Gemeinsam für die
SCHWEINE-
GENERATION
von morgen

Overview on ongoing projects at SUISAG

Division of breeding

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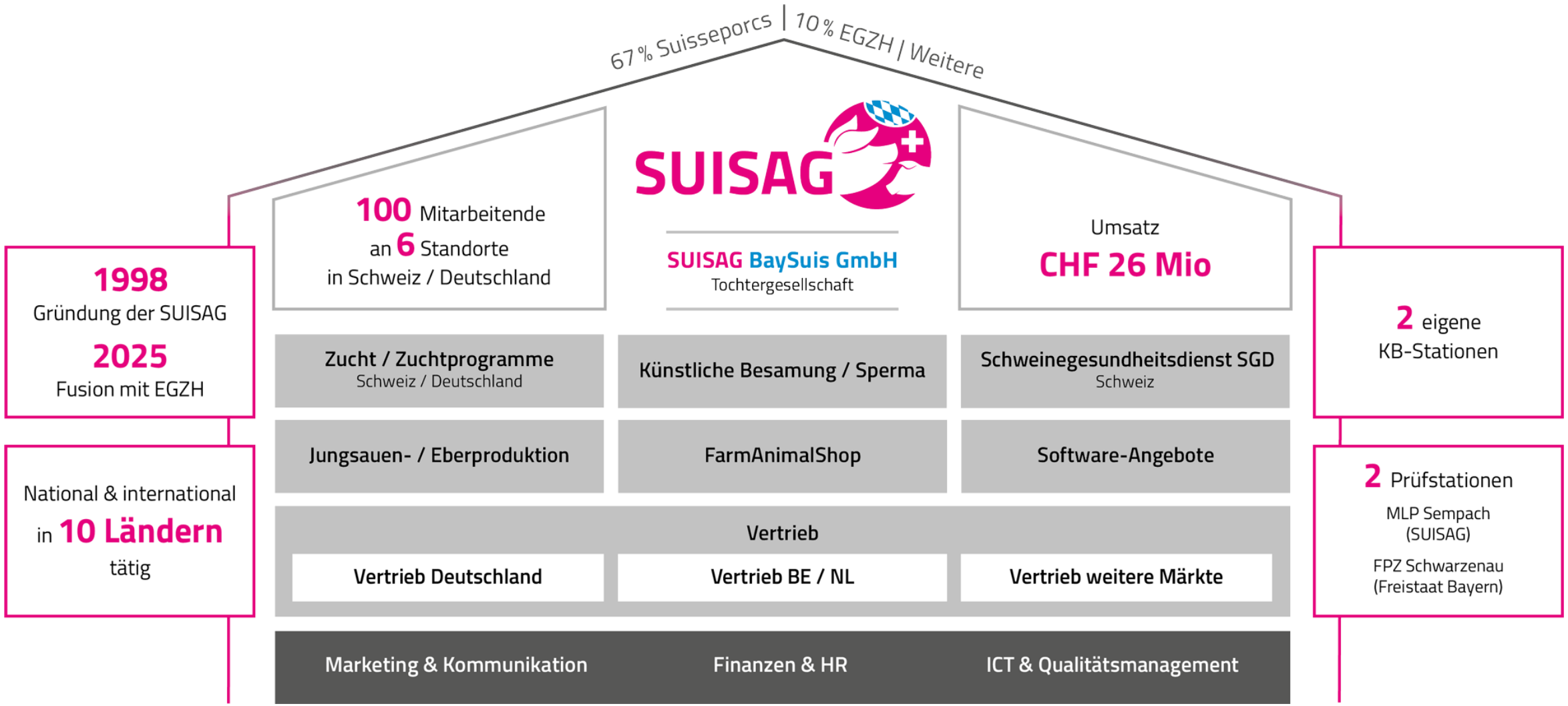
04.12.2025, Vetsuisse Bern

News about SUISAG

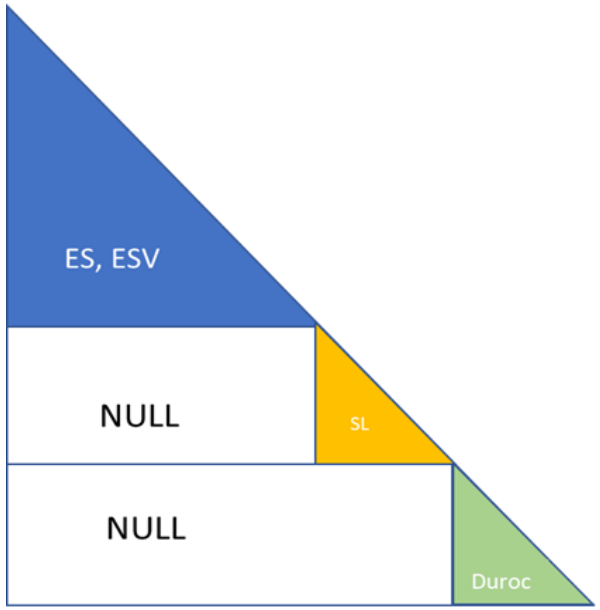


Projects

- Further development of EBV
- R&D projects

GEBV in Duroc

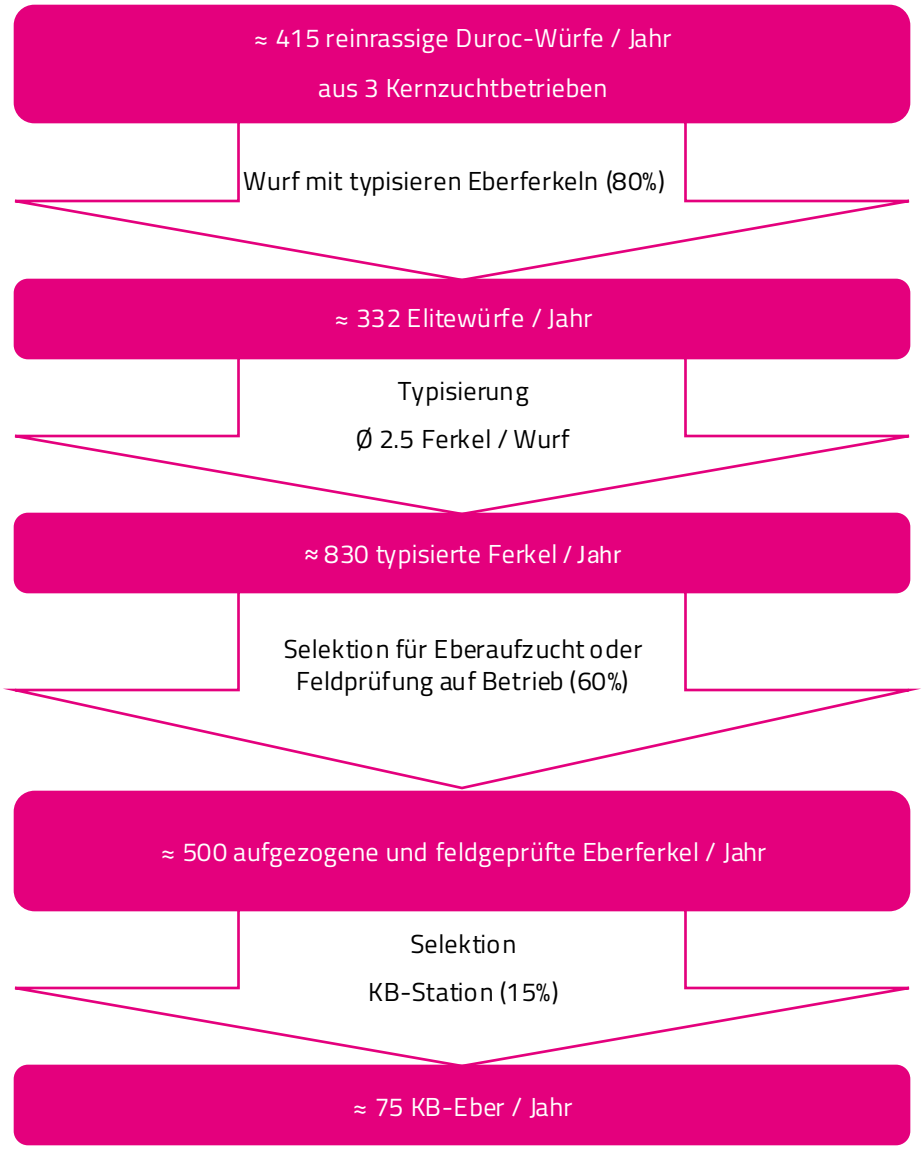
- Implementation in SuisData: 01. October 2025
- Over 5,000 genotyped Durocs; 30% are reference animals
- A separate GEBV is used, with no influence on the breeding values of the other breeds: Swiss Large White and Swiss Landrace



Genomic Relationship Matrix (GRM) for the Swiss Large White dam und sire lines (ES, ESV), the Swiss Landrace (SL) und the Duroc

SUISAG Duroc Breeding Program 2026: from Birth to AI Boar

- Purebred litters from three nucleus farms
- Three-step selection:
  1. 80% elite litters: 2-3 full-sib brothers per litter for rearing. They are genotyped.
  2. 60% of the young boars are selected at the end of the rearing: GEBV, Coli F18 and Coli F4, as well as a linear description.
  3. 15% of the young boars are selected for AI based on GEBV, Coli genotypes, and linear description scores.



Next Steps in the EBV

- The metafounder concept is that the genetic group of unknown parents (UPG) originate from a founder population. The relationship between UPGs is calculated based on their genotyped offspring.
- Comparisons with UPG:
  - Better compatibility between **G** and $\mathbf{A_{22}}$
  - Higher accuracy and lower bias in GEBVs: incomplete pedigree

H^{-1}-Matrix mit genetischen Gruppen von unbekannten Eltern:

$$H^{-1} = A^{-1} + \begin{bmatrix} 0 & 0 \\ 0 & G^{-1} - A_{22}^{-1} \end{bmatrix}$$

H^{-1}-Matrix mit Metafounder:

$$(H^{\Gamma})^{-1} = (A^{\Gamma})^{-1} + \begin{bmatrix} 0 & 0 \\ 0 & G^{-1} - (A_{22}^{\Gamma})^{-1} \end{bmatrix}$$

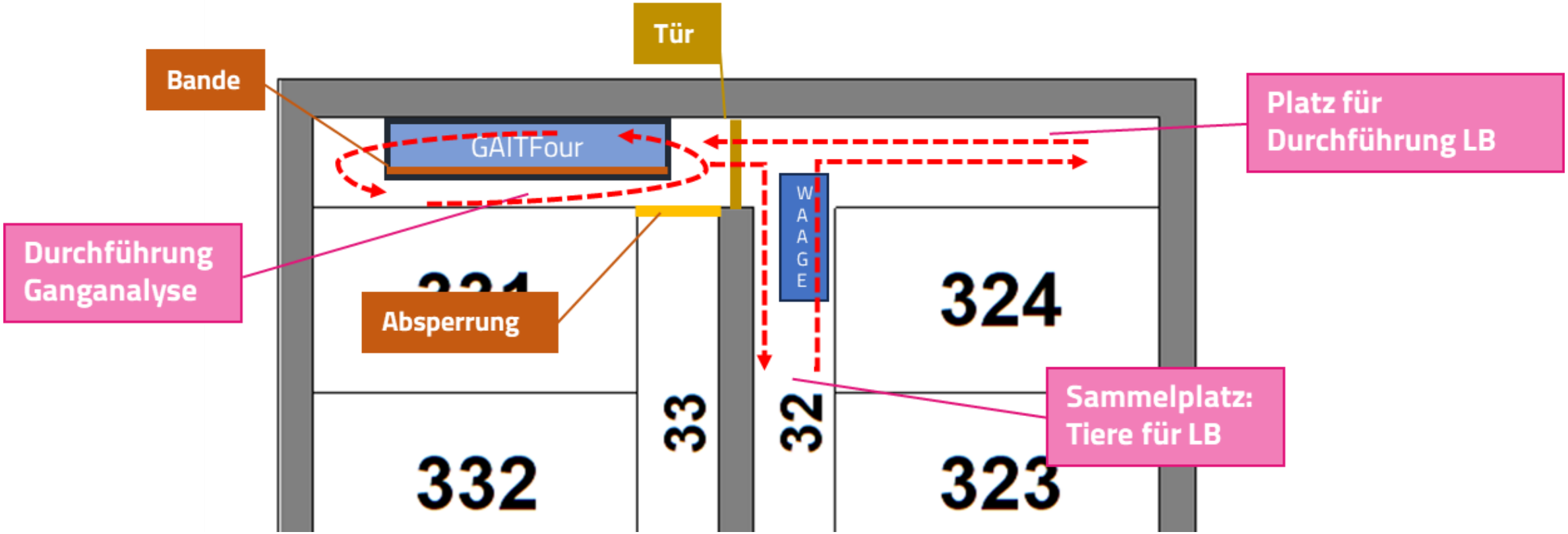
- Joining of the breeding programs and after that breeding values estimation in Switzerland and Bavaria.

Hoof Health

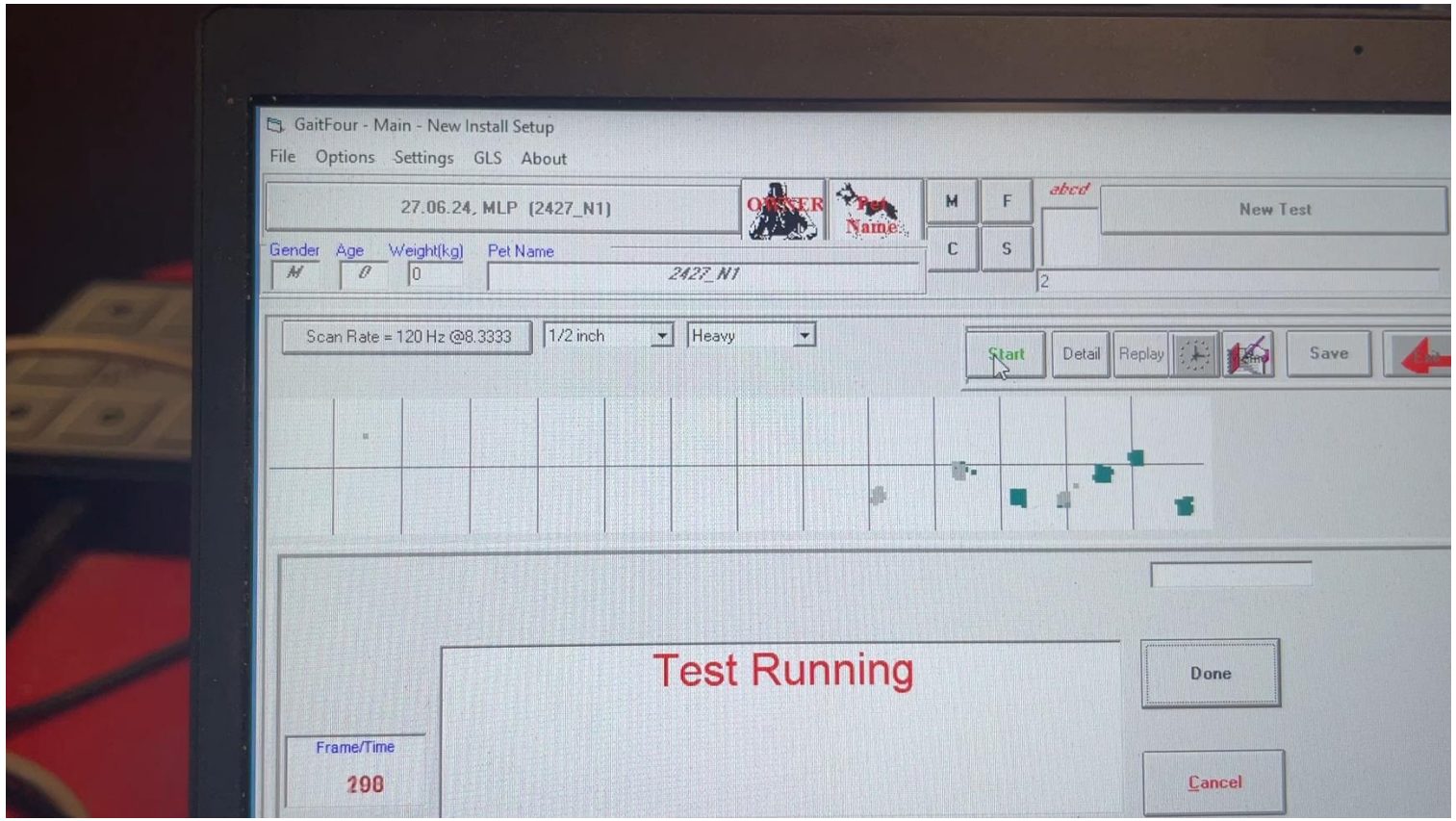
- BLW (Swiss Federal Office)-research project: January 1, 2025, to December 31, 2027
- Three phenotyping methods:
  - Gait analysis with the GaitFour-pressure mat
  - Pressure distribution using a pressure plate on a scale
  - Measurement of claw size using a camera on a scale
  - Possible implementation in the breeding program

ILVO
Flanders Research Institute for Agriculture, Fisheries and Food

Procedure

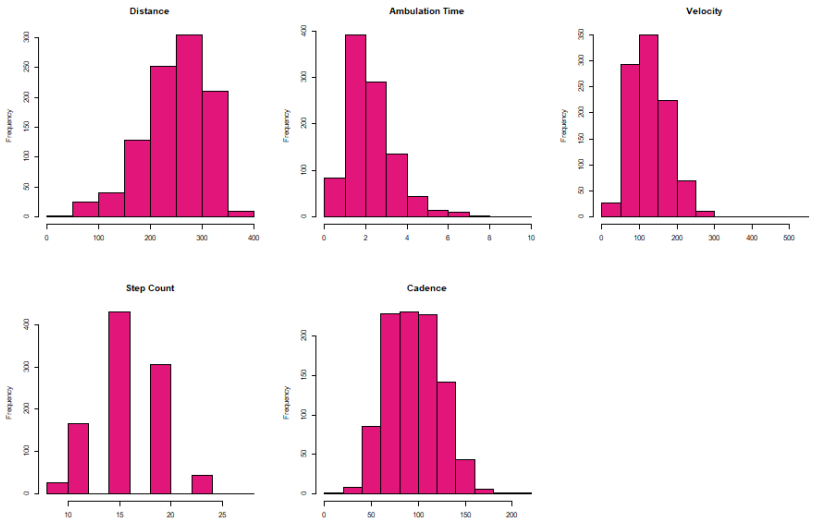

Tür
Bande
Platz für Durchführung LB
GAITFour
WAAGE
Durchführung Ganganalyse
Absperrung
324
33
32
Sammelplatz: Tiere für LB
332
323

Gait Analysis:
recording the gait analysis data in SUISAG central boar rearing

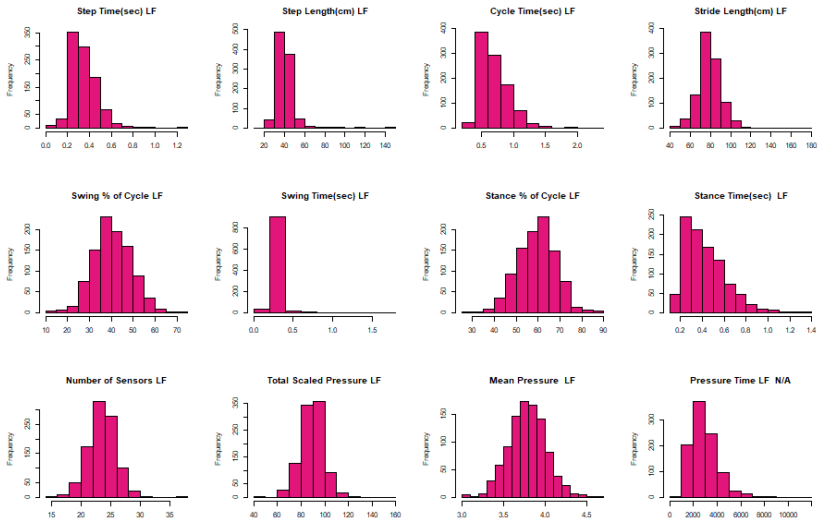


32+ Measurements

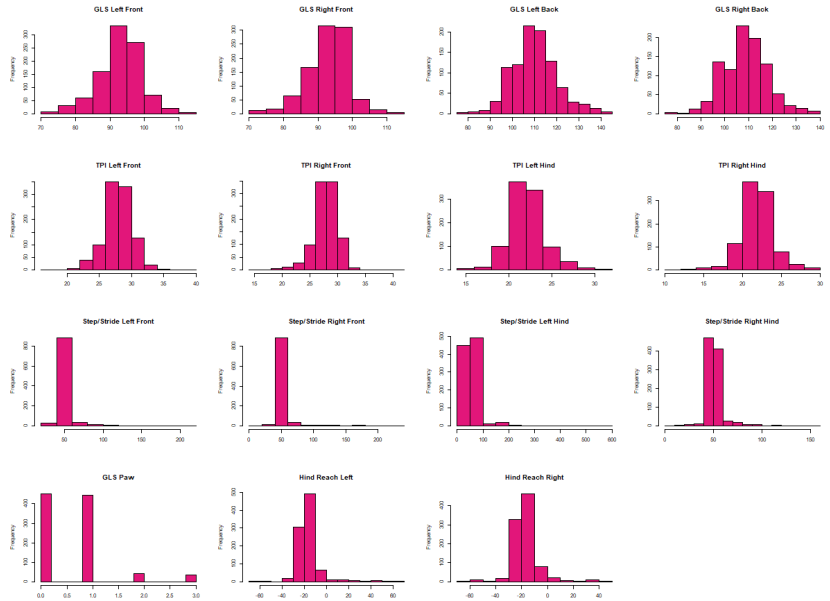
Temporal parameters



Spatial parameters



Pressure measurements



- Since summer, weekly measurements in the central boar rearing in Sempach.
- Swiss Large White and Swiss Landrace young boars at 80-90 kg live weight.
- So far > 800 young boars.

Repeatability for two measurements

LF: left front; RF: right front; LH: left hind; RH: right hind		Pilot study (n=32)		Long-term study (n=154)		Long-term study (n=368)	
		R	SE	R	SE	R	SE
Stance time (sec)	LF	0.588	0.027	0.371	0.014	0.443	0.009
	RF	0.668	0.029	0.358	0.015	0.418	0.009
	LH	0.609	0.025	0.331	0.014	0.404	0.008
	RH	0.213	0.031	0.352	0.015	0.426	0.009
Number of activated sensors	LF	0.620	0.455	0.568	0.168	0.592	0.112
	RF	0.559	0.443	0.468	0.178	0.543	0.120
	LH	0.661	0.366	0.488	0.122	0.428	0.082
	RH	0.432	0.315	0.526	0.144	0.510	0.092

Medium to high repeatability

Lower standard errors → accurate measurements

Hoof Measurements while Standing

- Hoof examination on the scale at the central boar rearing
- Dam line young boars with 80-120 kg live weight

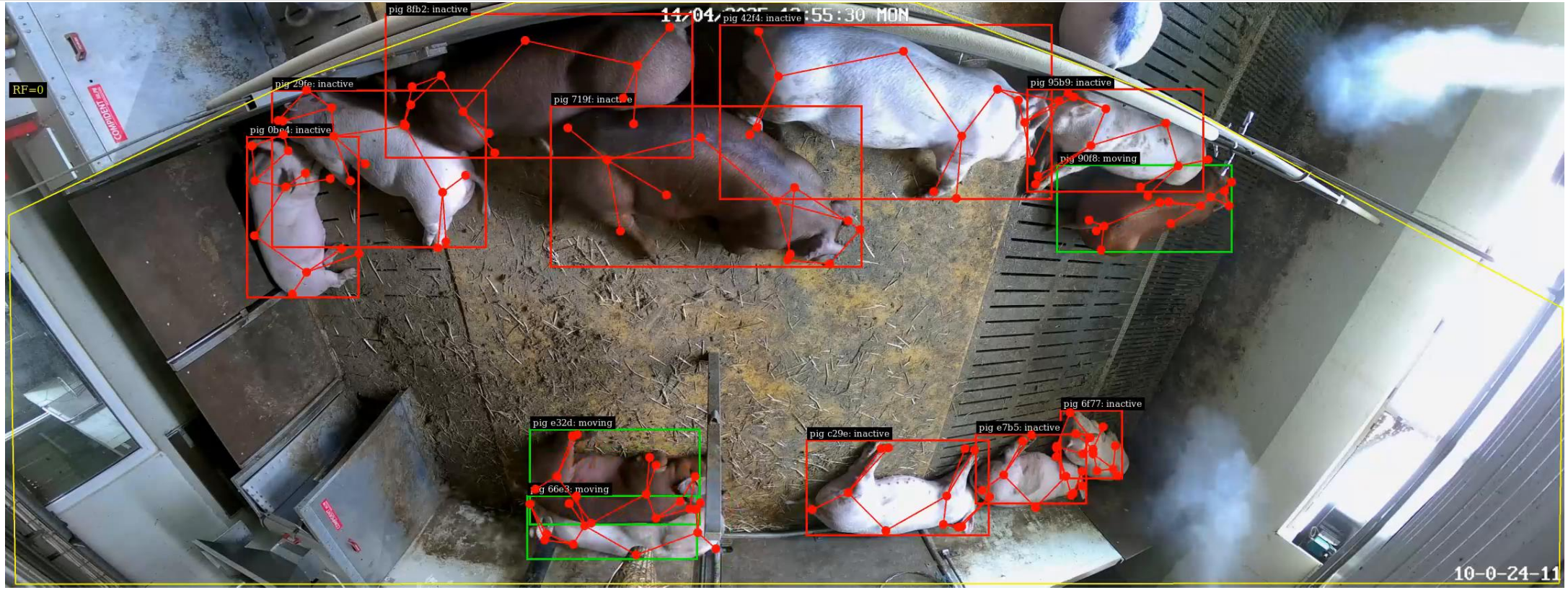
- **A prototype built by ILVO:**
  - Glass plate with 15 cameras and a MiniPC:
    - Size of claws
    - Cracks in claws
  - Pressure plate: Resolution 5 mm x 5 mm
    - Pressure distribution in claws
    - Size of claws
  - ILVO: develops software for data analysis

First Trial

- **First trial in September 2025**
  - IPT: ~ 60 young boars with 70-150 kg
  - FST: ~ 40 pigs with 80-110 kg
  - In order for the front and hind legs to stand on the glass and pressure plate once each, the boars hade to be driven onto the scale twice.

- **Experience with pilot measurements**
  - The glass plate becomes quickly slippery:
    - It must be cleaned every 2-4 pigs.
    - This can be dangerous for the pigs.
    - Does this affect the measurements?!
  - The pressure plate becomes also slippery, but obviously less so than the glass plate.

Automatic Behavior Recording in Young Boars

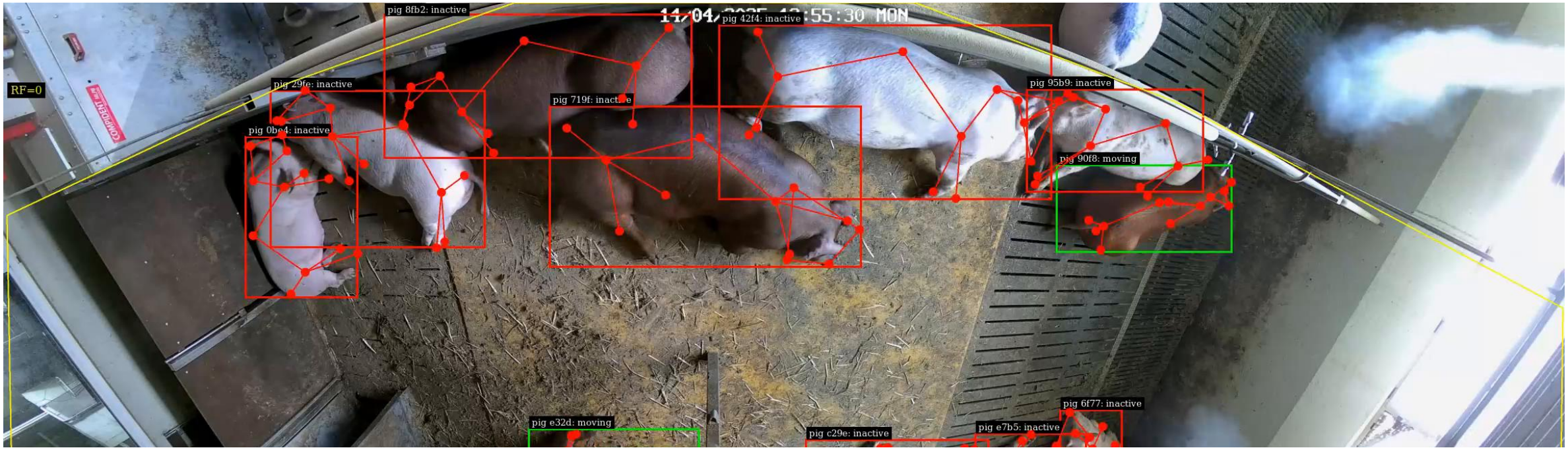


- BLW- innovative project starting January 1, 2025
- A collaboration with SERKET
  - Automated and animal-friendly phenotyping with camera, UHF ear tag and AI.
  - Web-based AI software: «reduces» pigs to «stick figures»

Behavior Recording at the Central Boar Rearing

- There are 4 pens and 12 boars each in barn 30.
- Equipped with **cameras** and **UHF antennas** from January 2025.
- Data is transferred from the server in the barn to the office.

Animal Identification



- Each pig is identified and assigned an internal ID.
- UHF ear tag numbers can be recognized from a maximum distance 1.5 m from the UHF antenna.
- The software links the internal IDs with the UHF number.

Behavior Recording in Young Boars

- **The SERKET software automatically analyzes the pig behavior**
  - Inactive = lying or standing
  - Active = moving
  - Eating = pig standing at the feeding station
  - Drinking = pig hat its snout at the drinking nipple
  - **Aggressive behavior**
    - Ear biting
    - Tail biting
    - Aggressive interaction

A Validation Example on June 11, 2025

A Validation Example on June 11, 2025

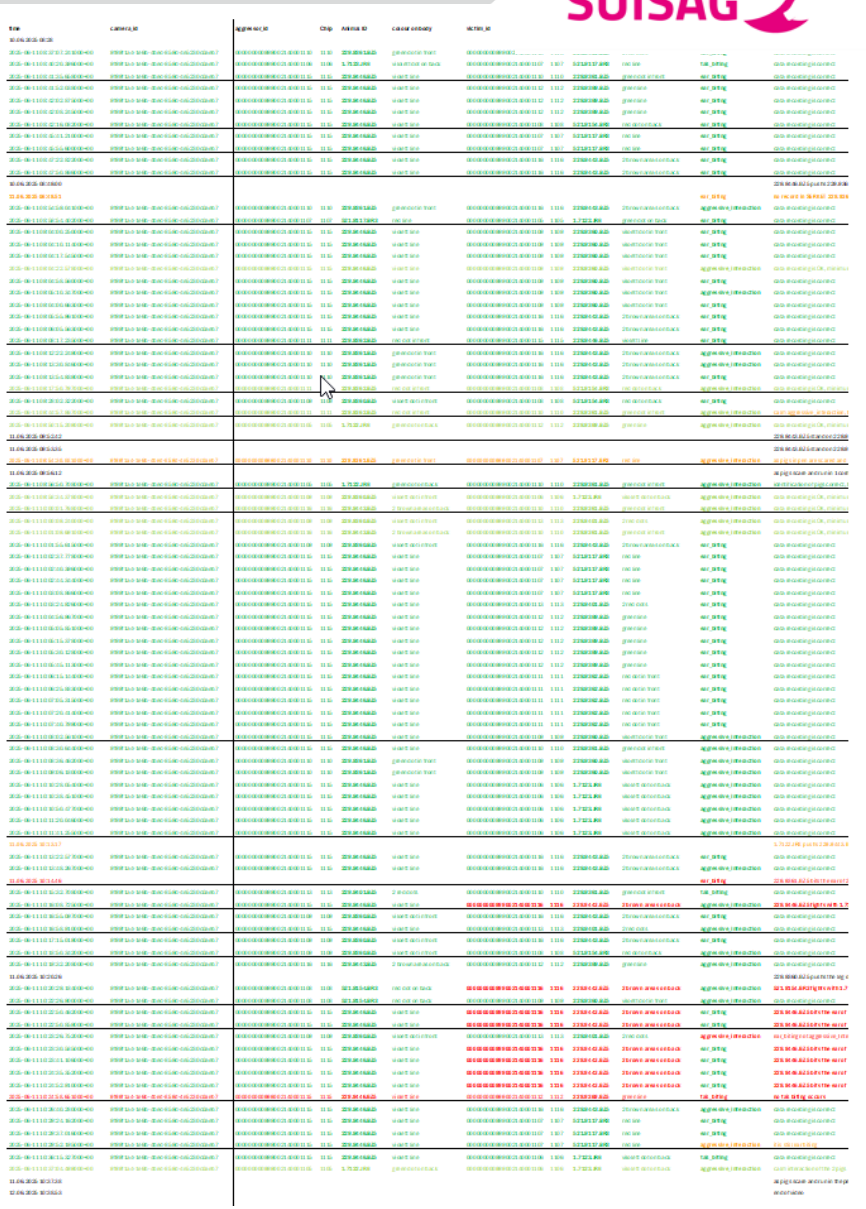
- **These entries come automatically from SERKET's AI software**

time	camera_id	aggressor_id	Chip	Animal ID	colour on body	victim_id	Chip	Animal ID	colour on body	interaction_type	remark Henning
10.06.2025 08:28											start of video, all 11 pig lay down
2025-06-11 08:37:07.241000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111O	1110	229.9361.BZ5	green dot in front	00000000099900214000111З	1113	229.9401.BZ5	2 red dots	ear_biting	data recording is correct
2025-06-11 08:40:20.396000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000110б	1106	1.7123.JR8	vilolett dot on back	00000000099900214000110Т	1107	521.9117.BR3	red line	tail_biting	data recording is correct
2025-06-11 08:41:35.658000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111O	1110	229.9361.BZ5	green dot in front	ear_biting	data recording is correct
2025-06-11 08:41:52.038000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111Т	1112	229.9389.BZ5	green line	ear_biting	data recording is correct
2025-06-11 08:42:02.875000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111Т	1112	229.9389.BZ5	green line	ear_biting	data recording is correct
2025-06-11 08:42:08.245000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111Т	1112	229.9389.BZ5	green line	ear_biting	data recording is correct
2025-06-11 08:42:16.082000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000110Ш	1108	521.9154.BR3	red dot on back	ear_biting	data recording is correct
2025-06-11 08:45:41.210000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000110Т	1107	521.9117.BR3	red line	ear_biting	data recording is correct
2025-06-11 08:45:55.600000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000110Т	1107	521.9117.BR3	red line	ear_biting	data recording is correct
2025-06-11 08:47:22.822000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111Ц	1116	229.9443.BZ5	2 brown areas on back	ear_biting	data recording is correct
2025-06-11 08:47:50.866000+00	9f99f1a4-1e6b-4bed-859d-4e5230c0aeb7	00000000099900214000111Б	1115	229.9446.BZ5	violett line	00000000099900214000111Ц	1116	229.9443.BZ5	2 brown areas on back	ear_biting	data recording is correct
10.06.2025 08:49.00											229.9446.BZ5 pushs 229.9362.BZ5 out
11.06.2025 08:49.51										ear_biting	no record in SERKET 229.9362.<bz5 bi

- Die AI software correctly detected that at 8:37:07 pig 229.9361.BZ5 bit pig 229.9404.BZ5 on the ear.

Validation on June 11, 2025

- Data validation 2:10 hours
- Registered 86 behavior records from 172 pigs
  - 86 culprits und 86 victims
  - In 8 records, the victim was incorrectly identified
  - 8 /172 = 4.7% of the animals incorrectly identified
  - This is still too high for breeding



Objectives

- **Automated behavior recording & animal identification** should function reliably in the 4 pens over the next 12 months → thereafter, installation of the technology in all 36 pens + annual payments for the AI software
- **At least 1,000 boars** for a reliable estimation of the heritability of aggressive behavioral traits
- **If a good heritability is evident:** Development of a breeding value estimation for behavioral traits in young boars → long term (10-15 years) fewer aggressive pigs

PigBones

- **Animal health:** Leg weakness in fast growing animals
- **Environmental impact:** Phosphorus excretion
- **Objective:** Breeding pigs with optimized P-utilization and increased bone stability
- **In cooperation with:** POROUS Cortical Bone Microstructure Analysis; Forschungsinstitut für Nutztierbiologie
- **Funded by:** eureka eurostars; GEFÖRDERT VOM Bundesministerium für Bildung und Forschung; International project supported by Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra, Swiss Confederation, Innosuisse – Swiss Innovation Agency

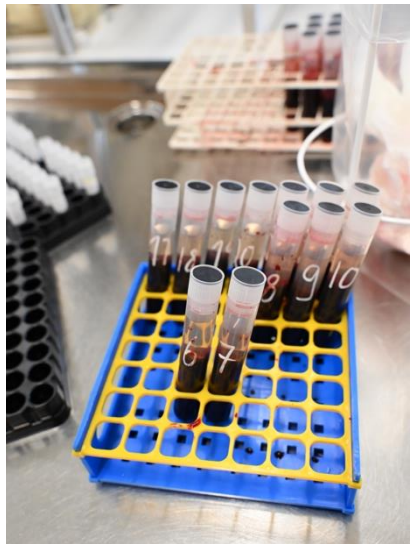
Implmentaion

POROUS
Cortical Bone Microstructure Analysis

Development of a non-invasive ultrasound method for measuring bone density and stability

Forschungsinstitut für Nutztierbiologie

BAP (Ostase) and β-CTX (C-terminal Telopeptide) as well as inorganic phosphorous, magnesium, and total calcium in serum are quantified

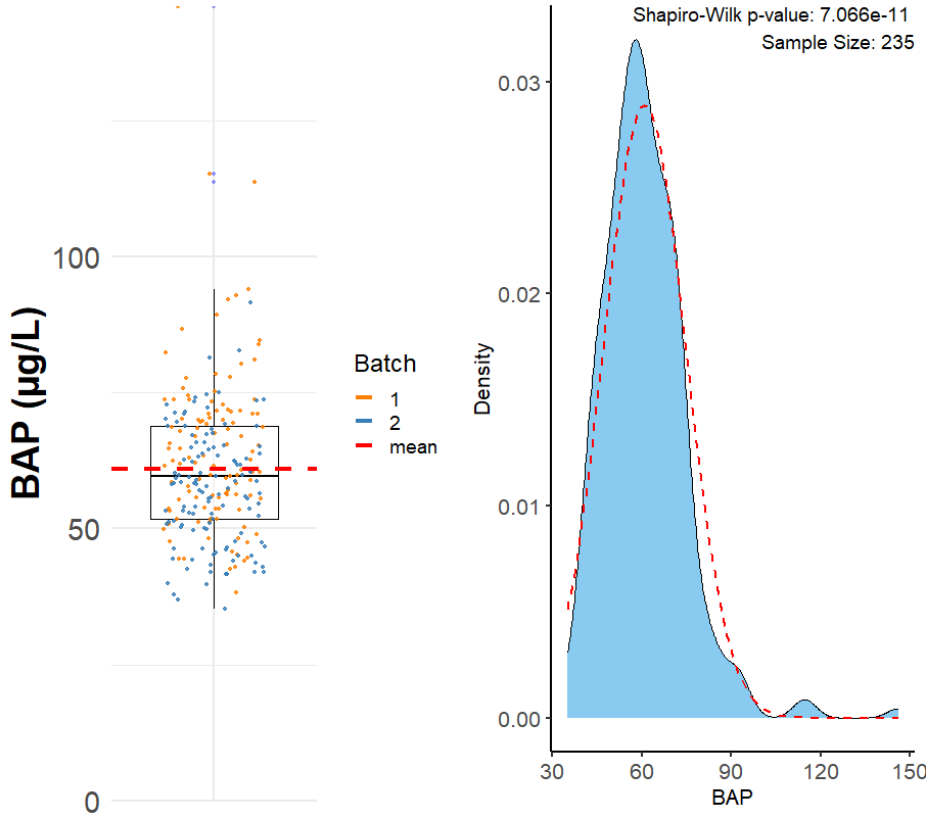


SUISAG

Data from the test station for the analysis
Bone fracture resistance is measured

Current Status

- 1/3 of the total number of samples was collected and recorded



BAP = bone-specific alkaline phosphatase
-> Important clinical chemical marker for bone formation

Objectives

- Develop a non-invasive, quantitative ultrasound method that is easy to use and provides rapid results after adjustment and validation
- Application of ultrasound-based assessment of bone characteristics in the performance testing, which can be incorporated into the EBV
- Identification of genetic markers that can serve as direct selection criteria

VIELEN DANK!

Questions?

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