Task 6.4: Improve sow welfare and piglet survival through selective breeding and innovation within farrowing house design for outdoor rearing

Involved partners:

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INRAE: Caroline Clouard, Stéphane Ferchau, Elodie Merlot, A Prunier, Céline Tallet

PPILOW Final conference – Africa Museum, Tervuren (Brussels)
11th-12th June 2024

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 816172

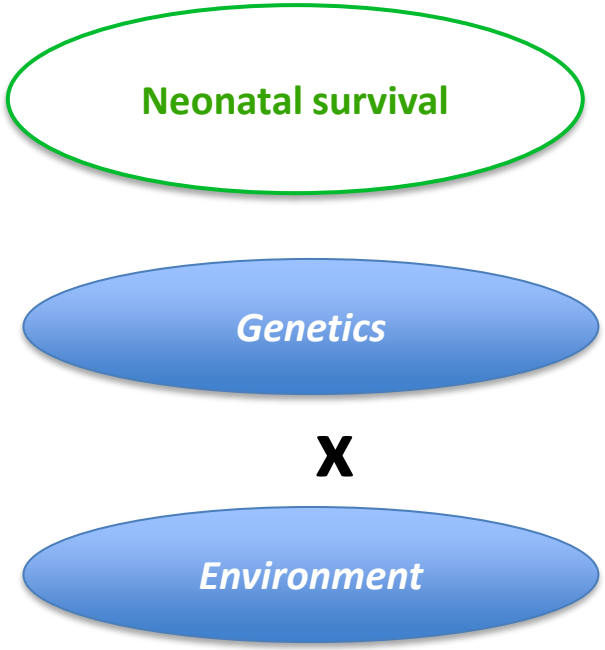
T6.4 context

- High neonatal mortality in organic pig farms (sometimes > 35%)
  in conflict with the high welfare principles of organic farming

- Major causes:
  Weakness
  Starving
  Crushing by the sow

- In PPILOW project:
  - Selective breeding experiment
    (INRAE)
    D6.6 and D6.7

  - Farrowing housing design for outdoor rearing
    (Vangaard)
    D6.8



- Sow maternal ability
- Piglet potential of survival

Influenced by dam and boar

- Sow capacity of adaptation

Maintaining production levels despite environmental changes or disturbances

- Housing

Sow ease of movement and behaviour expression
Piglet comfort

PPILOW

Improving sow capacity of adaptation and piglet survival through selective breeding

Coordination : Laurianne Canario
Collaborators: Caroline Clouard, Stéphane Ferchaud, Elodie Merlot*, A Prunier, Céline Tallet
(INRAE)

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*presenting today

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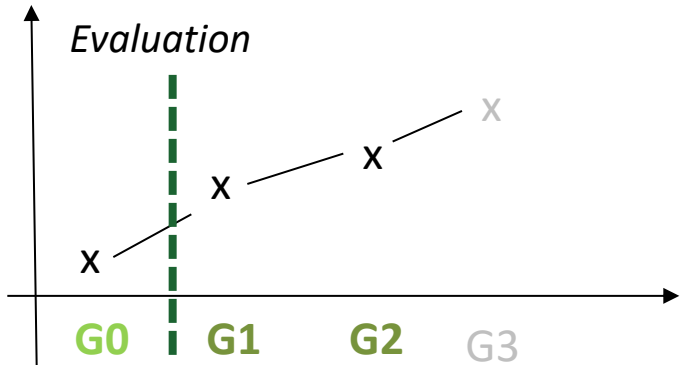
Selective breeding to improve piglet survival

Exploit genetic information (pedigree data) + non-genetic transmission of characters by descent

Selection upwards

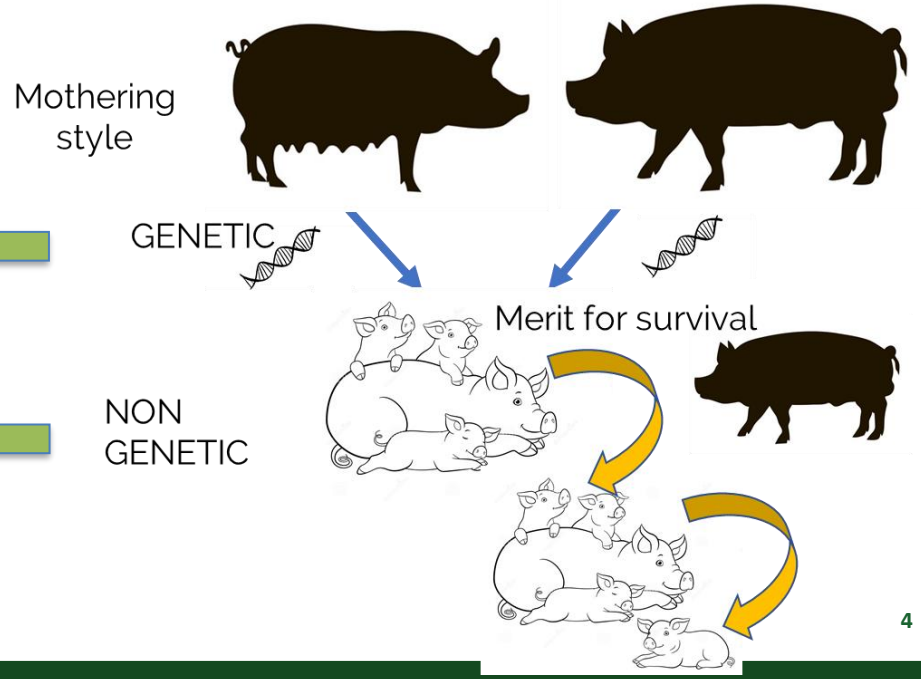
Criteria of selection : survival rate and litter size, number of piglets crushed

stability of performance, sow behaviour



Principle: sows inseminated over successive generations with semen from boars with a high genetic merit (breeding value) for piglet survival

Daughters from best dams chosen as future reproducers



Experimental design

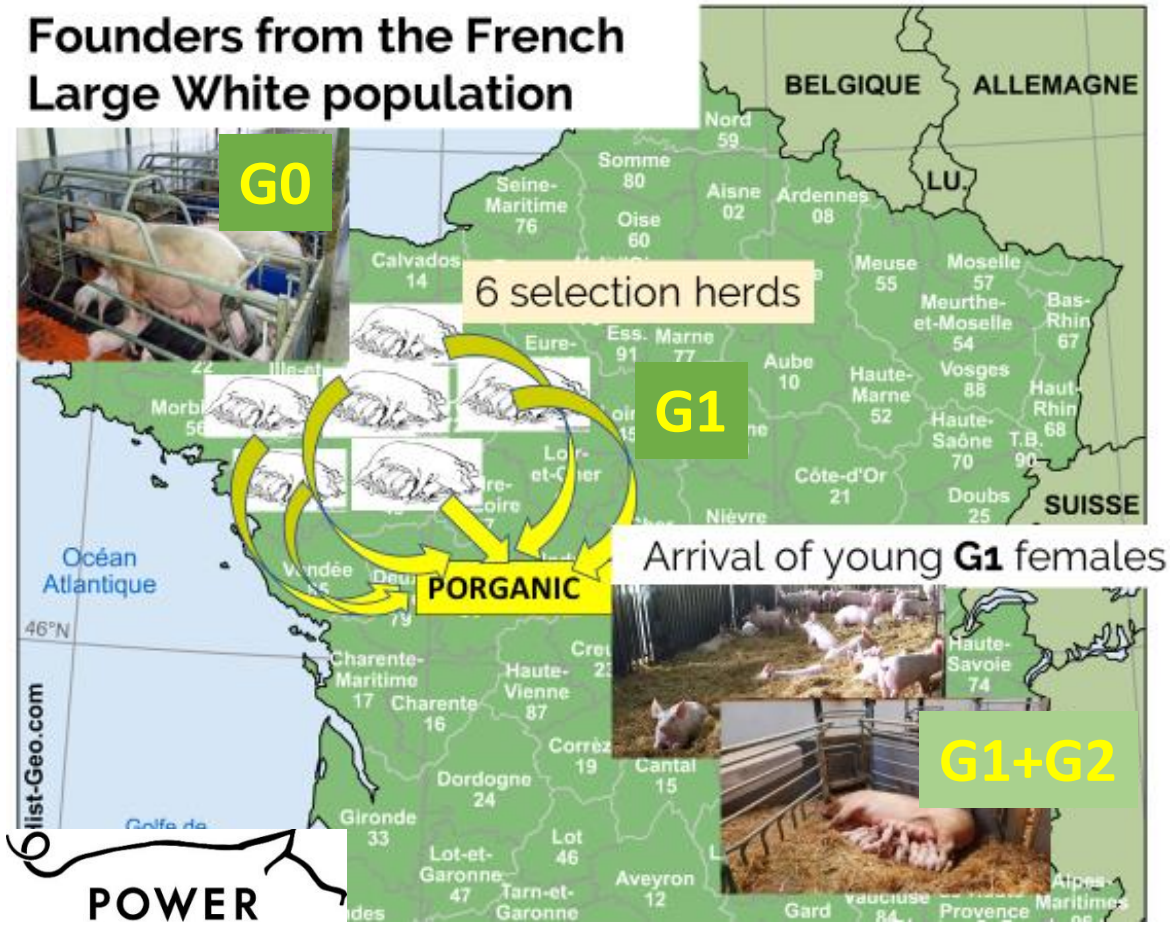
Large-White breed

Selection companies:

AXIOM l'évidence génétique

Nucléus L'innovation pour l'excellence

PORGANIC
INRAE organic farm



Impact of housing around farrowing

24 pairs of **G1** sisters evaluated inseminated with the same boar

90 % free **B**
(temporary crating)

100 % free **L**

Study of the first 3 litters of each sow, each raised in a given environment

Parity 1: insemination with **Pietrain** boars, crated from entrance in farrowing unit to L4, litter equalisation by adoption

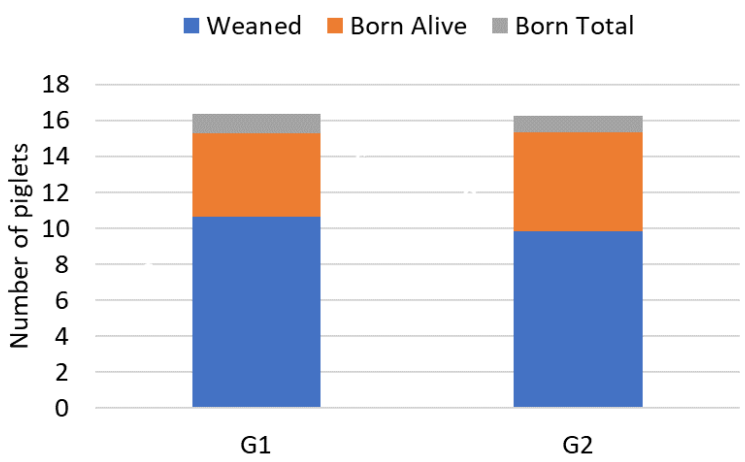
Parities 2 and 3: insemination with **Large White** boars, crated from 4 days after entrance to L4, no adoption

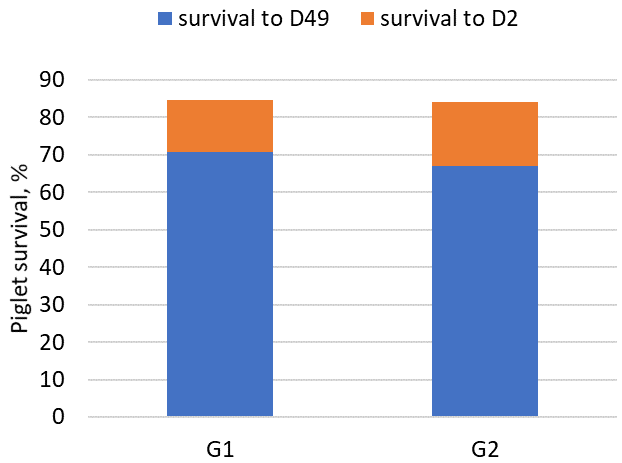
D4-D21 all sows free, i.e., loose-housed
D21-D49 in addition, access to a small yard

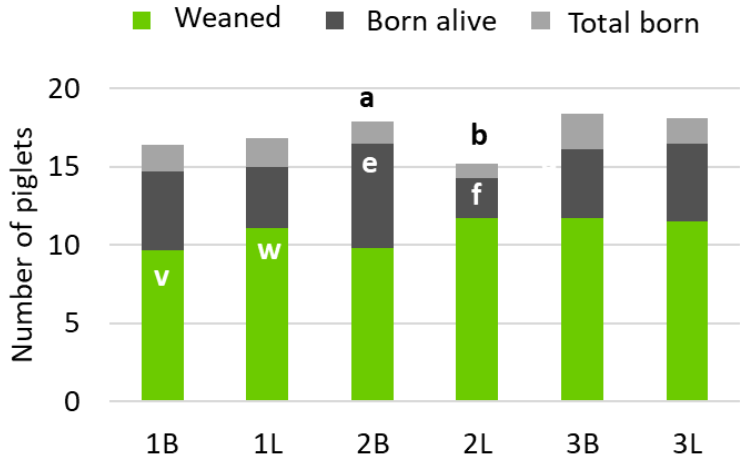
Boar semen + parity …effects

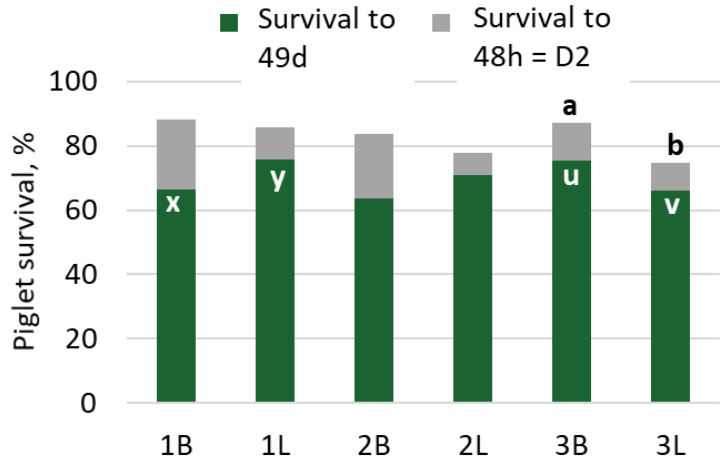
Late first AI : 340 d of age
Weaning : 49 d

Numerical reproductive performance = f (generation, parity and housing)









Generation effect

no statistical difference between generations

Crushed piglets

	Parity1	Parity2	Parity3
G1	1.56[a] 0.36	2.59[b] 0.36	2.50 0.39
G2	0.99 0.37	1.73 0.42	2.53 0.45
G2-G1	0.26	0.12	0.95

According to Parity
No difference in Born Alive and
Survival until D21

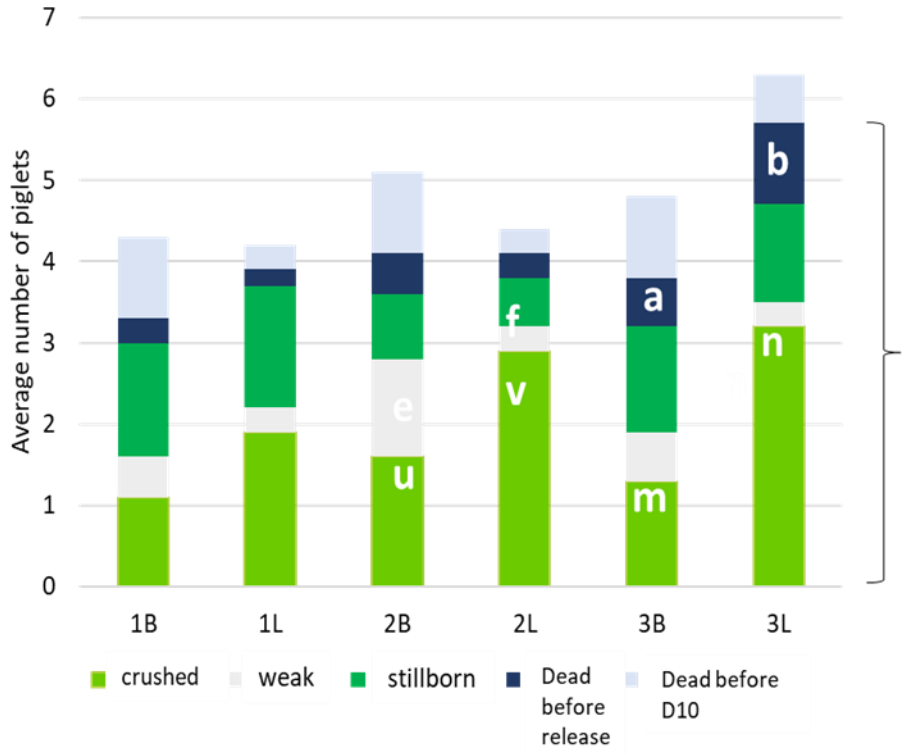
Effect of housing around farrowing

Strong parity x housing interaction

Fine characterisation of piglet mortality and maturity at birth

Causes of death:
External examination

Necropsy



G1

Before release of blocked sows

G1: more crushing in 100% free sows

No crushing differences between G1 and G2

Possible differences of maturity at birth between G1 and G2?

Physiological maturity
BMI, PI, ratio head length/BL
liver weight/ BW Canario et al. 2016

G1 + G2 Piglet plasma indicators at 1d of age:

Plasma variable	G1	G2	sem
IgG, g/L	23.3	24.6	2.8
Lactate, µmol/L	4029	4343	208
Glucose, mg/L	991	917	54
Albumine, g/L	9.13^{a}	9.86^{b}	0.23
dROM, CARRU	152^{a}	189^{b}	5
FRAP, molar Trolox eq./L	61.1^{a}	49.2^{b}	2.0

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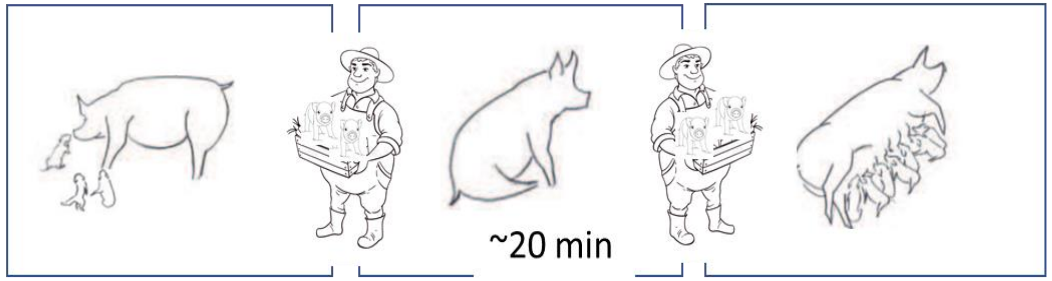
Sow behaviour : key factor for improvement?

observations on farm

Reaction of the sow when weighing piglets D1: separation test

on removal of the litter on return of the piglets

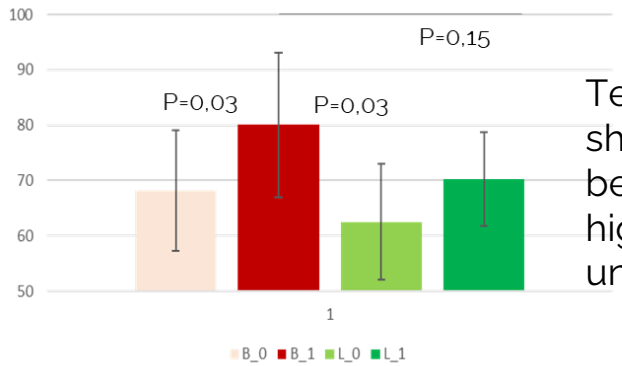


Items: Posture / Change of posture / Vocalizations / Mobility / Attention - Protection towards piglets / Exploratory behaviour / Difficulty of intervention

G1

Return after separation

Survival rate = f(housing x behaviour)



Temporary crated sows showing maternal behaviour at D1 have a higher piglet survival rate until weaning

Maternal attitude towards piglets

B: 36,4% vs L : 69,6% P=0.05

G1+G2

Saliva samplings from 105 d of gestation until 11 d of lacatation

G2 sows secrete less cortisol than G1 sows

Perspectives
Several datatsets to analyse jointly

General management of the population A Prunier L Canario
Precise determination of causes of mortality in early lactation ⇨ necropsy

Sow maternal behaviour L Canario
Reaction to separation from progeny, on-farm notations + video analyses

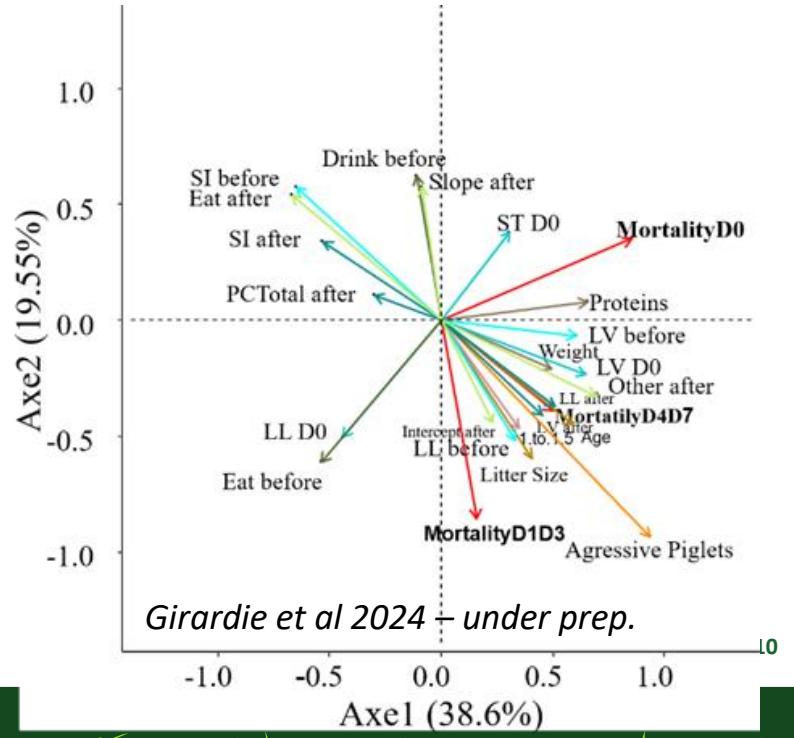
Sow stress around farrowing, piglet maturity E Merlot
Cortisol kinetics (saliva) – metabolites levels (blood)

Human-animal relationship C Tallet
Reaction of sows and piglets towards human approach + video analyses

Piglet social interactions C Clouard
video analyses

Assessment of sow investment in the raising of its progeny

Understand how these variables interact unpon genetic selection and over successive parities



Girardie et al 2024 – under prep.