



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



SIRES OF LOW AD LIBITUM-RESIDUAL FEED INTAKE PROGENY HAVE NO UNDESIRABLE EFFECTS ON GROWTH PERFORMANCE, GAIN COMPOSITION AND CARCASS TRAITS OF RESTRICTED-FED HEAVY PIGS



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RESIDUAL FEED INTAKE (RFI)

01 Captures **individual differences** in **maintenance** requirements

Quantified under *ad libitum* feeding conditions

03 Low RFI pigs → lower feeding consumption, reduced backfat, leaner carcasses, **altered meat quality**

PDO dry-cured ham → 9 months + 170 kg BW + raised under **restricted** feeding conditions

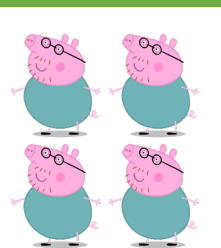
05 Quality of PDO dry-cured hams → subcutaneous fat thickness and fatty acids compositions



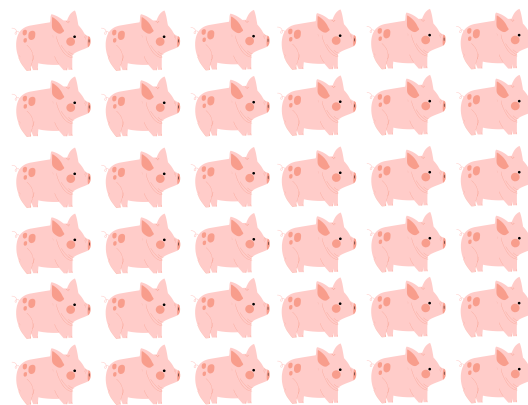
Ad libitum-fed progeny



Sires



Restricted-fed progeny



AIM OF THE STUDY

EXPERIMENTAL DESIGN



221 days, 161 kg

259 days, 173 kg

273 days, 169 kg

Start:
154 days old
98 kg BW

End:
slaughter

IN VIVO DATA COLLECTION

1

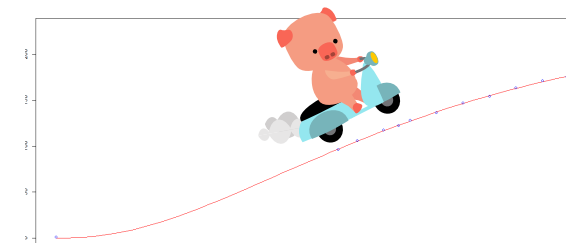
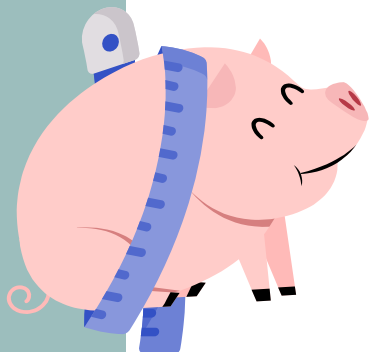
-  Individual weight (BW, kg)
-  Backfat depth (BF, mm)
-  Individual daily feed intake (ADFI, kg/day)

2

-  Empty body weight (EBW, kg)
-  Body lipid deposition (BL, kg)
-  Body protein deposition (BP, kg)

3

-  Average daily gain in EBW (EBW_{ADG} , kg/day)
-  Average daily gain in BL (BL_{ADG} , kg/day)
-  Average daily gain in BP (BP_{ADG} , kg/day)
-  EBW at the mid-test period (EBW_{MID} , kg)



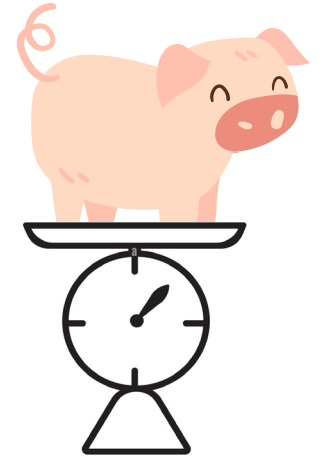
POST-MORTEM DATA COLLECTION

Carcass traits:

-  Carcass weight (kg)
-  Carcass yield (%)
-  Lean meat content (%)
-  Ham weight (% of carcass weight)
-  Fat cuts, lard and belly (% of carcass weight)

Ham quality traits:

-  Subcutaneous fat depth (mm): quadriceps femoris and semimembranosus m.
-  Iodine number (n°)
-  Linoleic acid (g/100 g of fat)
-  Stearic acid (g/100 g of fat)
-  PUFA (g/100 g of fat)



RFI was computed only for **LIB** pigs

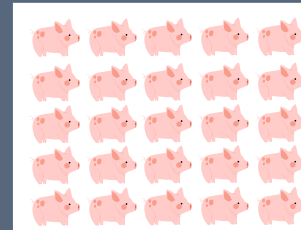
$$e_{ij} = \text{RFI (kg/d)}$$

$$\text{ADFI}_{ij} = \mu + \underbrace{\text{sex}_i}_{\substack{\downarrow \\ \text{gilts or barrows}}} + \beta_1 \text{EBW}_{\text{MID } ij} + \beta_2 \text{BL}_{\text{ADG } ij} + \beta_3 \text{BP}_{\text{ADG } ij} + e_{ij}$$

gilts or barrows

condition of **equal**
maintenance and tissue
growth

Ad libitum-fed
progeny



Sires



Restricted-fed
progeny

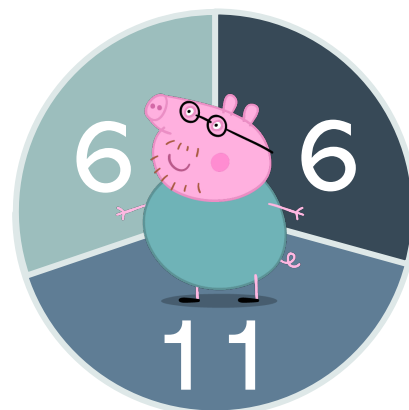


Additive genetic effects of sires

$$RFI_{ij} = \mu + \underbrace{\text{batch}_i}_{\substack{\downarrow \\ \text{4 levels}}} + \underbrace{\text{animal}_{ij}}_{\substack{\downarrow \\ \text{RFI of LIB progeny}}} + e_{ij}$$

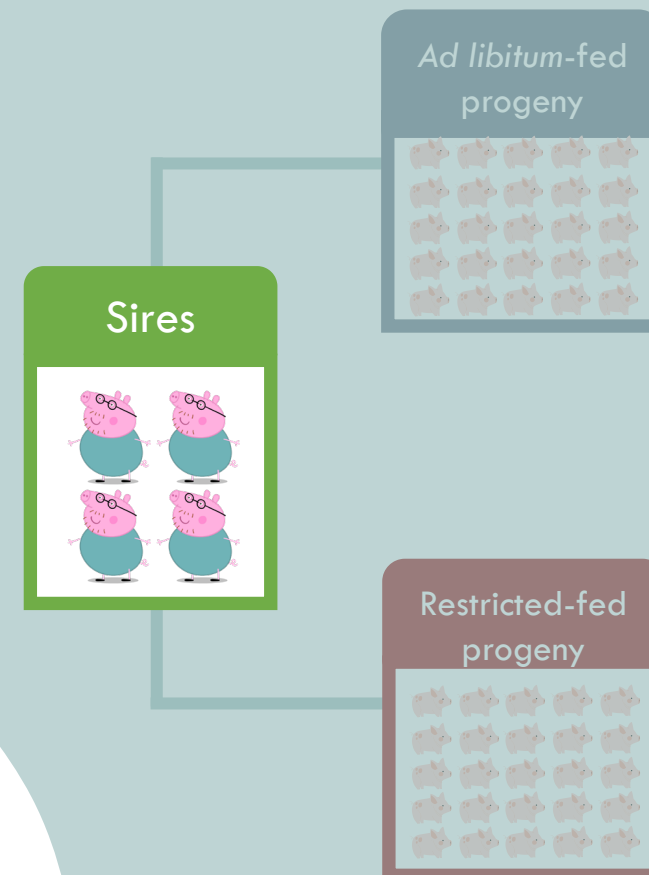
Sire classification

25% high-RFI
(**HRFI**)



25% low-RFI sire
(**LRFI**)

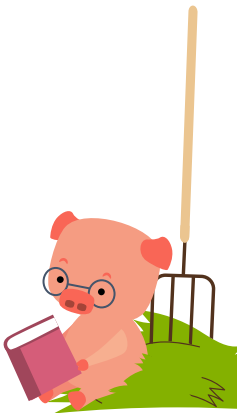
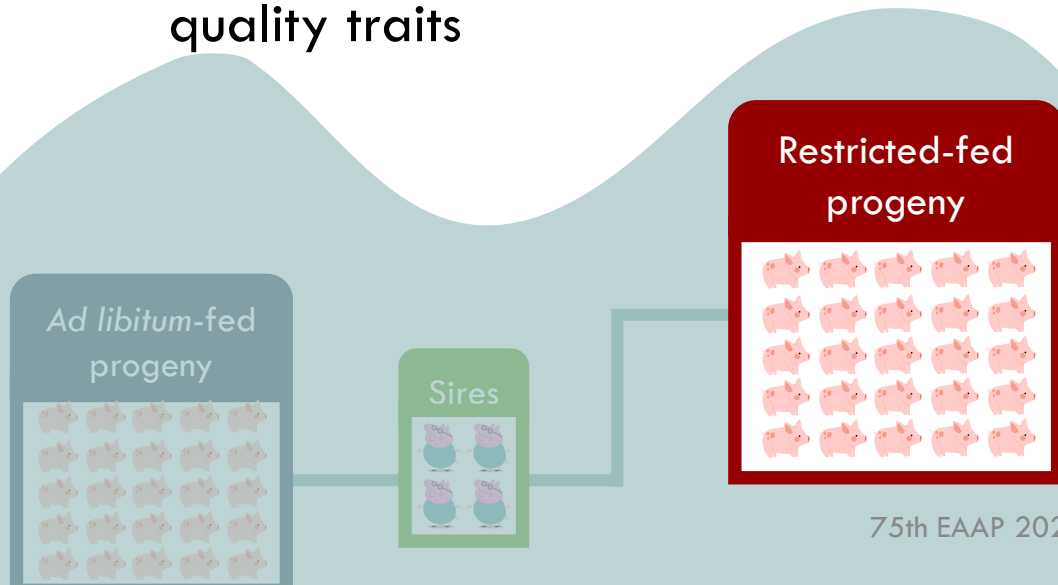
50% intermediate-RFI (**MRFI**)



Effect of sire classification on performance of **RES** progeny

$$Y_{ijklmn} = \mu + \text{sex}_i + \underbrace{\text{sire classification}_i}_{\text{LRFI, MRFI, HRFI}} + \text{batch}_k + \text{treatment}_l + \underbrace{\text{pen (batch x treatment)}_{m:kl}}_{\text{MP, LP}} + e_{ijklmn}$$

growth performance,
gain composition,
carcass and ham
quality traits



GROWTH PERFORMANCE and GAIN COMPOSITION

Trait	Sire classification			Contrasts	
	HRFI	MRFI	LRFI	LRFI vs MRFI	LRFI vs HRFI
ADFI, kg/day	2.717 ± 0.018	2.720 ± 0.016	2.633 ± 0.017	P<0.001	P<0.001
Average daily gain EBW, kg/day	0.605 ± 0.018	0.616 ± 0.018	0.624 ± 0.018	n.s.	P<0.1
Average daily gain BL, kg/day	0.223 ± 0.011	0.227 ± 0.011	0.230 ± 0.011	n.s.	n.s.
Average daily gain BP, kg/day	0.107 ± 0.004	0.108 ± 0.004	0.108 ± 0.004	n.s.	n.s.

CARCASS QUALITY TRAITS

Trait	Sire classification			Contrasts	
	HRFI	MRFI	LRFI	LRFI vs MRFI	LRFI vs HRFI
Carcass weight gain (kg/day)	0.372 ± 0.024	0.386 ± 0.024	0.399 ± 0.024	n.s.	P < 0.05
Carcass yield (%)	80.90 ± 0.25	81.00 ± 0.23	81.40 ± 0.24	n.s.	P < 0.1
Lean meat content (%)	51.60 ± 0.55	51.00 ± 0.52	50.80 ± 0.53	n.s.	P < 0.1
Ham weight (% carcass weight)	23.70 ± 0.10	23.80 ± 0.09	24.00 ± 0.09	P < 0.1	P < 0.05
Fat cuts weight (% carcass weight)	19.10 ± 0.41	19.50 ± 0.40	19.60 ± 0.40	n.s.	P < 0.1

FAT QUALITY TRAITS

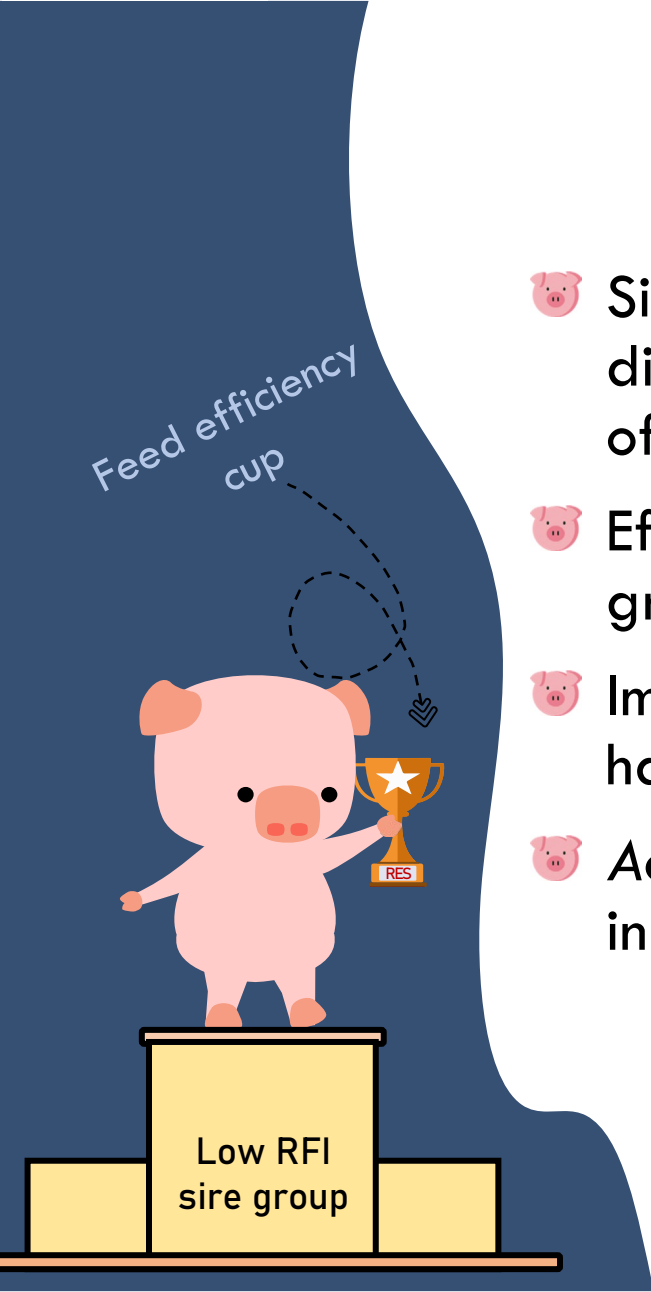
Trait	Sire classification			Contrasts	
	HRFI	MRFI	LRFI	LRFI vs MRFI	LRFI vs HRFI
Subcutaneous fat depth in the proximity of					
<i>quadriceps femoris</i> (mm)	28.10 ± 1.40	27.40 ± 1.35	28.10 ± 1.37	n.s.	n.s.
<i>semimembranosus</i> (mm)	6.86 ± 0.22	6.67 ± 0.21	6.67 ± 0.22	n.s.	n.s.
Stearic acid (g/100 g fat)	12.40 ± 1.64	12.70 ± 1.63	13.00 ± 1.63	P < 0.1	P < 0.01
Iodine number	66.50 ± 2.30	65.40 ± 2.29	63.90 ± 2.29	P < 0.05	P < 0.001
Linoleic acid (g/100 g fat)	15.70 ± 0.43	15.10 ± 0.41	14.40 ± 0.41	P < 0.05	P < 0.001
PUFA (g/100 g fat)	18.50 ± 0.50	17.90 ± 0.48	17.00 ± 0.48	P < 0.05	P < 0.001

WHAT CAN WE CONCLUDE?

-  Sire who generated low-RFI progeny under ad libitum feeding conditions, did not adversely affect important traits for PDO dry-cured ham in offspring under restricted feeding conditions
-  Efficient pigs exhibited lower feeding consumption and slightly faster growth at constant body composition
-  Improvements in sire feed efficiency lead to enhanced carcass value and ham quality in restricted-fed pigs
-  *Ad libitum* RFI can be considered as an indicator traits of feed efficiency in restricted-fed pigs → breeding programs

Future studies:

Selection criterion in breeding programs?



A photograph of several pigs in a metal-fenced enclosure. One pig in the center is looking directly at the camera, while others are seen from the back or side. The image has a semi-transparent dark overlay with text.

**THANKS FOR YOUR
ATTENTION**

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