Breeding for resilience: transitioning diverse livestock farming systems into the future

Validation of a high-throughput movable 3D device for the acquisition of the whole cattle body

Maxence Bruyas, Adrien Lebreton, Laurent Griffon, Laurent Delattre, Clément Allain
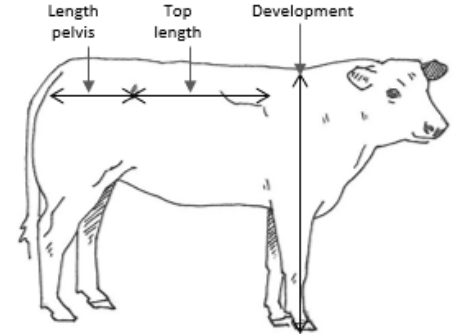
1) Project goals and context

2) Adaptability to on-farm phenotyping

3) Validation of the prototype

4) Next steps

5) Conclusion

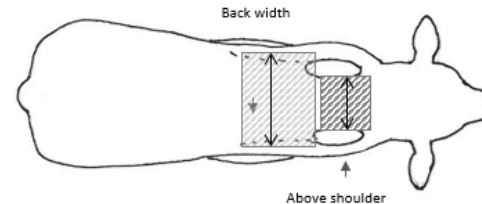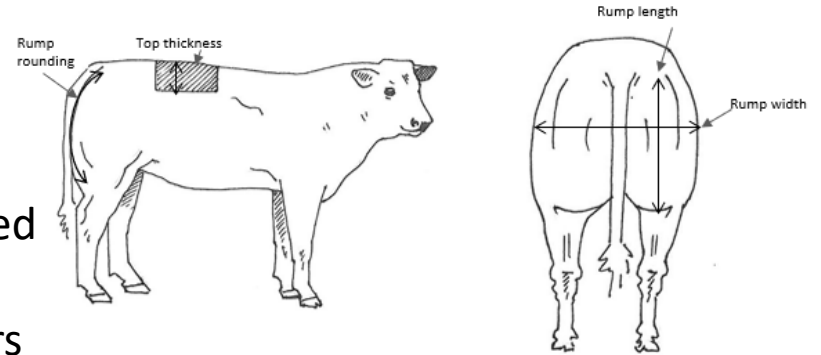# 1) Context : beef performance monitoring in France

Weighing

- By the farmer
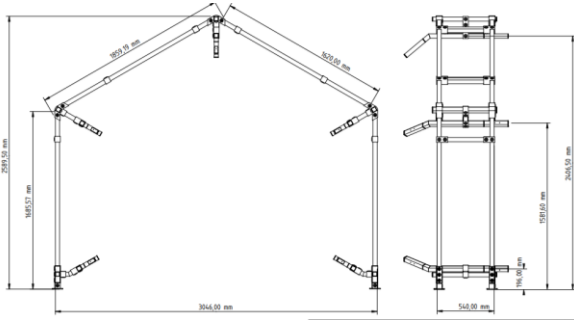- By the technician

Scoring

- 19 points of linear scoring common to all beef breed
- No mensurations
- 380 000 scoring per year on 10 races by 445 scorers
- Beetween 4 and 12 months

1) Project goal

Goal: Automate the collection of **live weight** and the **19 scores of linear scoring at weaning** (4-12 months) on the 10 beef breeds
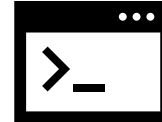
3 deliverables:

A 3D scanner for high-throughput phenotyping in farm

3D OUEST

Prediction algorithms

A service

Consortium Animal 3D

INSTITUT DE L'ELEVAGE idele
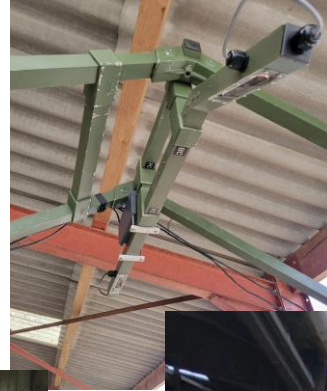
RACES DE FRANCE

1) Project goal

→ **Validate the adaptability to on-farm phenotyping**

→ **Validate the image acquisition and reliability of the image**

    → **To validate the prototype**

2) Adaptability to on-farm phenotyping

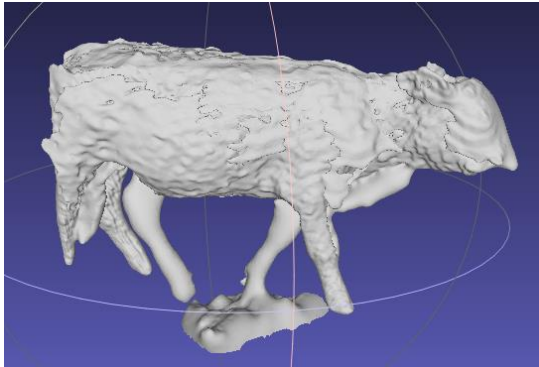# 2) Adaptability to on-farm phenotyping

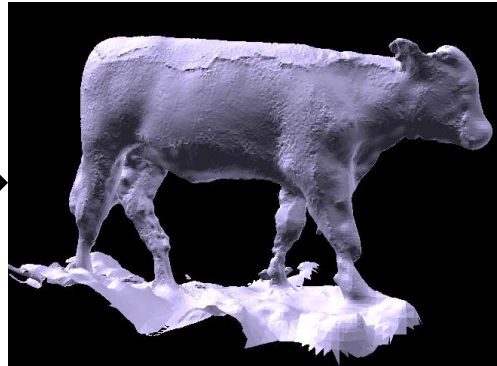~15 farms (including experimental farm) and ~30 configurations tested

3) Validation of the prototype
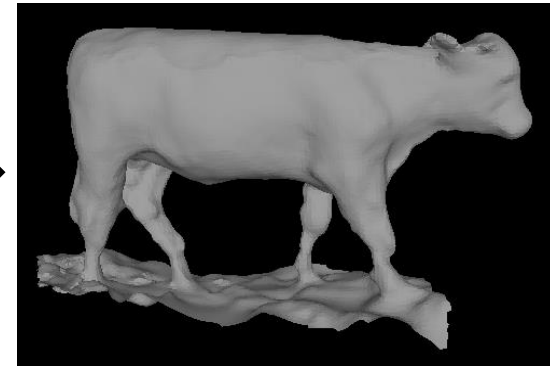# Scanner 3D : Advances in image acquisition and post processing

1st test in
april 2022

4th test in october
2022

April 2023 (reconstruction
improvements)

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3) Scanner 3D : validation of the prototype

Measures to evaluate the reconstruction on 33 animals between 6 and 12 months:

- Heights at withers and sacrum

- Chest depth

- Hip width

- Chest size

Reference method = Manual measurements

vs.

Measurements by operators on 3D images

Or

Automatic measurements on the image by algorithm

Goal: Correlation coefficient > 0.7

NB: At this stage the goal was to evaluate the 3D image accuracy

# 3) Scanner 3D : Validation of the prototype

Automatic and manual measurements on the 3D image vs. Reference measurements on the real calves

Goal : > 0,7 < 4%

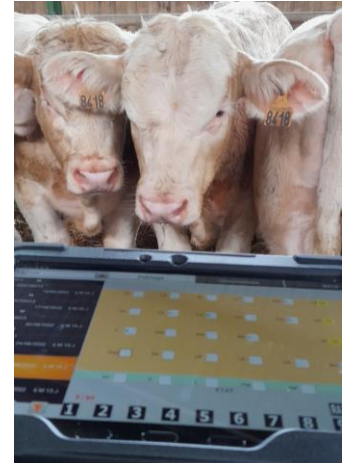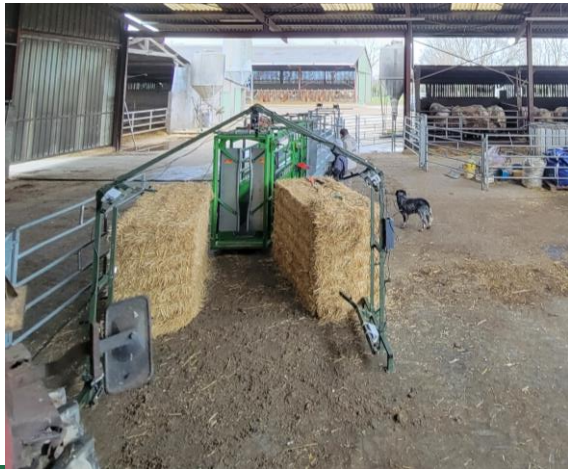| Measures	Correlation coefficient automatic	Correlation coefficient manual	Reproducibility coefficient manual
Height at withers	0,95	0,95	2,7%
Sacrum height	0,96	0,96	2,6%
Chest depth	0,93	0,94	1,6%
Hip width	0,87	0,86	2,6%
Chest size	//	0,88	2,5%

CS

HW
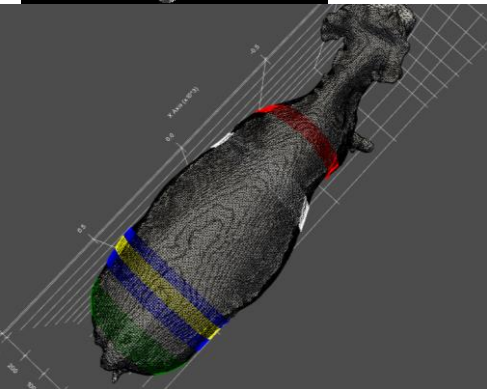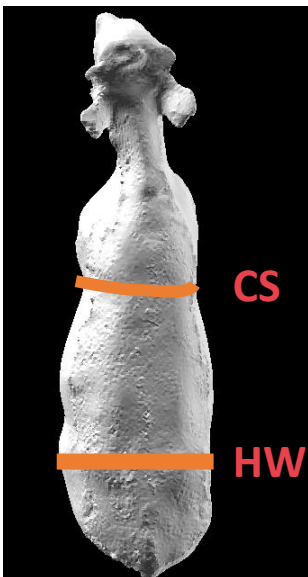
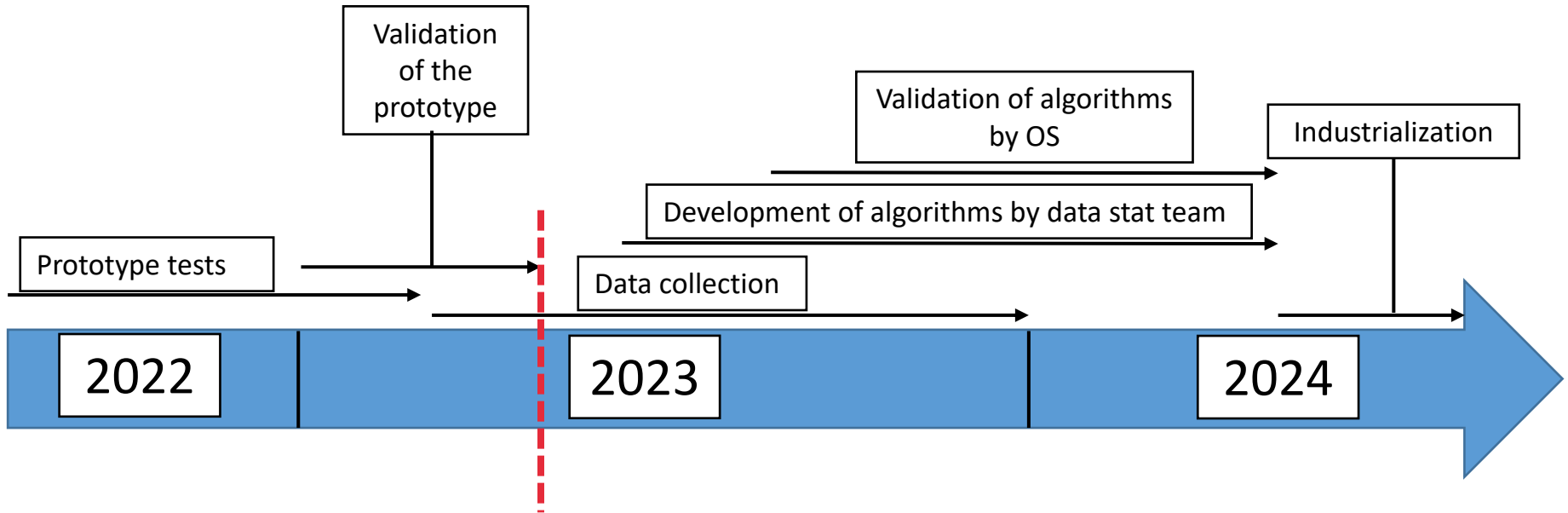# 3) Development of the scoring algorithms: collection of the data

Goal: to create a learning base (**3D images, live weights and linear scores**) bringing together all the variability (morphology, age) of the population of a breed

→ Algorithms only learn from what they see

→ Starting with 2 weeks of data collection in March (breed Charolais)

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4) Next steps

Timeline diagram showing project phases across 2022, 2023, and 2024:
- Prototype tests (2022)
- Validation of the prototype
- Data collection (2023)
- Development of algorithms by data stat team
- Validation of algorithms by OS
- Industrialization (2024)

We are here ! (marked at start of 2023)

Algorithms for linear scores and weight !

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5) Take home message

- Encouraging automated measurements test

- Two weeks of collection in March in the Charolaise breed very successful and a complete 1st part of the database → Collection of nearly 2,300 images

- Networks supporting the project!

Thank you for your attention !

ELIANCE
Des éleveurs. Une ambition.

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