

 Nunca Dejamos de Mejorar

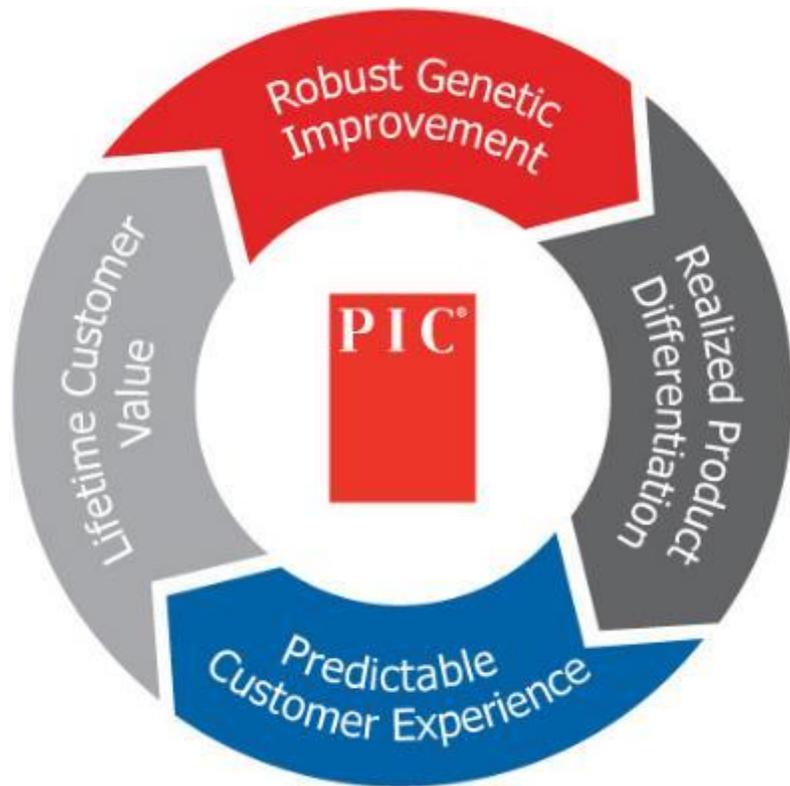
# Mejoramiento genético hoy para la porcicultura del futuro

Dr. Saskia Bloemhof-Abma

AMVEC - 2022  
Monterrey, Mexico



# Our Defining Goal

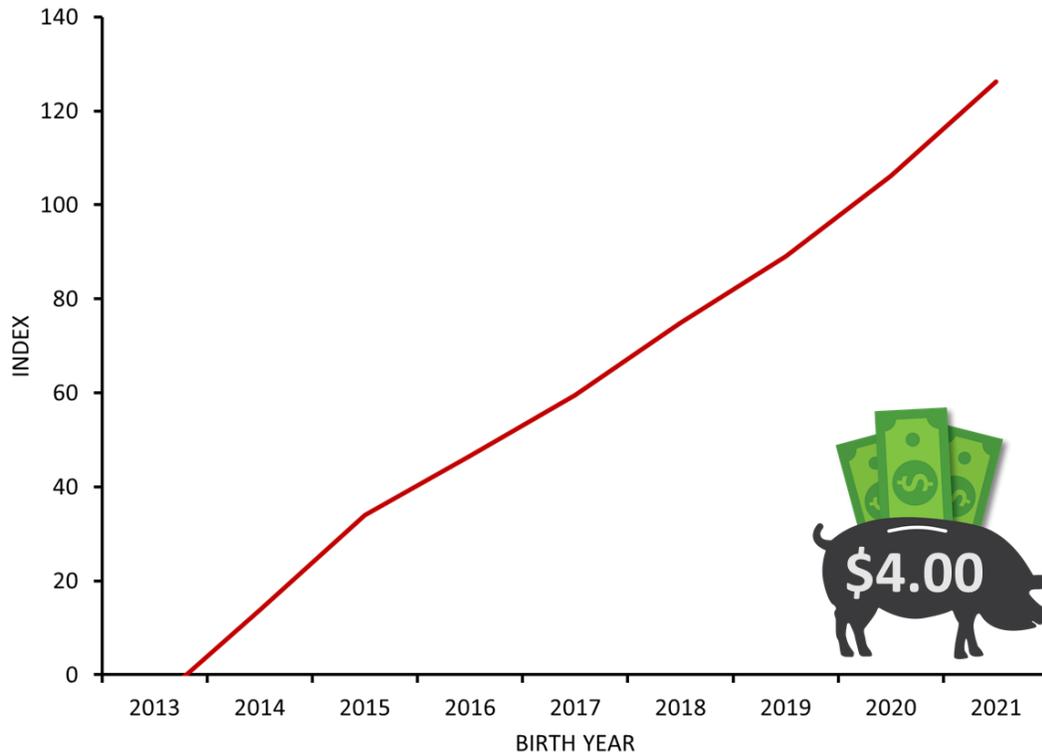


*We are driven to help make our customers the most successful pork producers and integrated systems in the world...*



*Deliver on the World's Best Pig*

# Leading the Industry in Rate of Genetic Improvement



Best data +  
Best science +  
Population size

= Continued progress

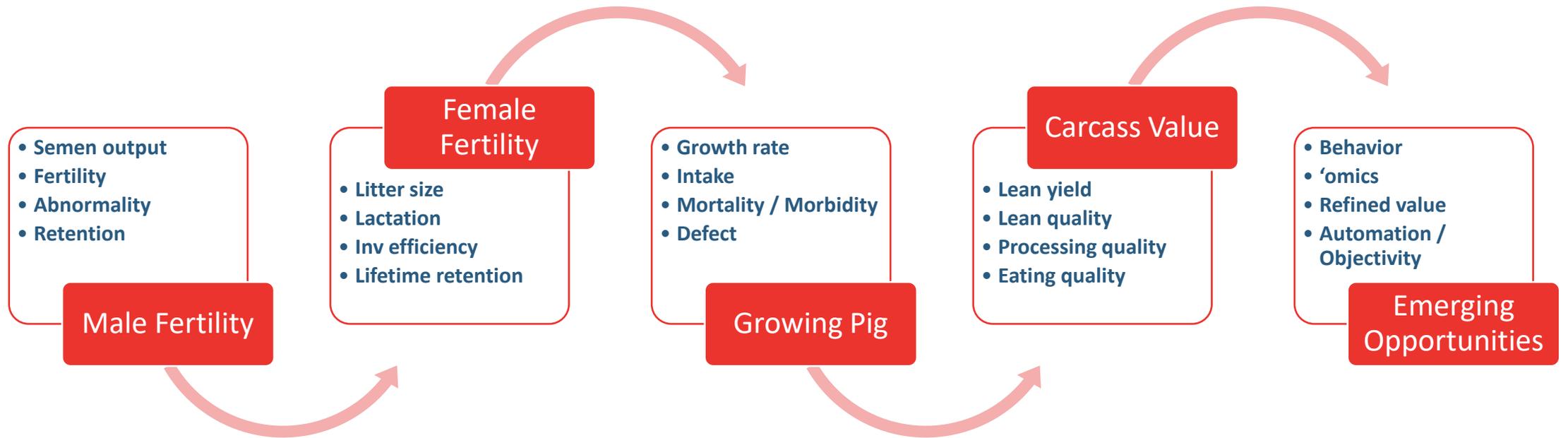
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# Best Capture Meaningful Data

System performance from conception to consumption



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# Excel at Best Science

The Power of A Large and Focused Innovation Engine

## Relationship Based Genomic Selection

**2012**

First in world implementation of single step genomic evaluation

**2022**

World leader in volume of animals tested, science of genomic evaluation and accuracy of utilization

## Genome Sequencing

**2015**

Announced strategic project with Roslin Institute for first large scale use of genome sequencing in swine

**2020**

Genome sequencing information on over 8,000 elite genetic animals and utilization pipeline in construction

## Precision Phenotyping

**2020**

Announced strategic partnership to develop digital phenotyping in pigs with KU Leuven

**2022**

Implementation of automated feet and leg scoring

## Gene Editing

**2015**

Announced results of University of Missouri project demonstrating PRRS resistant pigs

**2022**

Discovery independently verified, nucleus farms established & progressing to commercialization

**PIC**

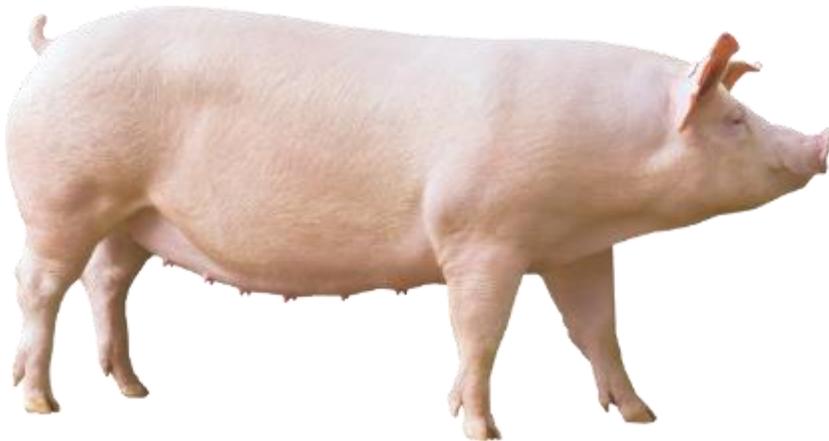


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# Large and diverse populations: PIC Camborough®

## The Camborough®

*Unrivalled performance, achieved efficiently*



The PIC Camborough is the ideal choice for producers looking for a low-maintenance, high-performing sow yielding the **lowest cost per weaned pig**

### Profitability drivers

#### Lowest weaned pig cost

- High selection and gilt success rate
- Large litters with uniform, vigorous piglets
- Low sow feed use
- Long Productive Sow Life

#### Contribution to progeny performance

- Efficient growth contribution to progeny

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# Large and diverse populations: PIC sirelines

Expansive sireline portfolio

- Two main global products
- Additional products for specific markets, including PIC's regional leaders such as PIC408

All sirelines selected for integrated value

- Robustness, efficient growth, and total carcass value

PIC sireline portfolio benefits producers

- Drives value along the chain
- Provides tailored options for each system and marketing goals
- Allows to anticipate future demands

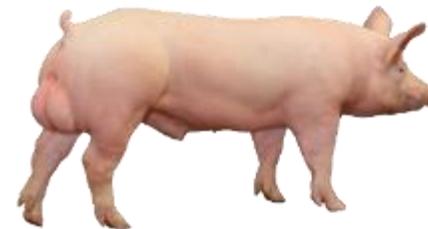
## PIC top selling global lines

### PIC800



- Superior throughput based on durability and excellent growth rate
- Excellent meat quality and carcass value

### PIC337



- Maximizes profit potential
- Superior feed conversion
- Excellent heavy weight performance

PIC®

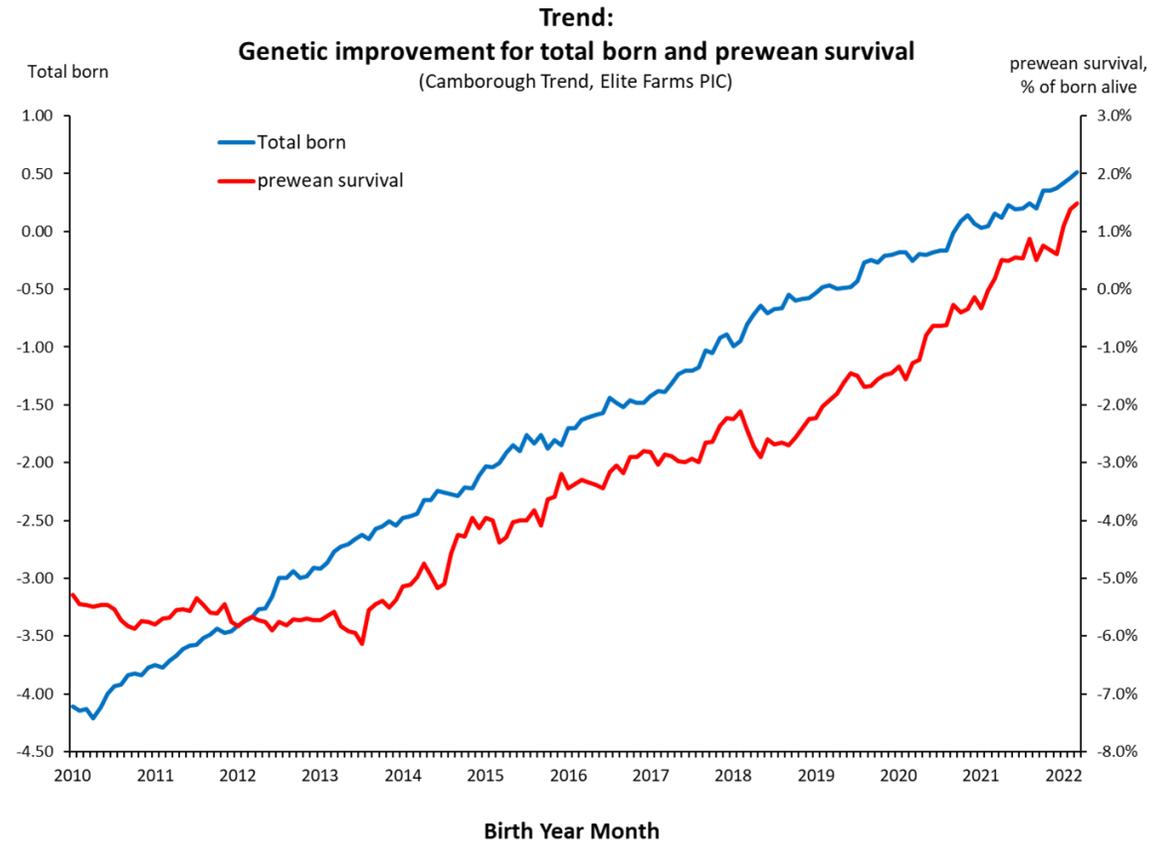
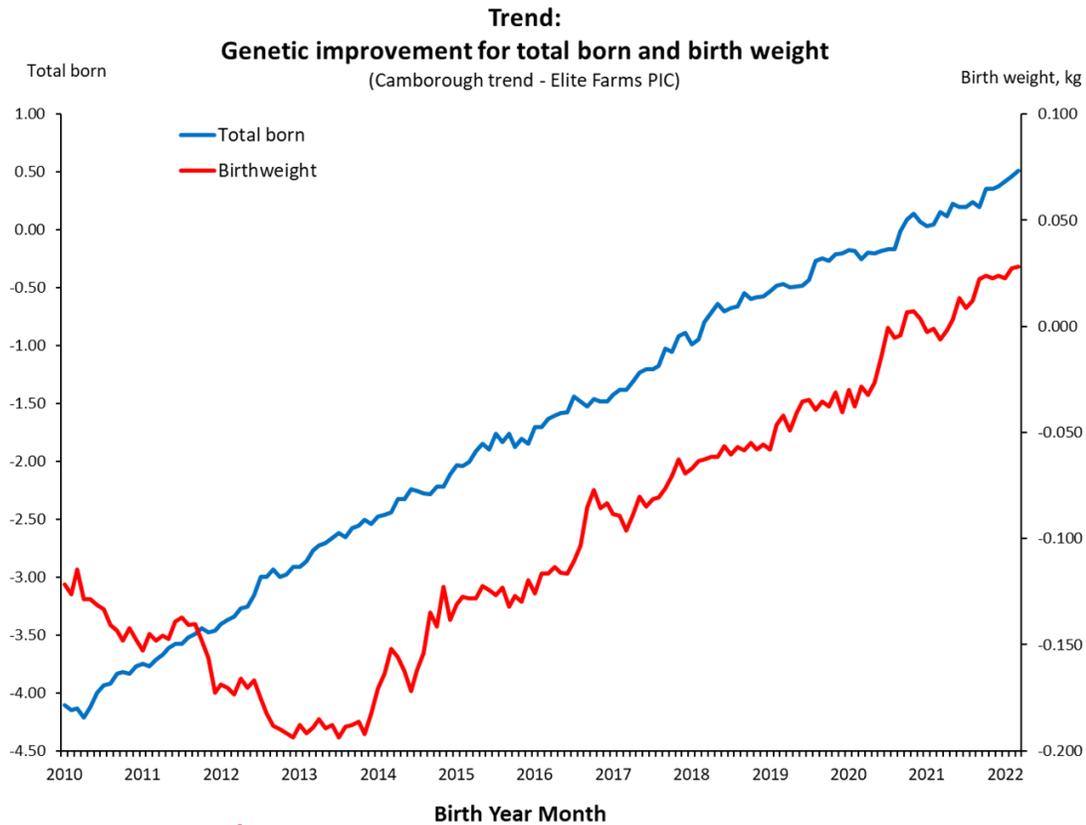


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A photograph of a piglet standing on a slatted floor in a nursery. The piglet is white with a small dark spot on its back. It is looking towards the right. In the background, other piglets are visible, some resting on a green mat. The lighting is bright and even.

Driving selection progress  
results in accelerated  
genetic gain

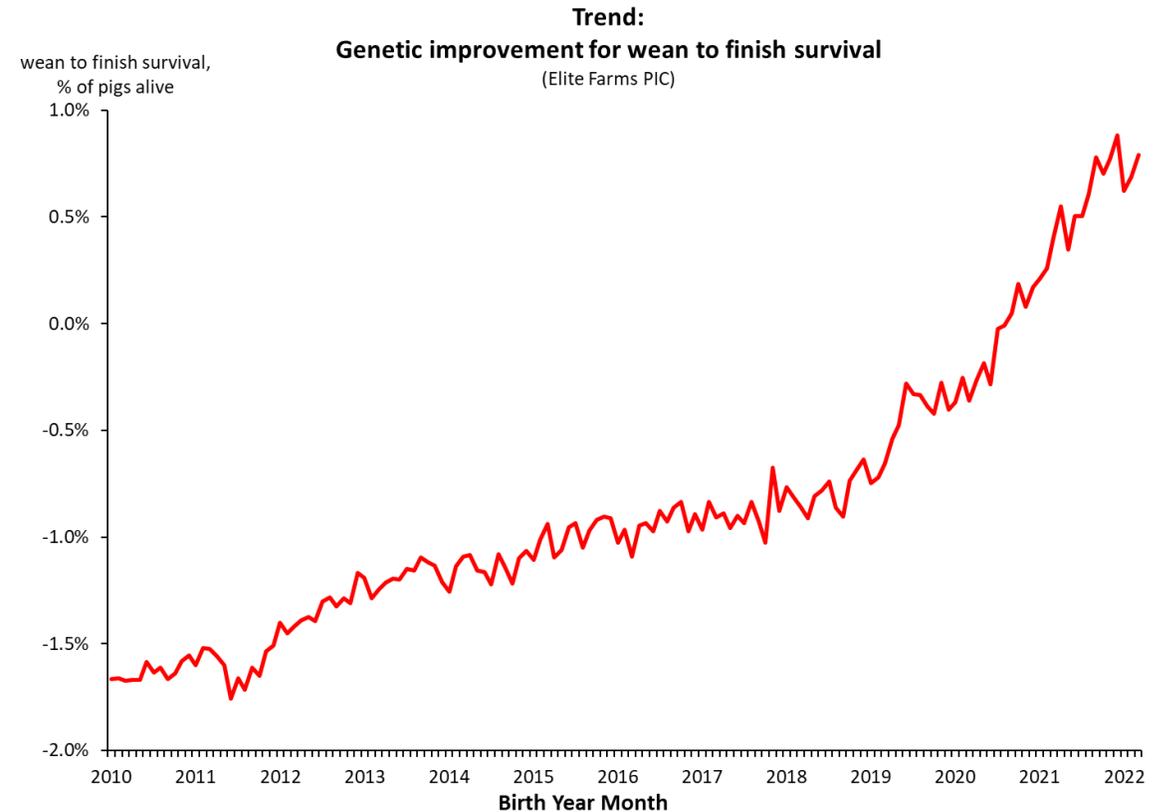
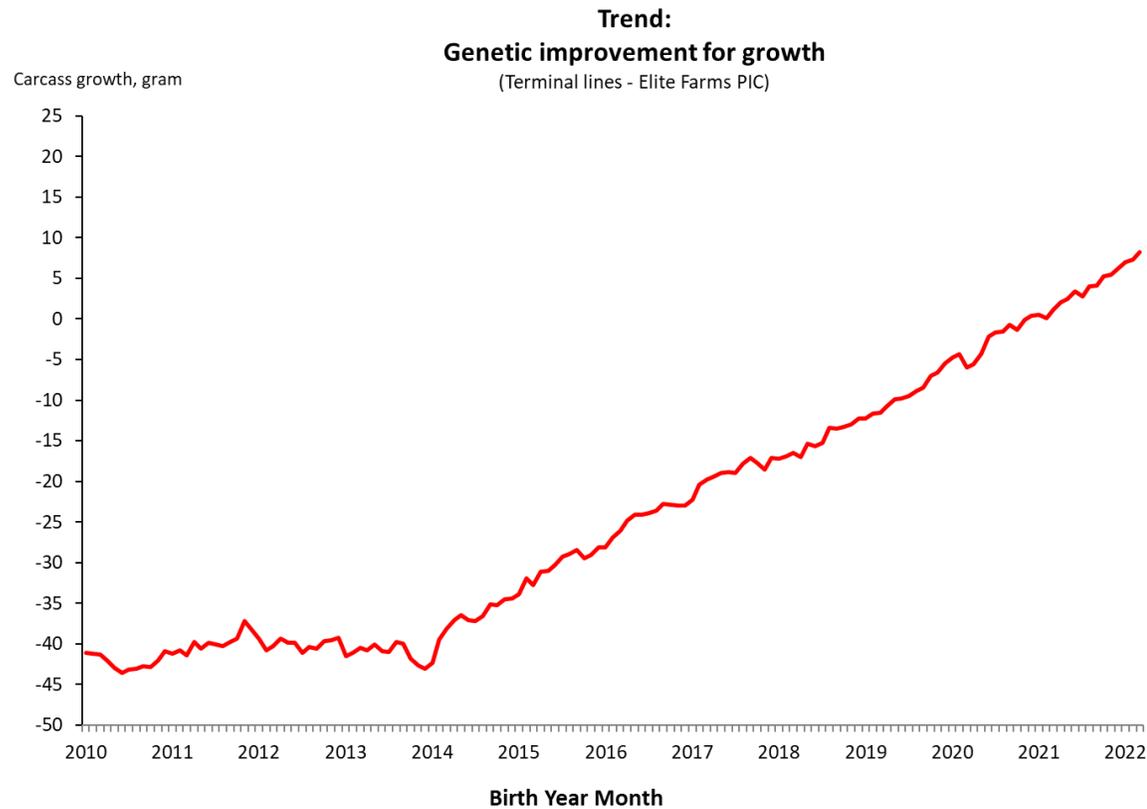
# Increasing quantity and quality of weaned pigs



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# Accelerating genetic gain: investments, traits & trends

Strong and continuous improvement in traits that matter



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# Predicting the future

There is a lot of improvement in the pipeline

PIC customer performance	Today	Annual change Average past 3 years	2032
Pigs/sow/year	33.5	1.2	45.5
Weaned / litter	13.4	0.49	18.3
Weaned weight / sow / year (kg, lb)	201	8.5	286
	444	18.7	631
Pigs weaned / sow / lifetime	60.9	2.2	82.9
Weight sold / sow / year (kg, lb)	4,058	198.1	6,039
	8,960	436.8	13,328
% Sold	93.2	0.38	97.0
Avg market weight (kg, lb)	130	1.14	141.4
	286	2.51	311.1
Whole System Feed efficiency	2.50	0.036	2.14



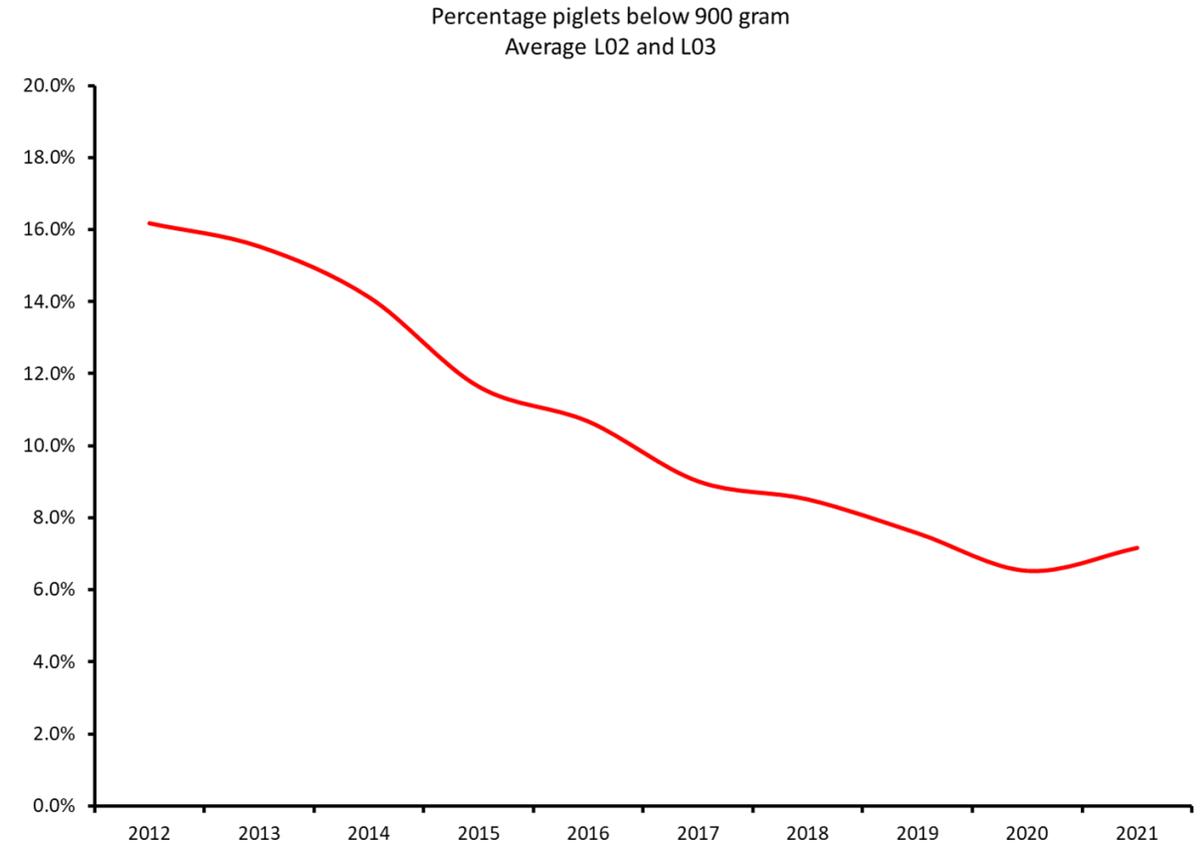
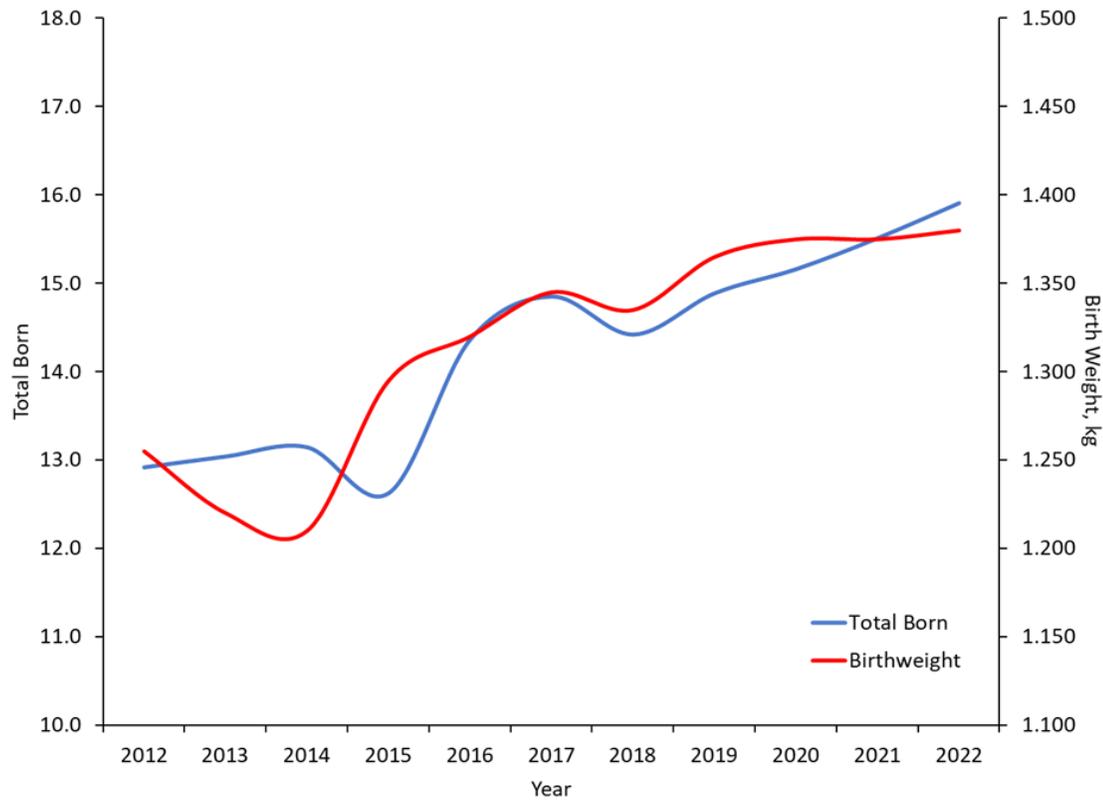
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A photograph of a piglet standing on a slatted floor in a farm setting. The piglet is white with a small dark spot on its back. It is looking towards the right. In the background, other piglets are visible, some resting on a green mat. The lighting is bright and natural.

And we are seeing it in our  
Elite Farms...

# And we expect more

High quality throughput of weaned pigs

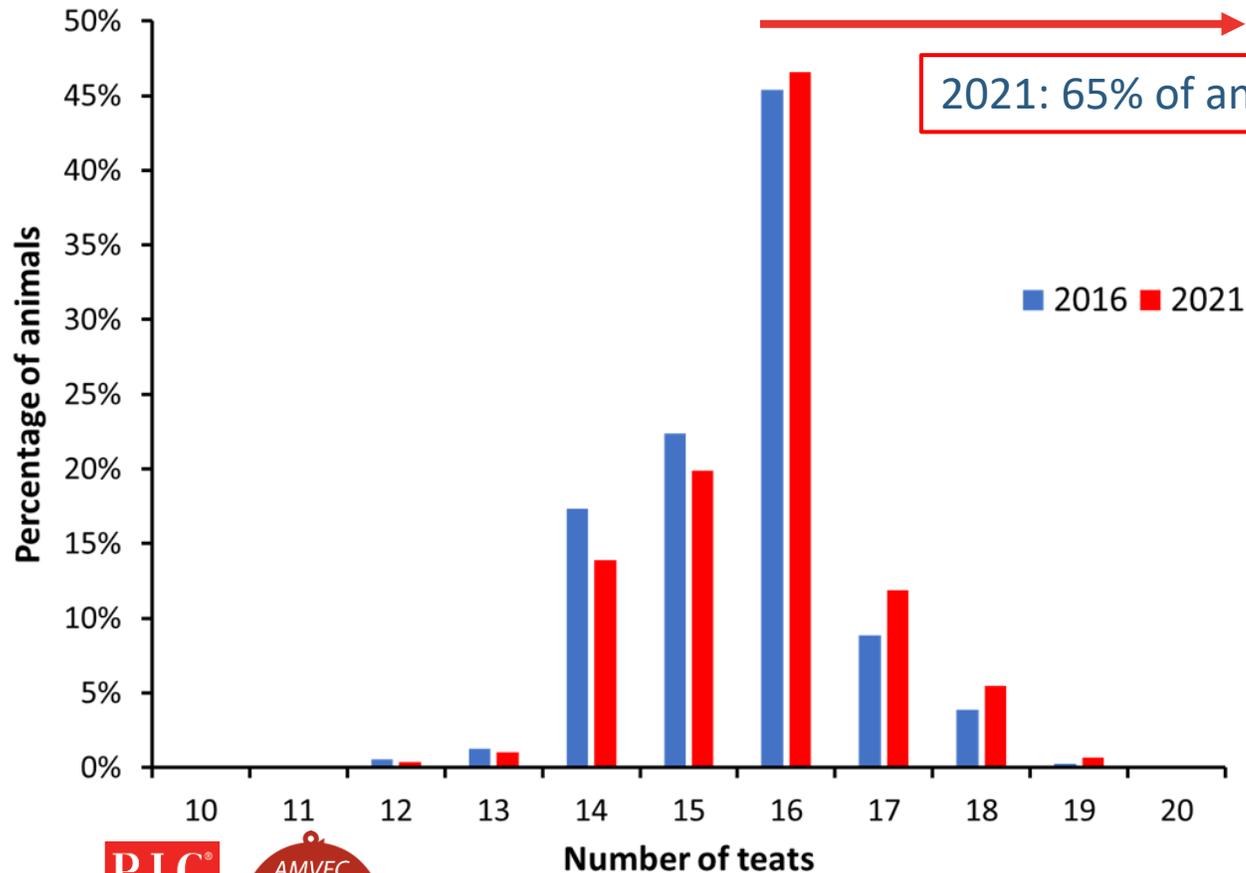


Pureline performance from PIC Elite Farms

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# Distribution of teats – L02 and L03 combined

PIC Elite Farms 2016 vs 2021



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# Never Stop Improving

We do not have a perfect pig but new technologies help us continue to try

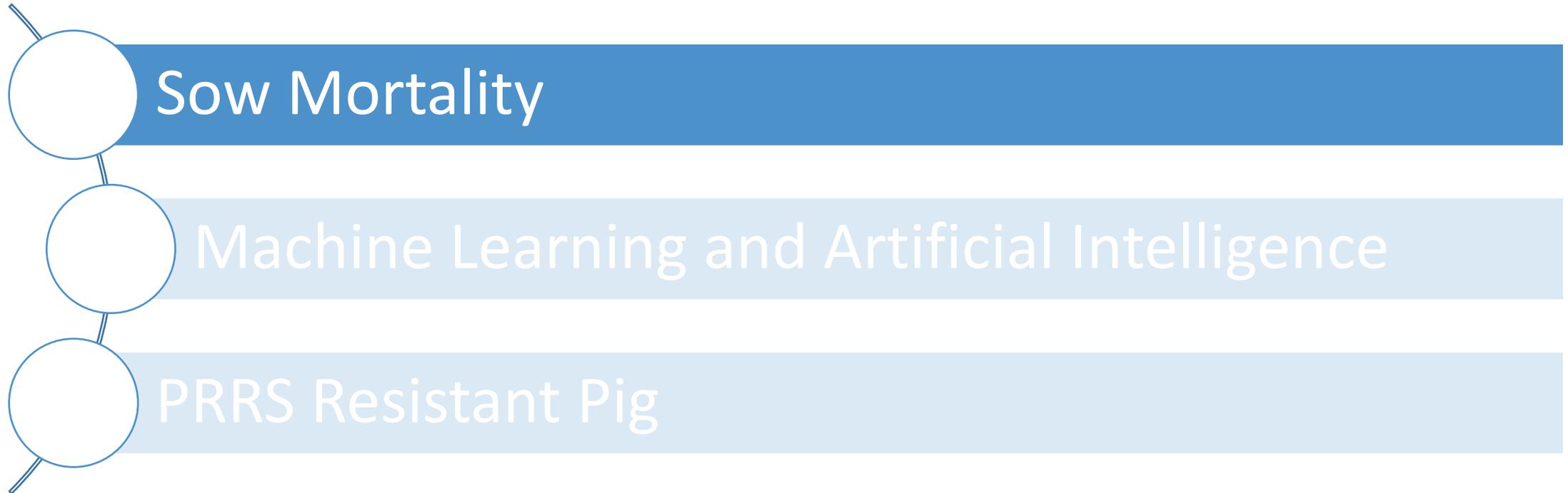
- Sow Mortality
- Machine Learning and Artificial Intelligence
- PRRS Resistant Pig



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# Never Stop Improving

We do not have a perfect pig but new technologies help us continue to try



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# How do you directly select for sow longevity?



Inventory efficiency traits are hard to measure

Sow retention  
Gilt utilization



Elite Farms are not a great data source

High replacement rate  
High health  
Low stocking density



Information from pedigreed Camborough sows needed

Most Camborough females are born from pooled semen – no sire information



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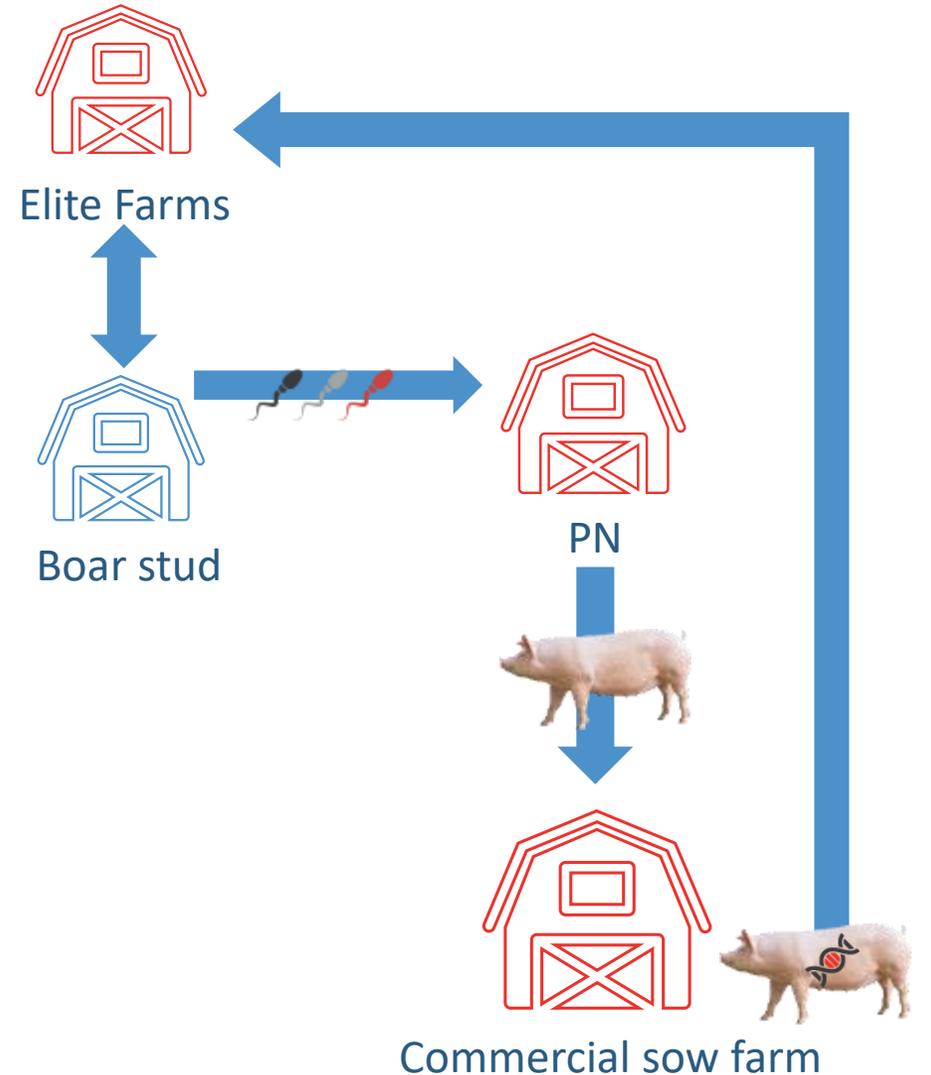
# Today: Implemented selection on commercial sow longevity

Longevity data from commercial sow farms

Linked back to Elite Farms using genomics

Allows selection for:

- Sow retention
- Gilt utilization



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# Never Stop Improving

We do not have a perfect pig but new technologies help us continue to try

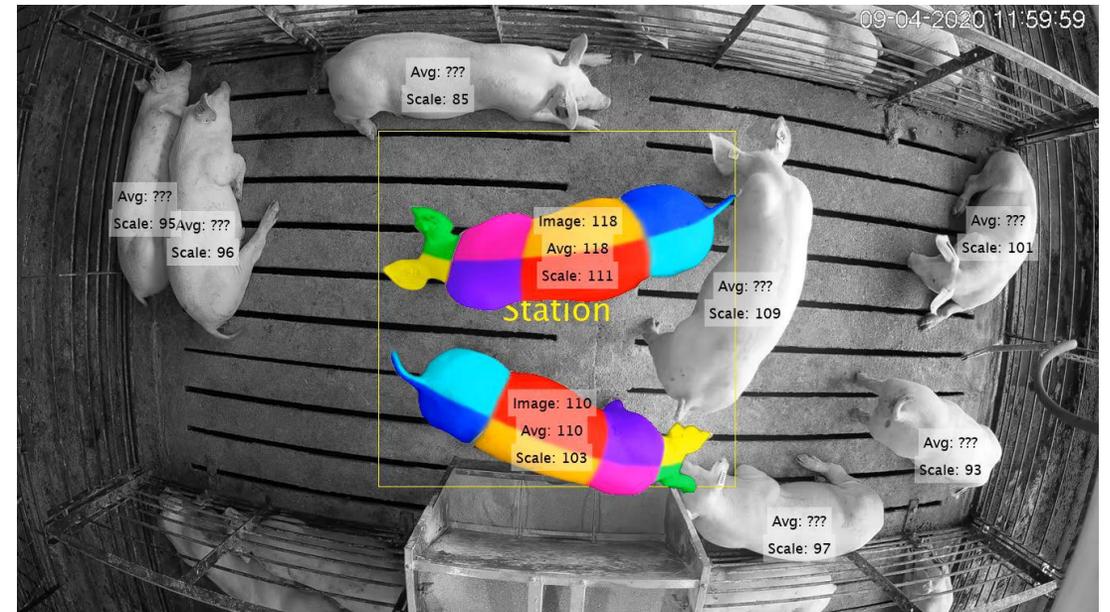


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# Automation

Exploring multiple options to...

- Reduce labor
- Enhance global consistency
- Increase % objective capture
- Explore new traits of interest

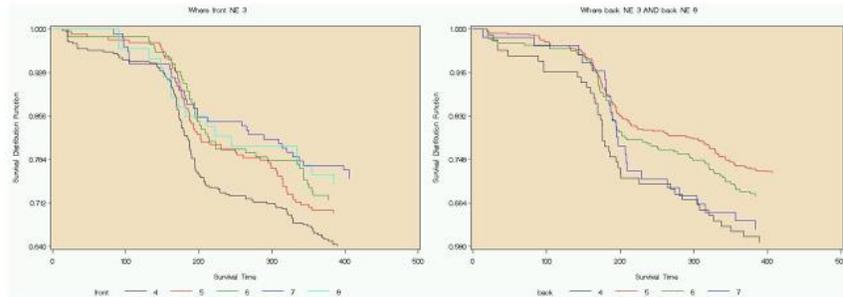


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# Structure and Lifetime Retention

Never Stop Improving

Sow retention by front & rear leg scores



Mean survival time (days)



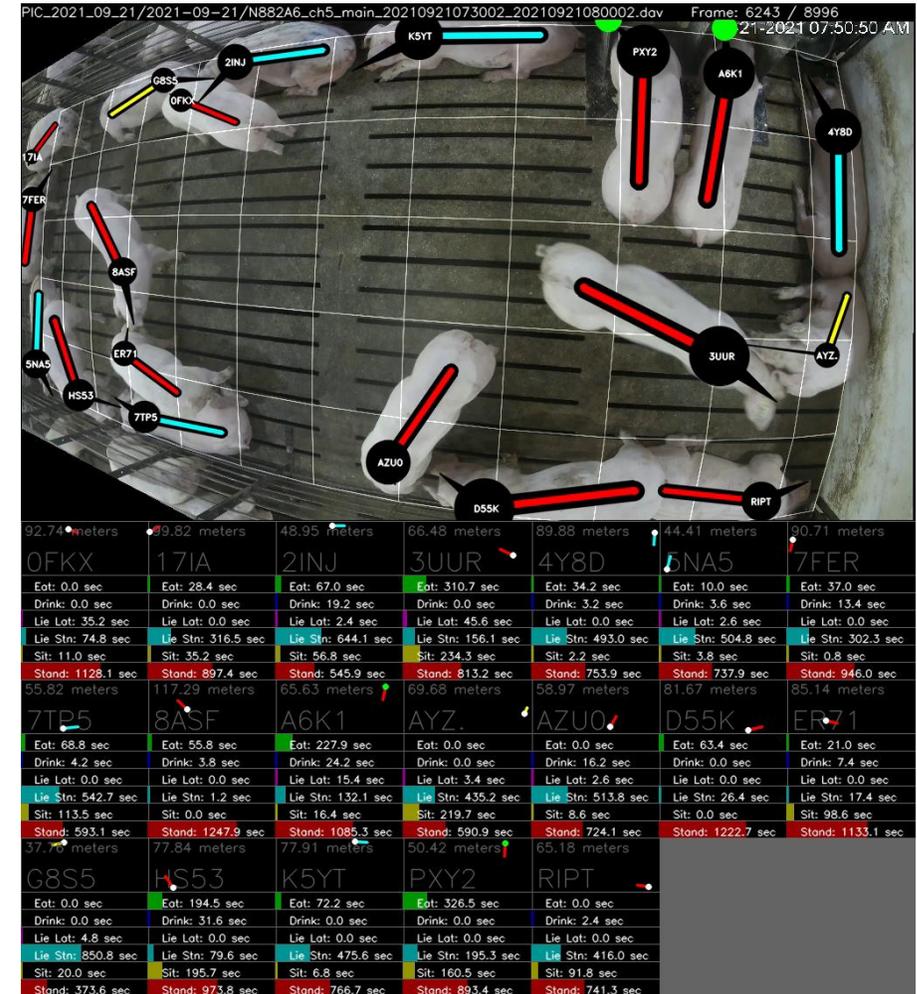
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# Behavior

Emerging opportunity area aligned with multiple complicated factors:

1. Escalating legal and marketplace demands
2. Disjoint between genetic gain and environment
3. Decreasing experience, skill and availability of labor

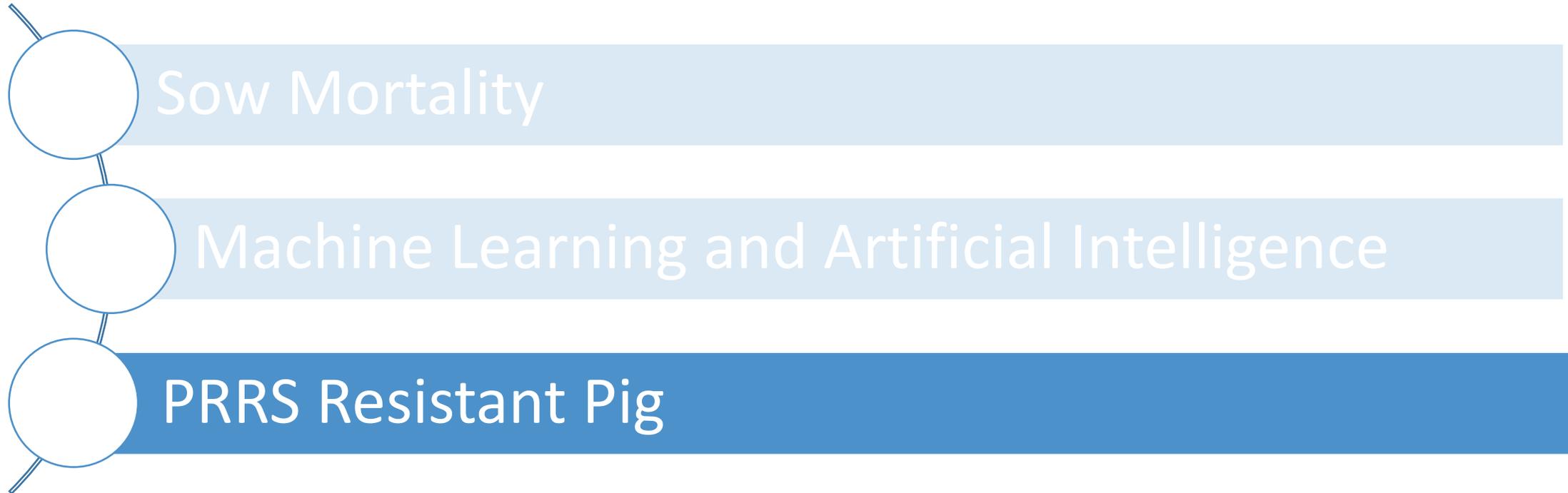
Phenotypes are incredibly difficult...



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# Never Stop Improving

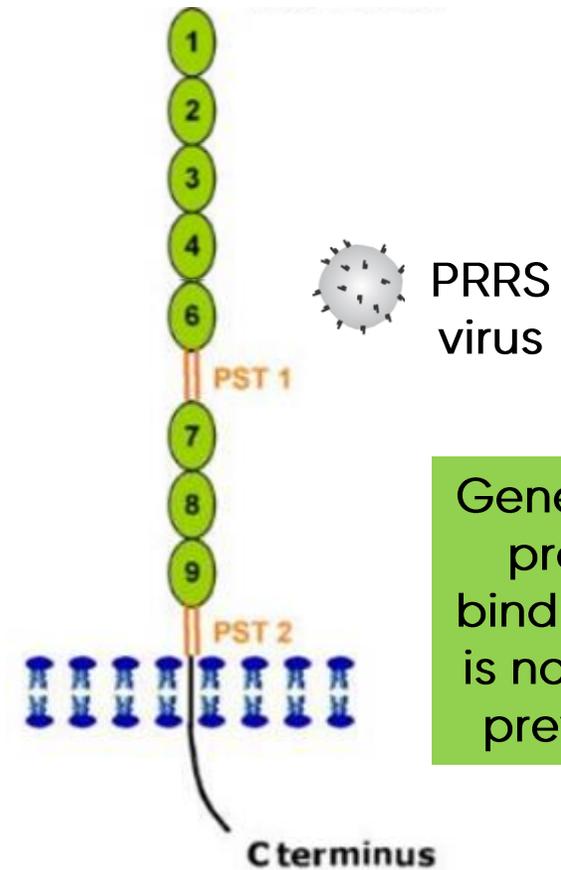
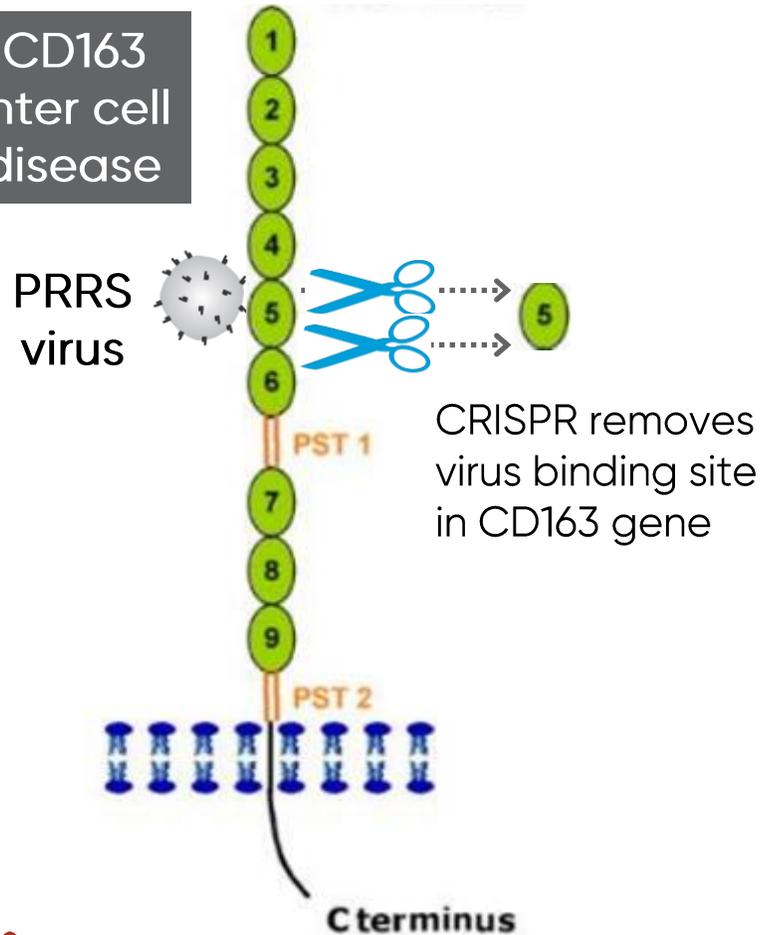
We do not have a perfect pig but new technologies help us continue to try



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# Our approach REMOVES PART OF THE GENE

Virus binds CD163 protein to enter cell and cause disease



Gene edited CD163 protein cannot bind virus, infection is not possible and prevents disease

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# Precise change delivers dramatic impact

nature  
biotechnology

## Gene-edited pigs are protected from porcine reproductive and respiratory syndrome virus

### To the Editor:

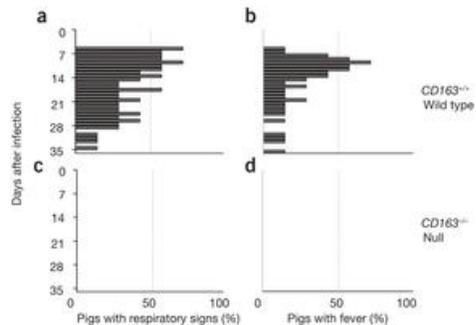
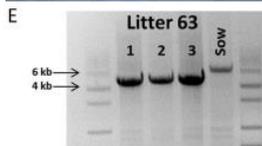
Porcine reproductive and respiratory syndrome (PRRS) is the most economically important disease of swine in North America, Europe and Asia, costing producers in North America more than \$600 million annually<sup>1</sup>. The disease syndrome was first recognized in the United States in 1987 and described in 1989 (ref. 2). The causative agent, porcine reproductive and respiratory

disease syndrome and porcine circovirus-associated disease, and can establish a lifelong subclinical infection<sup>6</sup>. In 2006, a more severe form of the disease, called highly pathogenic PRRS, decimated pig populations throughout China<sup>7</sup>. Although genetic selection for natural resistance is an option, success to date has been limited, possibly due to the genetic diversity of the virus<sup>8</sup>. It had been proposed that PRRSV infects

homologous recombination and somatic cell nuclear transfer) were infected with PRRSV and compared with infected wild-type pigs, no difference in virus replication was found<sup>9</sup>. To test the role of CD163 in infection, we previously created 45 live-born piglets with insertions ranging from 1 bp to 2 kb, deletions from 11 bp to 1.7 kb, as well as a partial domain swap in CD163 using CRISPR-Cas9 technology<sup>5</sup>.



University of Missouri



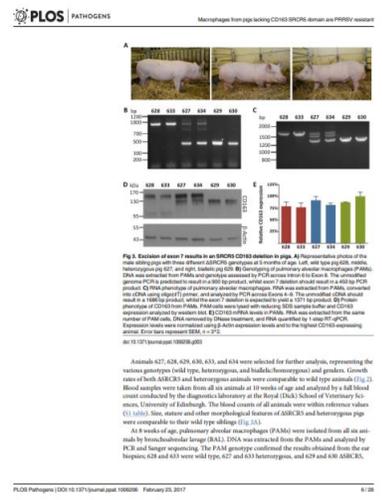
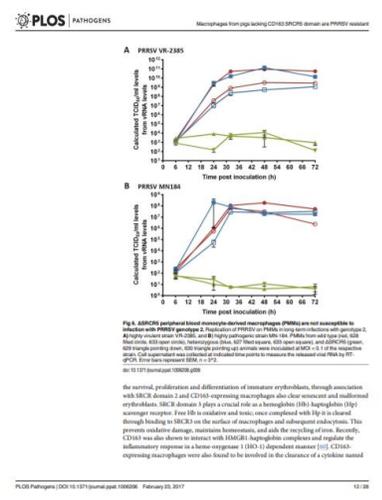
RESEARCH ARTICLE

## Precision engineering for PRRSV resistance in pigs: Macrophages from genome edited pigs lacking CD163 SRCR5 domain are fully resistant to both PRRSV genotypes while maintaining biological function

Christine Burkard<sup>1</sup>, Simon G. Lillico<sup>1</sup>, Elizabeth Reid<sup>2</sup>, Ben Jackson<sup>2</sup>, Alan J. Mileham<sup>3</sup>, Tahar Ait-Ali<sup>1</sup>, C. Bruce A. Whitelaw<sup>1</sup>, Alan L. Archibald<sup>1\*</sup>

**1** The Roslin Institute and Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush, Midlothian, United Kingdom, **2** The Pirbright Institute, Ash Road, Pirbright, Farnham, United Kingdom, **3** Genus plc, DeForest, Wisconsin, United States of America

\* alan.archibald@roslin.ed.ac.uk



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# Status of Key Work Streams

## Technology



- University of Missouri findings confirmed by academics in US, Europe, China
- Optimized the gene edit
- Founder population created
- Housed in two farms in the United States

## Regulatory



- Engaging with FDA for US regulatory approval, first submission filed
- Contact with international regulators, first submission in China filed
- Collaboration with advocacy groups

## Market acceptance



- Consumer sentiment surveys conducted in US and other countries
- Media strategy developed
- Industry stakeholder engagement
- Leadership role in the Coalition for Responsible Use of Gene Editing

## Go-to-Market



- Industry stakeholders mapped
- Dissemination strategies outlined
- Agreed licensing deal in China

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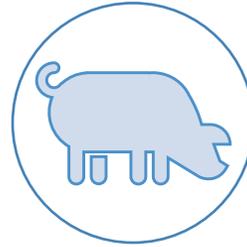
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# Market Acceptance Goals

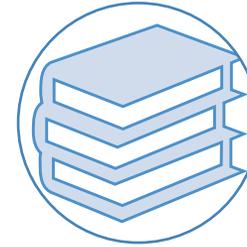
Market Acceptance Strategy Integrates Three Goals



Consumers  
Willing to Eat



Pork Chain  
Adoption



Regulatory  
Approval



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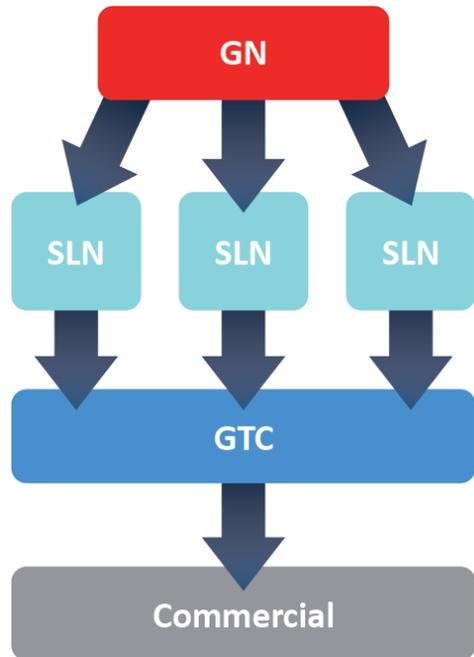
Deliver and realize genetic potential



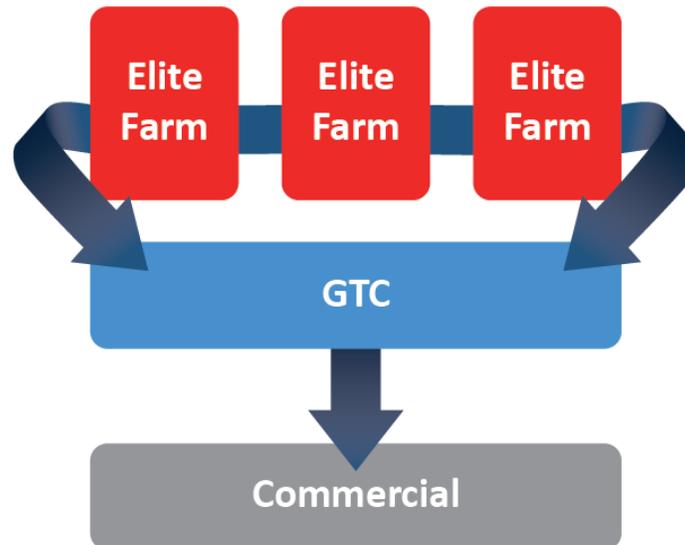
# Expanding Global Infrastructure for the Next Chapter

Our expanding global footprint allows us to create more progress in all regions

Previous: Traditional PIC System



Now: Elite Farms System



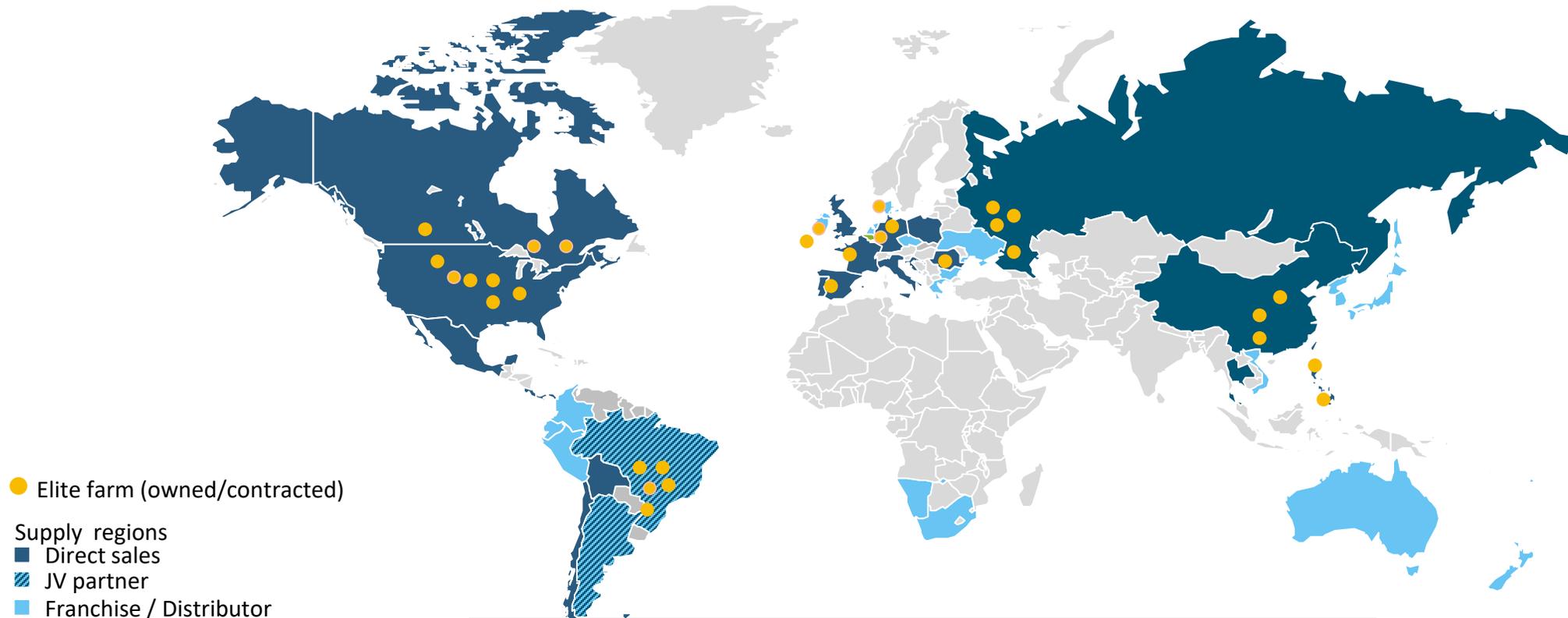
- Each elite farm has advanced testing and selection and the potential to contribute its most elite genes to the top of the pyramid
- Larger population to advance genetic improvement
- Allows for contingency and superior customer value



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# Regional Supply

Reduce genetic lag and provide contingency



PIC Supply Chain goal: provide the right product to the right place at the right time



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# New Sites in North America

Atlas (Canada)



Barrick (USA)



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# PIC Health Assurance focused on offering healthy supply



**Biosecurity** = risk assessment and reduction



**Surveillance** = early detection and immediate response



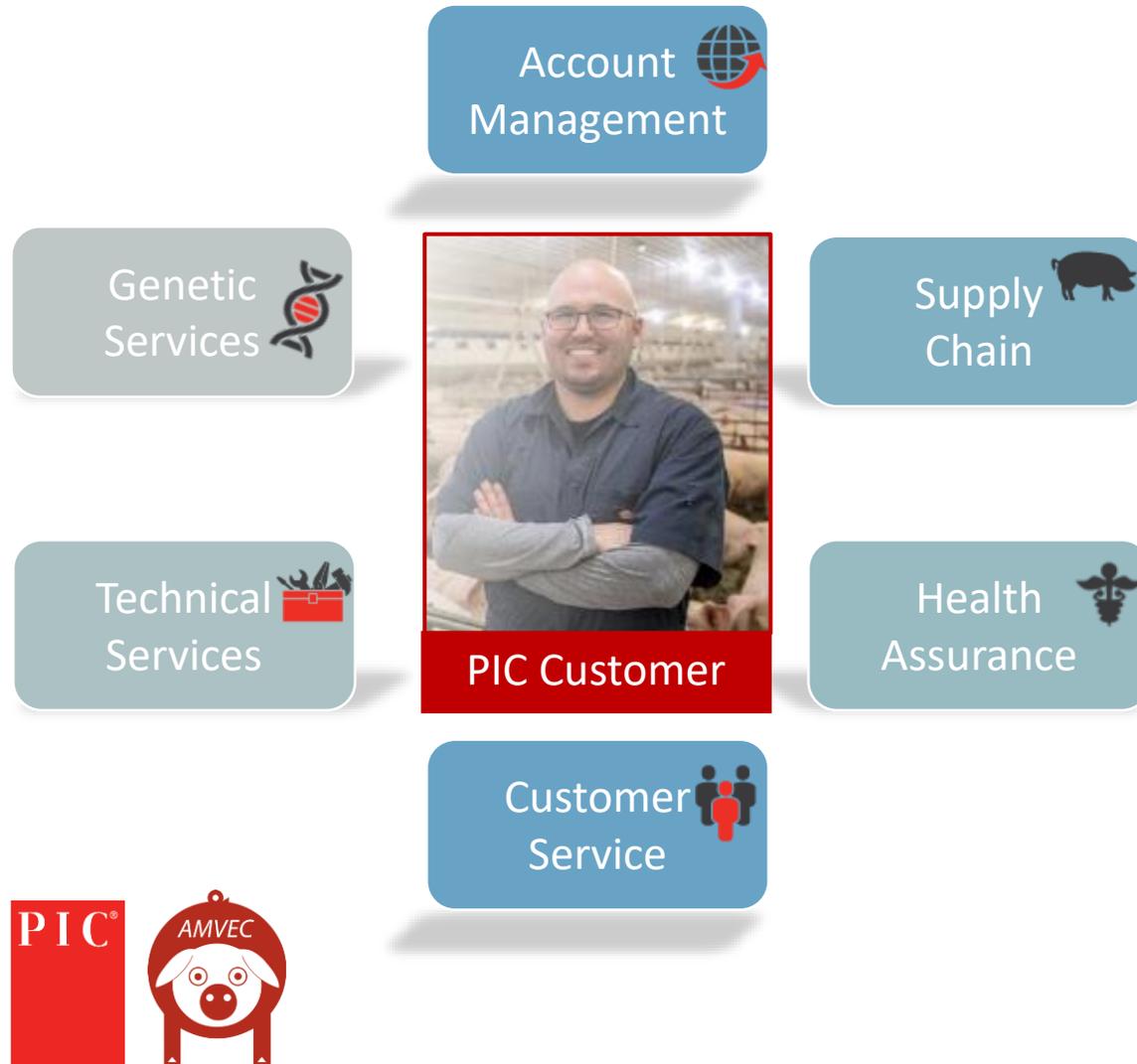
**Disease containment and Elimination**



**Transparent & opportune Communication**



# Local teams with global expertise



Global & local teams are ready to serve our customers

- Help PIC products perform in your farm
- Share production best practices
- Provide consumer and market trends
- Listen to understand how we can continue to improve our services

# Our team is ready to serve our customers



PIC Technical Services supports customers via farm visits, seminars, webinars, roadshows, and technical materials

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# A proud tradition and a bright future

