NorFor
Nordic Feed Evaluation System

Milk production responses to increased supply of AAT

A meta-analysis

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Introduction

- Traditionally feed evaluation systems have minimized feeding costs within certain constraints for energy (MY), feed intake, structure, NFC, AAT, PBV, FA etc.
- We want to optimize the economy in feeding dairy cows, i.e. we want the highest ”milk income over feed costs” (MOF)
- I.e. we need response functions for these nutrients

Recommendations in NorFor

- AAT: minimum of 15 g AAT/MJ (and max of 17)
- AAT/MJ = Available AAT for milk/(3.14*kg milk)
- PBV: minimum of 10 g/kg DMI
- These recommendations were made in order to optimize DMI & ECM – not to maximize
- Should these be revised ?

Data

- 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
- Table values were used if not available in the reference

Criteria to data

- In order to be characterized as an AAT-trial, a difference of >3 g AAT/kg DMI between lowest and and highest group was set as a criteria
- Furthermore, we wanted to determine the response of AAT from trials where the recommendation of PBV was fulfilled, i.e. PBV should be >10 g/kg DMI
- Total dataset: 63 trials & 166 treatment means
- Final dataset: 32 trials & 87 treatment means

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

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Variation in AAT and PBV according to stage of lactation

		g AAT/kg DM				g AAT/MJ NEL				g PBV/kg DM			
DIM	N	Avg	Std	Min	Max	Avg	Std	Min	Max	Avg	Std	Min	Max
<100	30	94	13	63	121	14.6	2.9	7.5	21.5	32	18	11	81
100-200	50	94	10	66	115	15.9	2.4	10.7	23.7	32	16	10	78
>200	7	78	11	64	94	16.0	2.5	12.8	20.2	32	11	19	49
Total	87	93	12	63	121	15.5	2.7	7.5	23.7	32	16	10	81

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

Model

- Full model:

  Y = ECM or MPY

  X = AAT/NEL, AAT/NEL^2

  PBV/DM, PBV/DM^2

  NEL/DM, NEL/DM^2

  FA/DM, FA/DM^2

  (ST+SU)/DM, $(ST+SU)/DM^2$

  Breed

  DIM, DIM^2

  & the effect of trial as a random term

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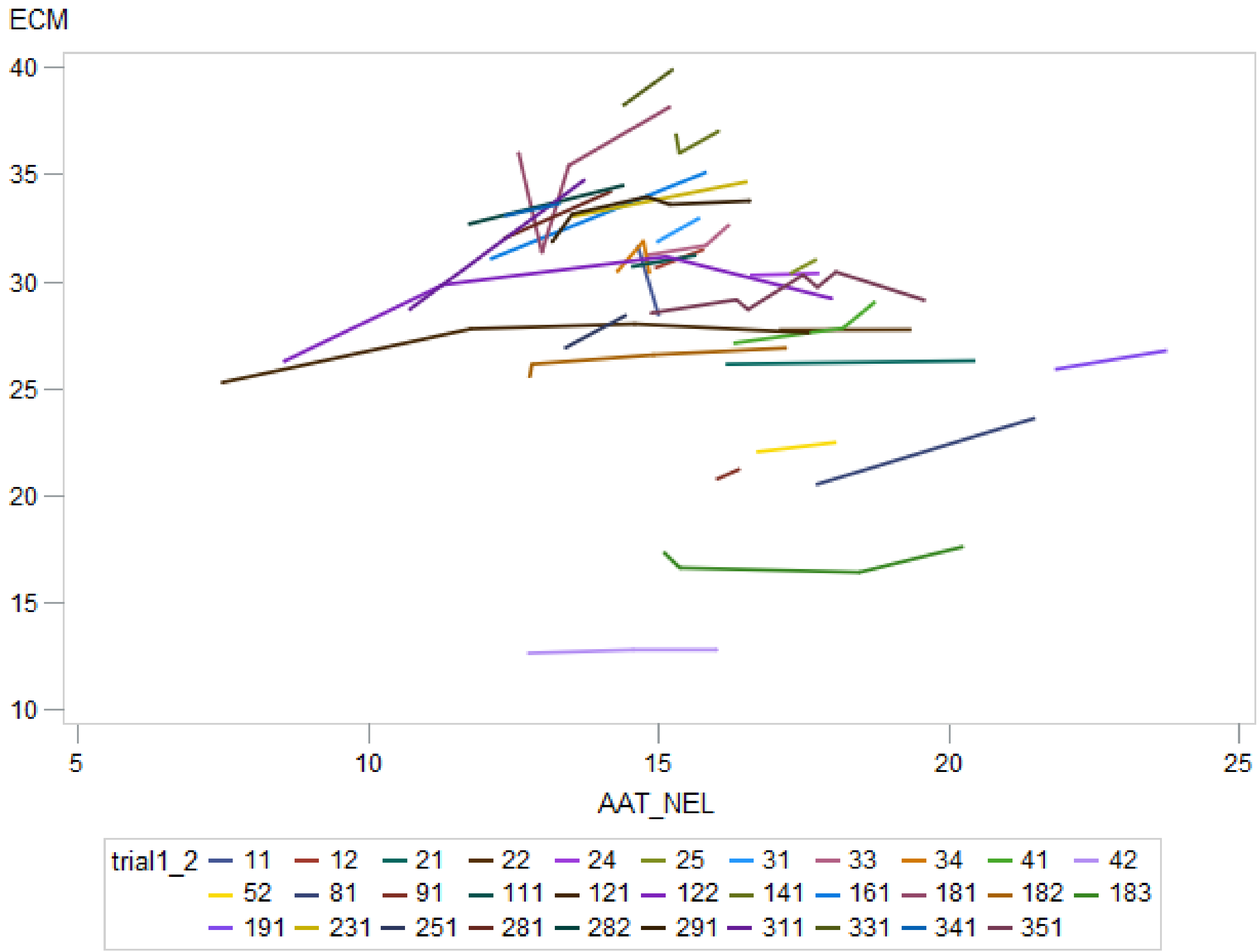
Plot of raw data - ECM



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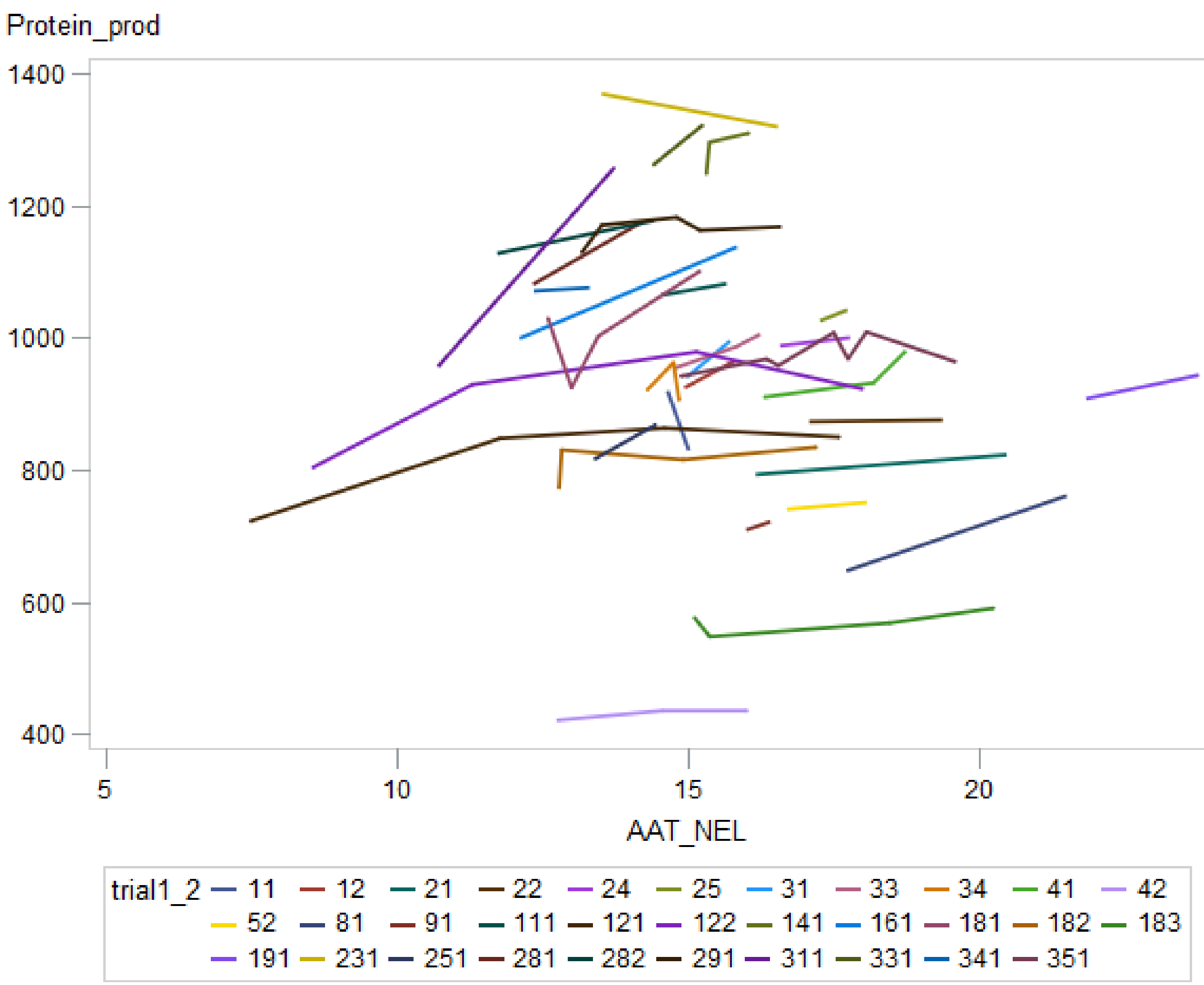
Plot of raw data – MPY



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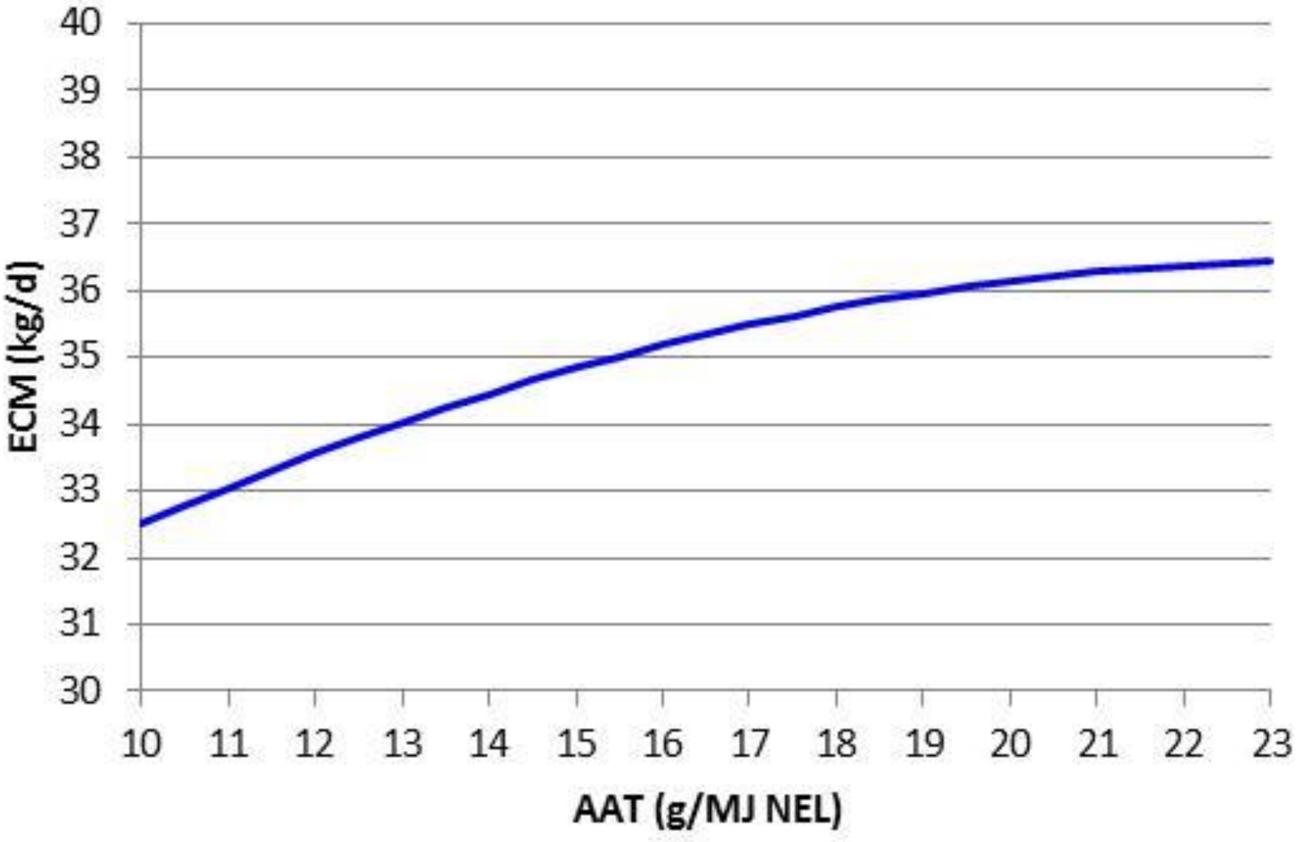
ECM response



HOL
DIM=130
PBV=20
NEL=7.0

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

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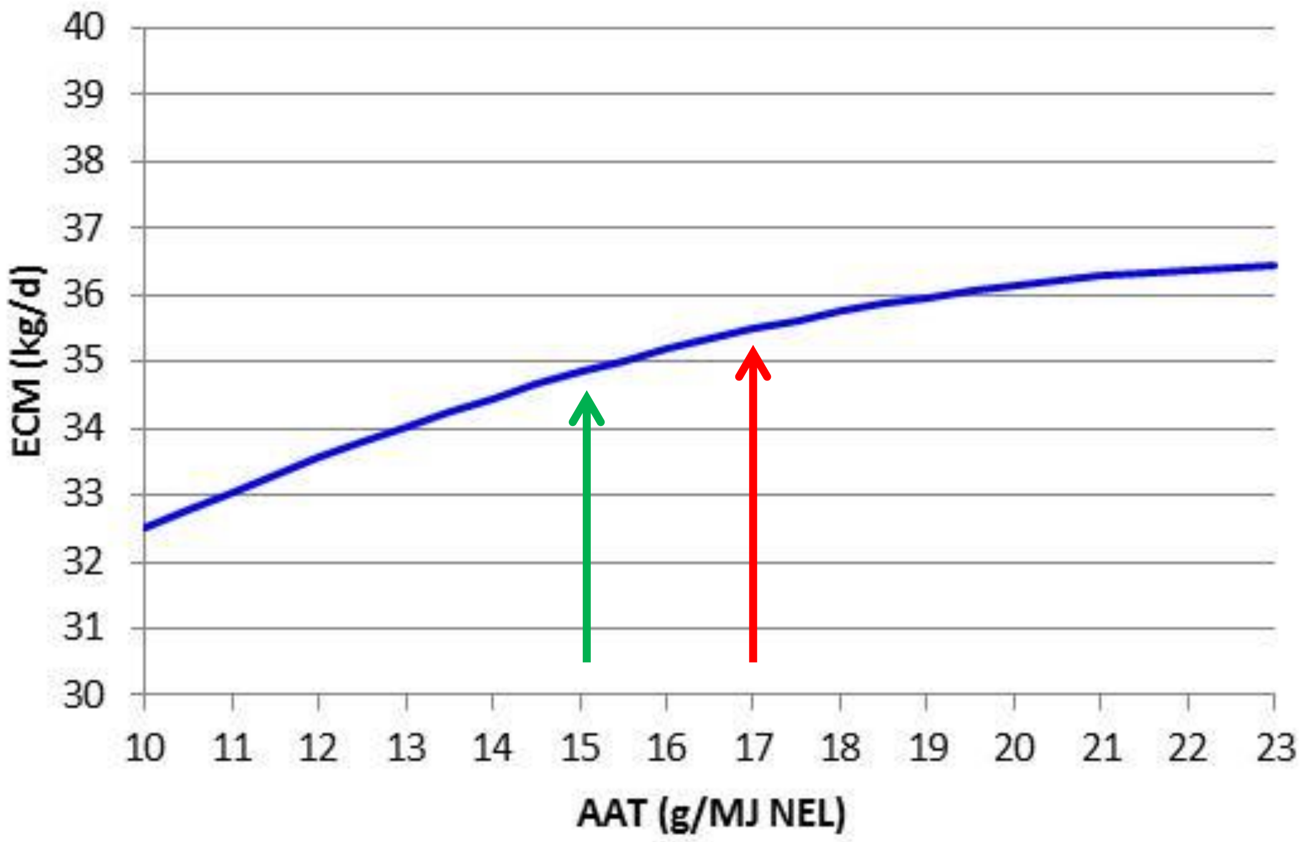
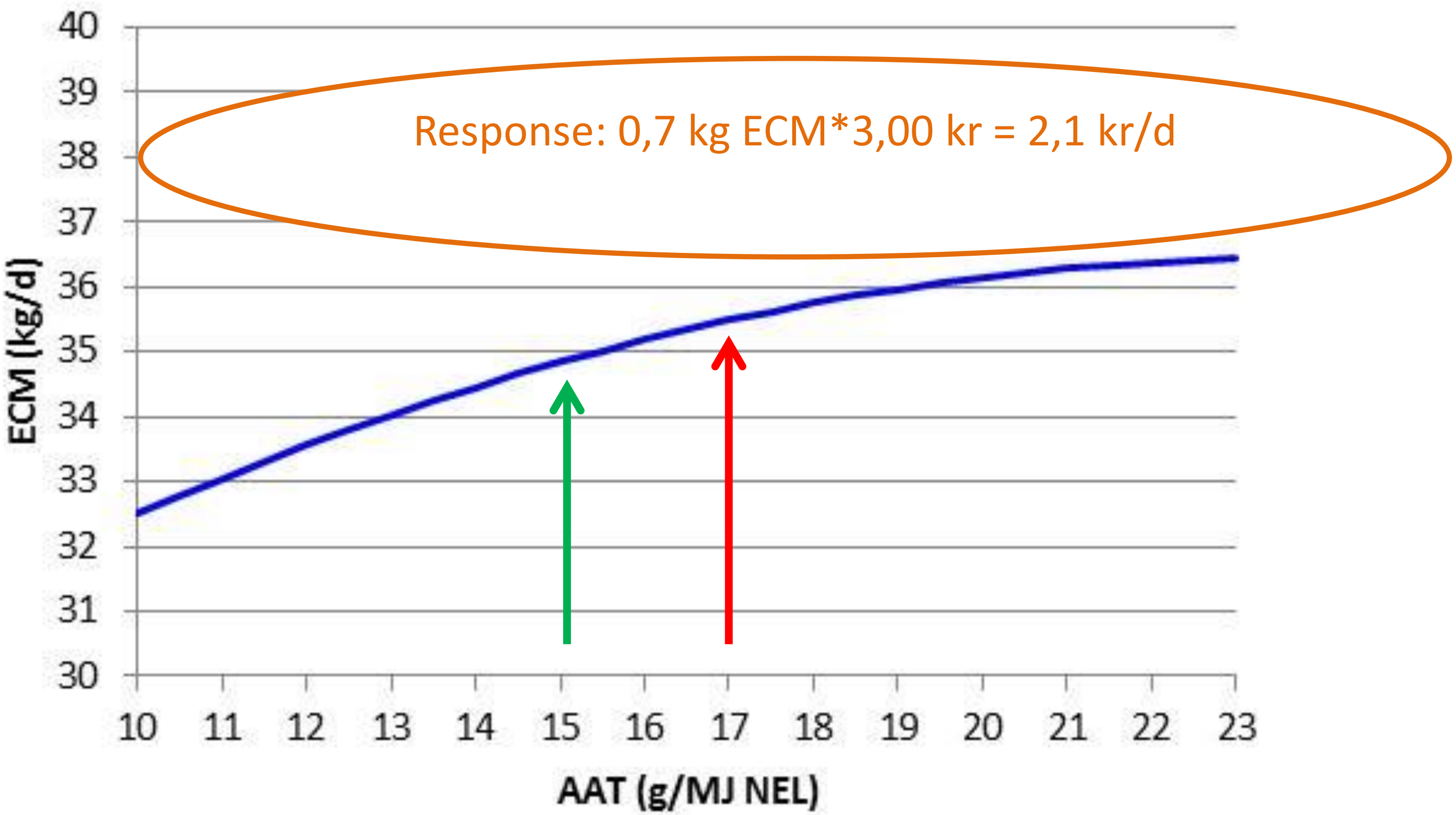
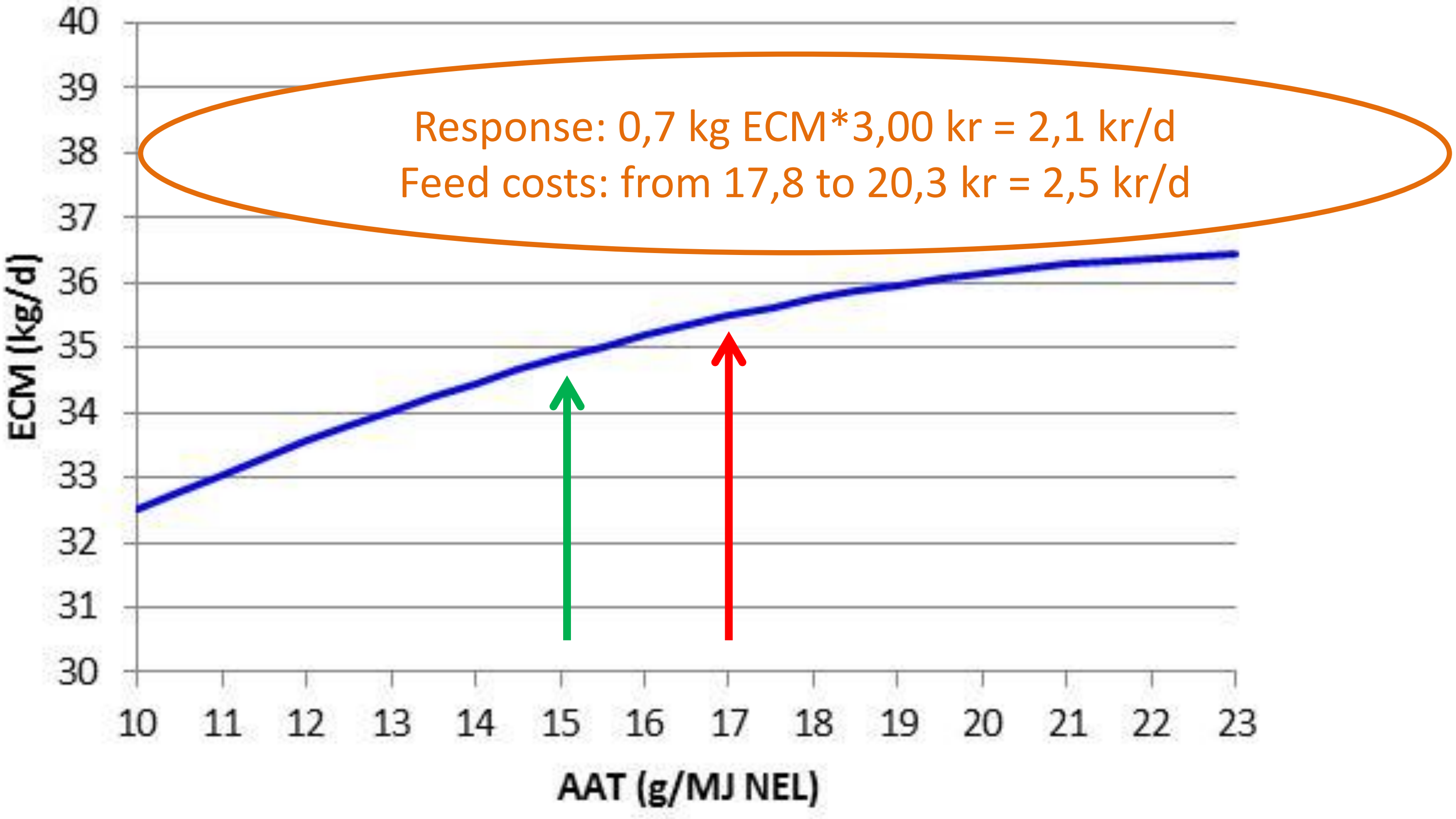
ECM response



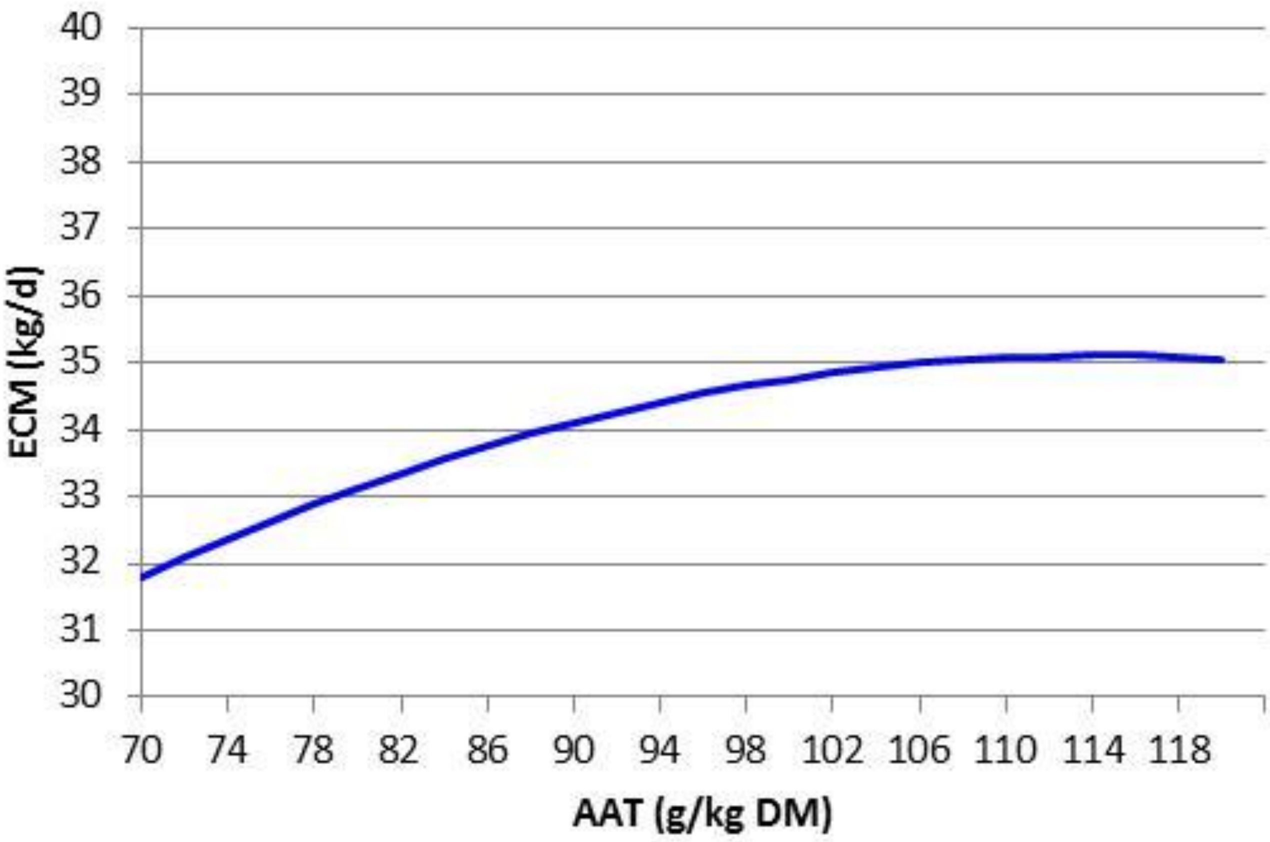
ECM response



ECM response

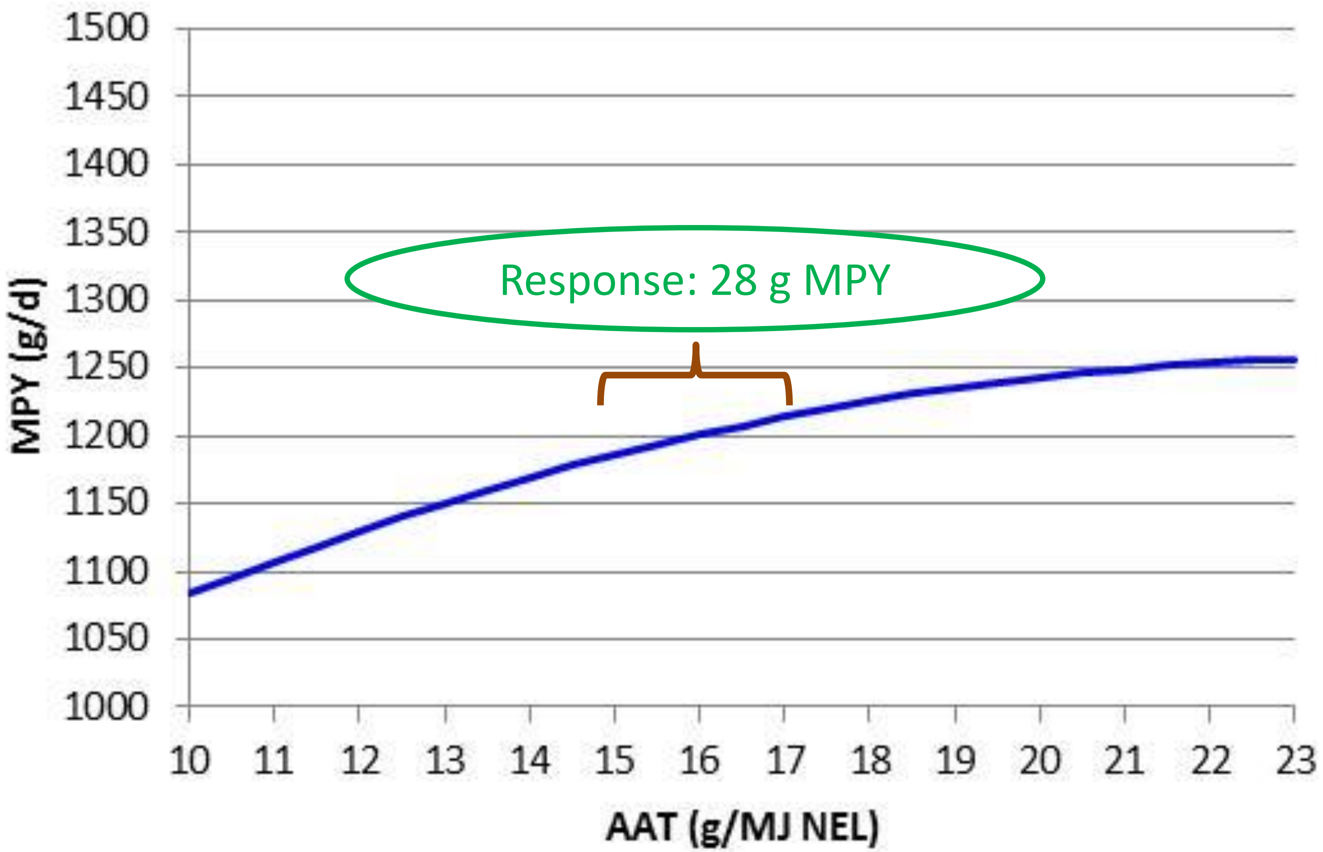


ECM response



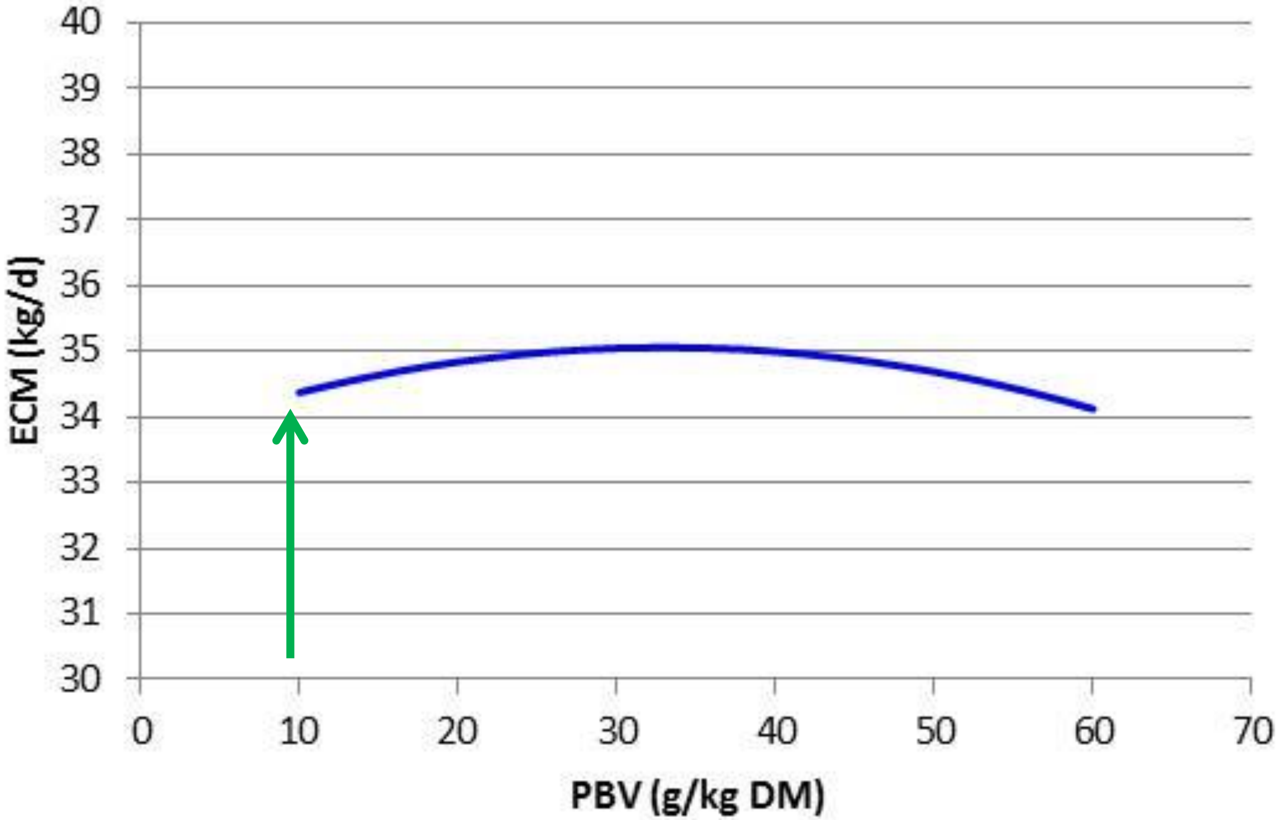
Linear & quadratic terms are significant ($p<0.05$)

MPY response



Linear & quadratic terms are significant ($p<0.05$)

Small positive response of PBV above 10 g/DM



HOL
DIM=130
AAT=15
NEL=7.0

Linear & quadratic terms are significant ($p<0.05$)

Conclusion

- Significant response in ECM and MPY to increased supply of AAT
- Max ECM and MPY was obtained at 23 g AAT/MJ
- Preliminary economic calculations indicates that the current rec of 15 g AAT/MJ is suitable
- Next step is to implement/visualize these response functions in the optimization of diets in NorFor

Questions ?

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