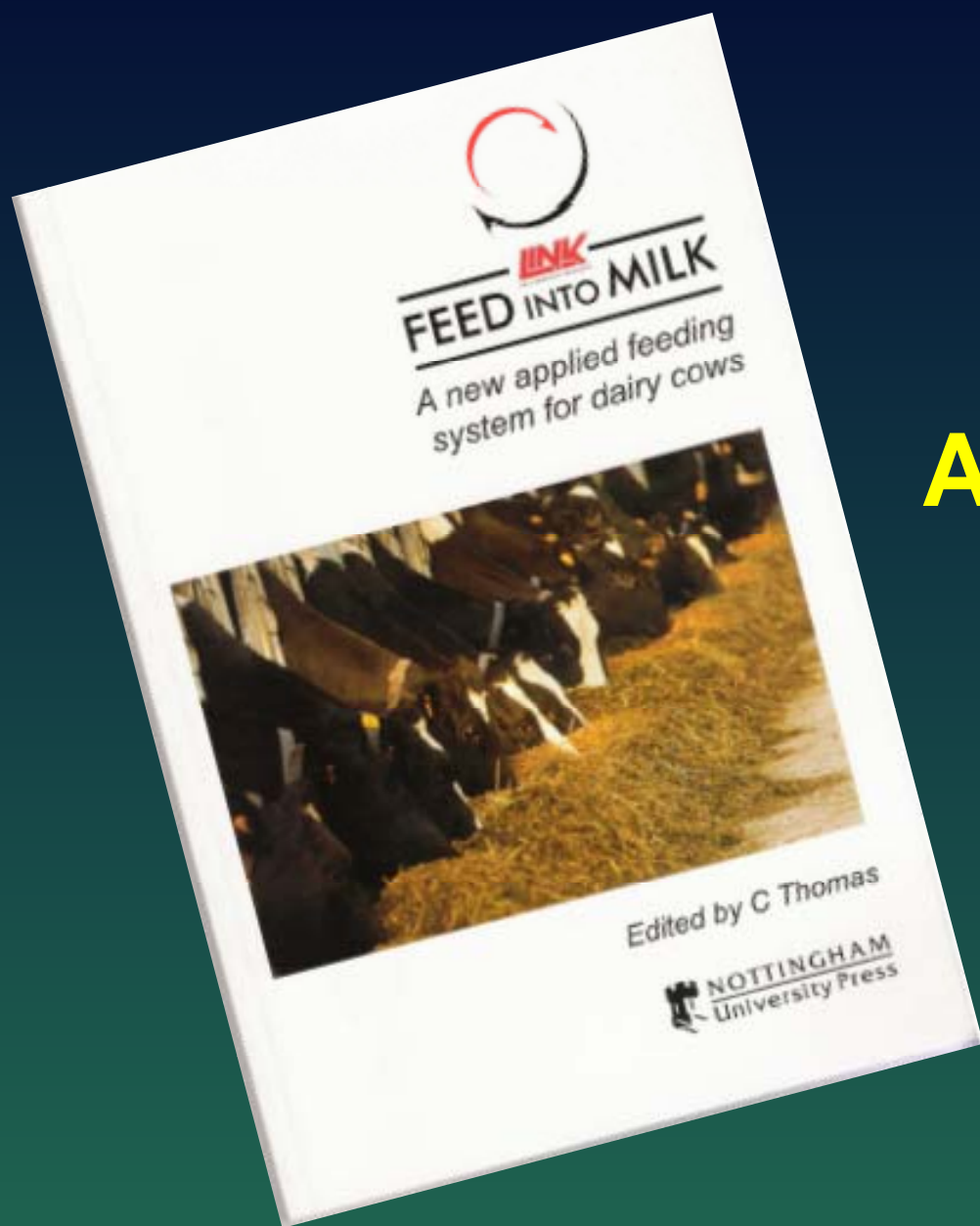


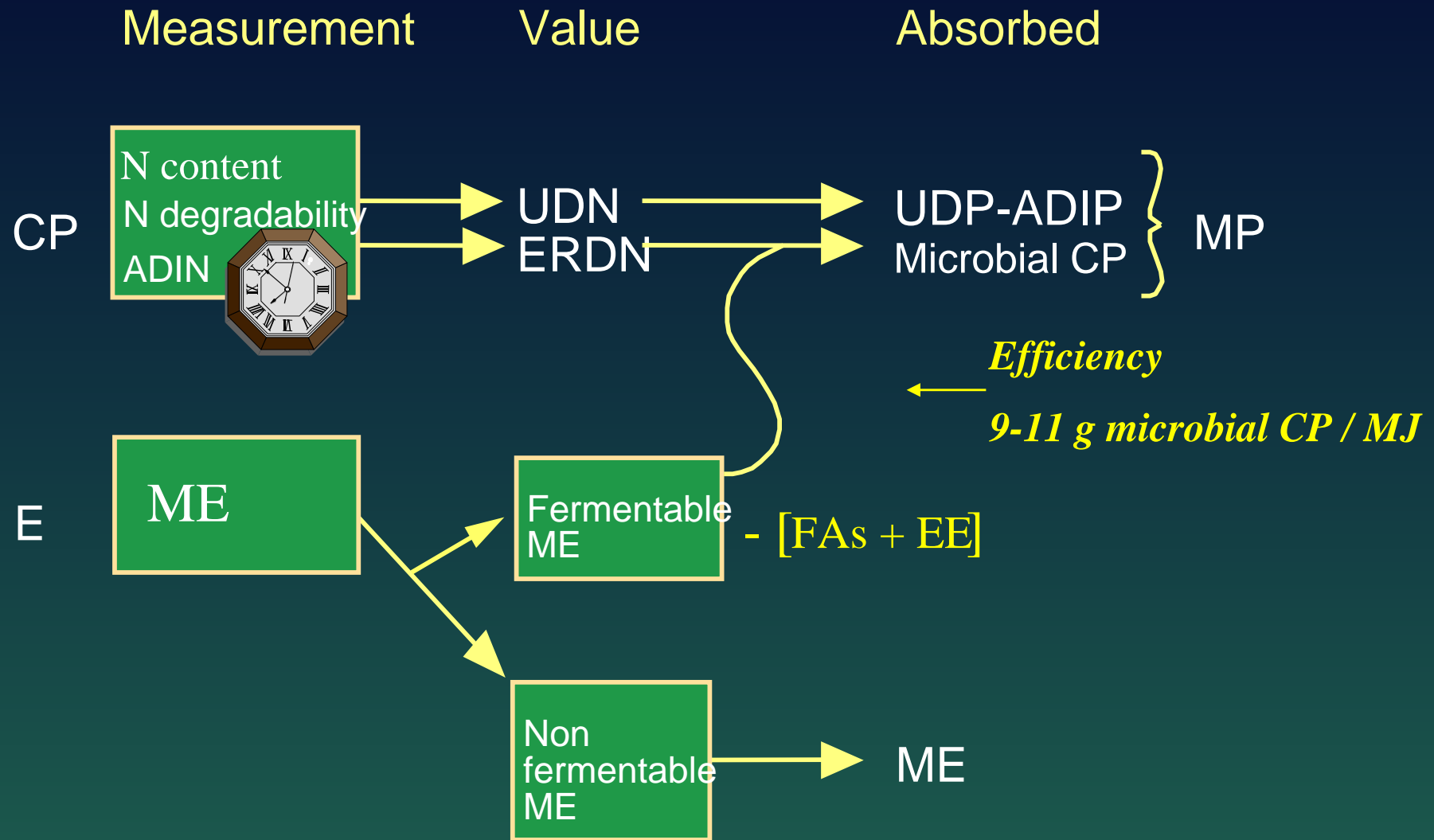
# REDNEX WORKSHOP 23 AUGUST 2008



## **FIM APPROACH TO PROTEIN SUPPLY AND REQUIREMENTS**

Ian Givens and Cled Thomas

# MP System Feed Characterisation Scheme



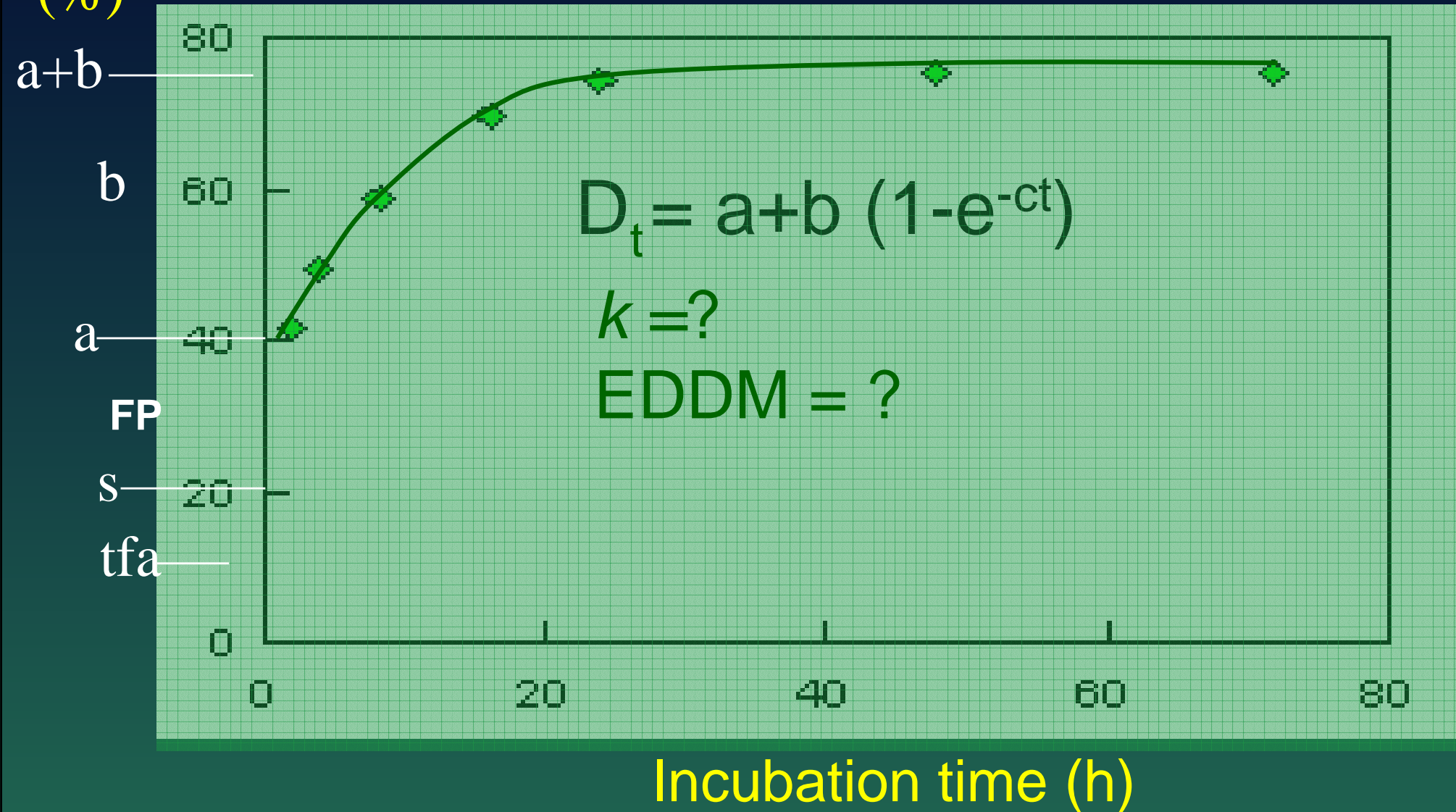
# KEY OBJECTIVES OF FiM RUMEN

- Improve characterisation of feed energy for microbes
- Dynamic description of the energy that microbes derive from degradation
- Create an system which predicts microbial and hence metabolisable protein supply better than the MP system - especially for HY cows

# ENERGY SUPPLY TO RUMEN

# ESTIMATING DM DEGRADABILITY *IN SITU*

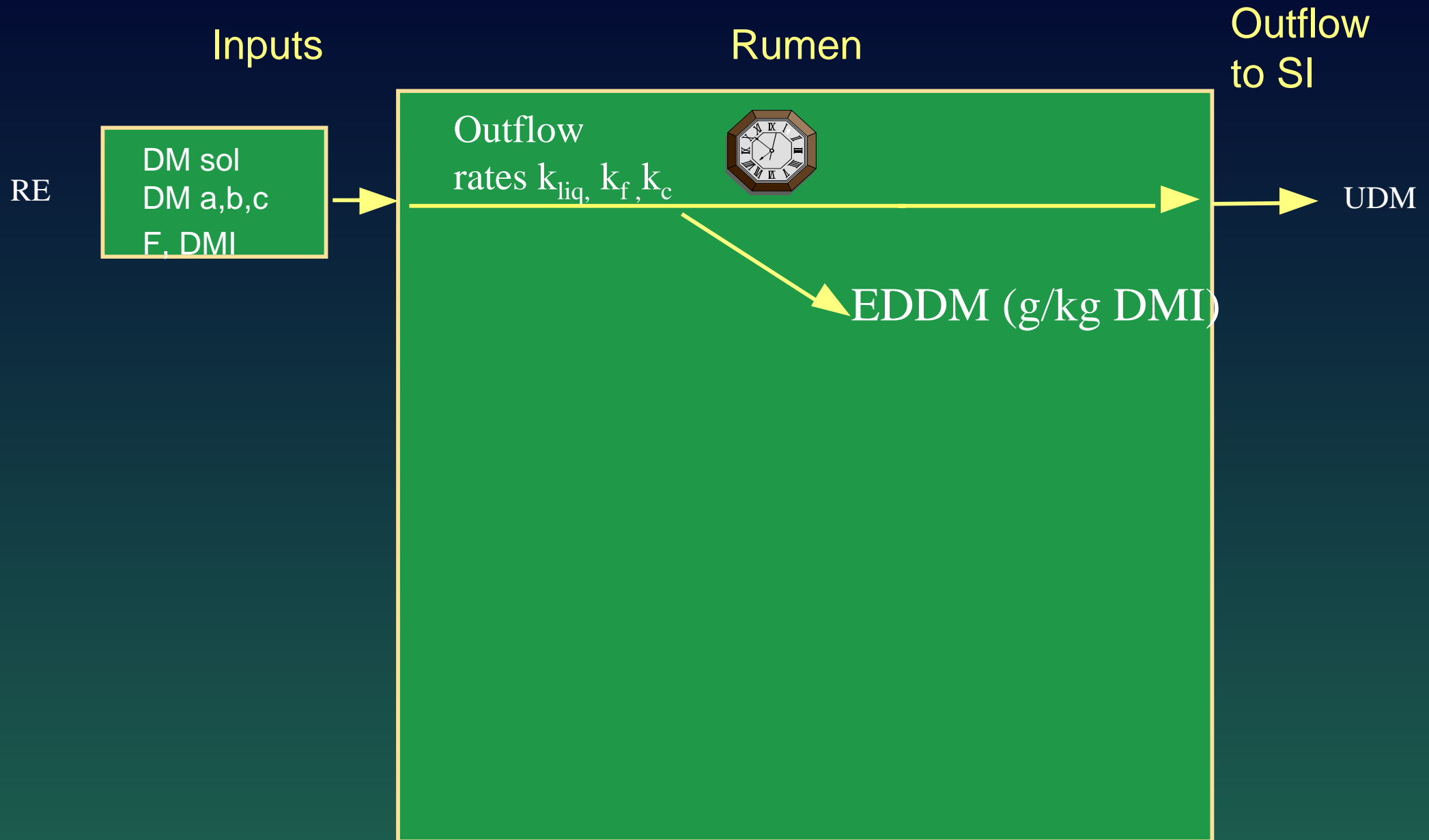
Deg  
(%)



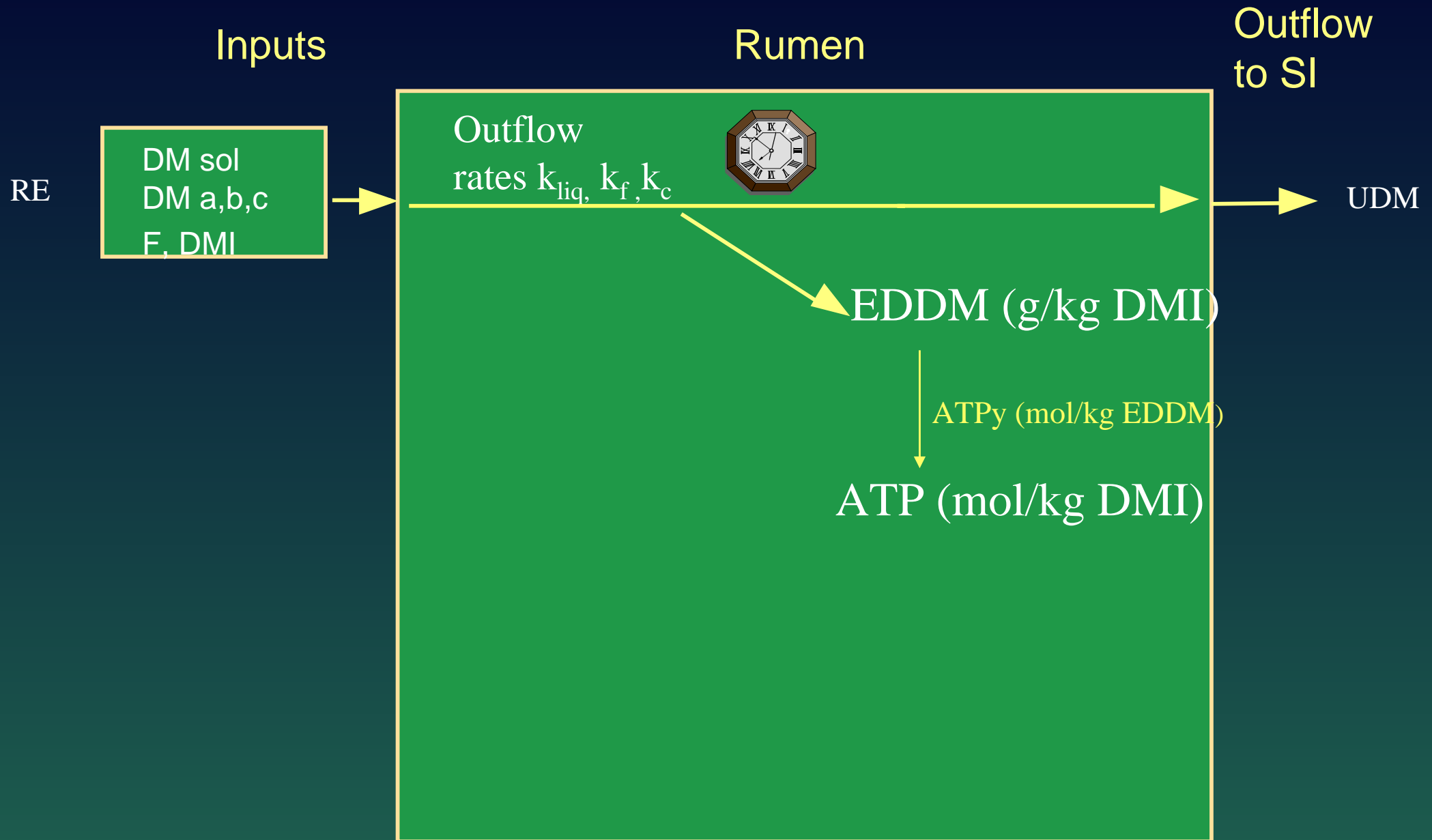
# REVIEW OF OUTFLOW RATE DATA

- Recent data relevant to UK examined
- Models of Sauvant and Archimède (1989) adopted
- Effect of animal production level less than MP
- Fractional outflow rates for forages, concentrates and liquids defined separately
- Defined by DMI, metabolic LW and prop of forage
  - ⇒S fraction flows with liquid phase highly degraded
  - ⇒FP fraction flows with liquid phase degraded at 'c'

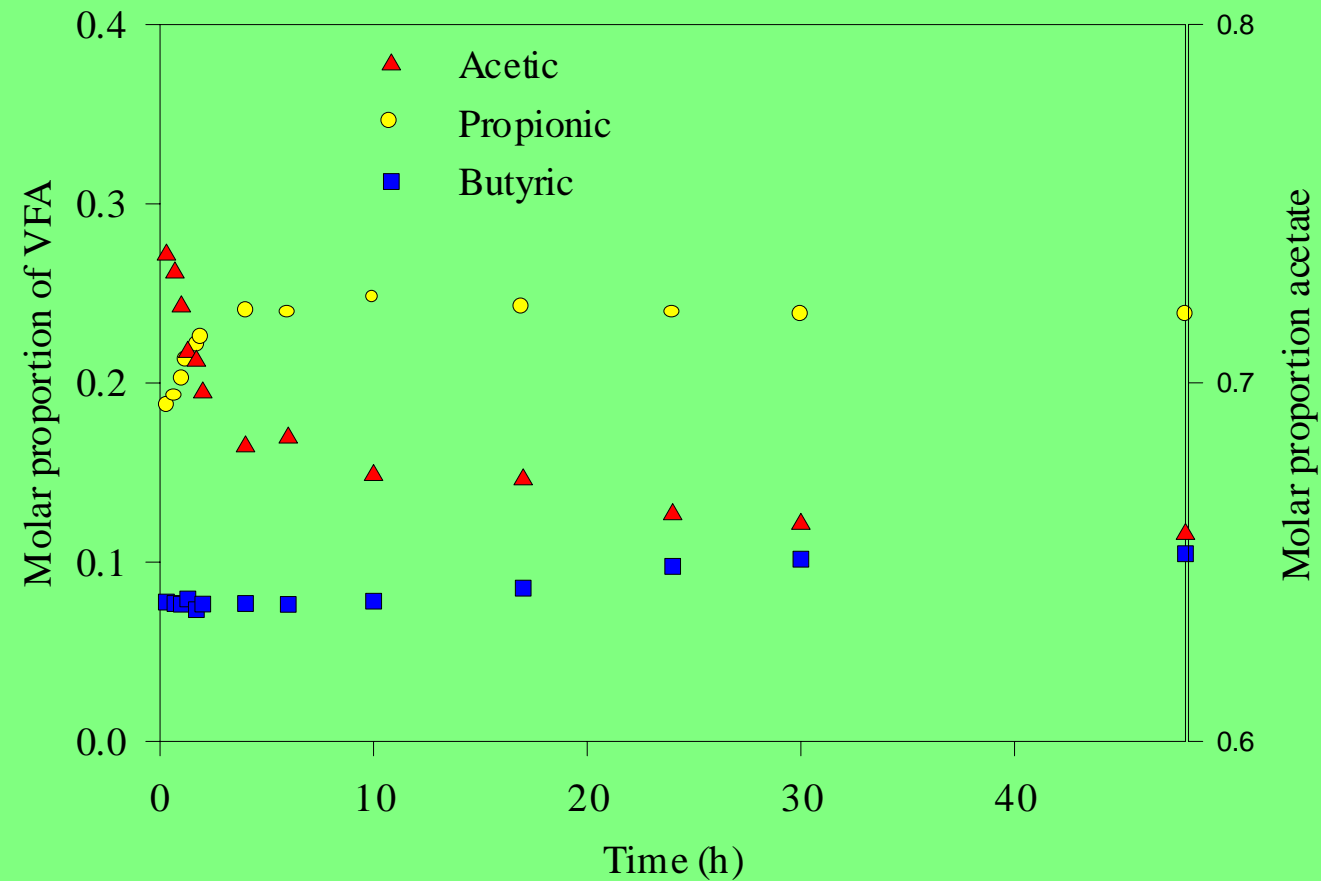
# FIM Feed Characterisation Scheme- Rumen Aspects



# FIM Feed Characterisation Scheme- Rumen Aspects

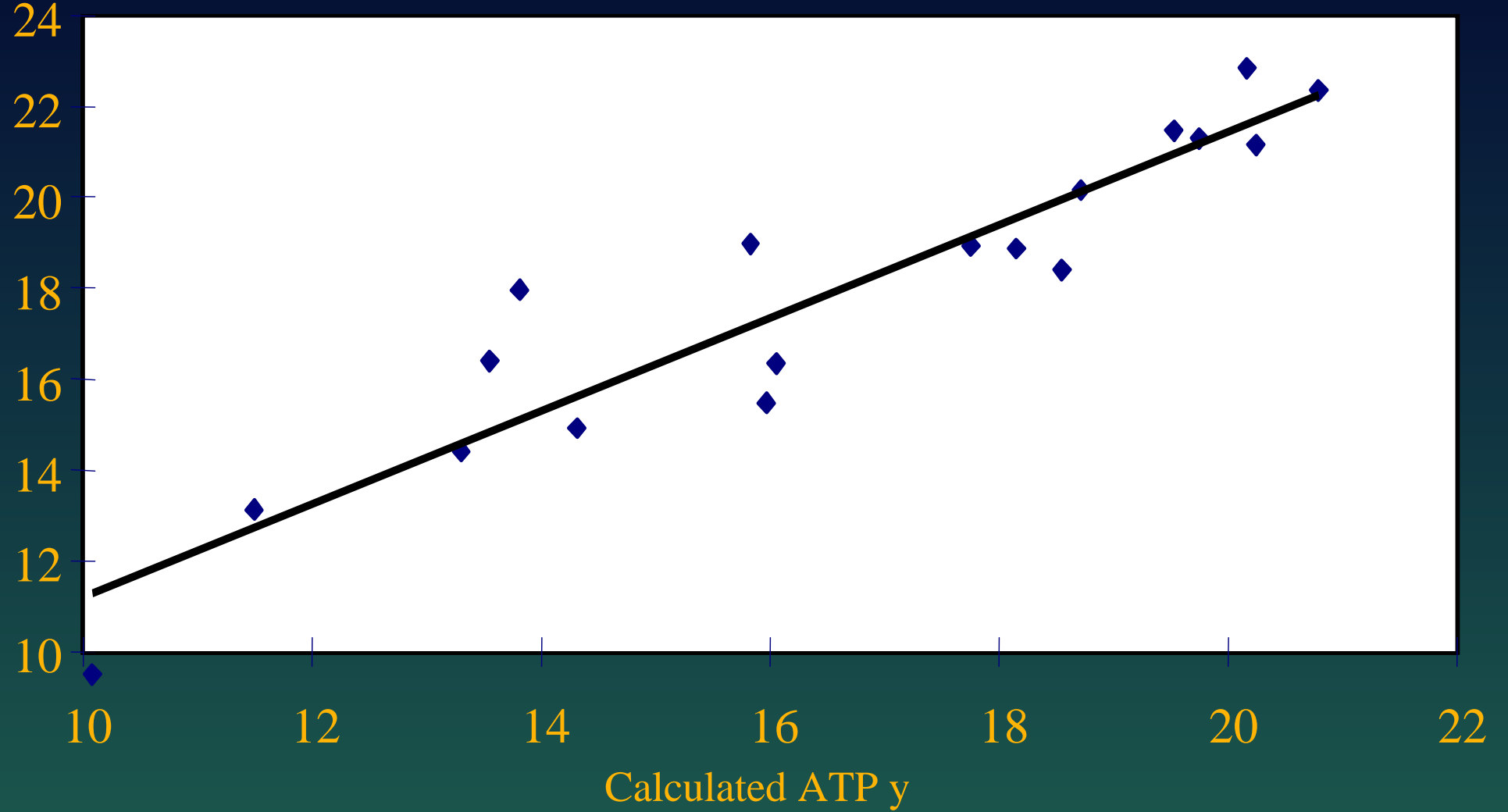


# Changes in VFA proportions with time with dried grass (Rymer, unpublished)

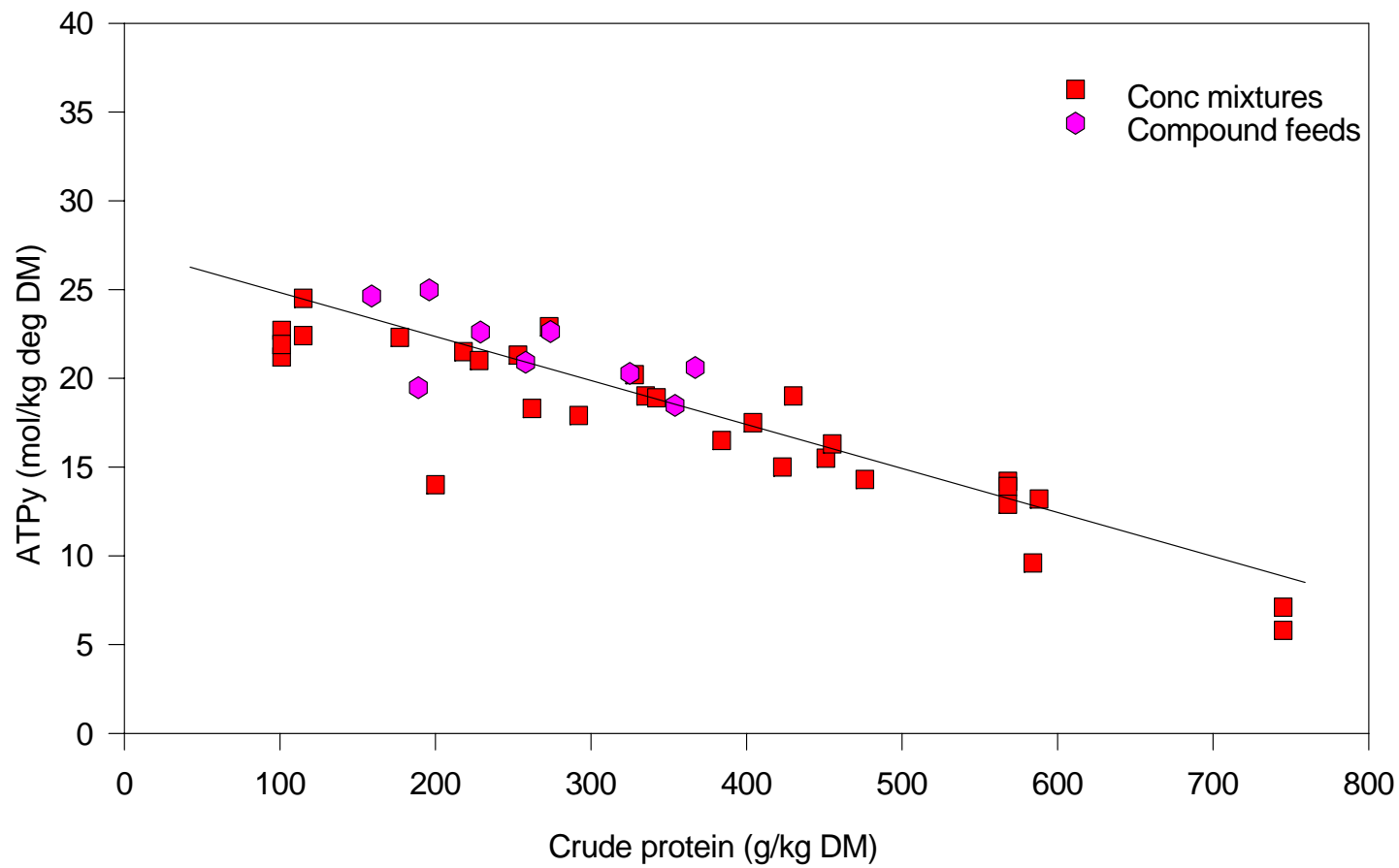


# Additivity of ATP<sub>y</sub> (mol/kg DM degraded) in feed mixtures

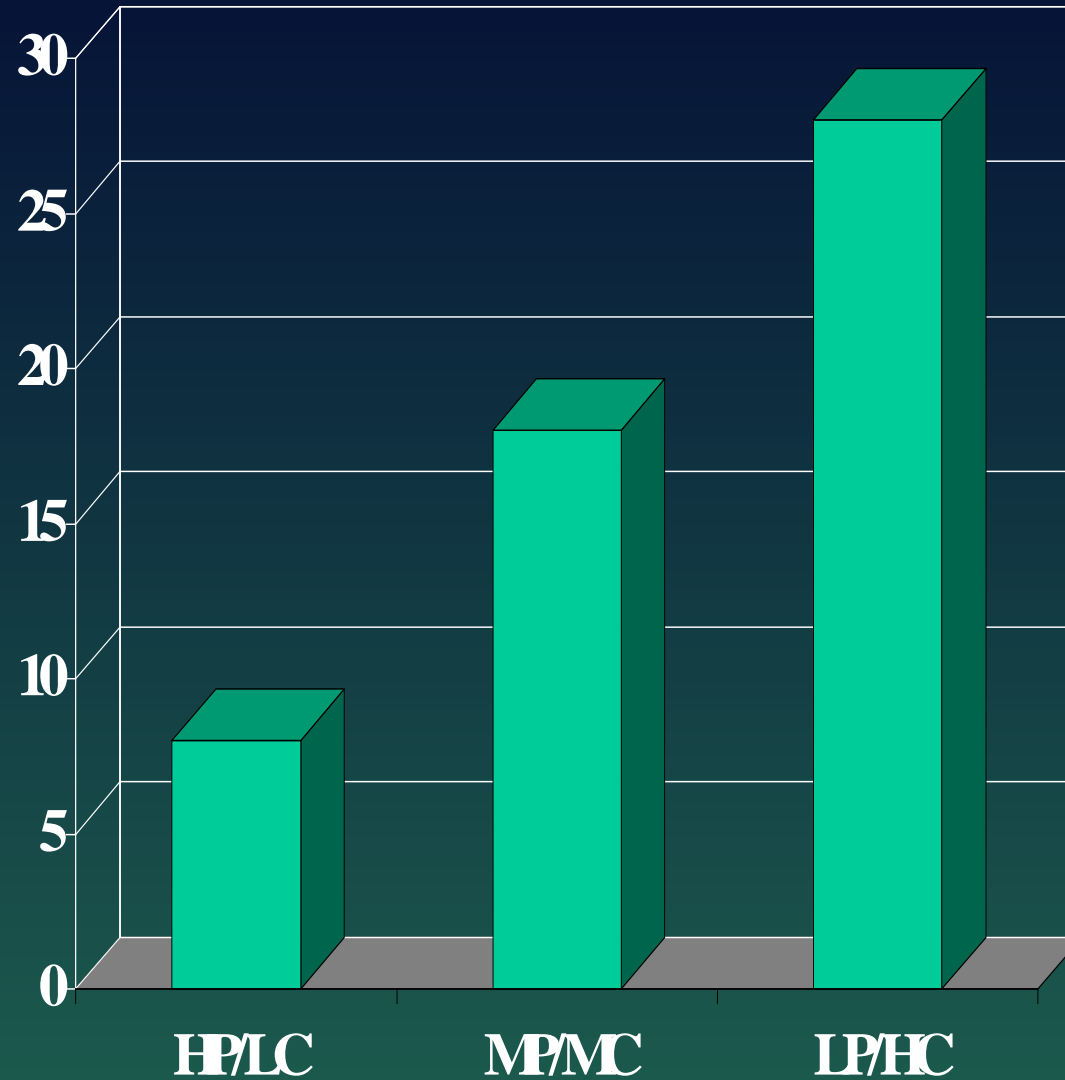
Measured ATP<sub>y</sub>



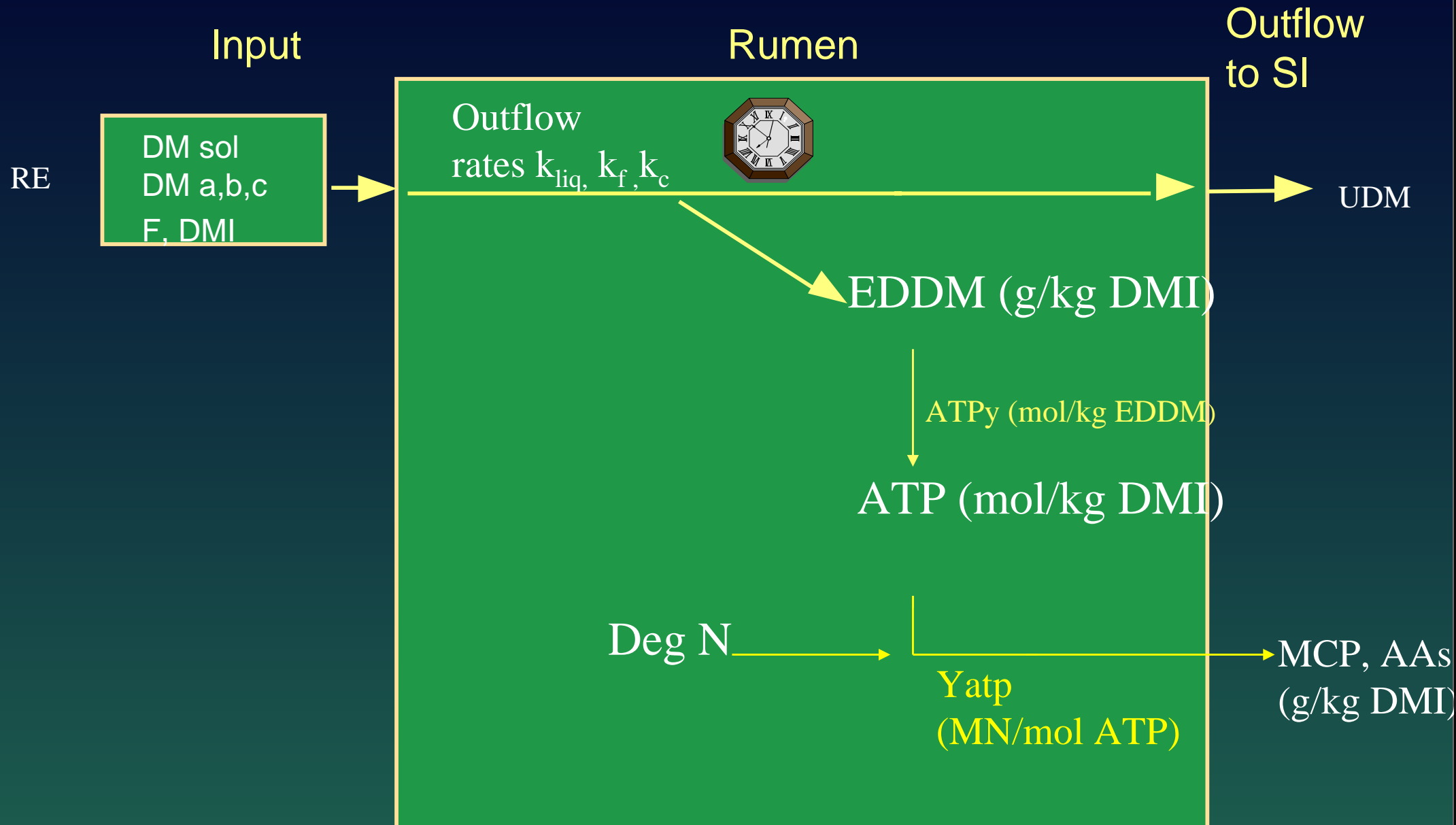
# PREDICTION OF ATP<sub>y</sub>



# Energy Supply to Rumen Microbes (ATP, mmol/g DDM)



# FIM Feed Characterisation Scheme- Rumen Aspects



# $Y_{ATP}$

Efficiency of use of ATP for microbial synthesis:

$$Y_{ATP_{liq}} = 9 + 50k_{liq}$$

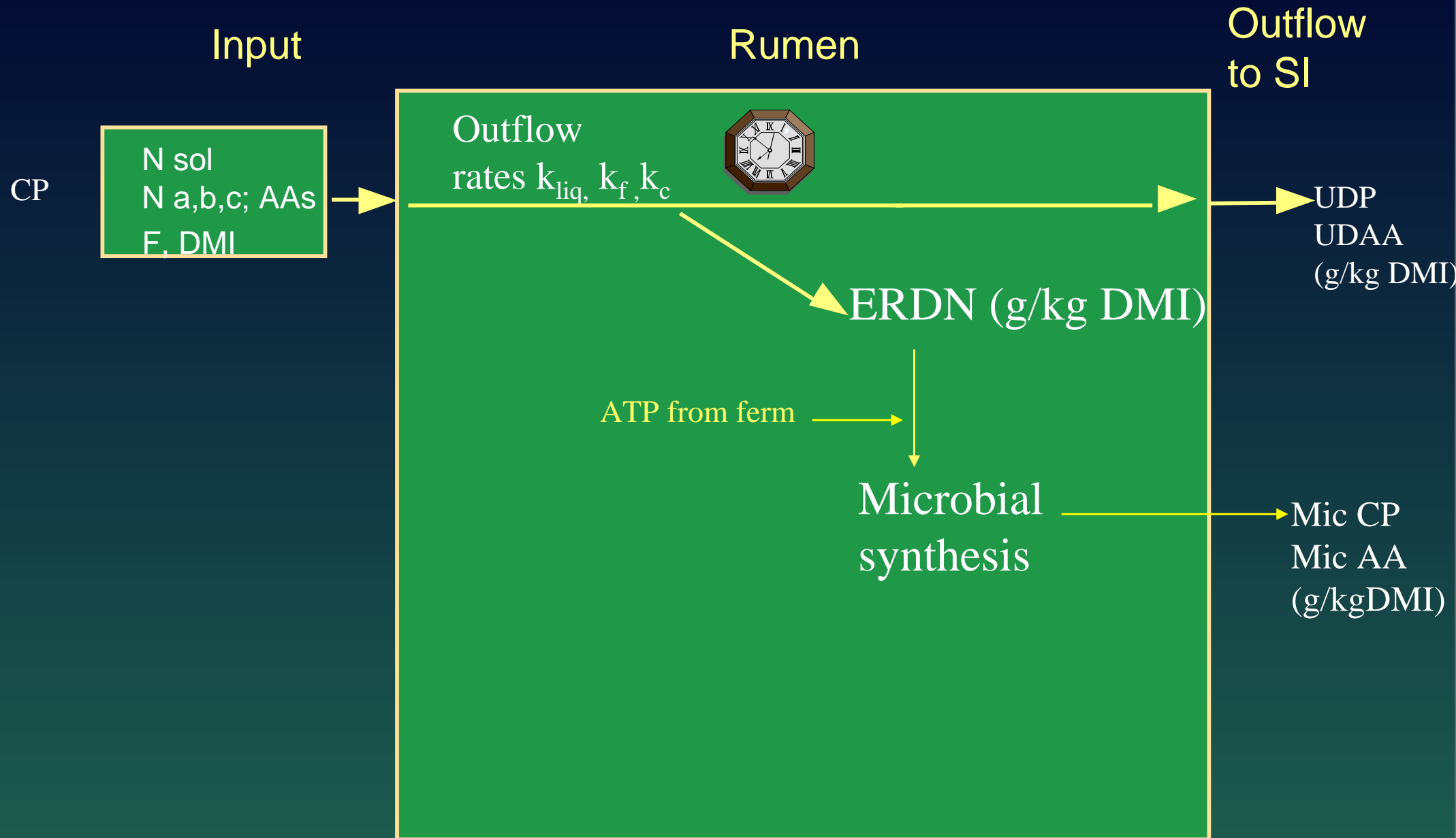
$$Y_{ATP_f} = 9 + 50k_f$$

$$Y_{ATP_c} = 9 + 50k_c$$

g microbial dry matter/mol ATP

# N SUPPLY TO RUMEN

# FIM Feed Characterisation Scheme- Rumen Aspects



# KEY IMPROVEMENTS

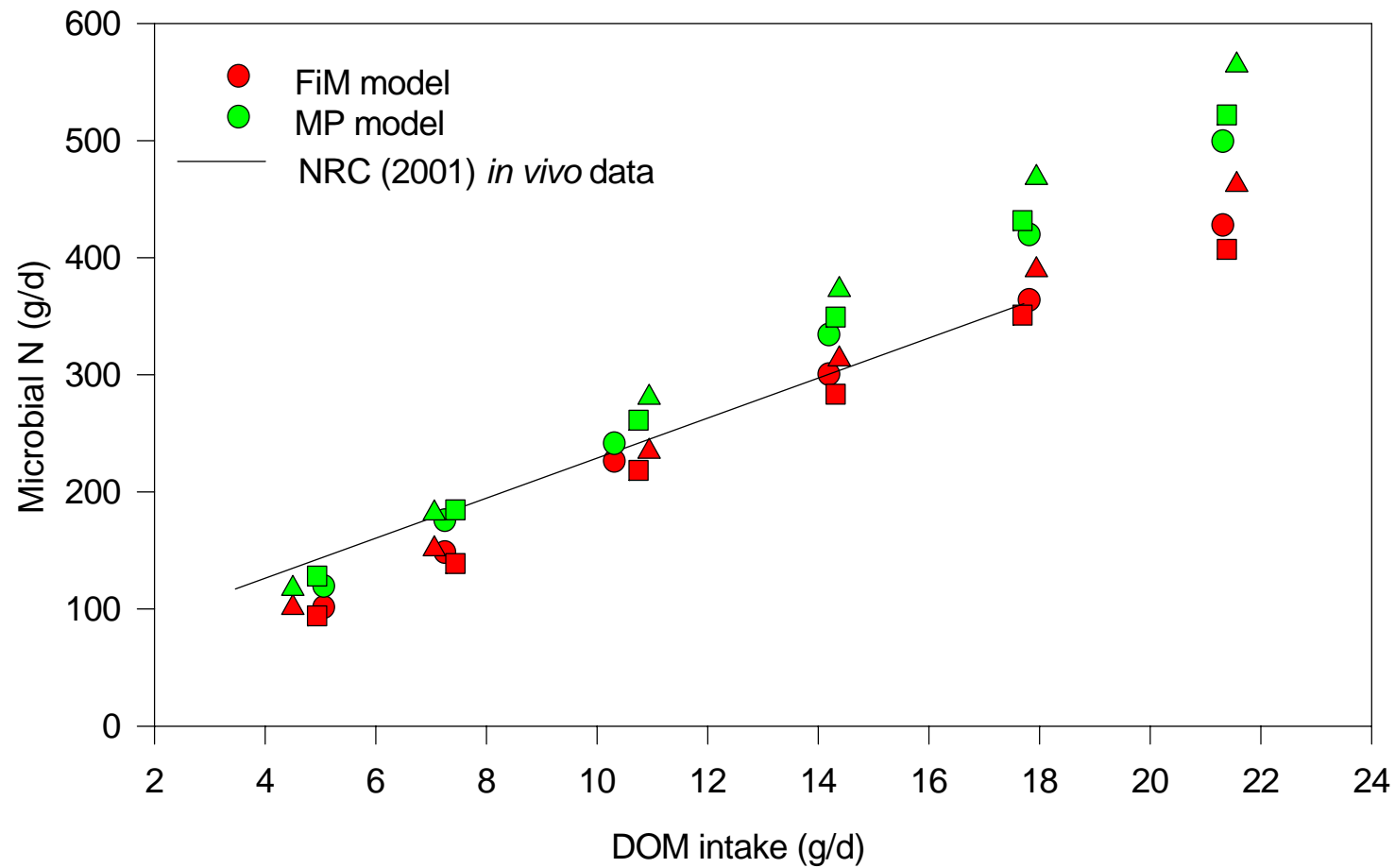
- ATP supply
  - dynamic, takes into account different outflow rates and different degradation curves for 3 pools to predict EDDM
  - deals with fine particles
  - substrate dependant - ATPy
- ATP utilisation
  - takes into account outflow rate for 3 pools
- Technique and maths for Energy and N similar

# Comparison between estimates of EMNS

	EMNS (g microbial N/kg OMTDR)		
	<i>In vivo</i> (n=320)*	MP	FIM
Mean	23.5	26.7	23.3
Minimum	14.2	24.0	11.4
Maximum	32.8	29.4	30.0

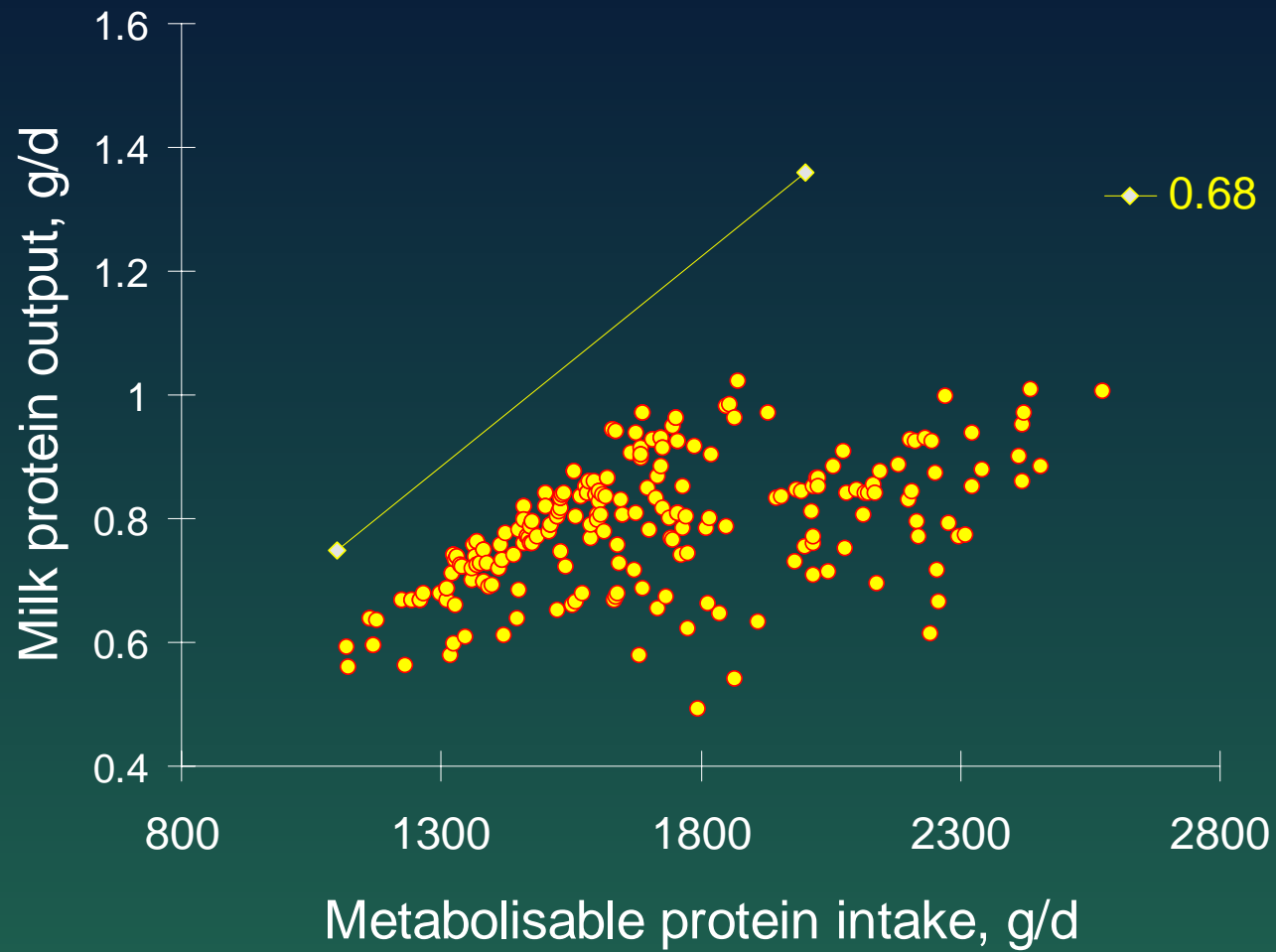
\*Archimède *et al* (1997)

# Relationship between DOM intake and microbial N supply



# TESTING WHOLE SYSTEM

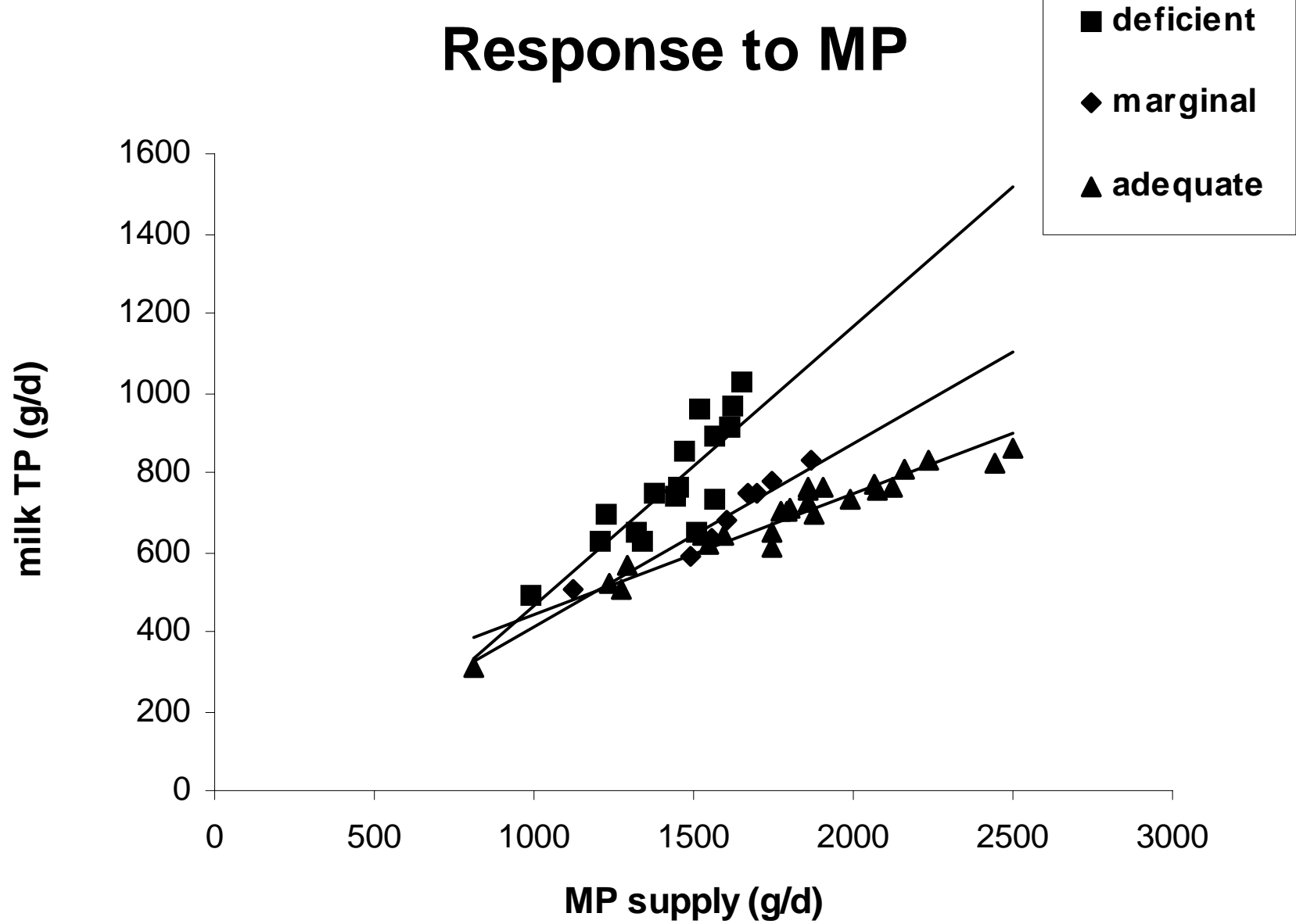
# AVAILABLE DATA



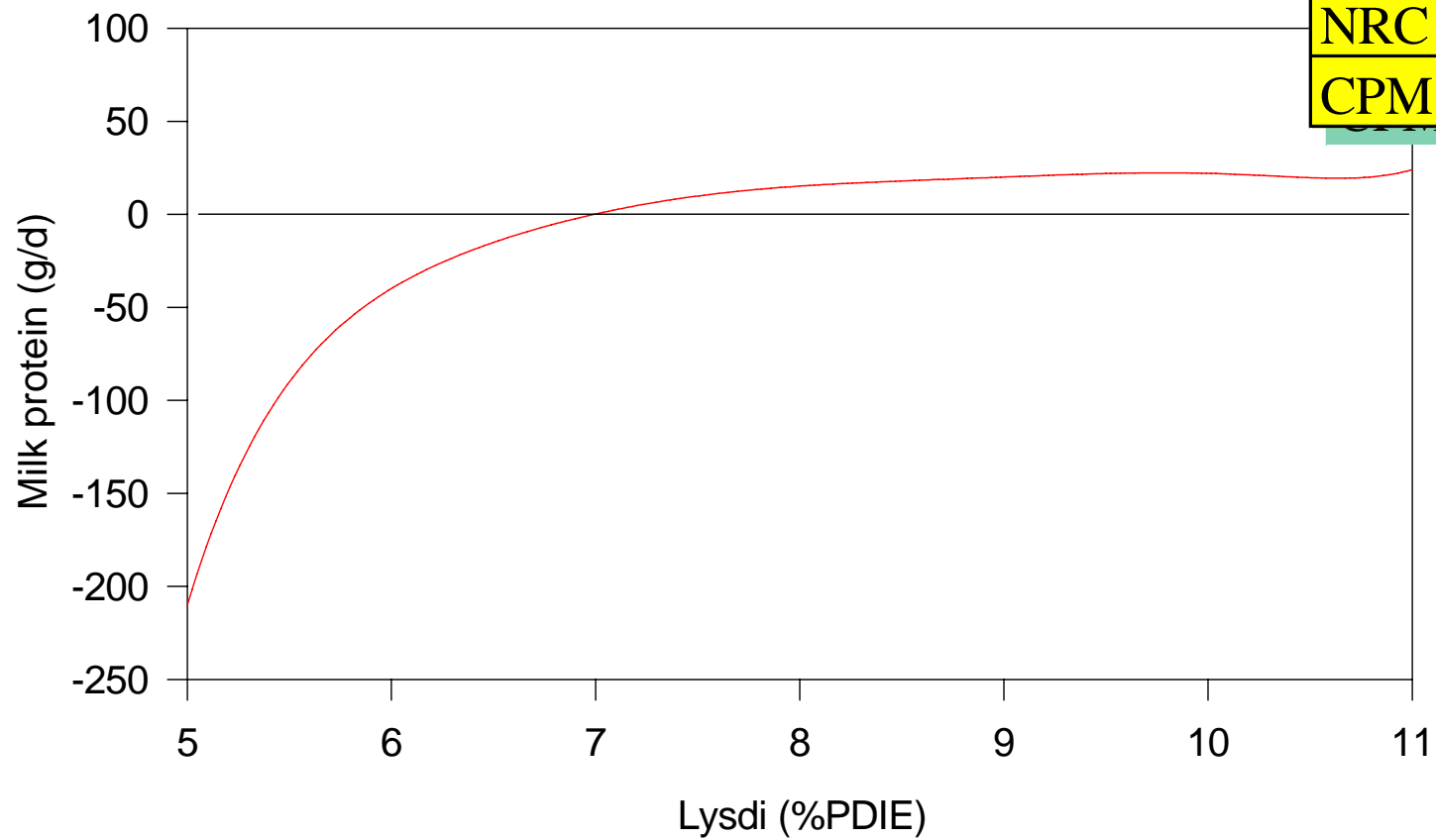
# METHOD

- Deficient diets -  $< 98\%$  of MP requirement (according to FiM)
- Marginal diets -  $98\%$  to  $102\%$
- Adequate diets -  $> 102\%$

# Response to MP



# AMINO ACID DSS



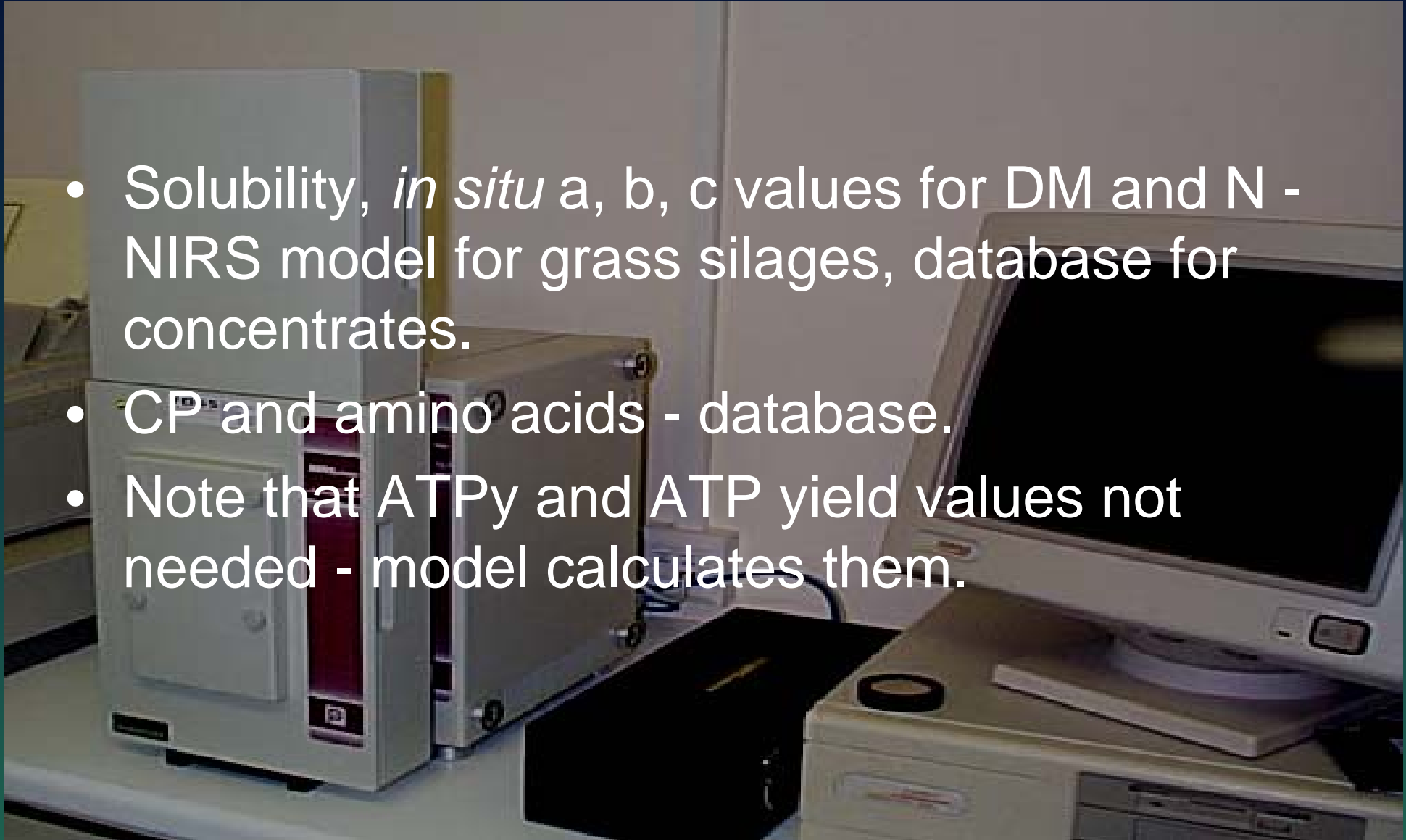
## Threshold values

	%MP
FiM	6.8
INRA	6.8
NRC 2001	7.4
CPM	6.83

# **FEED CHARACTERISATION -TIED TO THE SYSTEM**

# SUMMARY OF INPUTS NEEDED

- Solubility, *in situ* a, b, c values for DM and N - NIRS model for grass silages, database for concentrates.
- CP and amino acids - database.
- Note that ATPy and ATP yield values not needed - model calculates them.



# THINGS THAT NEED DOING

- Eventual replacement of *in situ* approach
- Prediction of variability of non-forages
- Incorporation of AA DSS into model proper
- Effect of rumen environment on microbial synthesis
- Etc.....
- Use as a response model?

**Thank you**