Tailored phase-feeding program for liquid-fed growing pig towards a reduced use of protein rich diet

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The 2-phase strategy (2P) allows for reducing the amount of AA supplied in excess

➔ reduced environmental impact and use of protein-rich ingredients without any difference in growth performance when AA requirements are met and diets formulated on right bases (net energy, ideal protein…)

Requirement in digestible lysine

(g/MJ NE)

Reduced excess

Diet 1

Diet 2
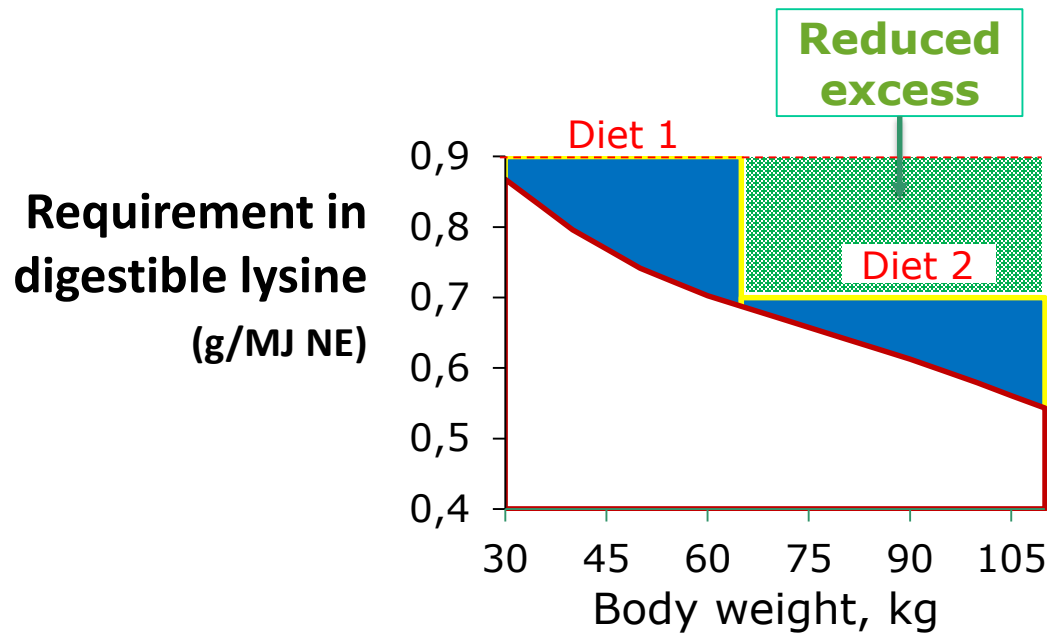
Additional progress is expected with more than 2 phases ➔ multiphase strategy

Body weight, kg

Body weight, kg
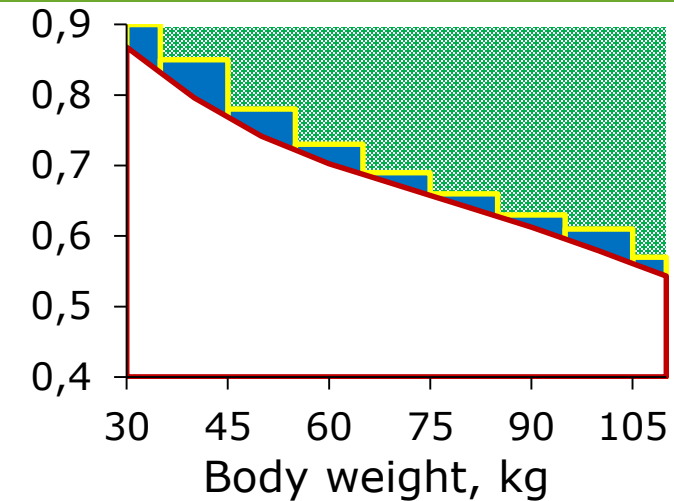
1. **Assessment of the dynamic of amino acid (AA) requirement**
2. **Mix 2 diets in different % at each phase**
3. **Implementation depends on the feeding system available**

Liquid feeding system?

Advantage and limitation of the liquid feeding system

Advantage

⇨ Feed restriction in order to improve the feed conversion ratio (FCR) and carcass leanness (2/3 of fattening pigs in France)

⇨ Incorporation of liquid byproducts, high-moisture corn…

## Limitation

⇨ All penmates are fed with the same diet/average feed allowance

⇨ A minimum amount of soup has to be prepared in the tank (quality ⬅➡ quantity)

= A minimum number of pens must switch from 1 phase to another simultaneously

➡ **maximum number of phases of the feeding program**

Experimental design

- Trial performed in a demonstration farm

- Crossbred gilts and barrows
  Pietrain Sire x (Large White x Landrace) sows

- Growth profile characterised
  with InraPorc® software

- Comparison of 2 feeding strategies

- 2 batches
    ⇨ 16 pens / strategy
    ⇨ 14 pigs / pen
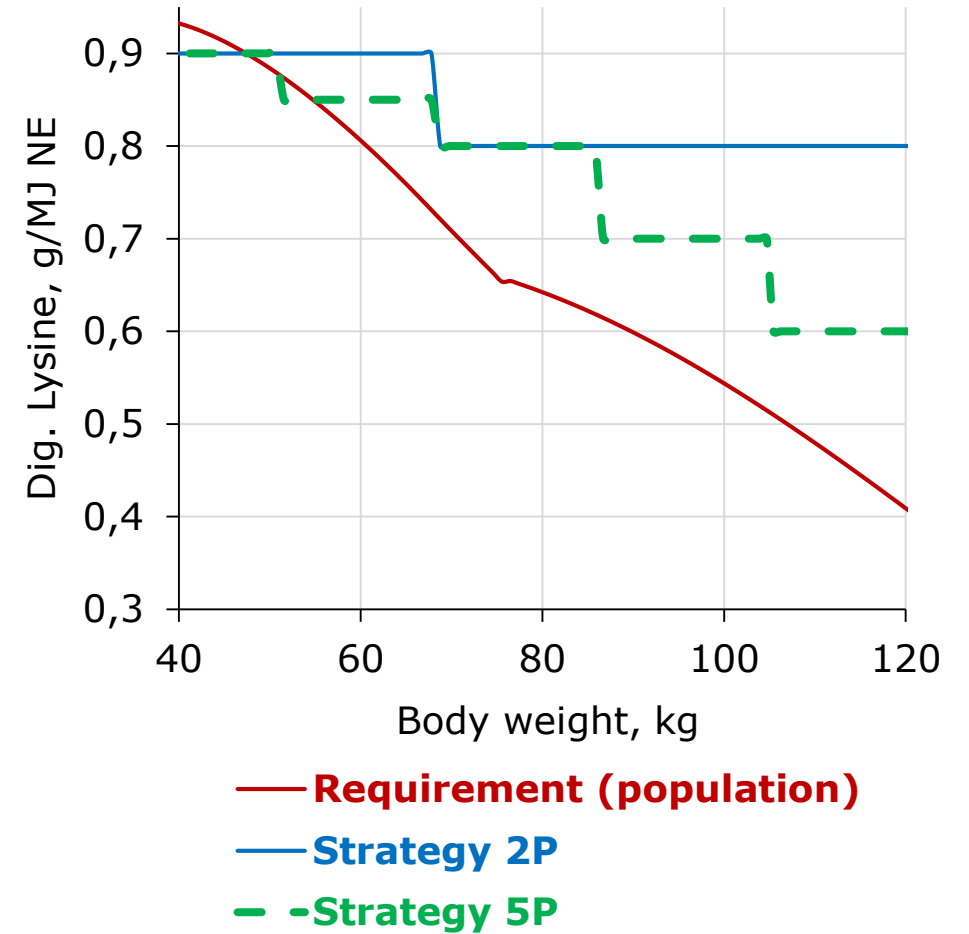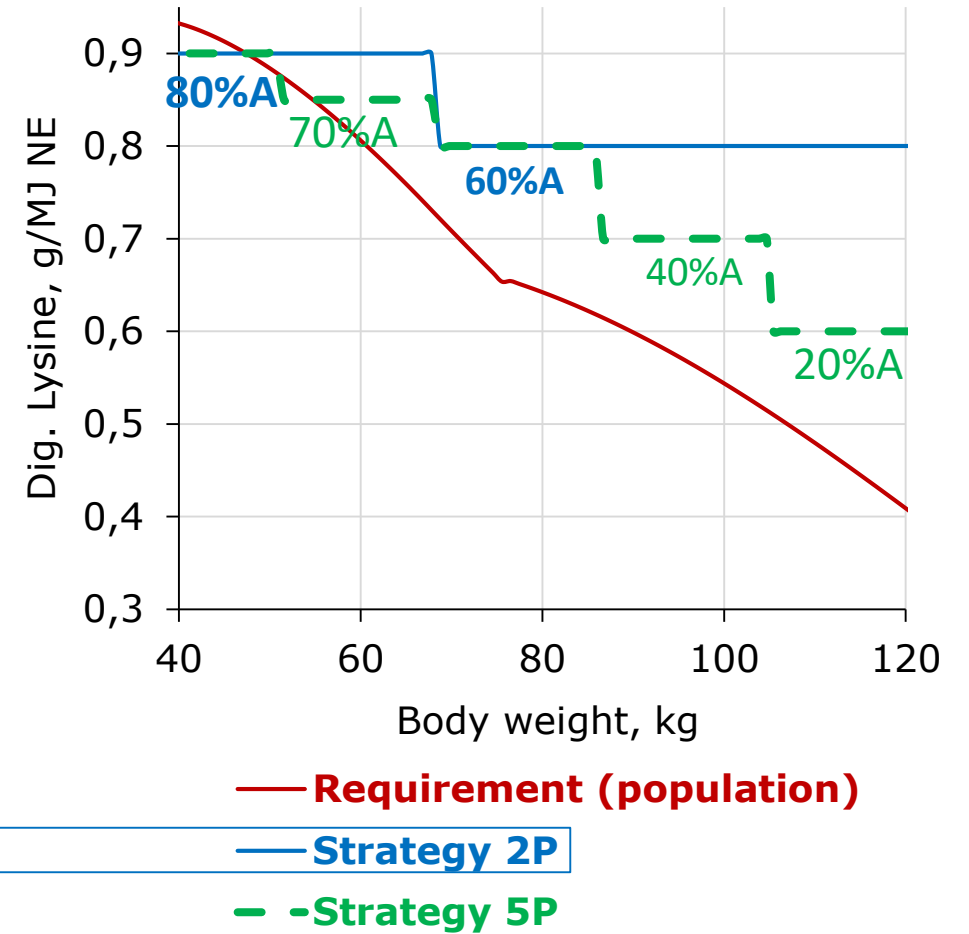
Characteristics of studied feeding strategies

- 2 diets mixed:

Diets	A	B
Net energy, MJ/kg	9.83	10.15
Dig. Lysine, g/MJ NE	1.0	0.5
Crude protein (CP), %	15.6	10.7

= low CP 2P strategy	
Growing phase	Finishing phase
14.6% CP	13.6% CP
vs. usual	
standard 2P	
16.0% CP	15.0% CP

Results (44-120 kg BW range, measurements)

Similar growth performance

Strategy		2P*	5P**	RSD	P-value
Daily feed intake,	kg	2.38	2.42	0.14	0.47
Average daily gain,	g	822	814	43	0.64
Feed conversion ratio,	kg	2.96	2.99	0.26	0.53
	MJ NE	29.1	29.9	2.6	0.43

* 16 pens, 216 pigs
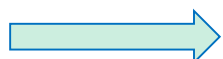
** 14 pens, 194 pigs ⟹ two pens removed from the trial due to difficult control of liquid feed delivery

Ssas. *Analysis of variance with the **S**trategy/**B**atch/Room within batch/SxB as fixed factors and sex ratio as covariate.*

Results (44-120 kg BW range, calculations)

Reduced local environnemental impact* with 5P

Strategy	2P	5P	RSD	P-value
N intake, kg/pig diets A/B	**4.93** $\xrightarrow{-3\%}$ **4.76**		**0.40**	**0.01**
N retained, kg/pig	1.97	1.99	0.05	0.37
N output, kg/pig diets A/B	**2.96** $\xrightarrow{-6\%}$ **2.77**		**0.09**	**0.04**

* $\text{Intake}_{A/B}$ x $[\text{CP}_{A/B}]/6.25 - \Delta N_{\text{body weight}}$ (Dourmad et al., 2016)

sas *Analysis of variance with the **S**trategy/**B**atch/Room within batch/SxB as fixed factors and sex ratio as covariate.*

Results (44-120 kg BW range, calculations)

Reduced local environnemental impact* with 5P

| Strategy	2P	5P	RSD	P-value
N intake, kg/pig diets A/B	**4.93** → -3%	**4.76**	**0.40**	**0.01**
standard diets	5.41 -9%↑ -12%		0.44	0.001
N retained, kg/pig	1.97	1.99	0.05	0.37
N output, kg/pig diets A/B	**2.96** → -6%	**2.77**	**0.09**	**0.04**
standard diets	3.44 -14%↑ -19%		0.09	0.02

Ssas. *Analysis of variance with the **S**trategy/**B**atch/Room within batch/SxB as fixed factors and sex ratio as covariate.*

Results (44-120 kg BW range, calculations)

Reduced use of protein-rich feedstuffs

Strategy	2P	5P	RSD	P-value
Soybean meal, kg	20.3	15.4	1.1	0.001
Rapeseed meal, kg	22.7	23.8	1.5	0.07
L-Lysine HCl, g	835	781	50	0.008
DL-Methionine, g	116	88	6	0.001
L-Threonine, g	269	223	15	0.001
L-Tryptophane, g	58	44	3	0.001

-25% -20% -15% -10% -5% 0% 5%

Change in the amount of feedstuff intake with 5P, % 2P

*Analysis of variance with the **S**trategy/**B**atch/Room within batch/SxB as fixed factors and sex ratio as covariate.*
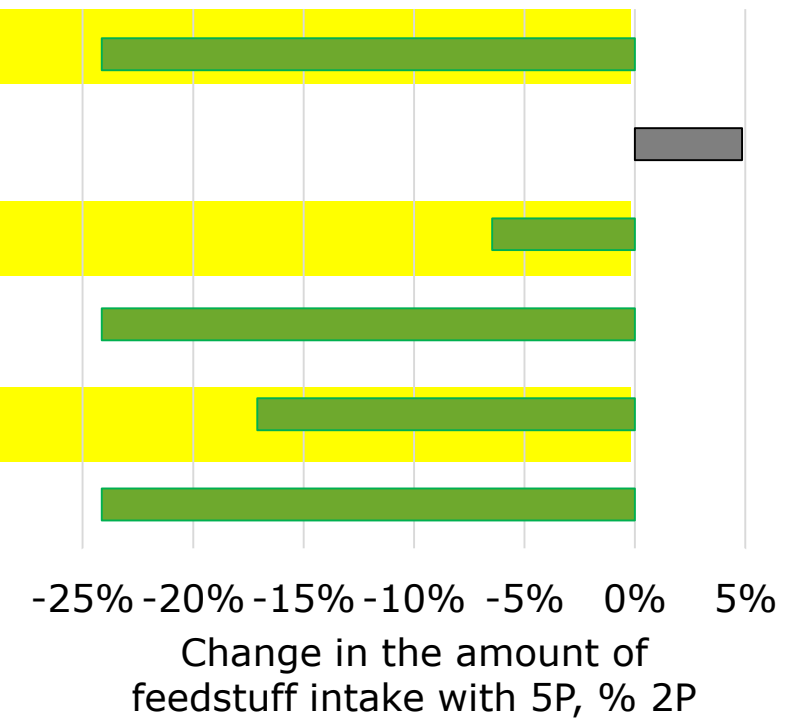
Conclusions on multiphase strategy implemented with the liquid feeding system

Similar growth performances

Advantages with 5P vs. 2P

- Less protein-rich ingredients and AA used

- Reduced environnemental impacts

Cautions:

- Growth profile has to be characterized precisely beforehand

- **Maximum** number of phases is limited by the **minimum** number of pens that can switch from 1 phase to another simultaneously without impairing the precision of liquid feed delivery

PigSys

Acknowledgement

Funding organizations of the SOS protein project