Feed-a-Gene

Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems

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Application of a precision feeding program in growing pigs - *Effect on performance and nutrient use*

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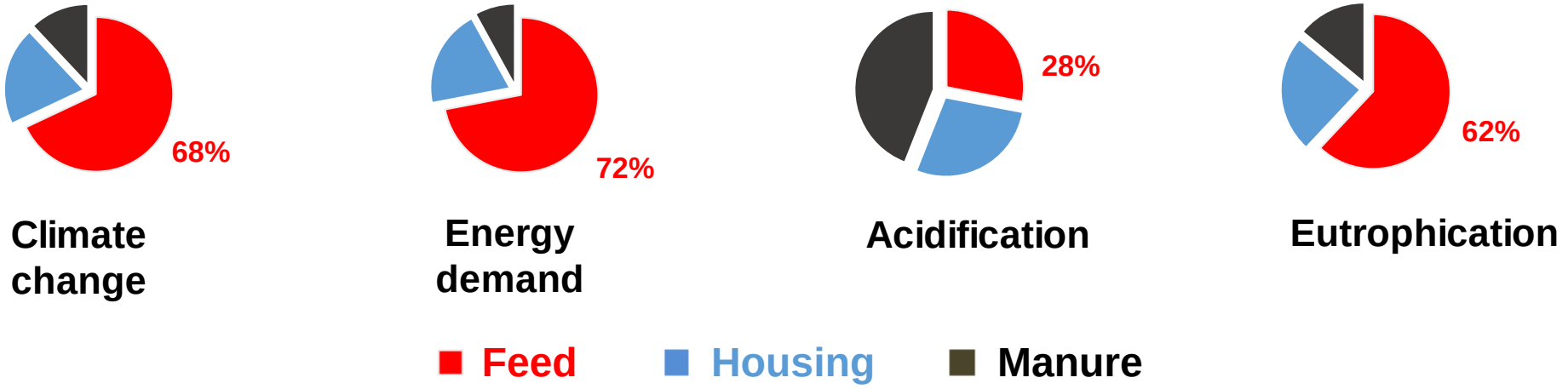
Improvement of feed efficiency - A key issue for sustainability of pig production

- **Feed = 60-70% of production costs in growing pigs** *(IFIP, 2017)*

- **Contribution of feed to environmental impact of pig production** *(Dourmad et al., 2014)*



Ways to improve feed efficiency

- **Management strategies**
  - Genetic selection
  - Entire males vs barrows
  - Slaughter weight

- **Nutritional strategies**
  - Multiphase vs two-phase strategies / adequacy of supply to requirements/potential
  - Reduction of crude protein content / use of synthetic amino acids…

(Millet et al., 2018)

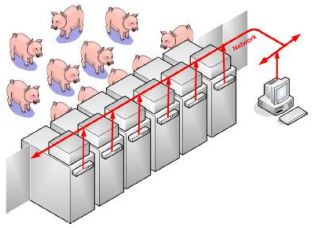
Difficult to implement in practice up to recently

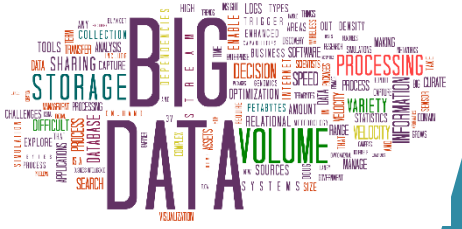
  - Variation of requirements over time / among individuals to be characterized in real-time
  - Equipment / systems for precise distribution of feed

Feed-a-Gene program

Taking opportunities offered by precision livestock farming to improve feed efficiency

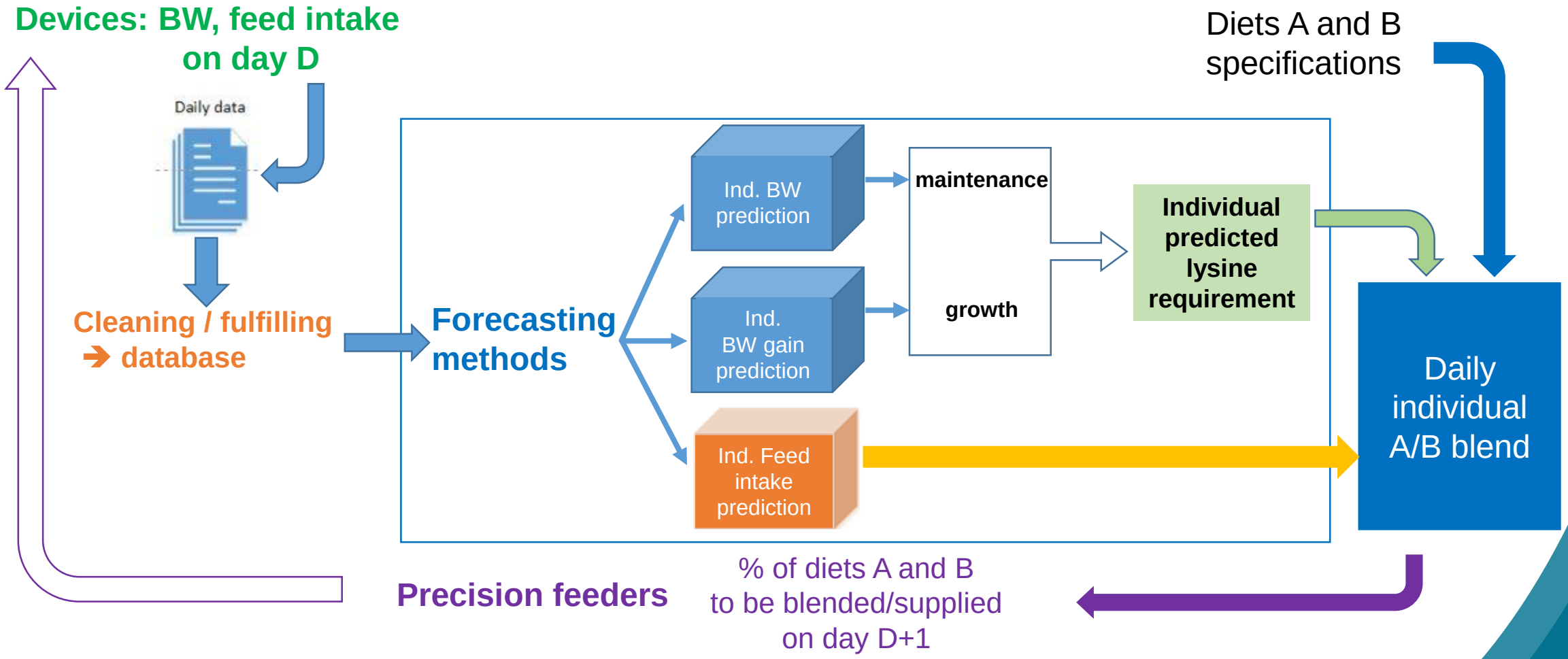
- **Precision feeding**
  - Dynamic adjustment (day by day) of nutrient supply to requirement (group or individual level) by blending premixes
  - Progress in sensors, automates and data treatment
    - ➔ opportunities for precision feeding application





- **During Feed-a-Gene program, development of automatized systems for precision feeding management**
  - Decision support system (DSS)
  - Coupling with data management system and precision feeders able to blend diets

DSS for precision feeding



Aim of the study

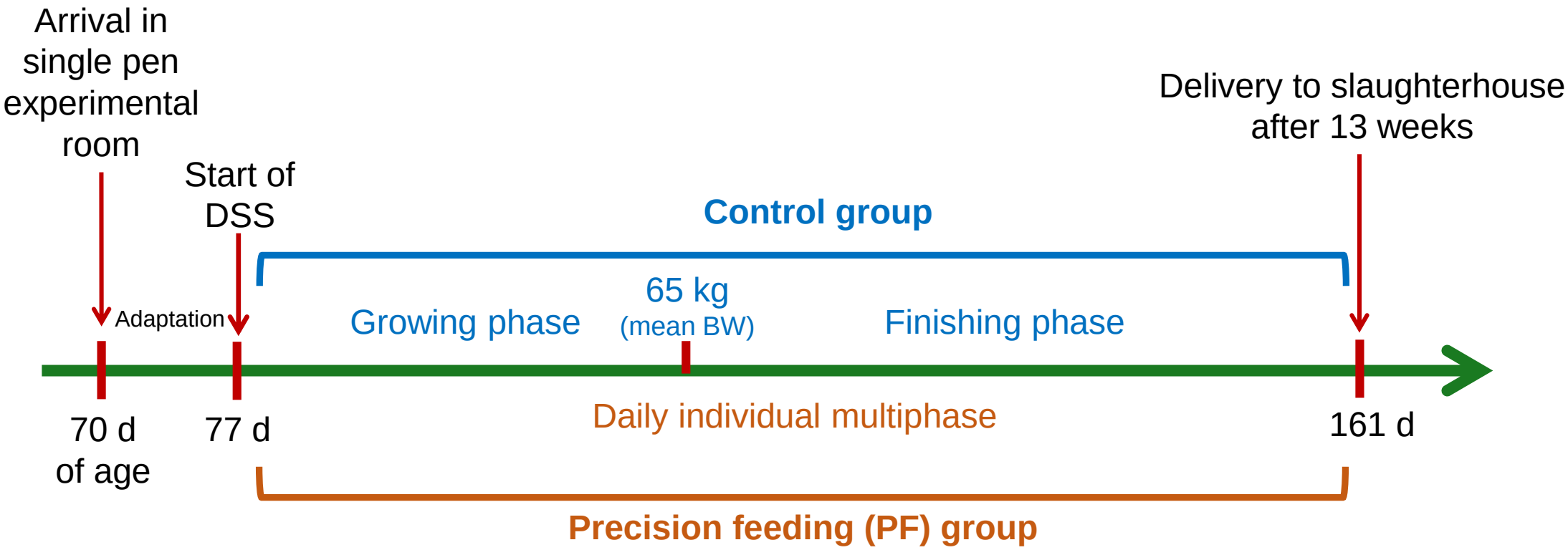
- **To test**
  - **the DSS functioning in practical conditions**
  - **the consequences of its application on performances and nutrient use of growing pigs fed *ad libitum***

Experimental design (1)

- 64 pigs (32 barrows and 32 gilts)
- 2 groups
  - Control: all pigs with the same two-phase feeding with two successive blends
    - 0.9 g SID Lys / MJ NE until an average BW of 65 kg (growing phase)
    - 0.7 g SID Lys / MJ NE thereafter (finishing phase)
  - Precision feeding (PF) : individual daily multiphase
    = individual application of precision feeding using DSS calculation
- 2 diets to be blended (both containing 9.7 MJ NE) to obtain Control or PF ration
  - A -> High SID Lys content: 1 g SID Lys / MJ NE
  - B -> Low SID Lys content: 0.4 g SID Lys /MJ NE

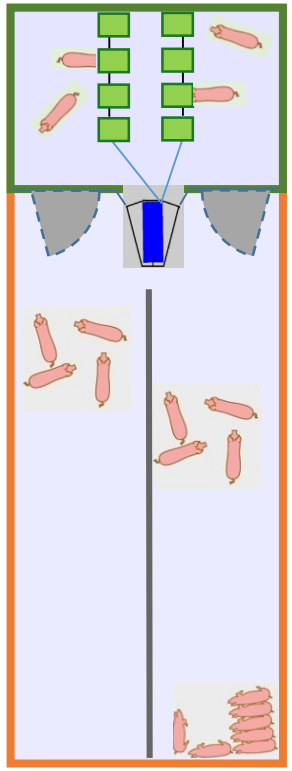
Experimental design (2)

Management of animals - treatment application



Experimental room & calculations

Single pen room



Resting area

Feeding area - 8 precision feeders

Weighing-sorting device

BW daily individual data

Mix up to 4 diets

Feed intake daily individual data

- From BW and FI data
  - Daily feed intake
  - Average daily gain
  - Feed conversion ratio
  - Nutrient use
    - SID Lys intake
    - N intake and excretion
- Stat. analysis: effect of treat., sex, treat. x sex

Results: Overall performance

Variable		Feeding strategy: Control	Feeding strategy: PF	RSD	P-value
Body weight, kg	Initial	33.0	33.7	1.3	0.10
	Final	108.6	108.2	9.4	0.88

➔ **No difference in initial and final BW**

Results: Overall performance

Variable		Feeding strategy: Control	PF	RSD	P-value
Body weight, kg	Initial	33.0	33.7	1.3	0.10
	Final	108.6	108.2	9.4	0.88
Daily feed intake, kg/d		2.37	2.39	0.24	0.80
Average daily gain, g/d		894	889	112	0.88
Feed conversion ratio		2.65	2.72	0.27	0.35

➔ **No difference in growth and intake performance**

Results: Overall performance

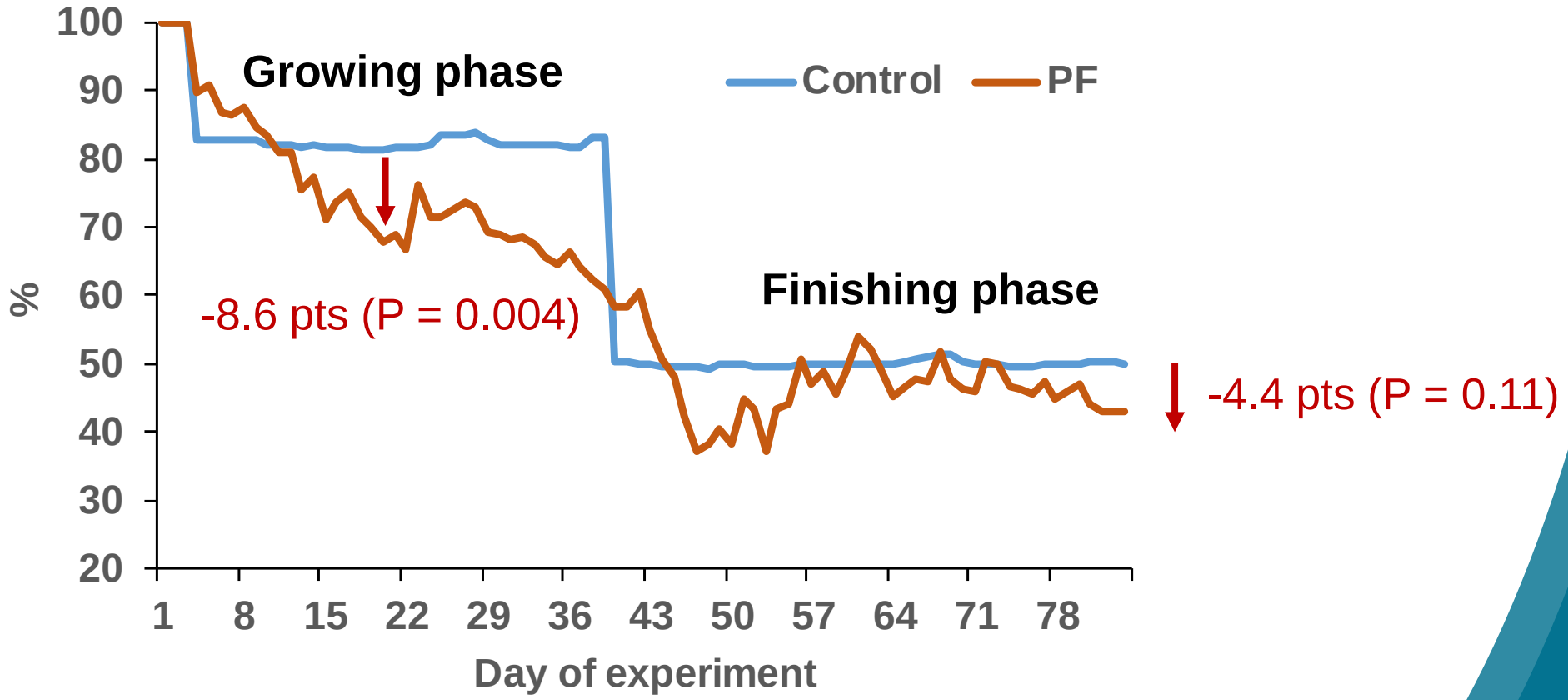
Variable		Feeding strategy: Control	PF	RSD	P-value
Body weight, kg	Initial	33.0	33.7	1.3	0.10
	Final	108.6	108.2	9.4	0.88
Daily feed intake, kg/d		2.37	2.39	0.24	0.80
Average daily gain, g/d		894	889	112	0.88
Feed conversion ratio		2.65	2.72	0.27	0.35
Digestible lysine intake, kg		1.56	1.49	0.19	0.22
N intake, kg		4.42	4.30	0.50	0.41
N excretion, kg		2.51	2.39	0.36	0.29

➔ **No difference in nutrient use (only numeric differences)**

Results: Overall performance

		Feeding strategy			
Variable		Control	PF	RSD	P-value
Body weight, kg	Initial	33.0	33.7	1.3	0.10
	Final	108.6	108.2	9.4	0.88
Daily feed intake, kg/d		2.37	2.39	0.24	0.80
Average daily gain, g/d		894	889	112	0.88
Feed conversion ratio		2.65	2.72	0.27	0.35
Digestible lysine intake, kg		1.56	1.49	0.19	0.22
N intake, kg		4.42	4.30	0.50	0.41
N excretion, kg		2.51	2.39	0.36	0.29
% of A diet		66	60	8	0.02

% of A diet *(1.0 g SID Lys / MJ NE)*



➔ **Reduction of the average A diet proportion in the blend with DSS application**

Results: Growing phase

Variable	Feeding strategy		RSD	P-value
	Control	PF		
Daily feed intake, kg/d	1.94	1.86	0.26	0.32
Average daily gain, g/d	835	823	165	0.82
Feed conversion ratio	2.34	2.34	0.47	0.99

➔ **No difference in performance during growing phase**

Results: Growing phase

	Feeding strategy			
Variable	Control	PF	RSD	P-value
Daily feed intake, kg/d	1.94	1.86	0.26	0.32
Average daily gain, g/d	835	823	165	0.82
Feed conversion ratio	2.34	2.34	0.47	0.99
Digestible lysine intake, kg	0.67	0.60	0.09	0.02

-11%

➔ **Reduction of SID Lys intake**

Results: Growing phase

	Feeding strategy			
Variable	Control	PF	RSD	P-value
Daily feed intake, kg/d	1.94	1.86	0.26	0.32
Average daily gain, g/d	835	823	165	0.82
Feed conversion ratio	2.34	2.34	0.47	0.99
Digestible lysine intake, kg	0.67	0.60	0.09	0.02
N intake, kg	1.80	1.64	0.25	0.04

-9%

➔ **Reduction of N intake**

Results: Growing phase

	Feeding strategy			
Variable	Control	PF	RSD	P-value
Daily feed intake, kg/d	1.94	1.86	0.26	0.32
Average daily gain, g/d	835	823	165	0.82
Feed conversion ratio	2.34	2.34	0.47	0.99
Digestible lysine intake, kg	0.67	0.60	0.09	0.02
N intake, kg	1.80	1.64	0.25	0.04
N excretion, kg	1.01	0.87	0.19	0.01

➔ **Reduction of N excretion** **-14%**

Results: Finishing phase

Variable	Feeding strategy		RSD	P-value
	Control	PF		
Daily feed intake, kg/d	2.73	2.83	0.27	0.24
Average daily gain, g/d	942	941	99	0.99
Feed conversion ratio	2.90	3.03	0.27	0.12
Digestible lysine intake, kg	0.90	0.90	0.12	0.98
N intake, kg	2.62	2.65	0.30	0.72
N excretion, kg	1.49	1.52	0.23	0.66

➔ **No statistical effect of treatment in finishing phase**

Conclusions

- DSS application allows to obtain the same growth performance
- Significant decrease in SID Lys intake and N intake and excretion only in growing phase
- No statistical improvement during finishing phase
  - Linked to slightly higher feed intake (+100 g/d, P = 0.24) in PF group
  - SID Lys supply already low (0.7 g SID Lys / MJ NE) in Control group

➔ Numerical effect in reduction in nutrient use by applying precision feeding with positive effect during growing phase

➔ Promising results to be confirmed in further batches

Thank you for your attention