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Fat and protein accretion in grower-finisher pigs fed two protein levels

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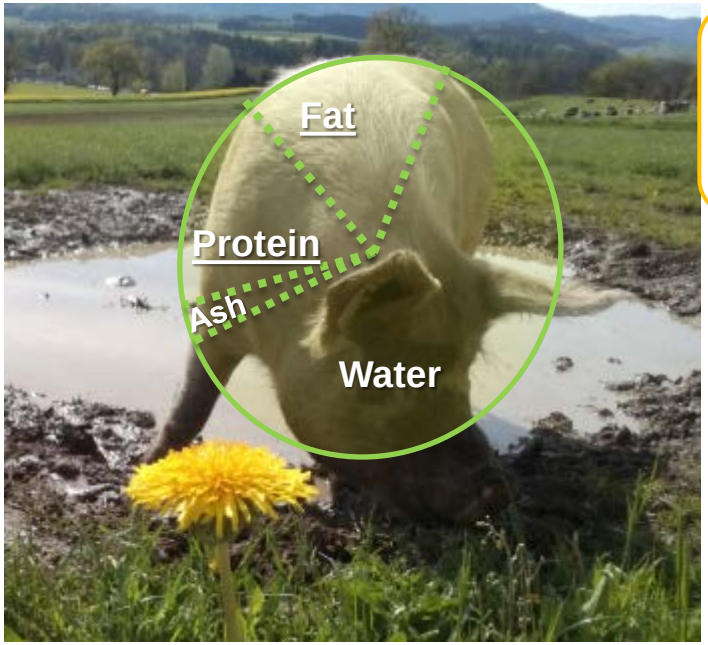
Introduction



Empty body (EB) composition
=
Water + Ash + **Protein** + **Fat**

Pig compositional growth models

Basic tools to optimize the efficiency of pig production since they are used to **elaborate and evaluate feeding strategies.**

Almost 3 decades of genetic selection process

- Leaner pigs
- Increased N-efficiency
- **Changes** in the **body's chemical composition** and **deposition** rates

Study objective

Increasing concern about environmental pollution

Cost of imported protein sources

(Too) large safety margin for protein requirements?

Objective

Acquiring NEW experimental data on the impact of a 20% amino acid and crude protein (**CP**) restriction on the dynamics in EB protein, lysine and fat composition from birth to 140 kg BW.

Material and methods

Diets

Control-diet (**C**): formulated to cover 100% of the CP and amino acid requirements (*Swiss feeding recommendations for swine*).

Low-protein-diet (**LP**): formulated to contain 80% CP, lysine, methionine + cystine, threonine and tryptophan of diet C.

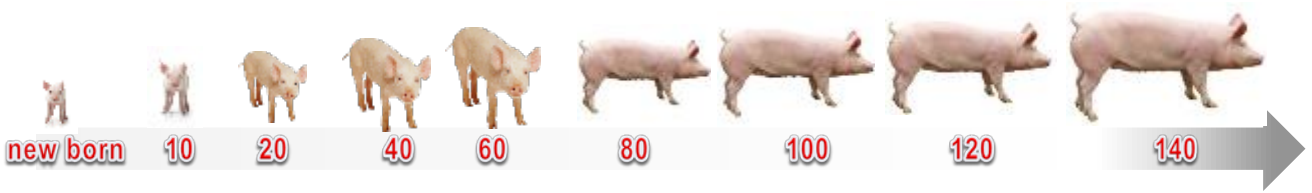
	Grower diet		Finisher diet I		Finisher diet II	
Analyzed dietary composition (as fed basis)	C	LP	C	LP	C	LP
Fat (%)	2.8	2.7	2.7	2.5	3.0	2.9
Digestible energy (MJ/kg)	13.2	13.2	13.2	13.2	13.2	13.2
CP (%)	16.3	13.4	13.8	11.4	12.6	10.6
Lysine (%)	0.96	0.76	0.77	0.61	0.69	0.57
Methionine (%)	0.32	0.23	0.24	0.18	0.21	0.22
Cystine (%)	0.29	0.26	0.27	0.23	0.24	0.22
Threonine (%)	0.73	0.57	0.59	0.48	0.51	0.36
Tryptophan (%)	0.23	0.18	0.18	0.15	0.16	0.13

Material and methods

Serial slaughter of 66 females (**FE**), 66 entire males (**EM**) and 58 castrates (**CA**)

Control groups		Low protein groups	
Entire **m**ales	**C-EM**	**E**ntire **m**ales	**LP-EM**
Castrates	**C-CA**	**Ca**strates	**LP-CA**
Females	**C-FE**	**Fe**males	**LP-FE**

Slaughter BW categories (kg)



Growth periods

Starter | Grower | Finisher I | Finisher II

The empty body was considered as the sum of:

CP, Lysine and fat content were analyzed

CP, Lysine and fat content in the empty body were calculated

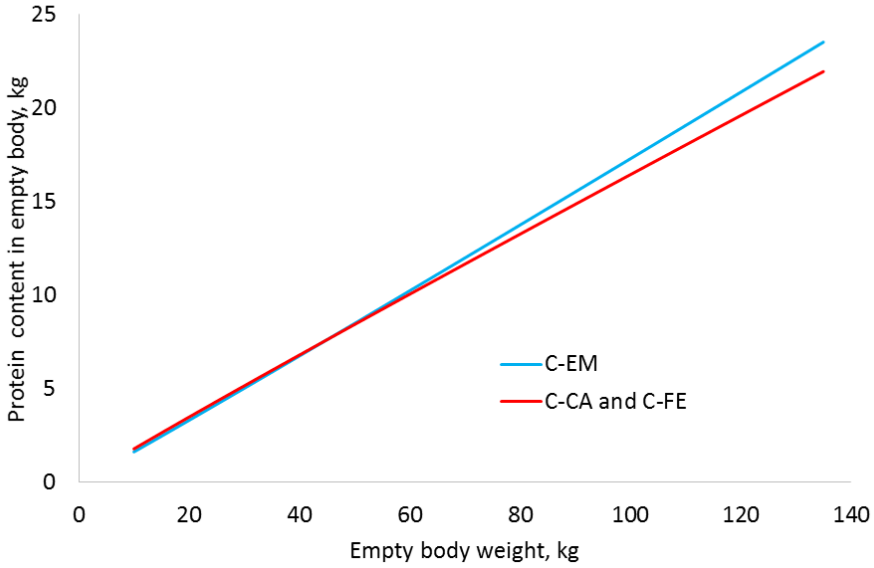
Material and methods

Data of protein, lysine and fat content were fitted to an allometric regression

Chemical component (g) = a × EB weight^{b} + c

The body **component deposition rates** (g/kg empty BW) were calculated as the derivative.

Protein



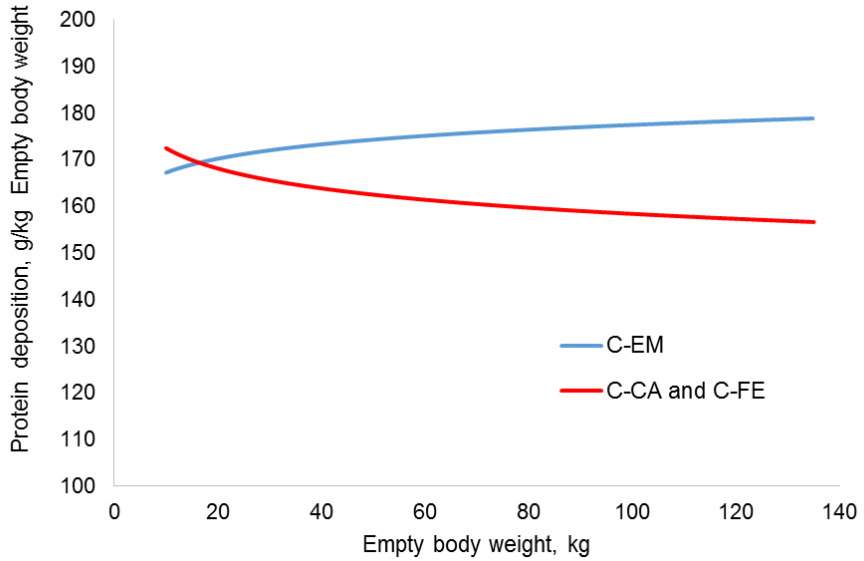
Control

C-EM Protein (g) = 153 × EB weight$^{1.026}$

C-CA & C-FE Protein (g) = 195× EB weight$^{0.963}$

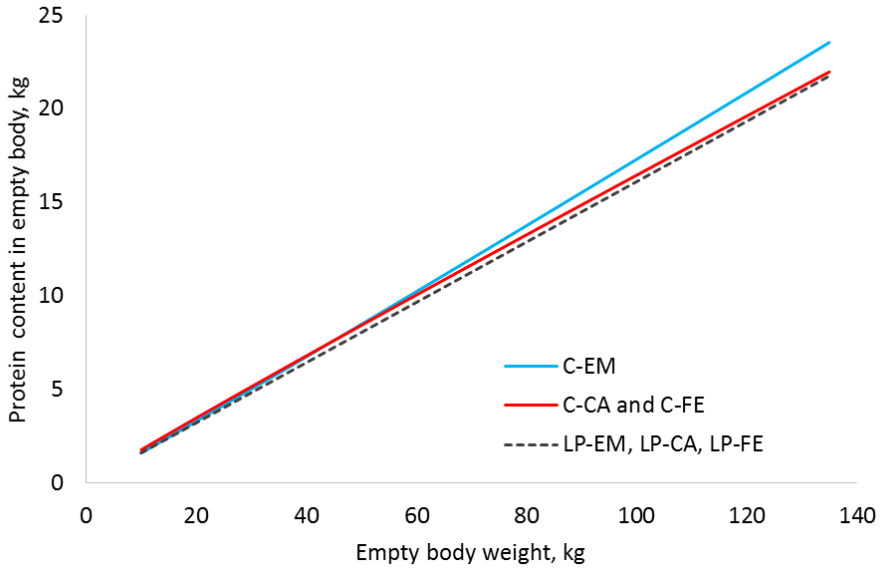
Low protein

LP-pigs



b coeficients ~ 1➔ linear increase in the predicted component content with increasing EB weight

Protein



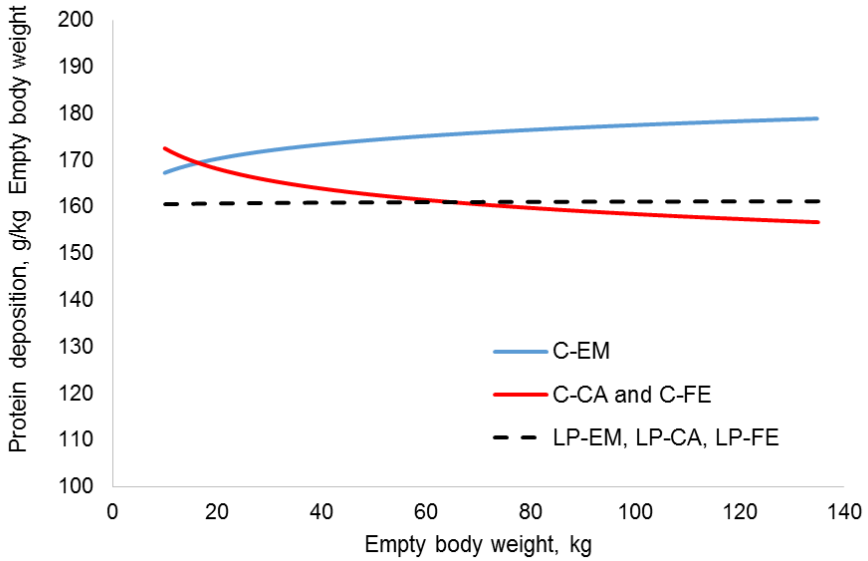
Control

C-EM: Protein (g) = 153 × EB weight$^{1.026}$

C-CA & C-FE: Protein (g) = 195× EB weight$^{0.963}$

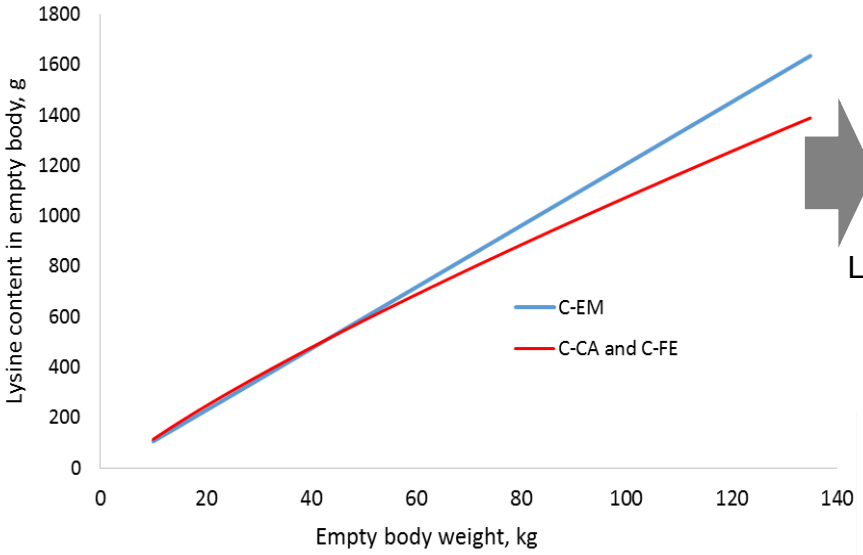
Low protein

LP-pigs: Protein (g) = 159× EB weight$^{1.002}$



b coeficients ~ 1➔ linear increase in the predicted component content with increasing EB weight

Lysine



C-EM
C-CA &C-FE

Control

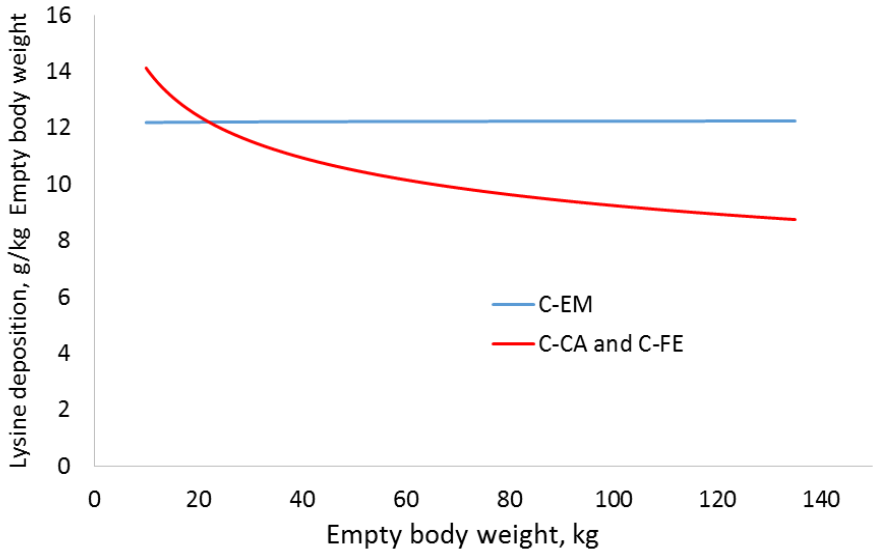
Lys (g) = 12 × EB weight$^{1.002}$ – 15

Lys (g) = 26 × EB weight$^{0.816}$ – 58

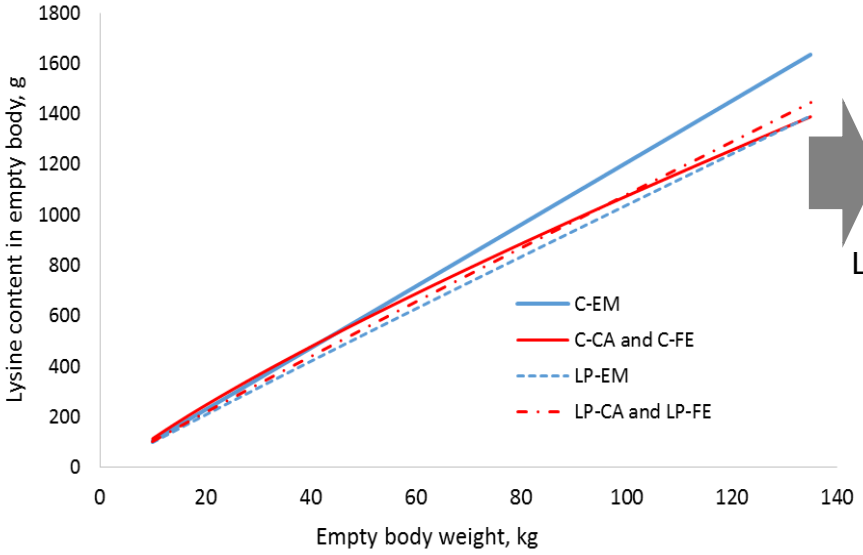
LP-EM
LP-CA & LP-FE

Low protein

The content and deposition rate of the lysine reflected those of the protein.



Lysine



Control

C-EM: Lys (g) = 12 × EB weight$^{1.002}$ – 15

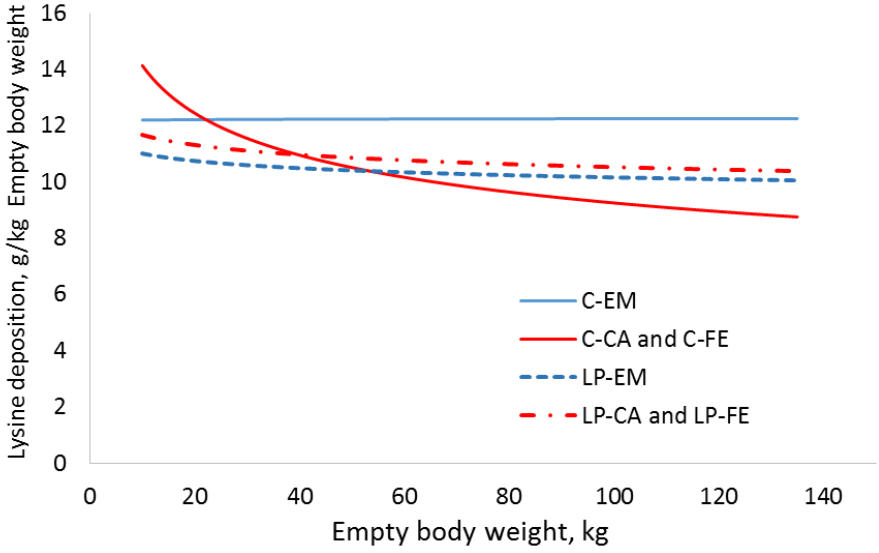
C-CA &C-FE: Lys (g) = 26 × EB weight$^{0.816}$ – 58

Low protein

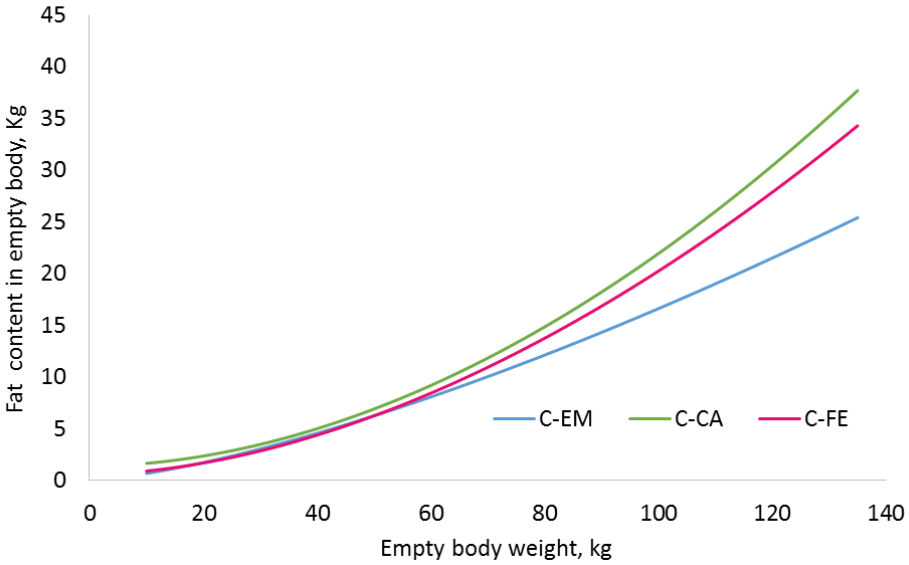
LP-EM: Lys (g) = 12 × EB weight$^{0.965}$ – 14

LP-CA & LP-FE: Lys (g) = 26 × EB weight$^{0.955}$ – 20

The content and deposition rate of the lysine reflected those of the protein.



Fat



Control

C-EM Fat (g) = 24 × EB weight$^{1.417}$ + 53

C-CA Fat (g) = 3 × EB weight$^{1.897}$ + 1405

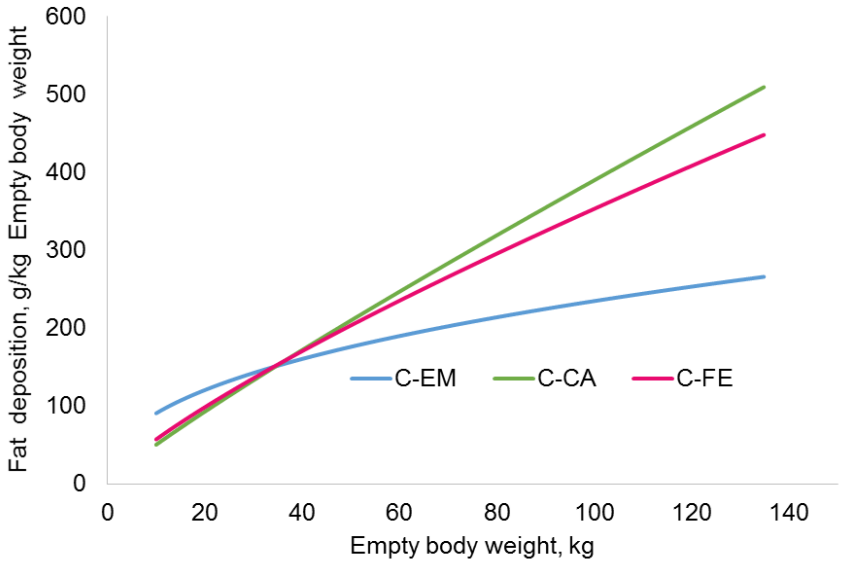
C-FE Fat (g) = 5 × EB weight$^{1.798}$ + 616

Low protein

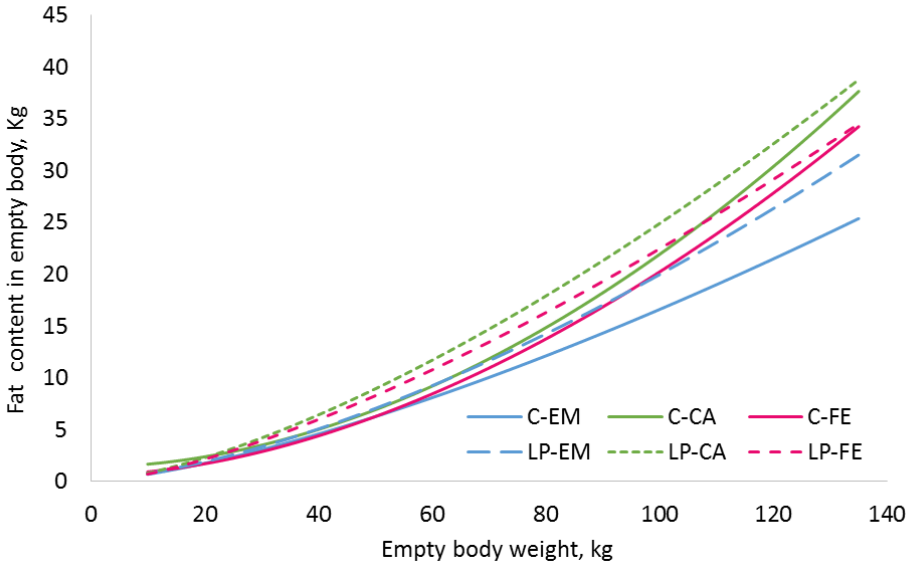
LP-EM

LP-CA

LP-FE



Fat



Control

C-EM: Fat (g) = 24 × EB weight$^{1.417}$ + 53

C-CA: Fat (g) = 3 × EB weight$^{1.897}$ + 1405

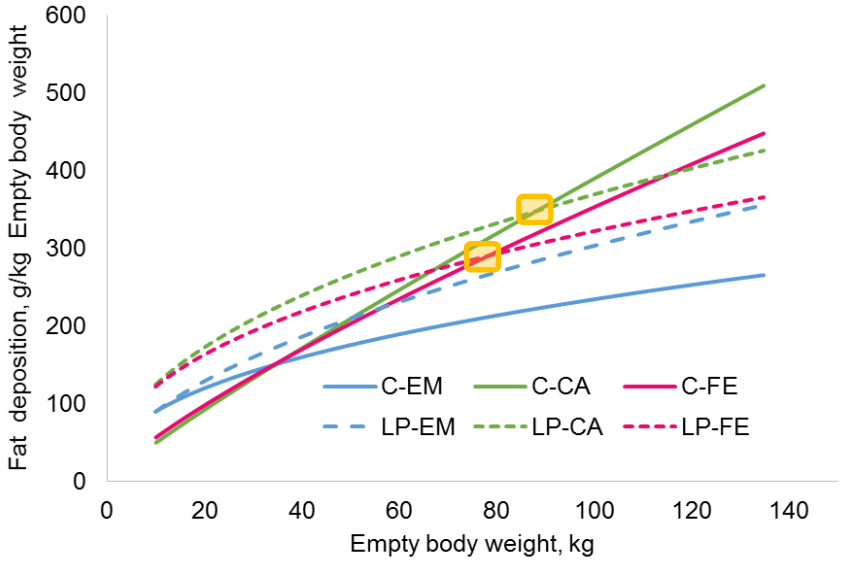
C-FE: Fat (g) = 5 × EB weight$^{1.798}$ + 616

Low protein

LP-EM: Fat (g) = 17 × EB weight$^{1.535}$ + 249

LP-CA: Fat (g) = 28 × EB weight$^{1.476}$ – 59

LP-FE: Fat (g) = 32 × EB weight$^{1.426}$ – 107



Conclusions

LP-EM pigs

- EB protein content and deposition rates are similar to LP-CA and LP-FE pigs
- slower lysine and greater fat deposition rates compared to C-EM

LP-EM could not cope with such a CP and essential amino acid restriction

LP-CA and LP-FE pigs

- faster protein deposition rates
- slower fat deposition rates than C-CA and C-FE pigs in the finisher period (100-140 kg BW).

Feeding recommendations for the finisher period for C-CA and C-FE pigs need revision.

Thank you for your attention

Agroscope good food, healthy environment