Improvements in amino acids requirements estimation to maximize nitrogen retention in precision feeding for growing-finishing pigs

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A precision feeding (PF) system that **customizes diets daily for each pig** of the herd based on its individual feed intake and growth patterns has been developed (Pomar et al., 2009, Hauschild et al., 2012, Andretta et al., 2014).

The use of PF can **reduce the protein supply by 25%** and **nitrogen excretion by 38%** (Pomar et al., 2011, Andretta et al., 2014).

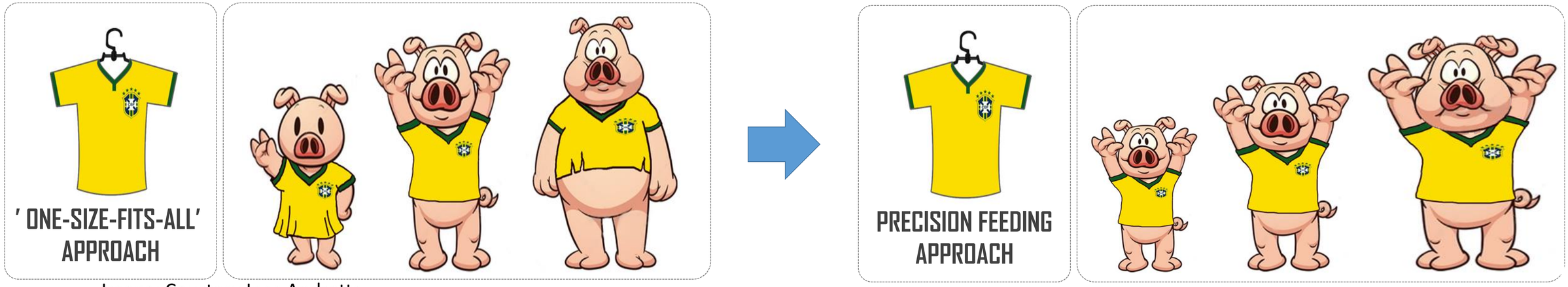

Image: Courtesy Ines Andretta

Applying PF requires dynamic estimation of real-time individual nutrient requirements by mathematical models. And these models have to be frequently updated to **ensure maximal efficiency**.

The objective of this study was to review the calibration of the model (Hauschild et al., 2012) used to estimate real-time individual growing-finishing pigs Lys requirements.

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Two 28 d growth experiments were performed with 110 pigs distributed in a complete randomized design with growing (25 kg BW ± 2.1, n = 60; 10 pigs per treatment) or finishing barrows (68.1 kg BW ± 6, n = 60; 10 pigs per treatment).

Treatments consisted in **60, 70, 80, 90, 100, or 110%** of pig's estimated individual standardized ileal digestible **(SID) Lys (SIDLys) requirements**.

Pigs of each growing-phase were housed in the same pen but fed individually using computerized feeding stations.

Body composition was measured by dual-energy X-ray densitometry on d 1 and d 28 of the trial.

The Mixed and NLIN procedures of SAS were used to analyze the data and obtain optimal SIDLys requirements.

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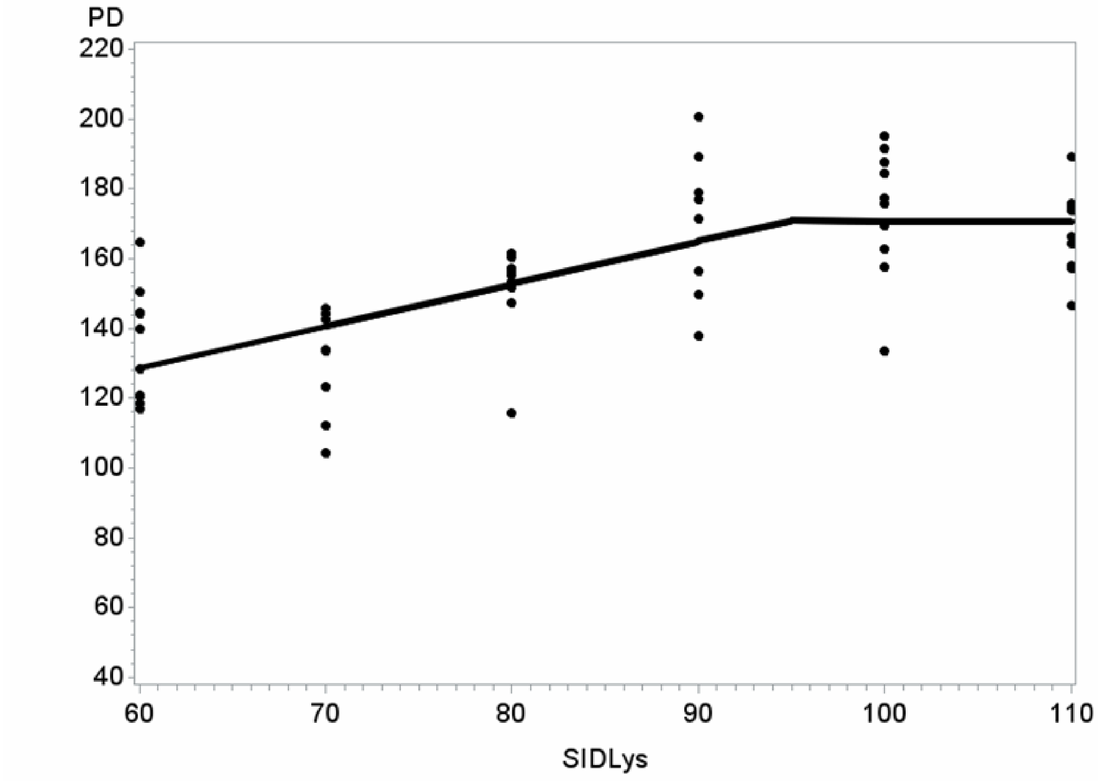
Growing phase

Maximum ADG (0.98 kg/d) and **protein deposition** (PD; 170 g/d) were observed in growing pigs fed at **100% of the estimated SIDLys requirements** (P<0.001).

Protein in weight gain (%) and **N efficiency increased linearly** (P<0.01) with increasing levels of SIDLys.



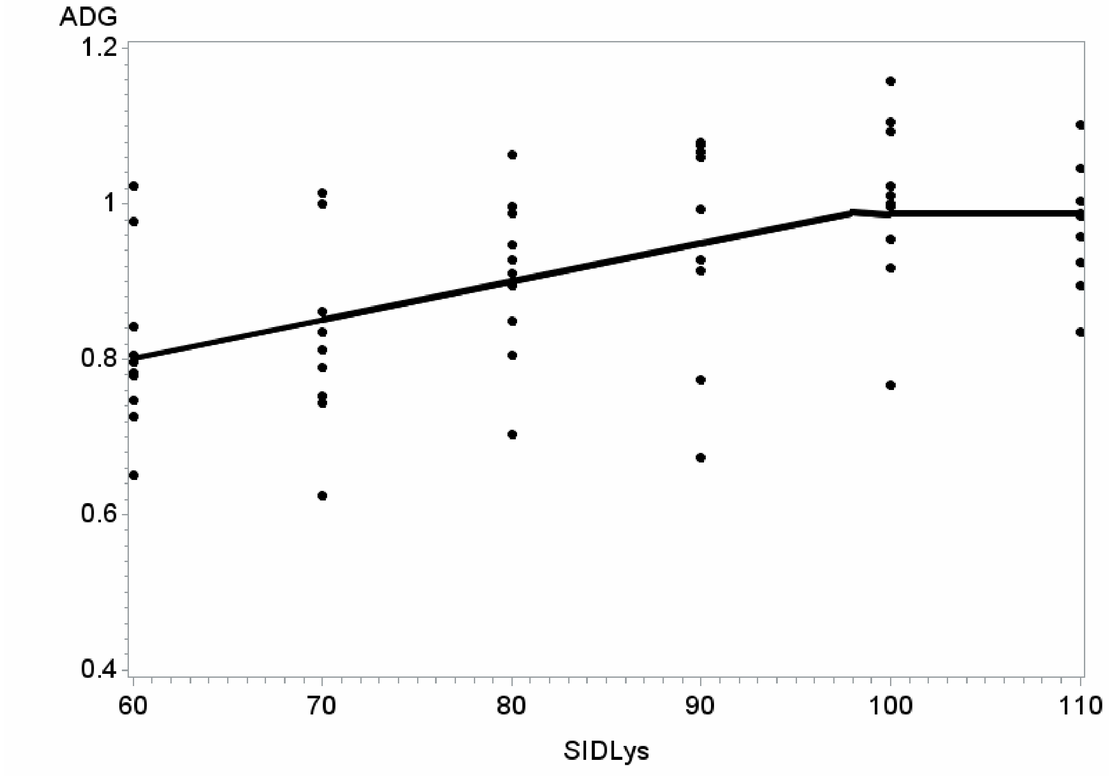


Figure 1. Protein deposition (PD, g/d) and average daily gain (ADG, kg) in function of inclusion rate (%) of standardized ileal digestible lysine (SIDLys) predicted by the IPF model (Hauschild et al., 2012) for growing pigs (25 – 50kg of BW).

SID Lys requirement = 0.09 g/g of PD or 0.02 g/g of ADG

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Finishing phase

Finishing pigs had maximal ADG (1.2 kg/d) when fed at 100% of the requirement, but PD increased linearly (P<0.05) with SIDLys levels preventing the identification of the optimal SIDLys requirement for maximal PD.

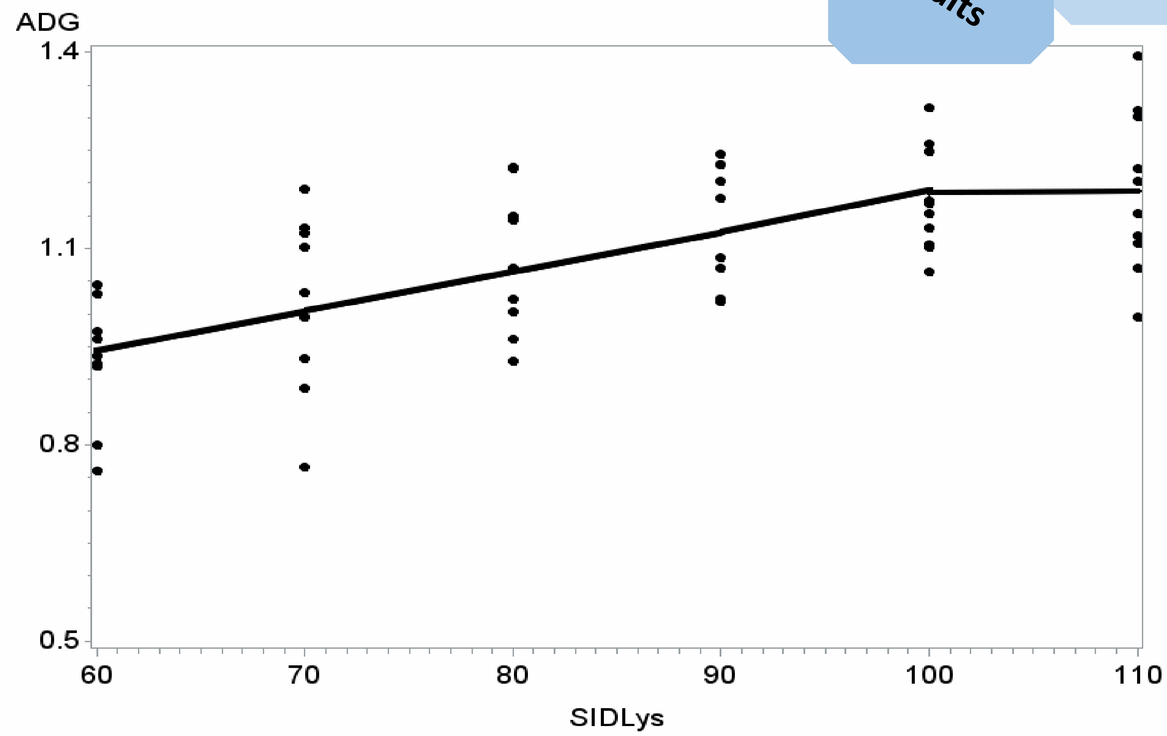
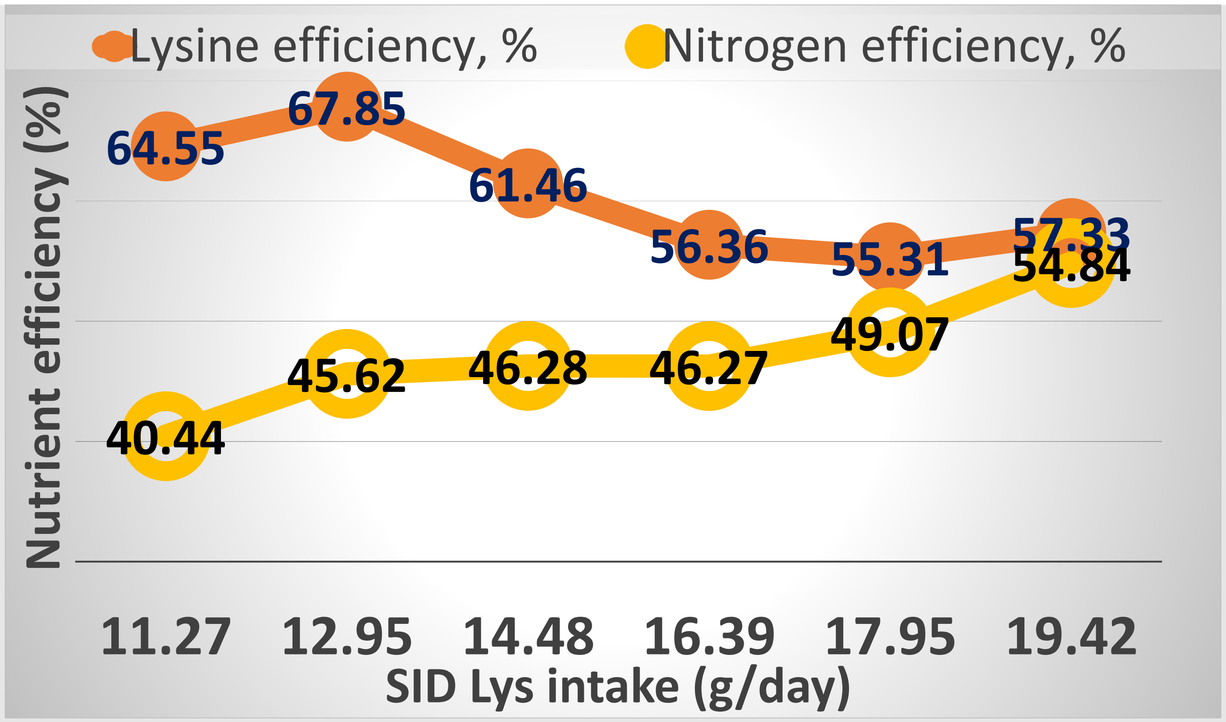


Figure 2. Average daily gain (ADG, kg) in function of inclusion rate (%) of standardized ileal digestible lysine (SIDLys) predicted by the IPF model (Hauschild et al., 2012) for finishing pigs (65 –100kg of BW).



Increasing in SID Lys from 60% (11g/d) to 110% (19 g/d) **improved nitrogen efficiency** in 38%.

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During the growing phase, **protein deposition (PD), average daily gain (ADG) and nitrogen retention were maximized simultaneously** at 100% of SID Lys estimated by the model (Hauschild et al., 2012). Values were equivalent to 0.09 g of SID Lys per g of PD, 27% less than the recommended by the NRC (2012).

Whereas, during the finishing phase, increases in 10% of SIDLys estimates resulted in greater PD and nitrogen retention, showing opportunities for further improvements in SIDLys requirements estimation to maximize nitrogen retention in this growing phase.

Considerations

Fine-tuning the IPF model has the potential for increasing the utilization of dietary nutrients and thus reducing feeding costs and nutrient excretion in growing-finishing pigs. The question whether, formulation should be performed for maximal nutrient efficiency of utilization or maximum growth performance should be considered when stablishing requirements for pigs.

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Acknowledgment

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