, i.e. a reduction in conc-share

What does the farmer want ?

- The actual energy intake is ~160 MJ/older cow
- Farmer: OK to decrease conc-share (and loose milk) if I can make more money!
- New ration contains 4% less concentrate (~1 kg/cow)
- Conc-share decreased from 49 to 45 % of DM

Results in herd_TJ

		Before	New feed ration
Roughage share	% of DM	51	55
Feed intake	kg DM/d	23,2	23,1
Energy intake	MJ NEL/d	155	159
Crude protein	g/kg DM	174	171
Feed costs	dkr/d	30,7	29,0

Results in herd_TJ
Small changes - small effect....

		Before	New feed ration
Roughage share	% of DM	51	55
Feed intake	kg DM/d	23,2	23,1
Energy intake	MJ NEL/d	155	159
Crude protein	g/kg DM	174	171
Feed costs	dkr/d	30,7	29,0
DIM		181	188
1. parity share	%	42	43
ECM yield	kg/d	34,0	33,7
Milk minus feed	dkr/d	**37,30**	**38,40**

Conclusion

- New EOF-model for NorFor developed
- Test of EOF shows promising results
- It was possible to increase MMF using the new optimization in these two herds
- Important that farmers are motivated to improve economic results

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