Economic optimum of roughage share in the ration

Nicolaj I. Nielsen, R&D NorFor & SEGES

NorFor advisor workshop, September 2017, Holland

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

Miljø- og Fødevareministeriet
Landbrugsstyrelsen

Den Europæiske Landbrugsfond
for Udvikling af Landdistrikterne

LDP 2020

Se EU-Kommissionen, Den Europæiske Landbrugsfond for Udvikling af Landdistrikterne

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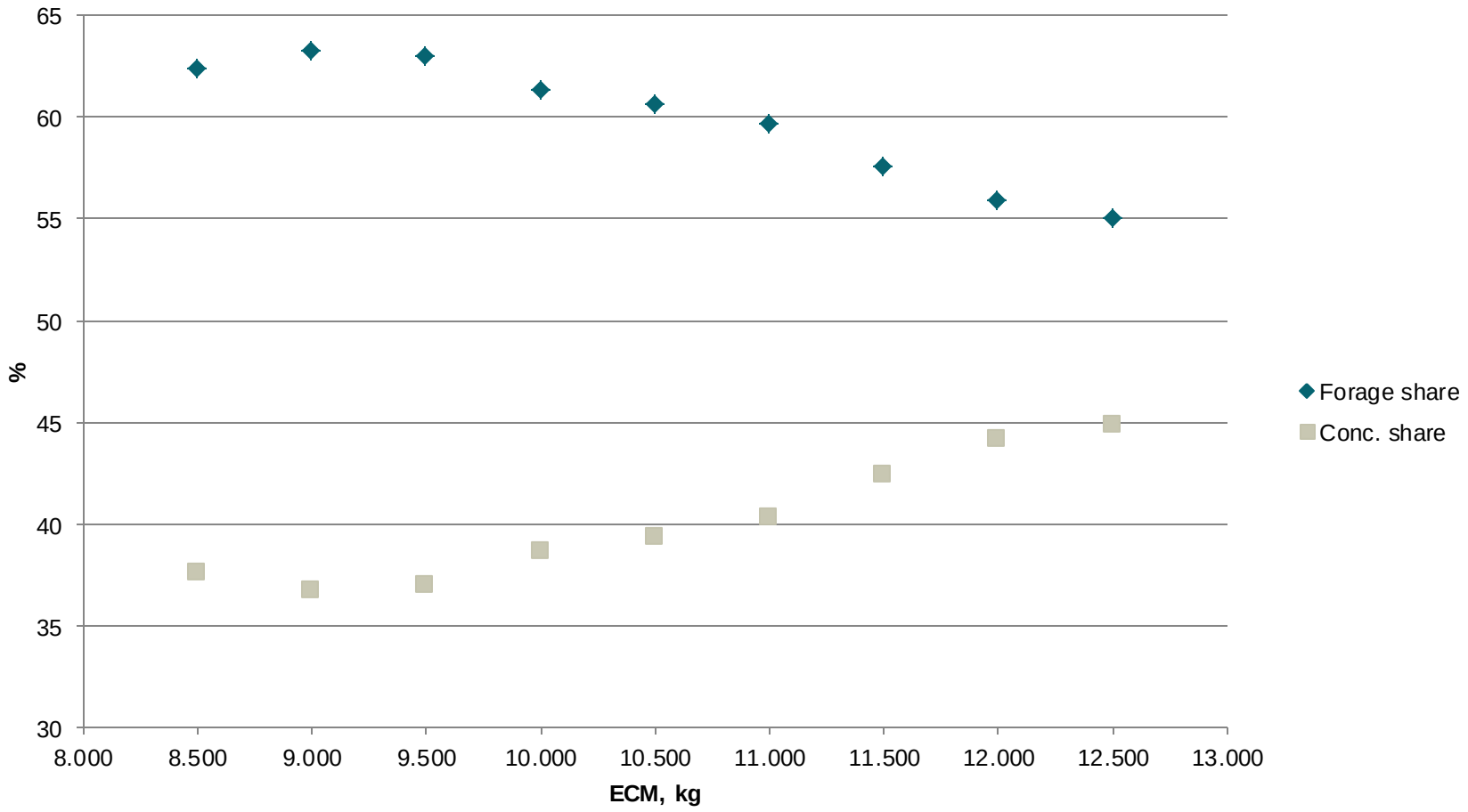
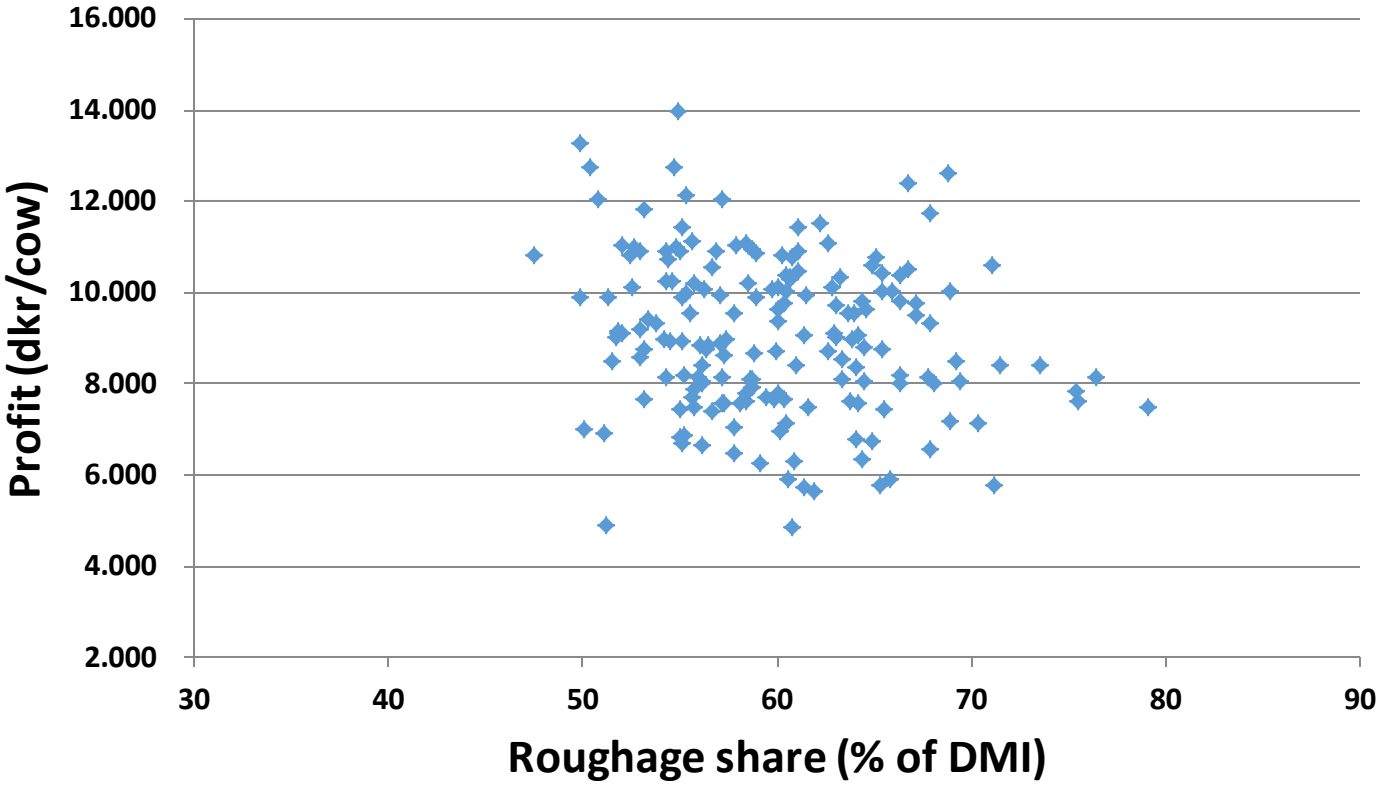
Introduction

- High fluctuations in milk price and protein supplements when you produce milk to an export market
- Should we always feed the same energy/nutrients or should we change inputs ?
- Today NorFor is minimizing costs within constrains
- Constrains are not ”price-sensitive”
- Optimizing on MilkMinusFeed demands response-functions => how much do we get for AAT, FA & MJ ?

HENRIK SHOWED A POSITIVE RELATIONSHIP BETWEEN CONC-SHARE AND ECM-YIELD….



Relationship between roughage share and profit



Danish_Benchmark_2016; 180 herds, conventionel, large dairy breed
Cows & young stock, gain; std. roughage price

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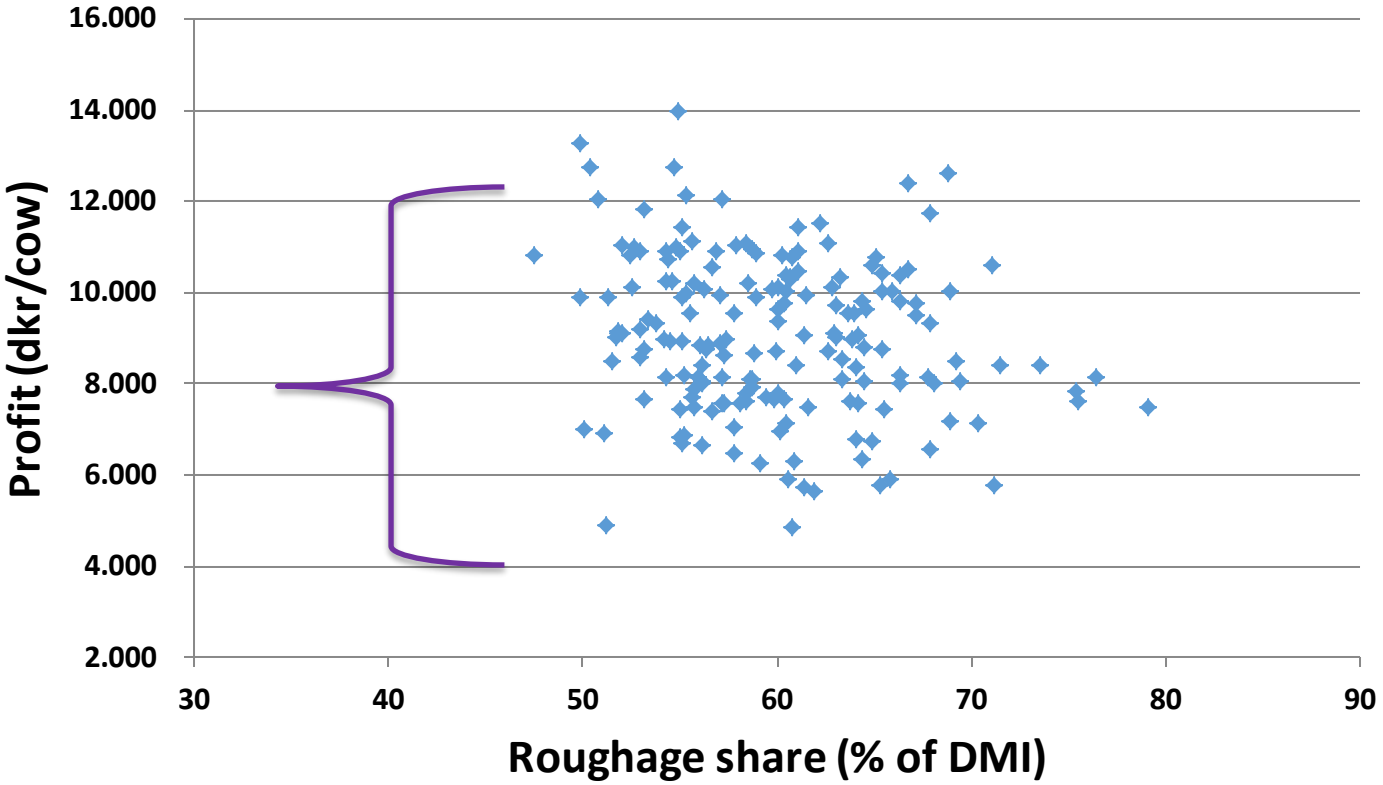
Relationship between roughage share and profit



Danish_Benchmark_2016; 180 herds, conventionel, large dairy breed
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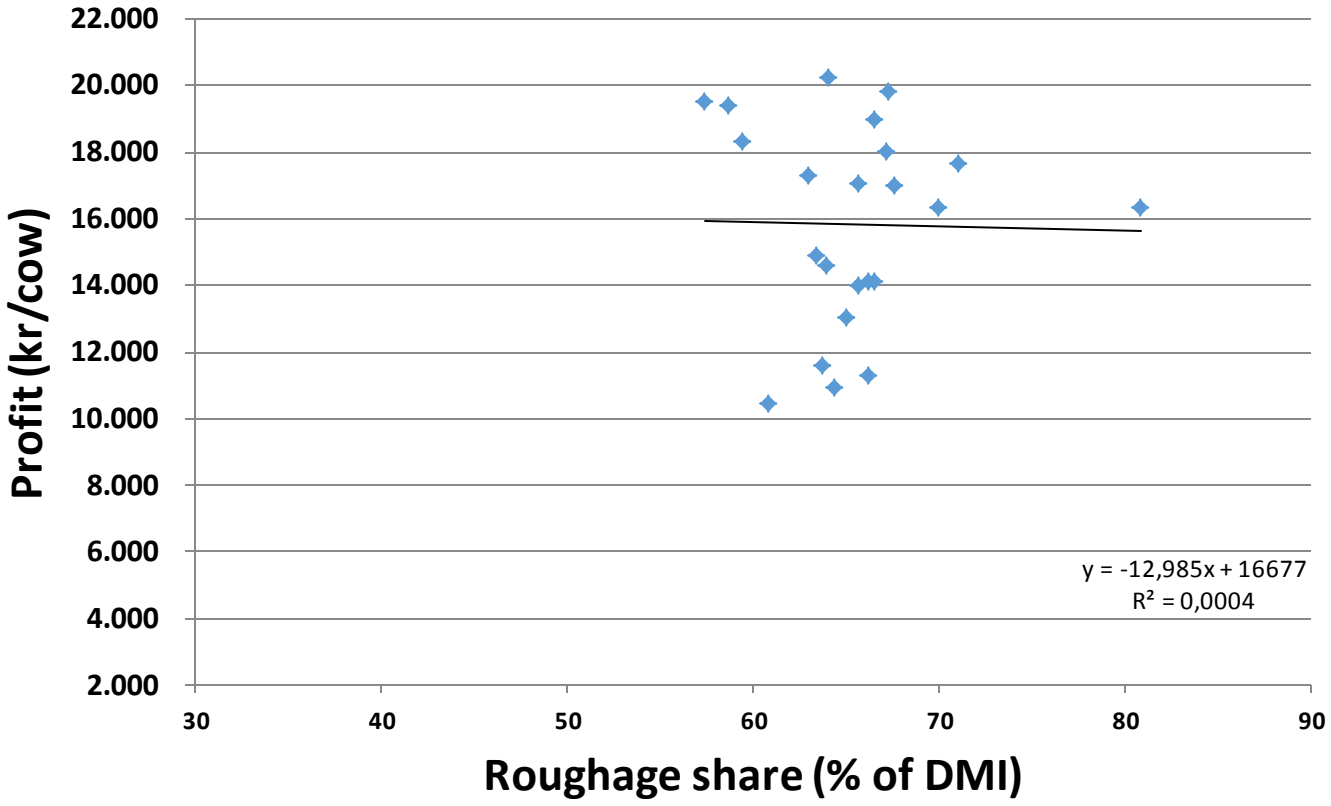
Relationship between roughage share and profit

Organic



Danish_Benchmark_2016; 23 herds, organic, large dairy breed

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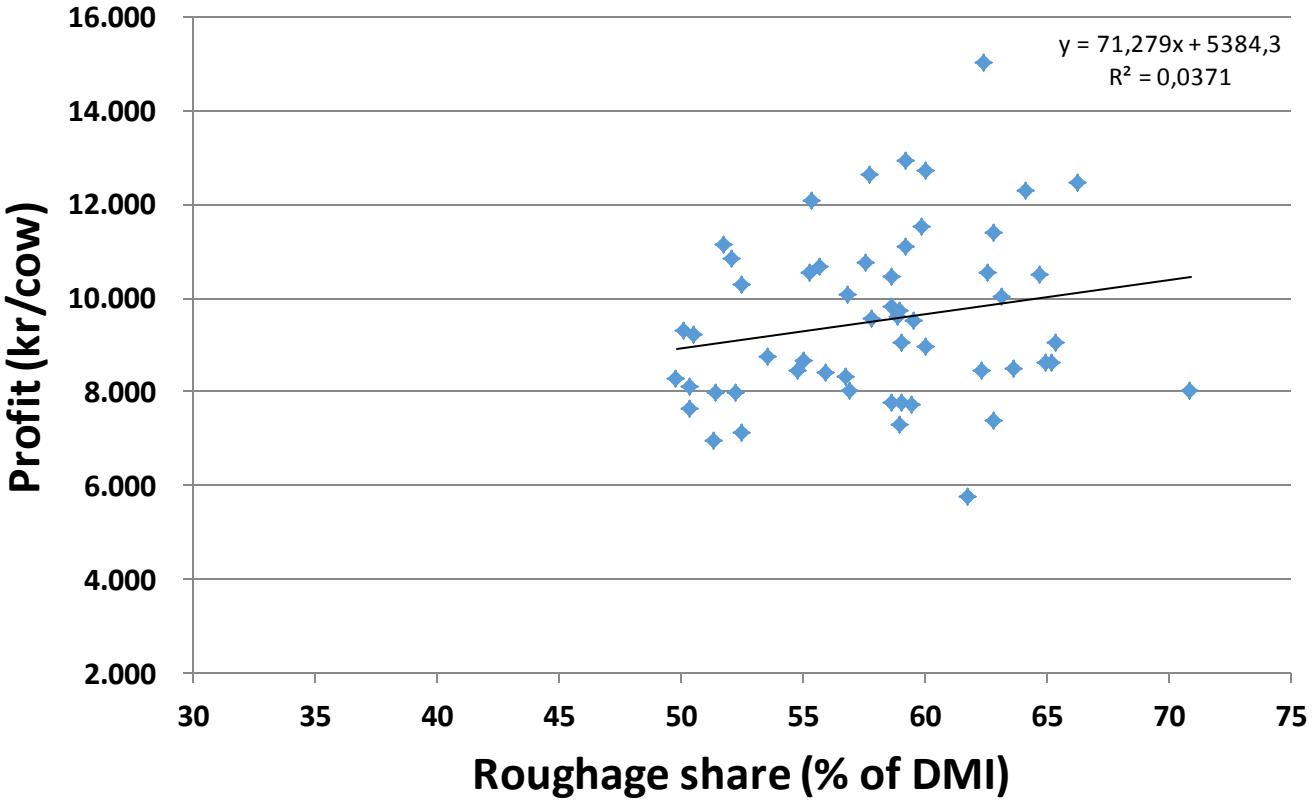
Relationship between roughage share and profit

Jersey



Danish_Benchmark_2016; 55 herds, conventionel

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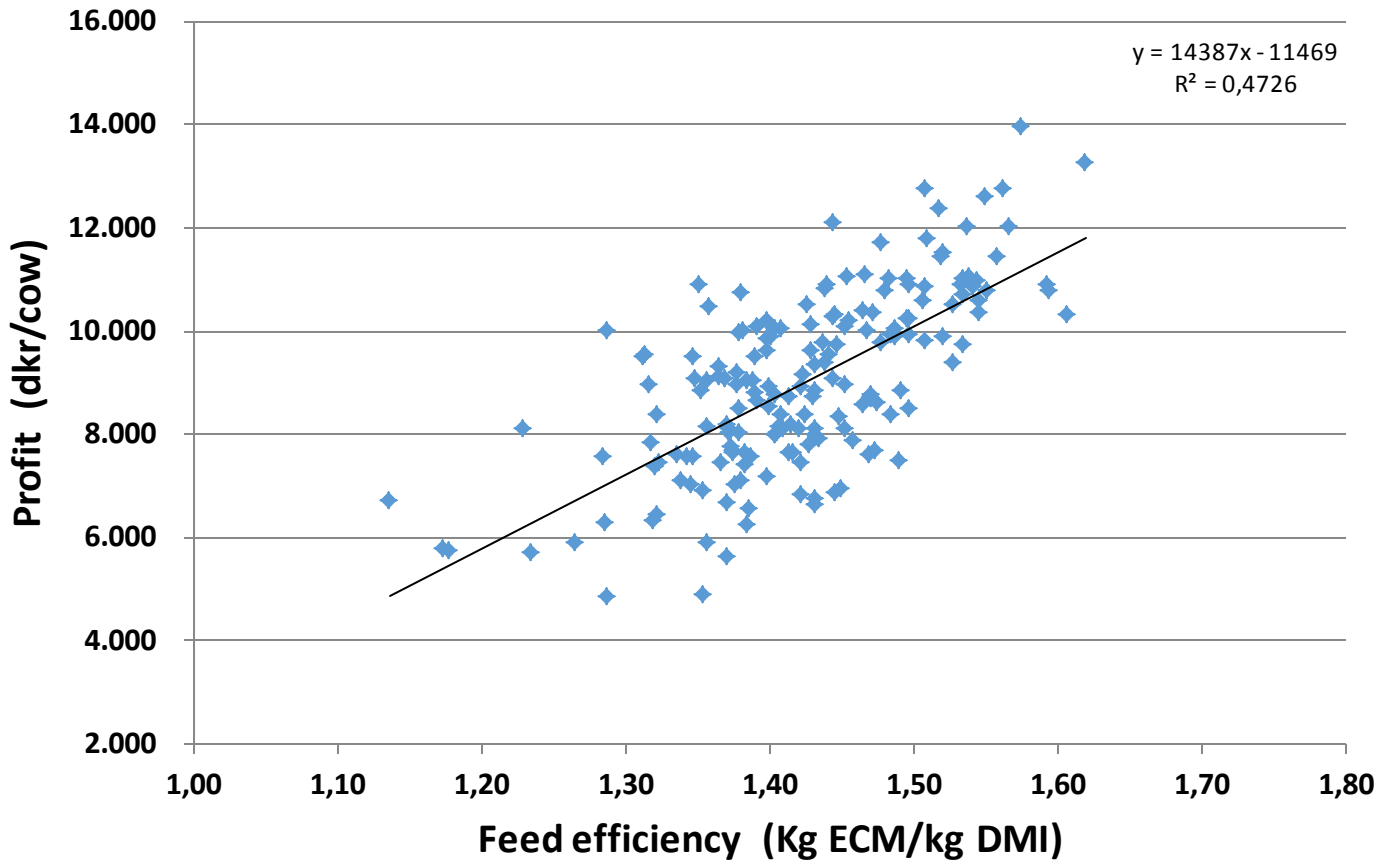
Feed efficiency explains profit



Danish_Benchmark_2016; 180 herds, conventionel, large dairy breed

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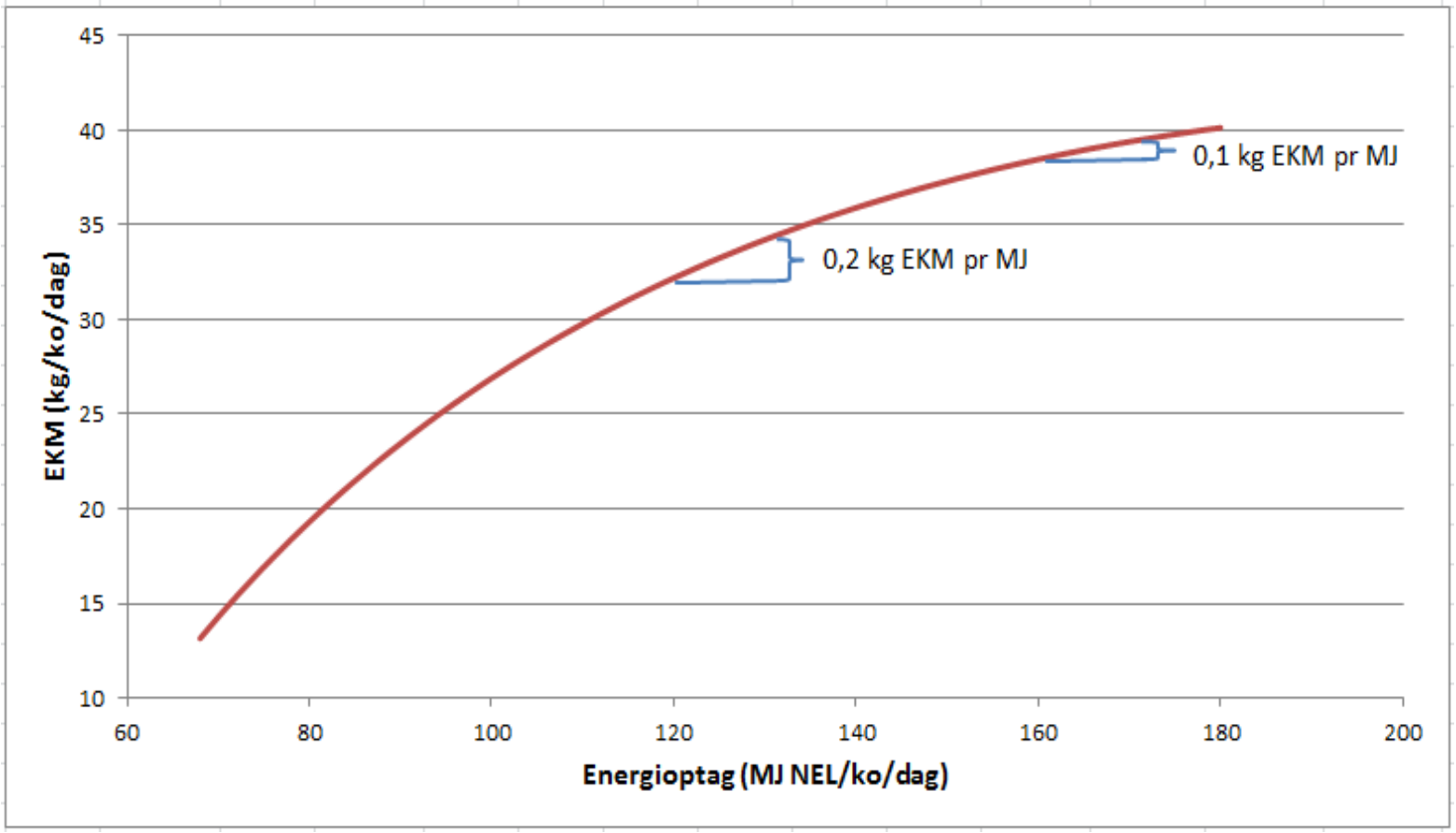
Apparently roughage share does not matter a lot… but what if we go within herd ?



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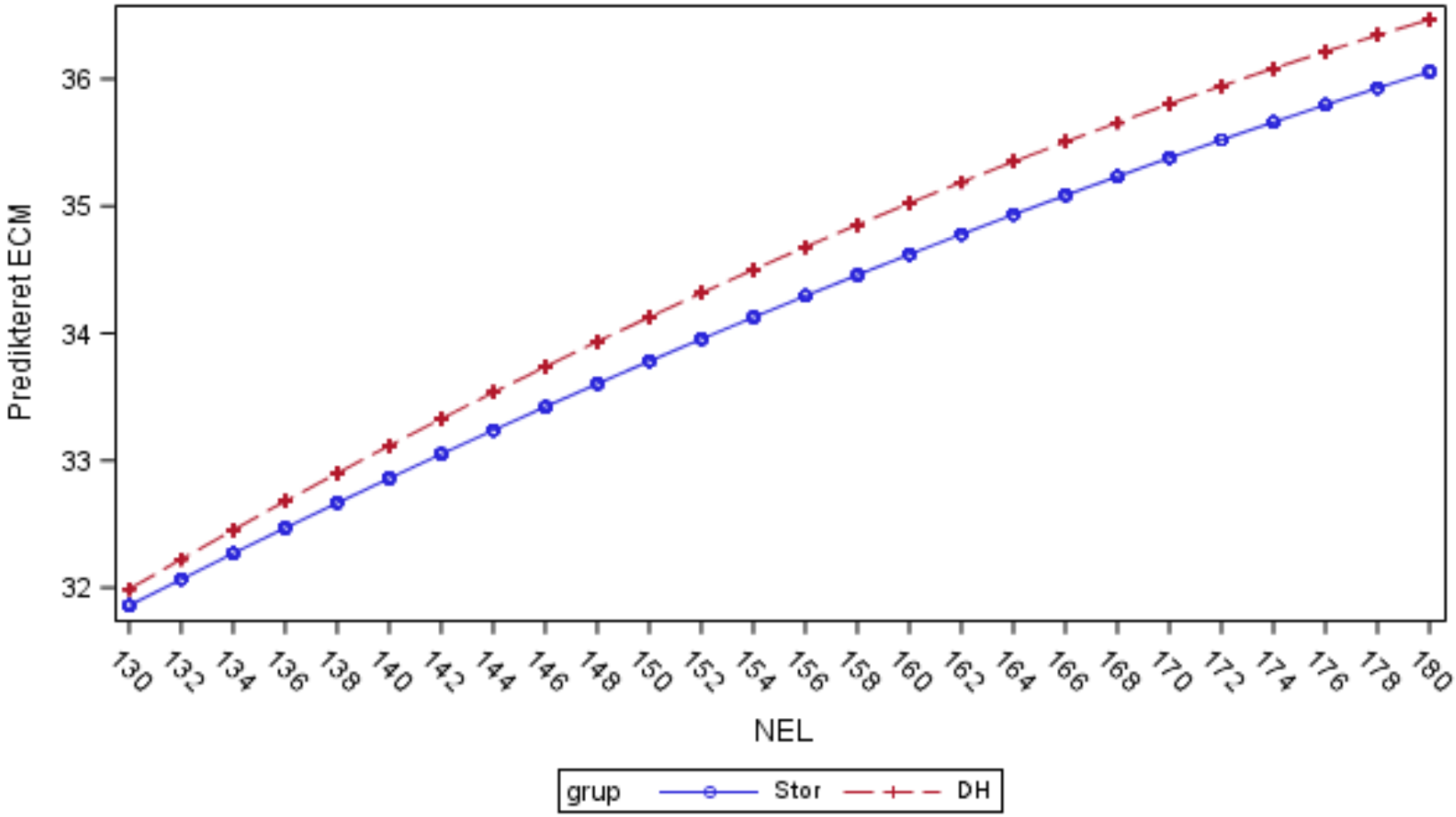
Response to energy on herd level

(n=8543 OFCs & 453 herds)



Response to energy on herd level

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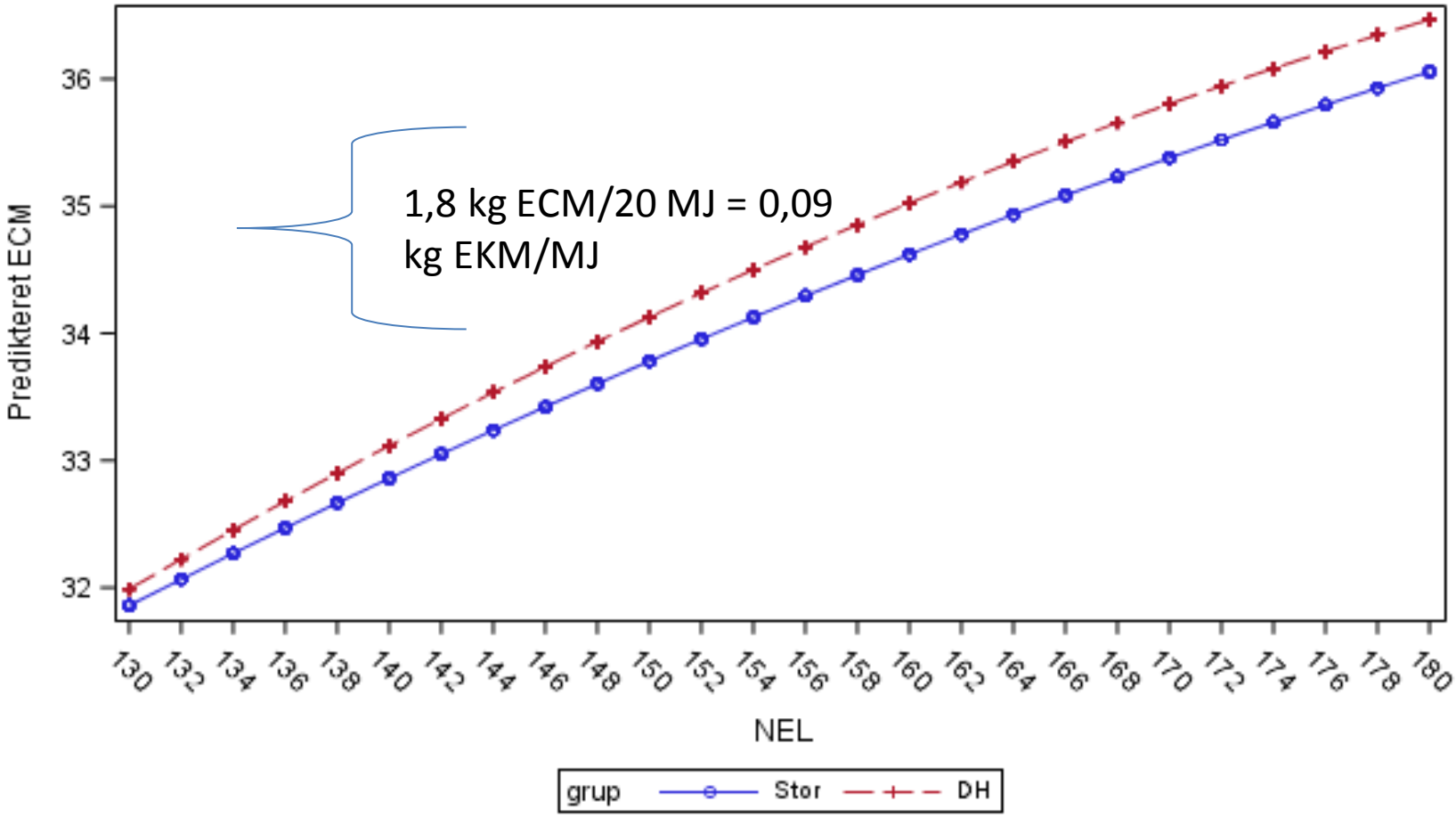

Test on farm

NorFor model for calculation of energy level applied on farm

- ~ 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

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Inputs used at herd_TJ

- Prices
  - Milk: 0,30 eurocents/kg ECM
  - Gain: 2,4 euros/kg SW
  - Roughage (2,0 eurocents/MJ)
  - Concentrate (3,4 eurocents /MJ)
- NorFor model suggest ≈153 MJ/cow, i.e. a reduction in energy/concentrate

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What does the farmer want ?

- The actual energy intake is ~160 MJ/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

		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	156
Crude protein	g/kg DM	174	171
Feed costs	dkr/d	30,7	29,0

Results

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Energy intake	MJ NEL/d	155	156
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

- Roughage share between 50% and 70% seems to be of less importance for the profit looking across herds
- What really drives profit is feed efficiency
- However, within farm roughage share can be important for tuning/increasing ”milk minus feed”
- New MMF-model for NorFor developed

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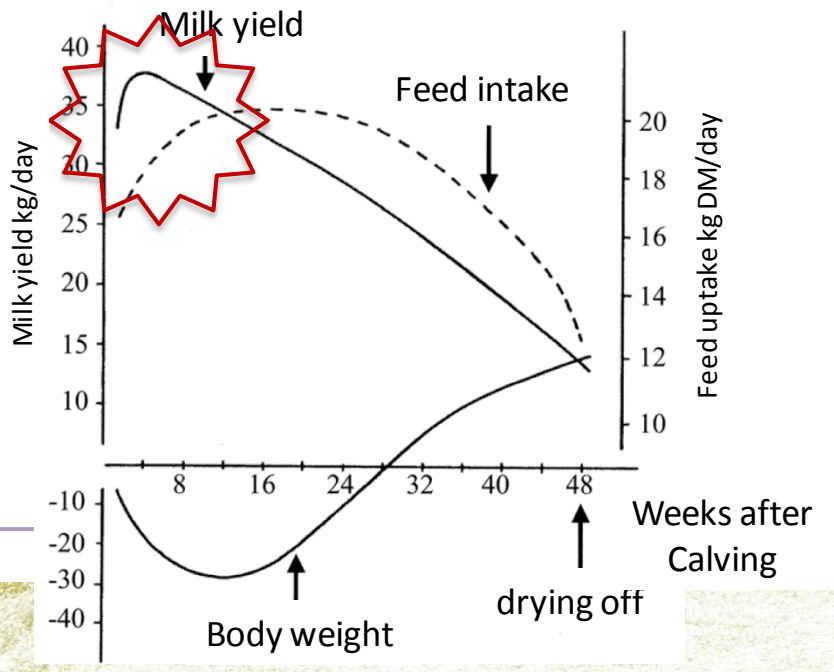
Responses to nutrients

Is glucose the driver for milk production in early lactation?

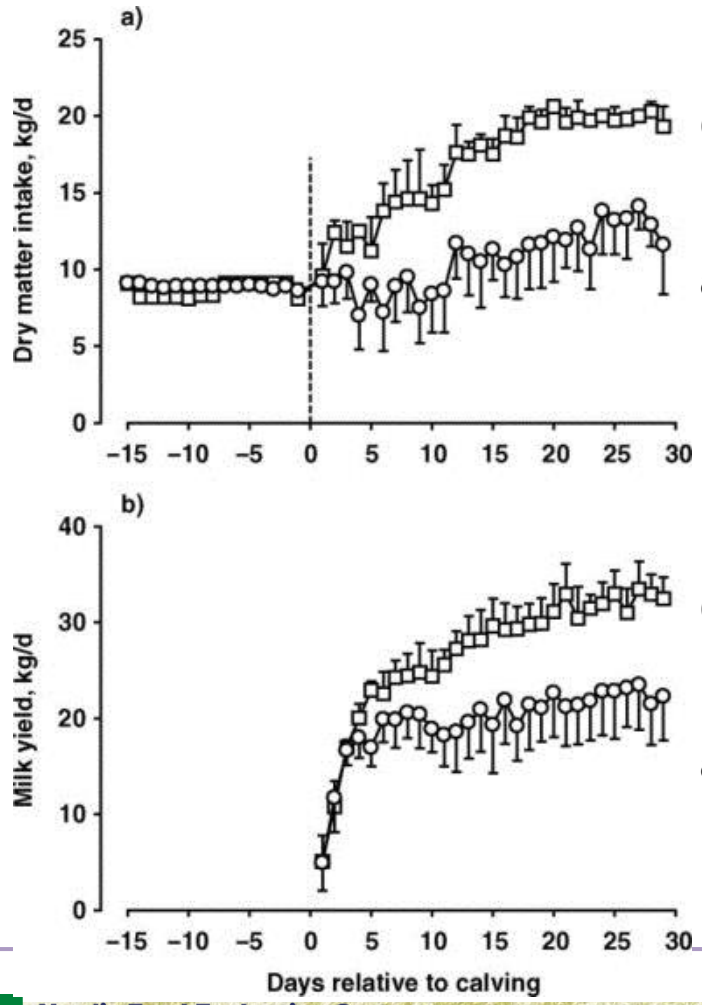
Early lactation:

- mobilization from body reserves
- glycogenic status in blood decreases

=> risk of ketosis/fatty liver



Response to glucose / by pass starch



Control

Infusion of glucose direct into the abomasum

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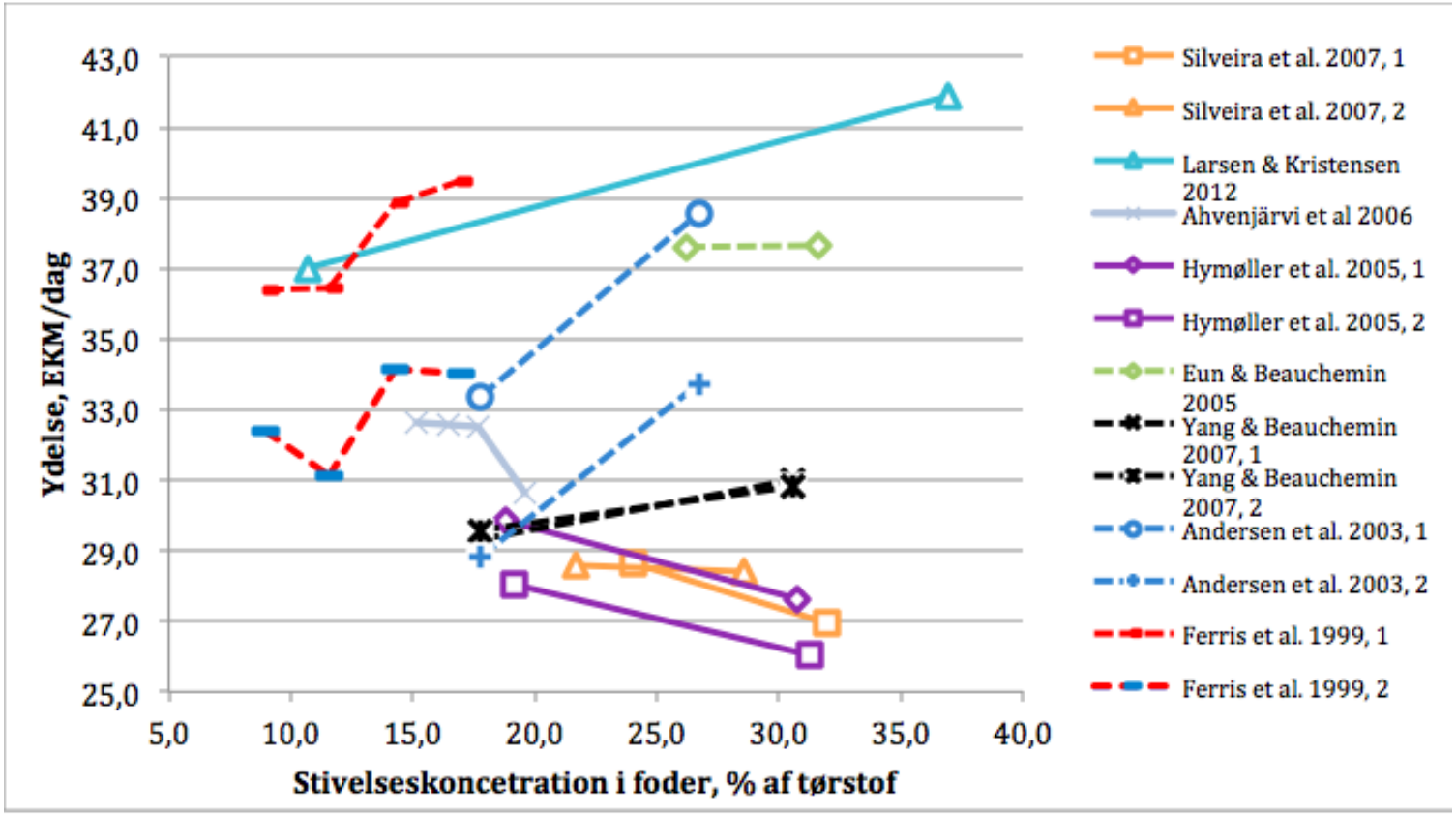
Infusion of glucose direct into the abomasum

Larsen & Kristensen, 2010

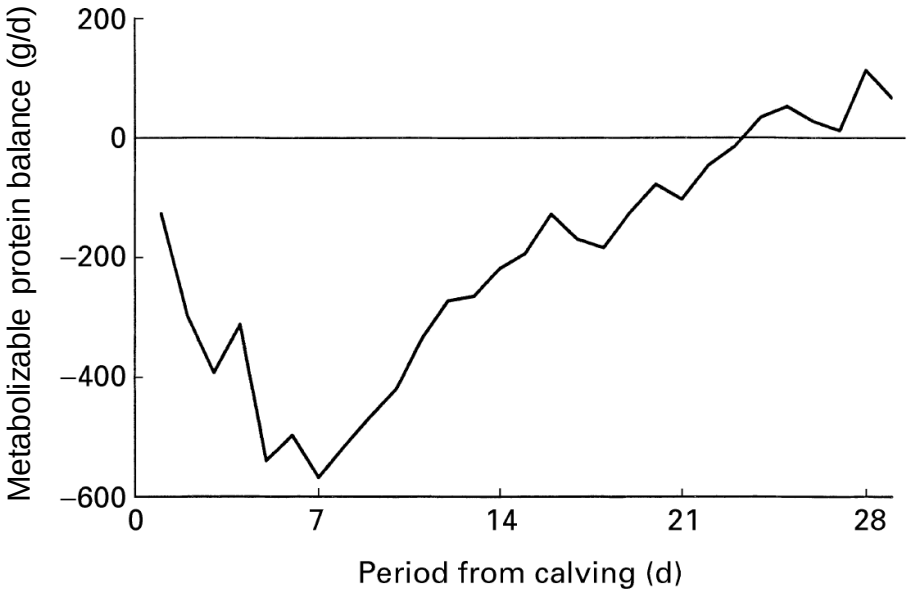
Response to starch



Figur 3.1: Mælkeydelse som funktion af stivelseskoncentration i foderrationer med fast (—) og varierende (- - -) grovfoder/kraftfoder-forhold fodret til malkekøer.

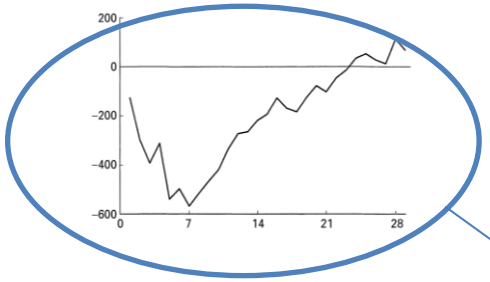
Hansen & Billing, 2015

….. could it be that cows lack amino acids (not glucose) available for absorption in the small intestine?



AAT in NorFor

Feeding the same TMR for fresh cows



Transition cows

Tildeling pr. dyr pr. dag			0-28	>33	0-33
Fodermiddel	Enhed	Øre/kg	Tildelt	Tildelt	Tildelt
Blanding, 19-02-2014 1	Kg TS	52,7	17,3	20,8	20,5
Asimo II Star 2013/2014	Kg TS	**223,8**	**2.7**	**3.4**	**2.7**

Rationsparameter	Enhed	Opt.	Tildelt	Tildelt	Tildelt
Pris	kr./dag	☐	28,53	34,66	32,53
Foderoptagelse	kg TS/d	☐	20,0	24,2	23,2
Kraftfoder	kg TS/d	☐	7,5	9,2	8,4
Energioptagelse	MJ/dag	☐	131,2	155,2	149,1
Energi	MJ/kg T	☐	6,54	6,40	6,42
Energibalance	%	☑	101,0	100,0	100,0
AAT til mælk	g/MJ	☑	14,8	18,1	18,3
AAT i foder / NEL i foder	g/MJ	☐	15,5	16,7	16,4
PBV	g/kg TS	☑	29	21	22
Fedtsyrer	g/kg TS	☑	31	31	31
NDF	g/kg TS	☐	324	323	325
Vombelastning	Ingen en	☑	0,34	0,33	0,33
Stivelse	g/kg TS	☐	157	157	158
Calcium i alt	g/dag	☐	147	177	171

Feed intake (kg DM/day)

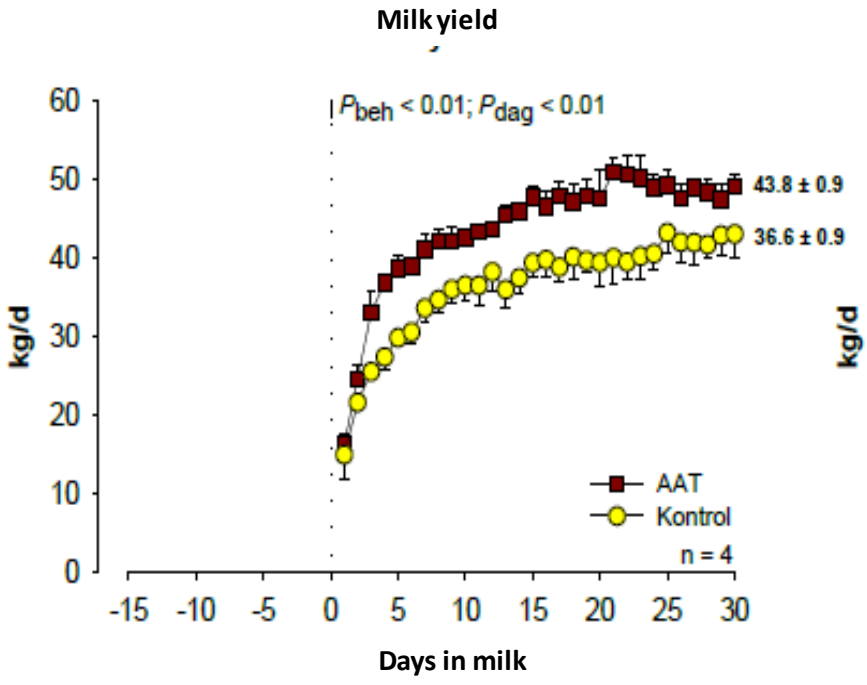
Energy balance (target 100%)

Amino asides absorbed in the small intestine available for milk production (min. 15 g/MJ)

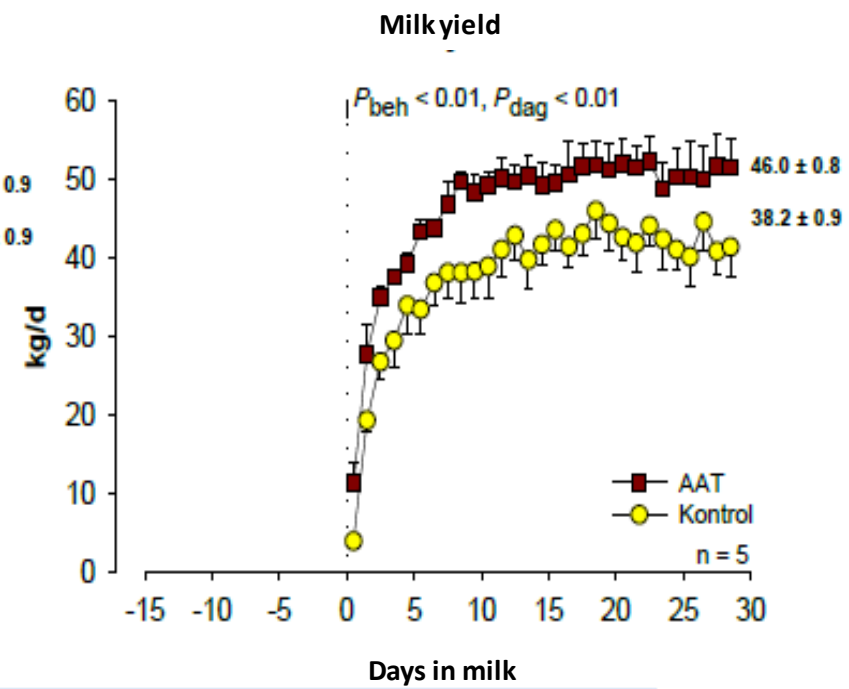
Rumen protein balance (target 10)

Trials with increased AAT to fresh cows

Danish trial



Canadian trial



Increased milk yield on 5-7 kg/day!

Larsen et al., 2013

Data for response analysis

- Protein trials with different protein levels & sources
- Mainly soybean- and rapeseed meal
- Swedish, Norwegian, Finnish, Danish, British & US trials
- Silages: grass, clovergrass, alfalfa, maize
- All diets were calculated according to NorFor in order to obtain energy and nutrient supply
- Final dataset: 32 trials & 87 treatment means

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Variation in nutrients

Variable	N	Avg	Std Dev	Min	Max	10th Pctl	90th Pctl
g AAT/kg DM	87	93	12	63	121	76	107
g AAT/MJ NEL	87	15.5	2.7	7.5	23.8	12.3	18.5
MJ NEL/kg DM	87	6.64	0.65	5.01	8.38	5.94	7.59
g PBV/kg DM	87	32	16	10	81	14	58
g Fatty acids/kg DM	87	28	5.9	18	55	20	32
g (ST+SU)/kg DM	87	276	92	109	439	161	405

Variation in production

Variable	N	Mean	Std Dev	Min	Max	10th Pctl	90th Pctl
ECM, kg/d	87	29.0	5.7	12.6	39.9	20.8	35.1
Milk, kg/d	87	29.5	6.7	13.1	43.7	23.2	38.3
MPY, g/d	87	946	202	422	1371	710	1183
DIM	87	130	54	49	273	63	192

Breeds: HOL, RED & NRF
Mainly older cows

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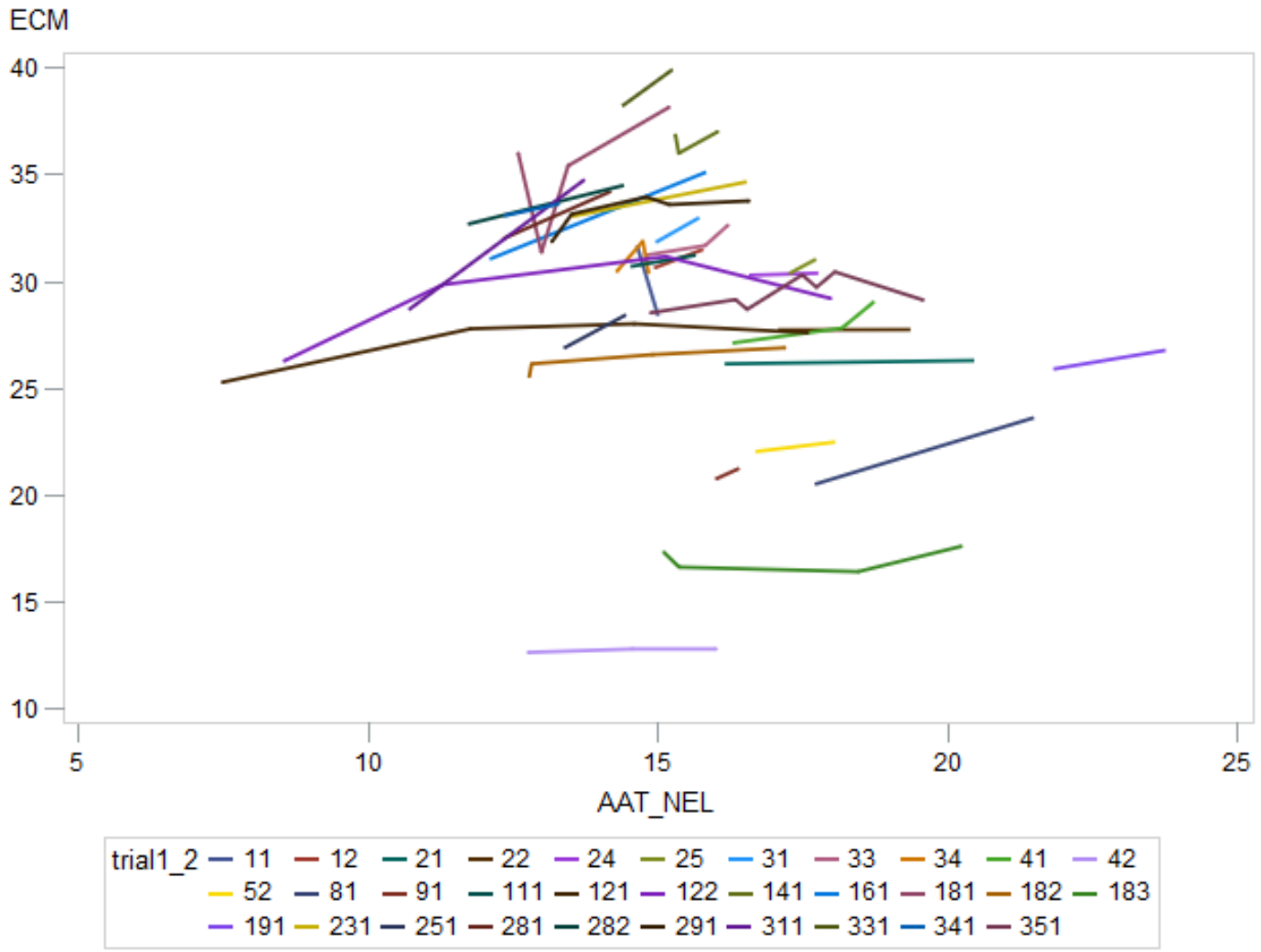
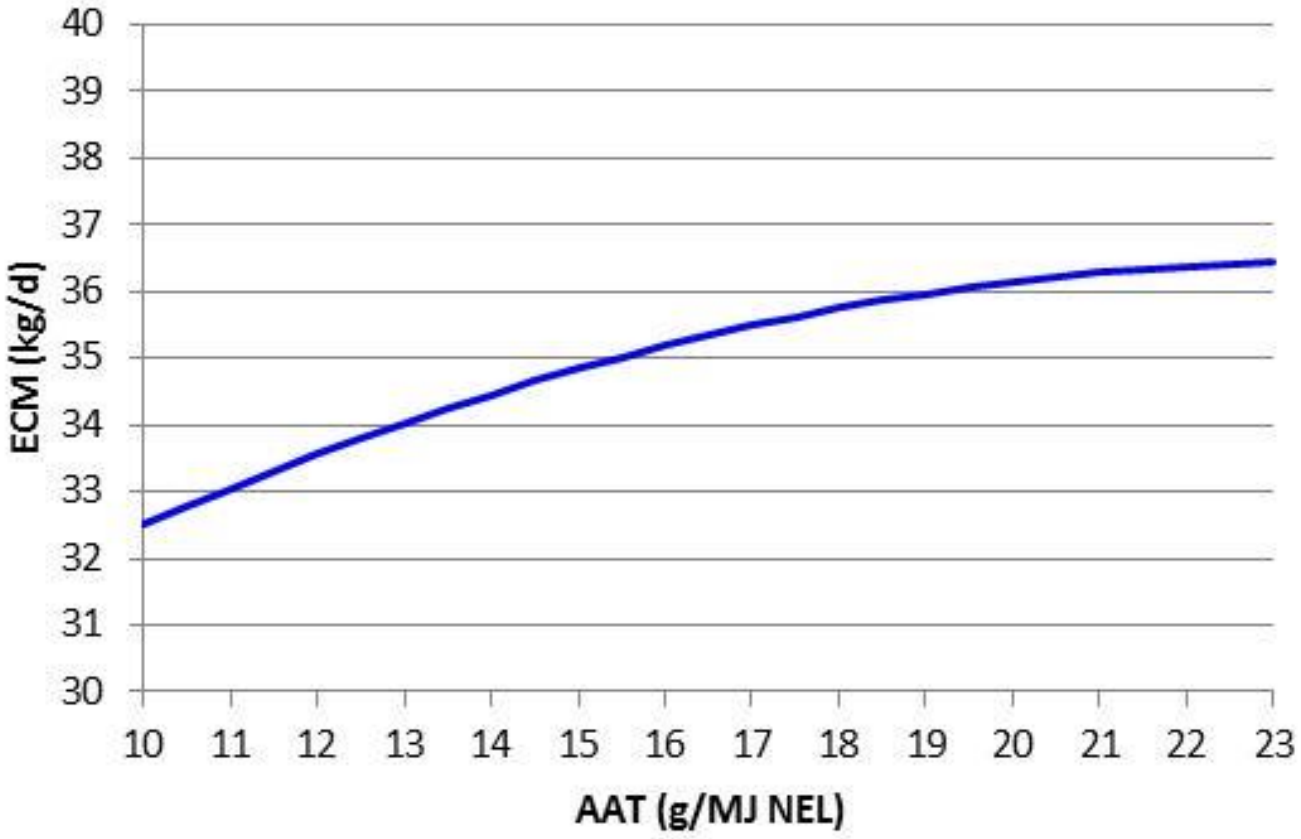
Plot of raw data - ECM



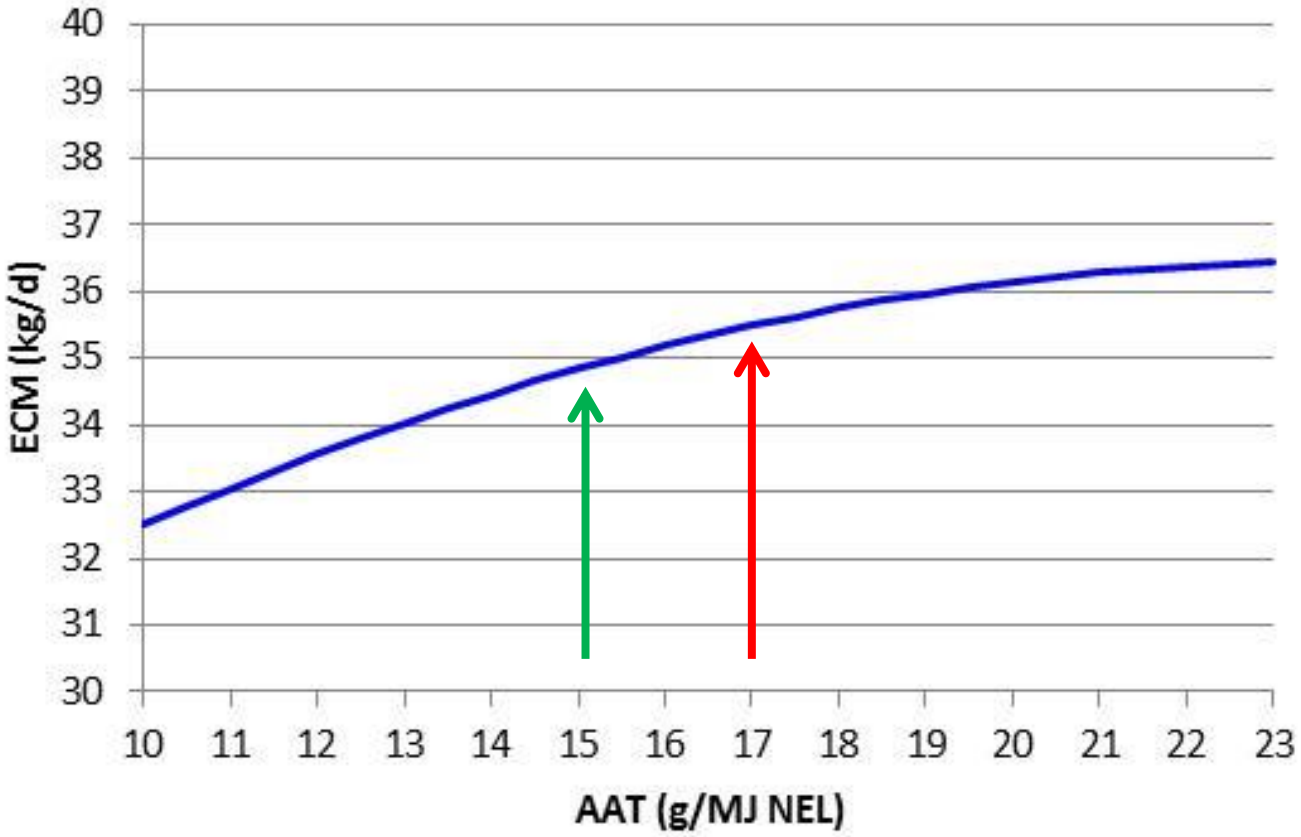
ECM response



HOL
DIM=130
PBV=20
NEL=7.0

Linear ($p<0.01$) & quadratic ($p<0.10$)

ECM response



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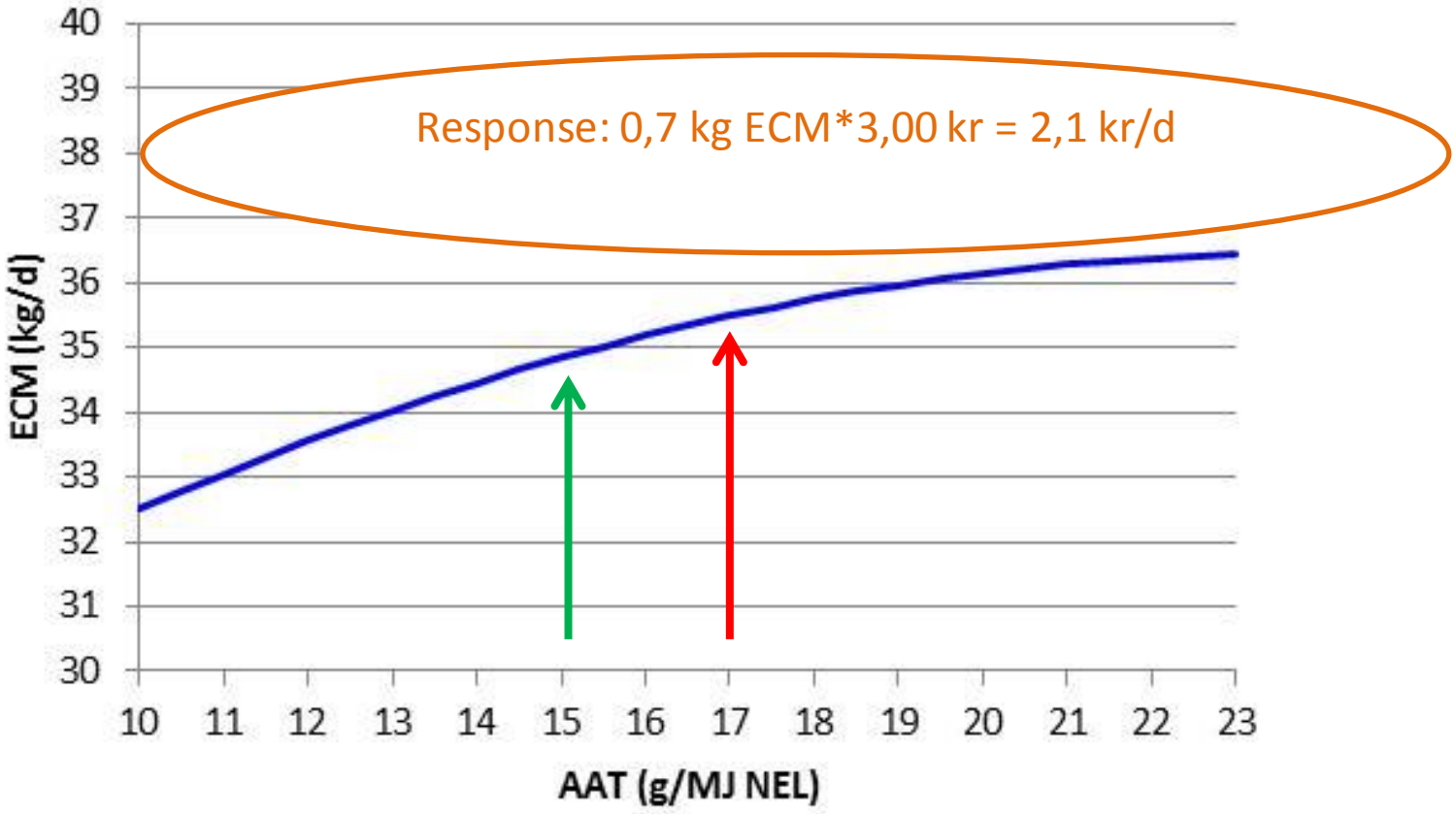
ECM response



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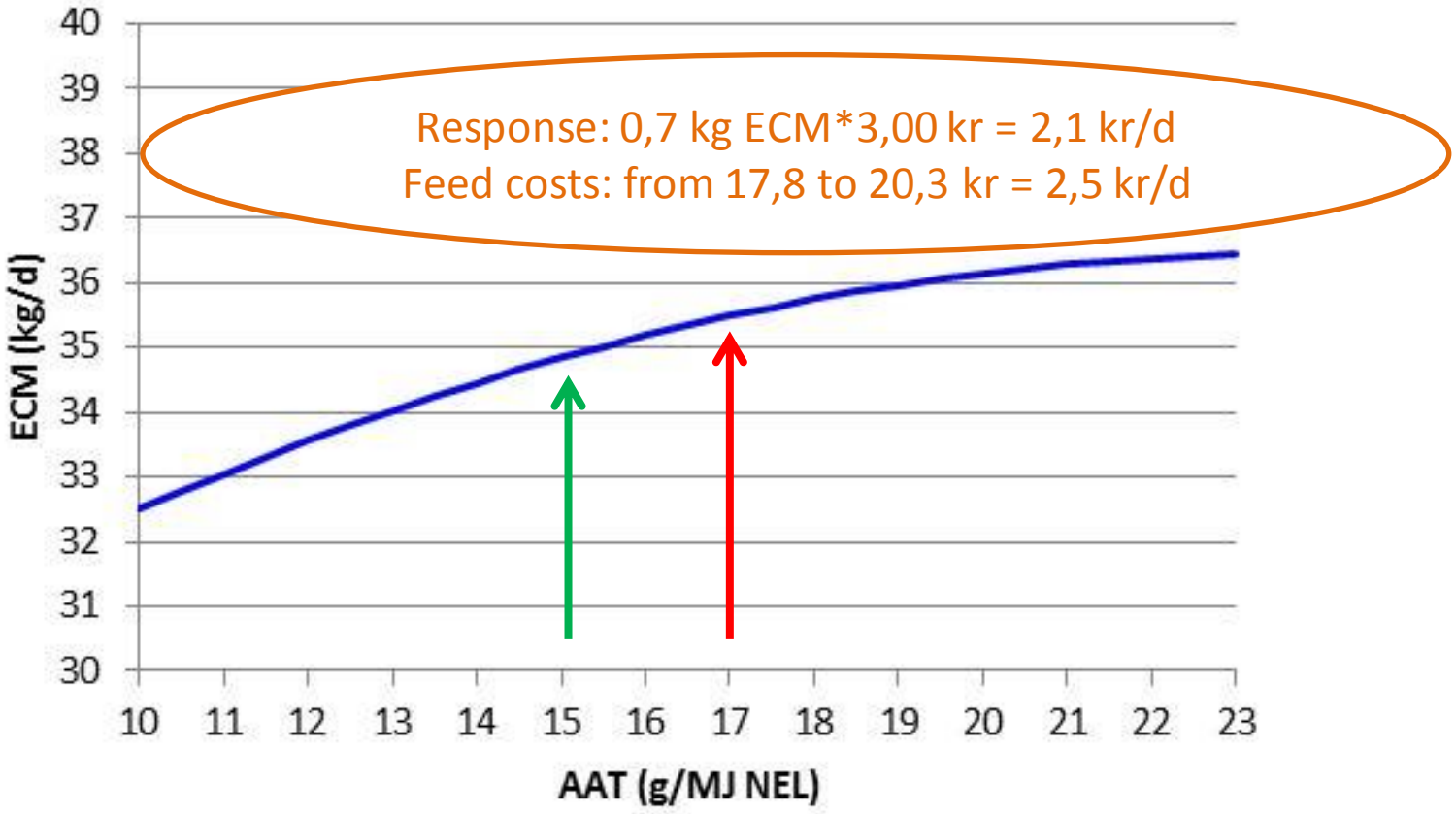


RAPE SEED MEAL HAS REPLACED SOY BEAN MEAL WHEN PRODUCING MILK BASED ON NON-GM FEED

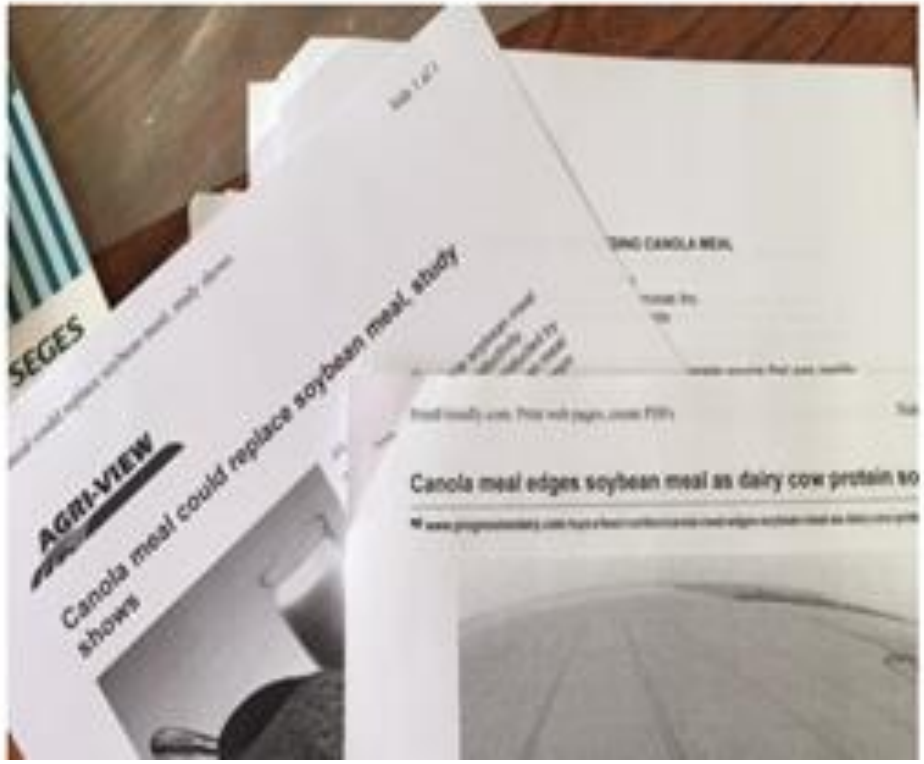
(kg DM/day)	Jersey (n=26)		Large breed (n=63)	
	Before	After	Before	After
Rape seed products	2,79	3,44	2,08	3,15
- Rape seed meal	0,15	0,80	0,26	1,02
Soy bean meal	0,61	0,14	0,82	0,10

FEEDING CONTROLS INDICATES NO CHANGE IN ECM AS RSM REPLACES SBM

	Jersey (n=26)		Large breed (n=63)	
	Before	After	Before	After
CP (g pr kg DM)	171	169	169	167
AAT (g pr MJ)	16,9	16,5	16,1	15,6
PBV (g pr kg DM)	13	14	20	21
FA (g pr kg DM)	35	37	32	33
NDF (g pr kg DM)	324	320	329	319
Energy eff. (%)	103	103	100	99
Conc. share (%)	41	42	41	41
ECM (kg/day)	29,9	30,0	32,2	32,4

COMMERCIAL NON-GM HERDS SEEMS TO CONFIRM UNIVERSITY TRIALS

- Internationale studier viser at rapsskrå bidrager med unedbrudt foderprotein og aminosyrer til absorption i tarmen på linje med sojaskrå



Conclusion

- AAT increases milk yield in older cows in early lactation
- Response to AAT for TMR-feeding is limited
- Increasing starch shows no clear response
- We have to look into if the AAT-value in SBM is over-rated relative to RSM