

Feed the Future: New Technologies for Modern Swine Farmers

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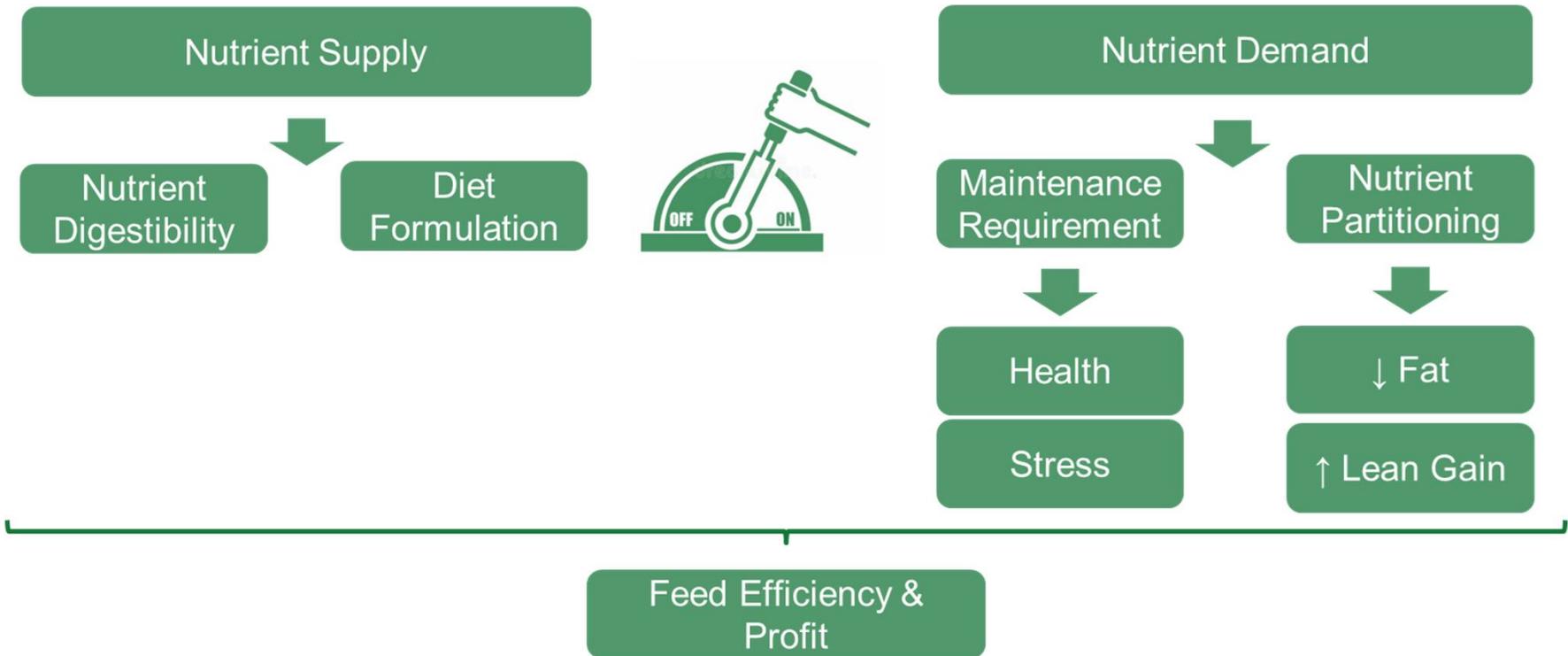
New technologies on modern pig genetics for shorter days to harvest...

Precision nutrition for the genetic potential of the animal boosts efficiency, profitability and sustainability.

Outline

- I. Overview on Global Context – Pork industry trends
- II. Precise Nutrition for Efficiency, Profitability, and Sustainability
 - a. Nutrient supply & Nutrient demand
 - b. Genotype vs. Phenotype
 - c. Phosphorus and Standardized Ileal Digestible Lysine or SID Lysine requirements for modern pig genetics
- III. Take home message

Achieve efficiency & profitability with Precise Nutrition



Lean Gain definition and it's importance

Lean Gain is the amount of muscle while ADG or average daily gain is the total weight gained per day. **Lean gain** is a component of that growth.

↑ ADG ideally correlating with a greater proportion of lean muscle mass rather than fat.

In pigs, ↑ ADG is a desirable economic trait, but this is often a result of increased **lean gain**, not just fat gain, as lean pork is preferred by consumers.



KNOW THE DIFFERENCE
FIT **FAT**



Genetic trends show increases in ADG and better FCR, which are related to a lean gain increase

PIC

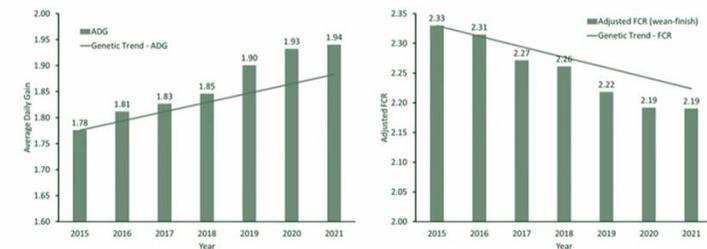
PIC (wean to finish)

From 2015 to 2021:

ADG increased by 70 g/d from a base of 805 g/d

FCR improved by 0.14 points from a base of 2.33

Wean to Finish – Actual and genetic trend
Using 2015 as the base for calculated expected performance



Topigs Norsvin

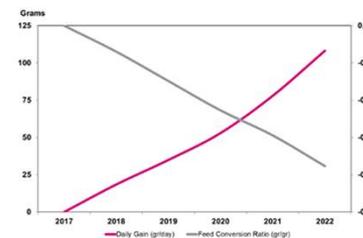
Topigs (35-120kg)

From 2017 to 2022:

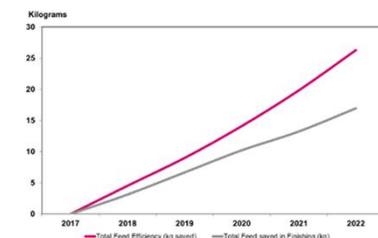
ADG increased by 100 g/d

FCR improved by 0.20 points

Terminal Sires x TN70



Terminal Sires x TN70



Source: information shared during Cargill and Genetic companies exchange (2022 - 2024 sessions)

Genotype vs. Phenotype



Genotype is the genetic constitution of a pig.

Phenotype is the set of observable traits of a pig resulting from the interaction of its genotype with the environment.

Genotype vs. Phenotype

Yesterdays Phenotype



Lean Gain 290 g/d (120 g/d PD);
ADG 790 g/d



Lean Gain 340 g/d (140 g/d PD);
ADG 840 g/d



Lean Gain 390 g/d (160 g/d PD);
ADG 900 g/d

Today's Phenotype

Lean Gain 340 g/d (140 g/d PD);
ADG 840 g/d

Lean Gain **390 g/d (160 g/d PD)**;
ADG 900 g/d

Lean Gain 440 g/d (180 g/d PD);
ADG 970 g/d

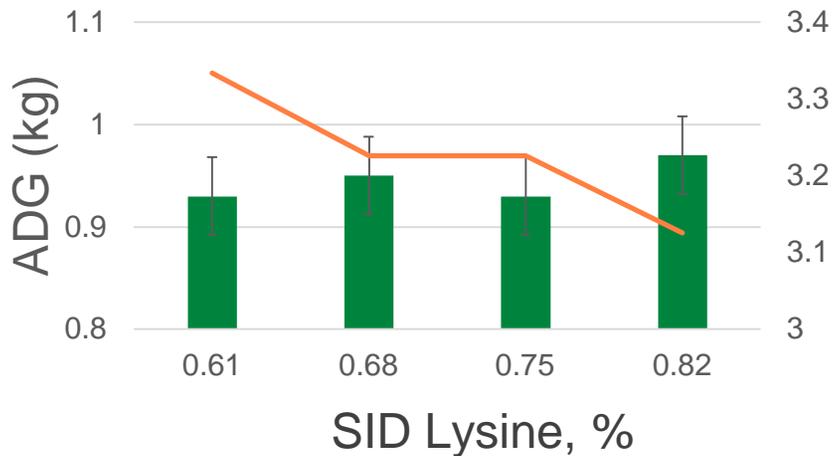
ADG increase and FCR improves at higher SID Lysine

Hilario et al. 2024

- PIC 337 sire line

103 - 129 kg Pigs

■ ADG ■ FCR

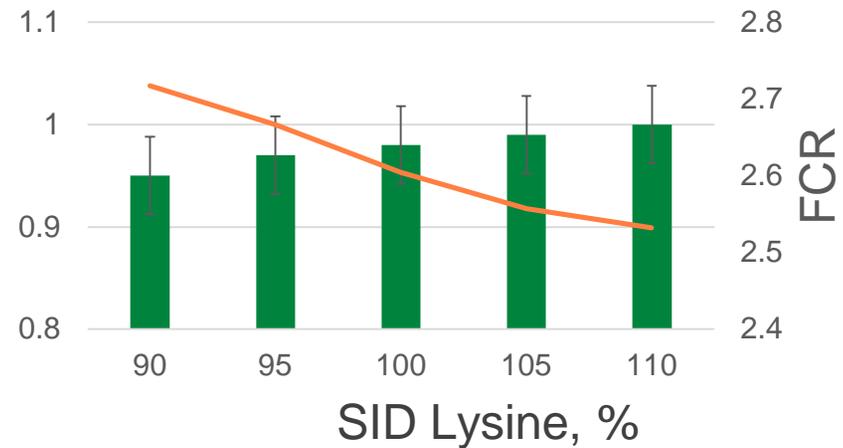


Fent et al. 2023

- DNA Genetics

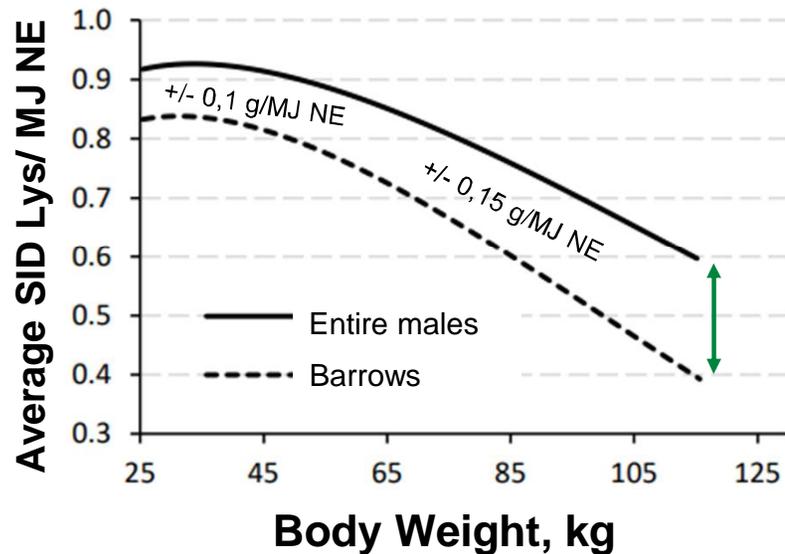
31 - 133 kg

■ ADG ■ FCR

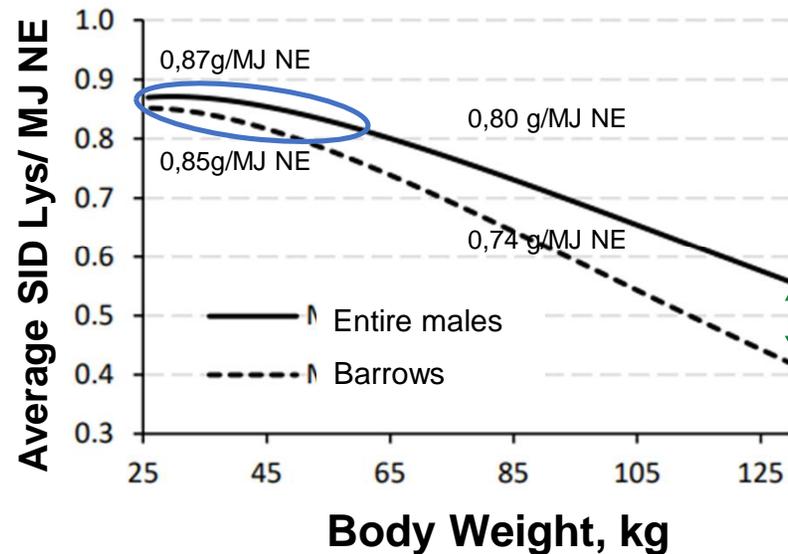


Evolution of the SID Lys requirements according to gender and genetic progress

Genetic profiles of 2010



Genetic profiles of 2023



Smaller gap compared to 2010

Source: Quiniou et Gaudré, 2023

Phosphorus – common terminology and digestibility

Total vs. Apparent vs. Standardized (NRC, 2012)

- **Total Phosphorus** is the total amount of phosphorus in the diet.
- **Apparent Total Tract Digestible Phosphorus (ATTD P)** does not differentiate excreted endogenous losses from non-digestible nutrients.
- **Standardized Total Tract Digestible Phosphorus (STTD P)** corrects for basal endogenous losses of nutrients.

More accurate measure of the phosphorus that pig can absorb and use

Phosphorus requirements for modern pig genetics

Determine the STTD P requirement for 24- to 130-kg pigs housed under commercial conditions.

- 4 dietary phases
 - Increased monocalcium phosphate to manipulate STTD P
 - No phytase used in diets
 - Constant total Ca:P of 1.14 to 1.16

	Phase 1	Phase 2	Phase 3	Phase 4
Ca, %	0.56-0.84	0.50-0.75	0.45-0.67	0.42-0.61
P, %	0.49-0.73	0.44-0.65	0.40-0.59	0.37-0.53
STTD P, %	0.25-0.46	0.22-0.40	0.19-0.36	0.17-0.31

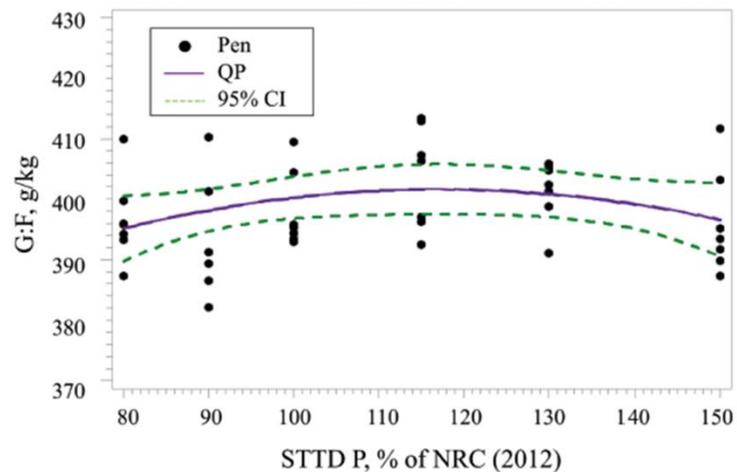
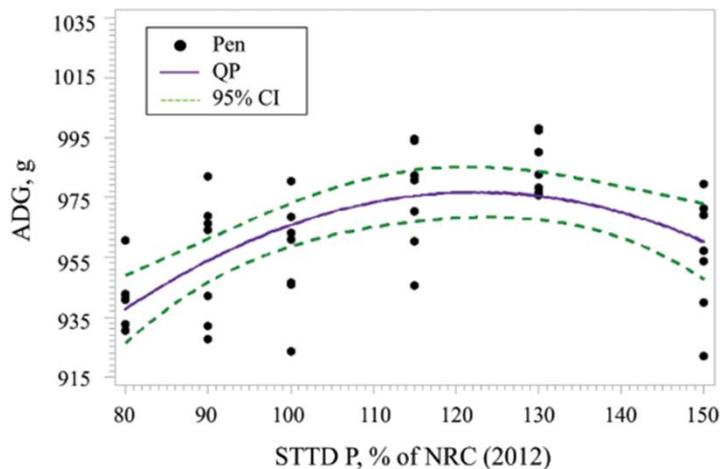
Source: Vier et al, 2019

Phosphorus requirements for modern pig genetics

Assuming 135 g/d protein deposition or ~330 g/d lean growth rate:

Optimal STTD P for **ADG**
was **+22% NRC (2012)**

Optimal STTD P for **FCR**
was **+16% NRC (2012)**



Source: Vier et al, 2019

Importance of Calcium to Phosphorus Ratio

- **Increasing dietary calcium linearly reduces ADFI of pigs regardless of the level of Digestible Phosphorus (ATTD P).**
 - ✓ Reduction in ADFI = Decline in ADG
- **Optimal ratios of Calcium to Digestible Phosphorus are greater for maximizing bone mineralization than for optimizing performance.**
- **Formulate to a ratio of Calcium to Digestible Phosphorus (Ca/ATTD P) of 2.2 to 2.4 to optimize performance.**

Phosphorus and SID Lysine response in modern pig genetics

Objective:

- 1) Determine the extent that changing SID Lysine and Digestible Phosphorus individually and together impact technical growth performance of pig and financial outcomes.
- 2) Determine the effect of these changes on Nitrogen and Phosphorus excretion.

TRT	Description	SID Lys, %	DIG P, %
A	Current	1.09 / 1.02 / 0.86 / 0.72	0.27 / 0.24 / 0.19 / 0.16
B	Current + new DIG P	1.09 / 1.02 / 0.86 / 0.72	0.33 / 0.30 / 0.27 / 0.24
C	Current + new SID LYS	1.22 / 1.10 / 0.97 / 0.80	0.27 / 0.24 / 0.19 / 0.16
D	Current + new DIG P + SID LYS	1.22 / 1.10 / 0.97 / 0.80	0.33 / 0.30 / 0.27 / 0.24

Source: Cargill Research, 2024

Increasing phosphorus and SID Lysine levels increased weight at market and improved FCR

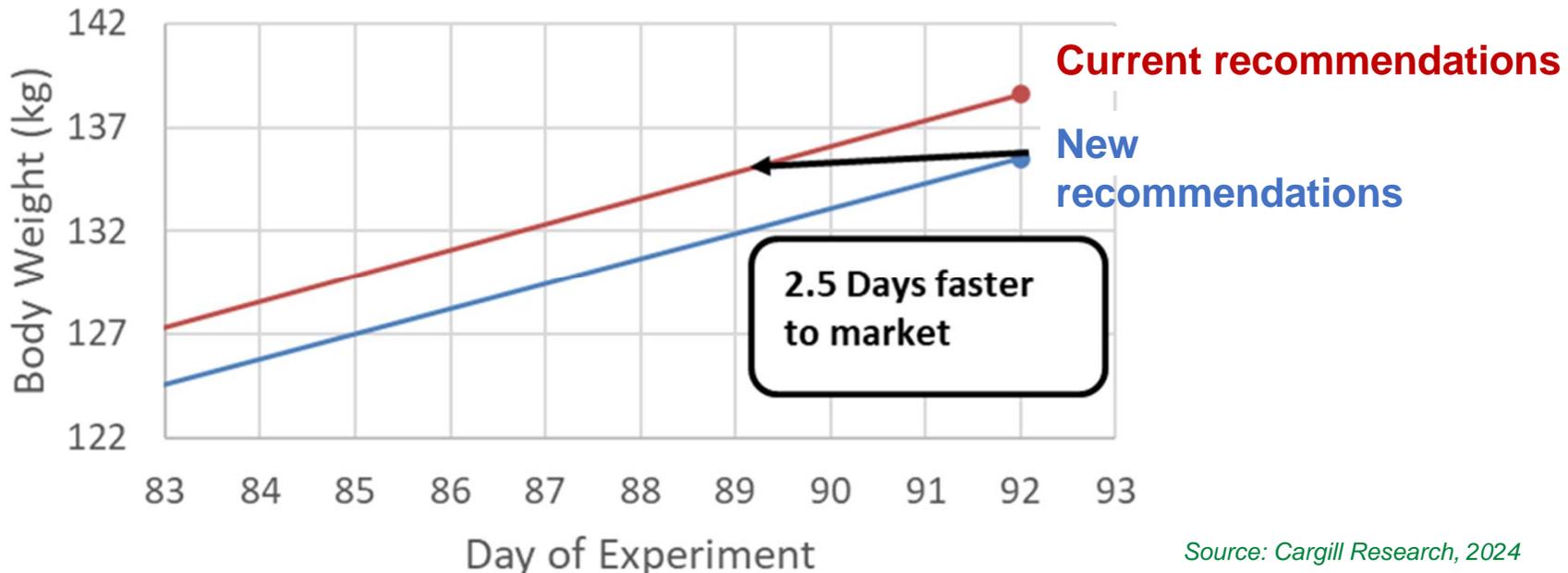
TREATMENT (TRT)	A	B	C	D	Difference between TRT D vs. A
Day 0 Body Weight (kg)	29.5	29.5	29.5	29.5	0
Day 92 Body Weight (kg)	135.5	136.4	136.5	138.6	3.3
Average Daily Gain (kg)	1.15	1.16	1.16	1.19	0.04
Average Daily Feed Intake (kg)	2.53	2.52	2.54	2.54	0.01
Feed Conversion Ratio	2.19	2.16	2.17	2.13	0.06

Note: Within this trial, pigs grew extremely well reaching higher than 135 kg after 92 days on trial (~155 days of age) with a Feed Conversion Ratio (FCR) of 2.17.

Source: Cargill Research, 2024

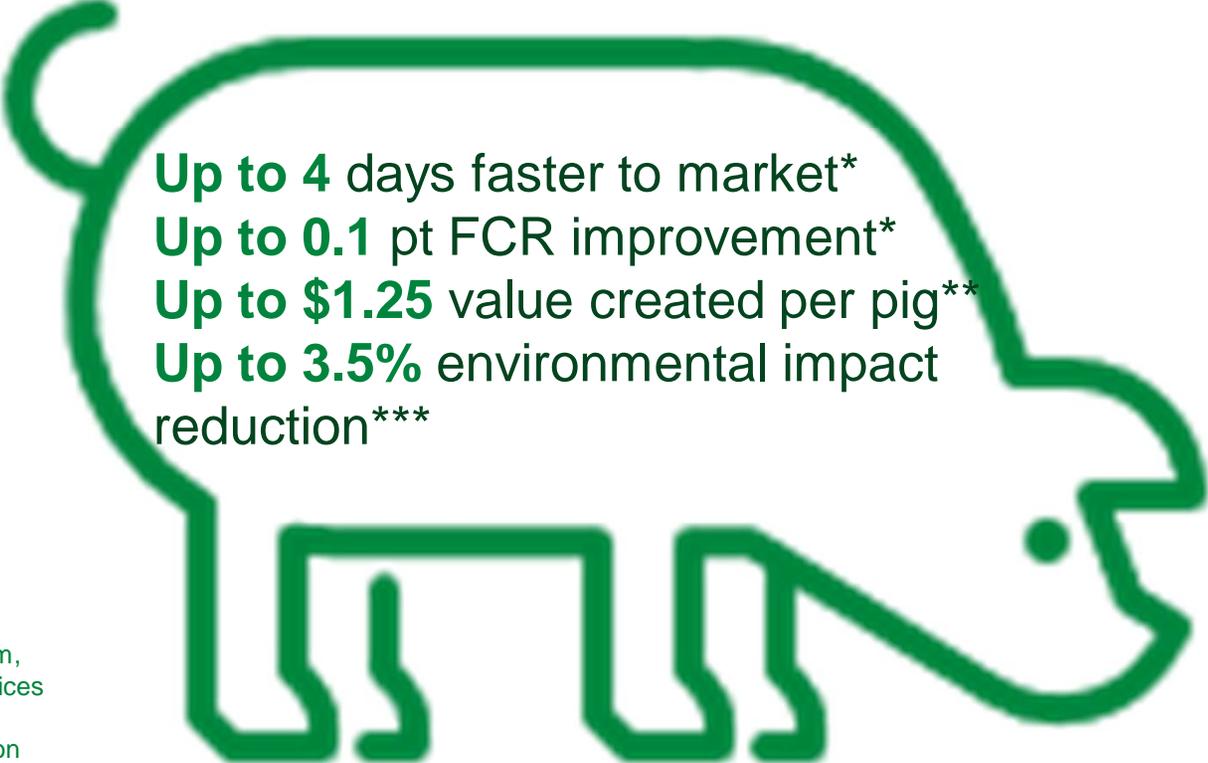
Increasing phosphorus and SID Lysine levels reduces days to market

This will reduce days to market by 2.5 days when feeding to a fixed body weight, with **7.9 kg less in feed consumed** and an overall **FCR improvement of 0.07**.



Source: Cargill Research, 2024

And what is the value per pig that can be observed?



Up to 4 days faster to market*
Up to 0.1 pt FCR improvement*
Up to \$1.25 value created per pig**
Up to 3.5% environmental impact reduction***

*Estimated performance value simulated with Cargill Pork MAX

**Using The Netherlands, Vietnam, Thailand June 2024 ingredient prices

*** Using Opteinics LCA estimation

Impact on nitrogen and phosphorus retention

Increasing SID Lysine and Digestible Phosphorus, increased nitrogen and phosphorus retention in modern pig genetics.

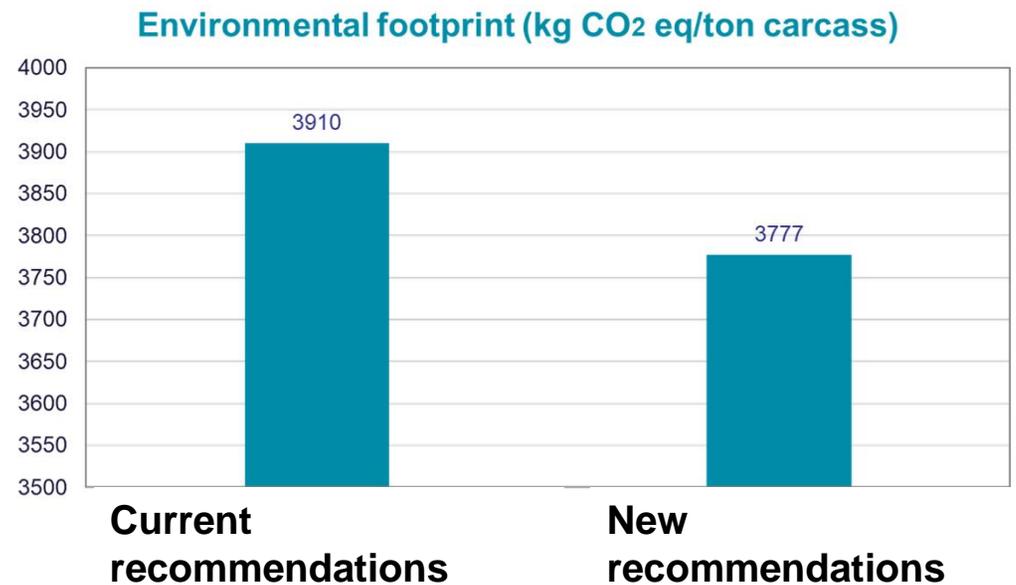
Variable	Current recommendation	New recommendation
Nitrogen Retention (g)	74	83
Nitrogen Efficiency (%)	65	68
Phosphorus Retention (g)	10	14
Phosphorus Efficiency (%)	68	70

Source: Cargill Research, 2024

Impact on environmental footprint

Reduction on environmental footprint of 133 kg CO₂ eq/ton carcass (3.5%).

- **↓ 4.4% CO₂ eq/ton carcass coming from **Feed****
- **↓ 2.6% CO₂ eq/ton carcass coming from **Farm + Slaughter****



Source: Cargill Research, 2024. Based on Opteinics LCA estimation

Take Home Messages



- Genetic improvement is 25-40% higher than it was 5 years ago – update nutrient recommendations to maximize performance.
- Understanding the difference genotype vs. phenotype is crucial to define the right nutrient requirements for a specific pig farm.
- Precision nutrition for the genetic potential of the animal boosts efficiency, profitability and sustainability.
- Optimal lysine and phosphorus levels increases ADG and improves FCR; reduces market days of fatteners and reduces environmental footprint.

Thank you!
Salamat po!