



# GenTORE

Genomic management Tools to Optimise  
Resilience and Efficiency

**YOUNG SCIENTISTS SESSION**

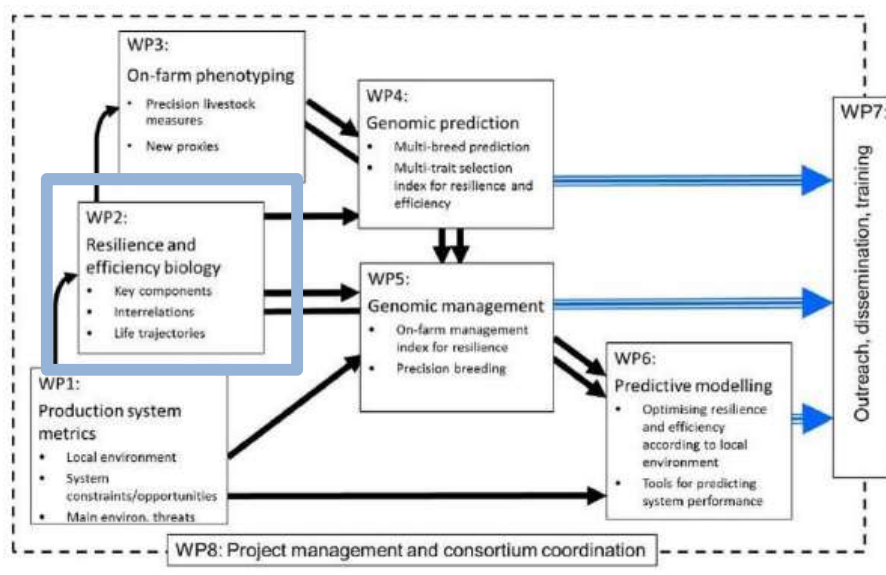
**Use of sensors to detect the effect of feeding  
and weighing management on the daily  
behaviour of beef cows.**



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## WP2 – R&E Biology Across Growing and Adult Phases

**Task T2.3 – Multi-site Experiment To Validate RFI And Resilience Measures, And Develop Precision Livestock Phenotyping Of Resilience And Efficiency Components**



Research stay

UMR Herbivores INRAE, France

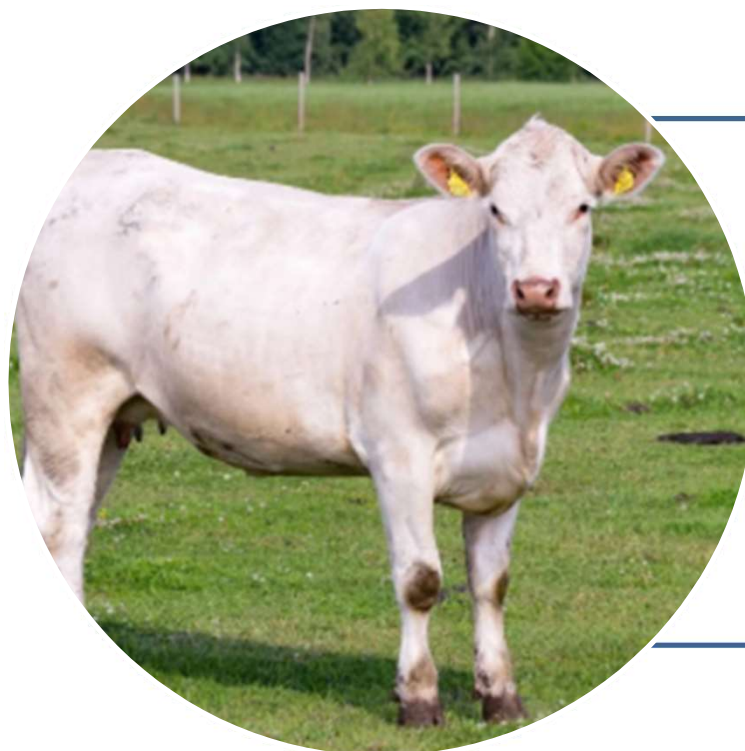
September-December 2019

**Authors:** Orquera, K., Ortigues-Marty, I., Thollon, N., Casasús, I., Sepchat, B., De La Torre, A.





# INTRODUCTION



Changing  
environments

# ROBUSTNESS

Conversion of  
resources into  
products





## AIM

(Larger experiment aiming to analyse the components of feed efficiency and resilience of beef cows)

- This study focused on the **effect of routine weighing** of beef cows on their **behaviour patterns**, and if this effect depended on the **feeding level**.





## MATERIALS AND METHODS

- Laqueuille experimental farm (INRAe)
- Twelve 4 year-old Charolais beef cows
- Diets
  - composition:
    - hay (105 g CP/kg DM , 4787 MJ NE lactation /kg DM)
    - concentrate (203 g CP/kg DM, 6922 MJ NE lactation/kg DM)
  - formulated with INRAtion software (cow weight, milk yield)
  - offered individually at 08:00, in individual troughs with automatic gates





# MATERIALS AND METHODS

Five nutritional challenges from the second month of lactation

	<i>Period 1</i>		<i>Period 2</i>		<i>Period 3</i>		<i>Period 4</i>		<i>Period 5</i>		<i>periods 2, 4, 5 used in the current study</i>
	<i>Ch</i>	<i>Rec</i>	<i>Ch</i>	<i>Rec</i>	<i>Ch</i>	<i>Rec</i>	<i>Ch</i>	<i>Rec</i>	<i>Ch</i>	<i>Rec</i>	
n° days	4 d	17 d	10 d	18 d	4 d	3 d	4 d	3 d	4 d	10d	

## ➤ FEEDING MANAGEMENT

**Challenge** (50% reqs.) vs. **Recovery** (100% reqs.)

## ➤ WEIGHING MANAGEMENT

cows moved from their pen and weighed at 13:30 on some days (**BW**) but not on others (**WO**)

<i>Per. 2, 4, 5</i>	
<b>Ch</b>	<b>Rec</b>
<b>BW</b>	<b>BW</b>
<b>WO</b>	<b>WO</b>



# MATERIALS AND METHODS



AXEL accelerometer sensors and data logger

Raw data every 5 minutes

Database > 100000

5 activities

- Ingestion
- Rumination
- Rest
- Over-activity
- Other activities

➤ **Statistical analyses:**  
**linear mixed models**  
*daily time dedicated to each activity*  
*n=34 days*

- Fixed effects:
  - Feeding management -> **Challenge vs. Recovery**
  - Weighing management -> **BW vs. W0**
  - Period -> **2, 4, 5**
- Random effect: cow

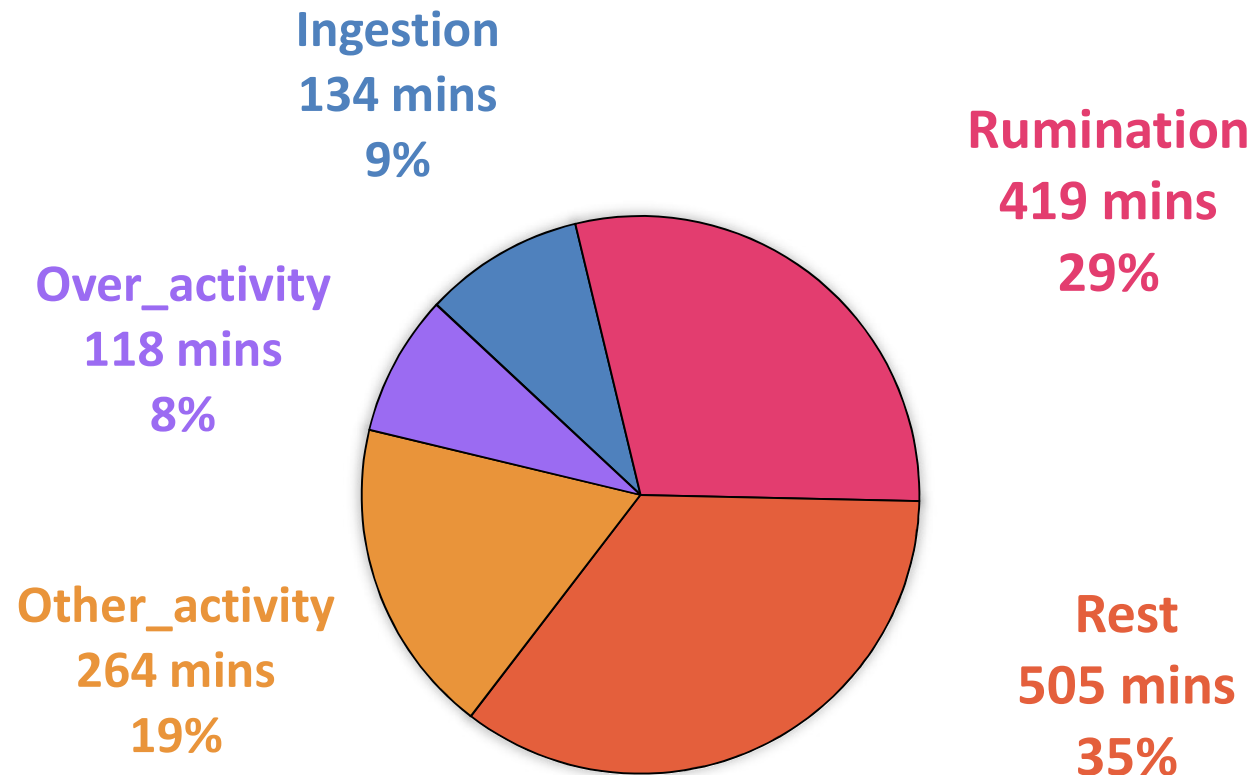




# RESULTS

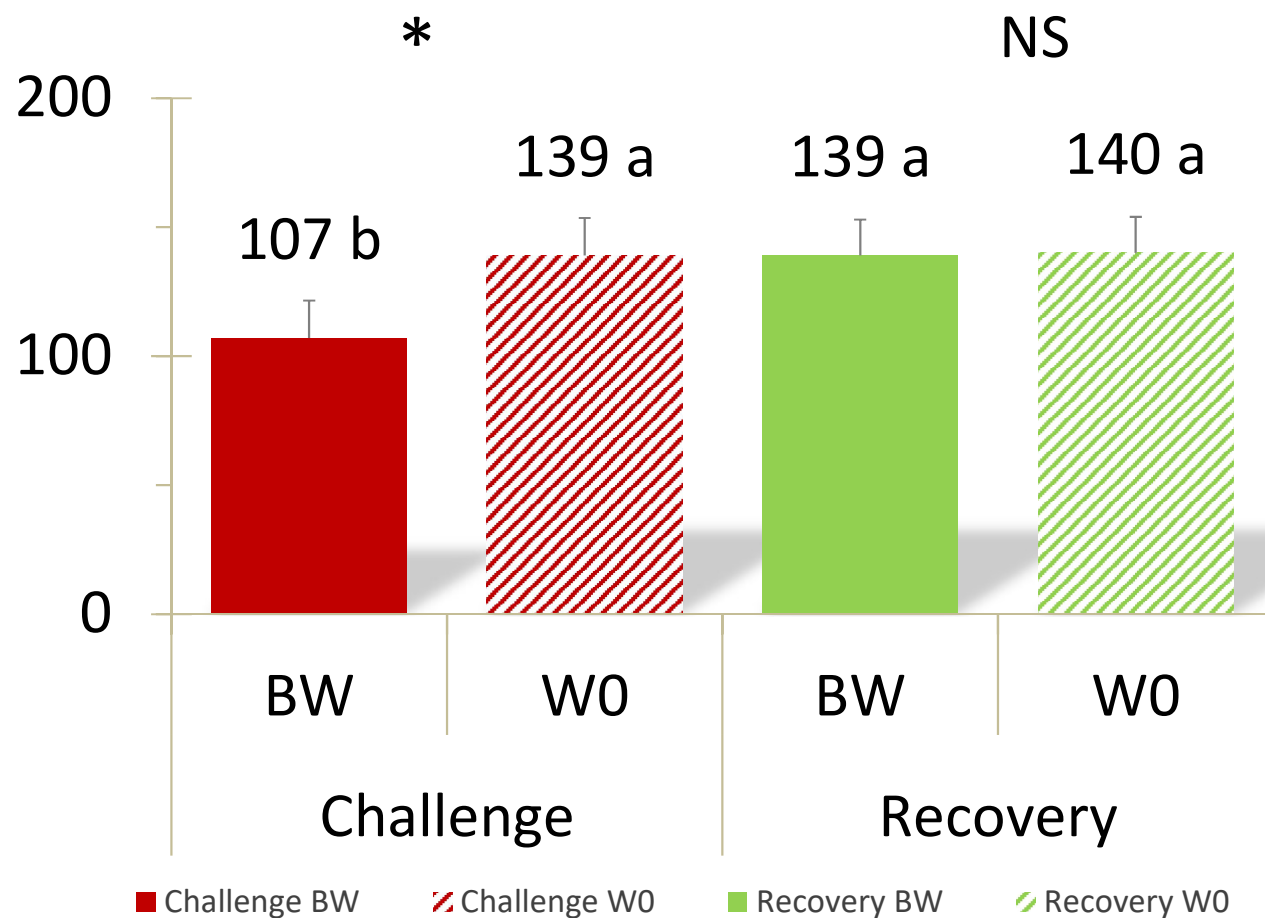


## Daily activity budget





## Ingestion, mins/d



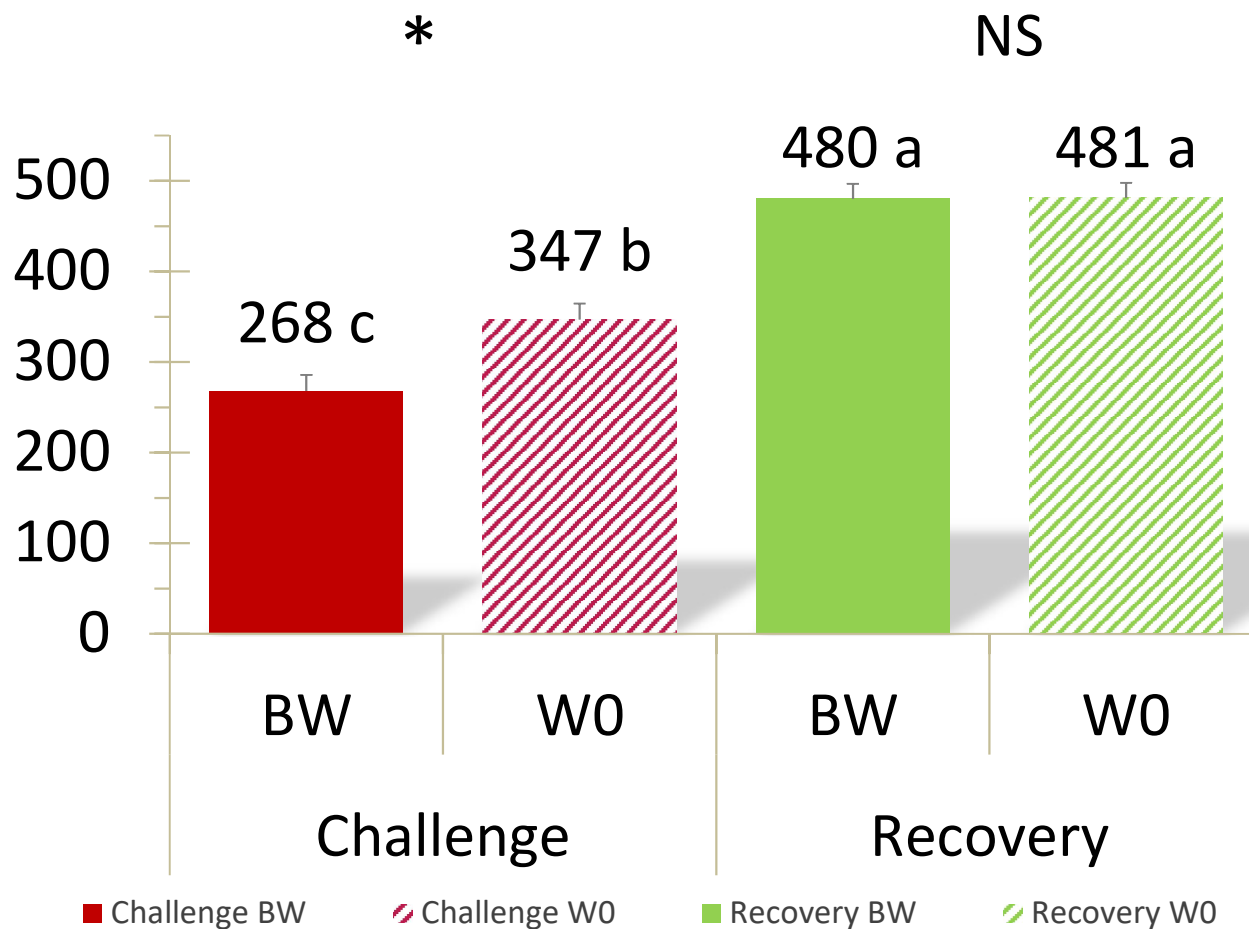
Shorter ingestion time in BW than W0 days during Challenge but not during Recovery

*Weighing management*

*Feeding management*



## Rumination, mins/d



Shorter rumination time in BW than W0 days during Challenge but not during Recovery

*Weighing management*

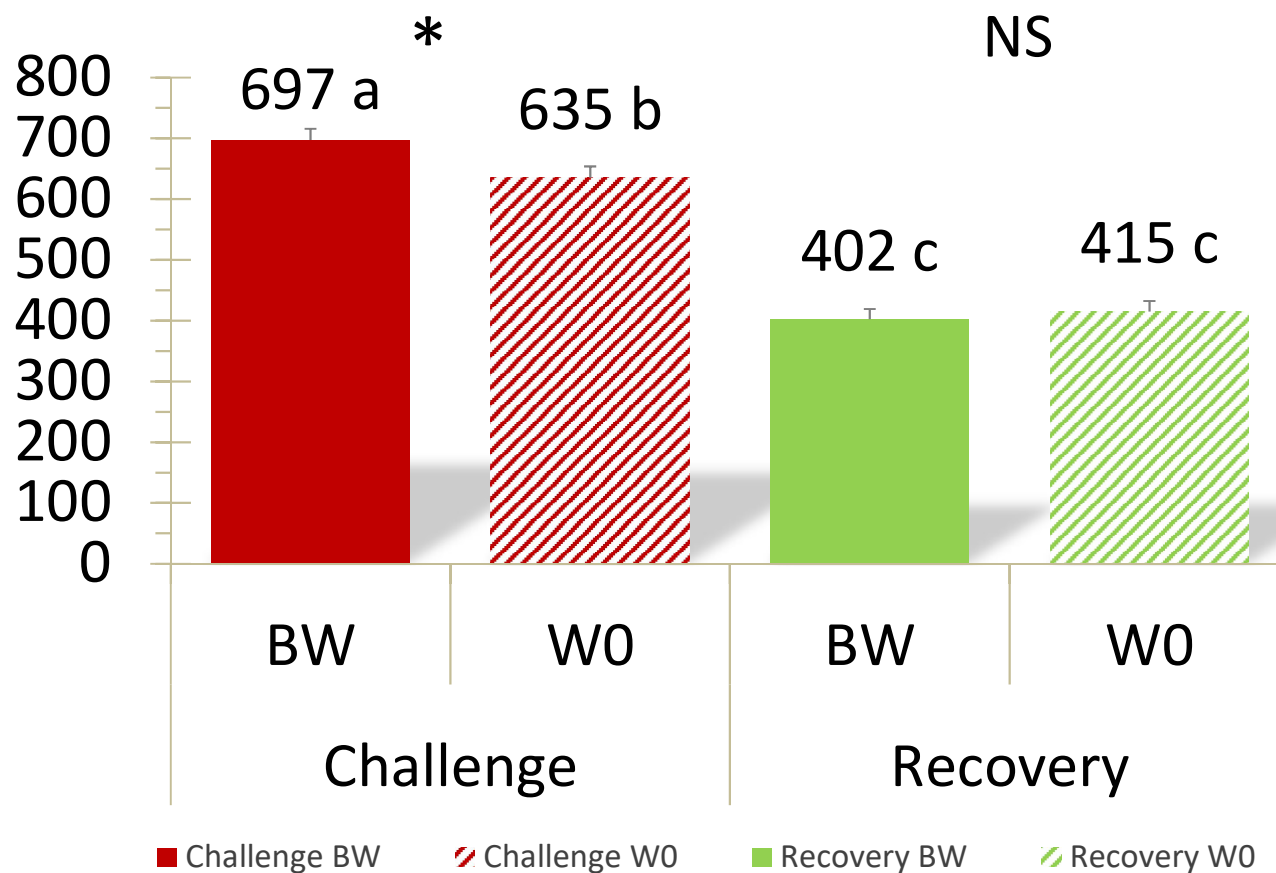
*Feeding management*



***Moving the cows from their pens to the scale and back, had a clear effect both on intake and rumination, when feed was restricted to 50% but not to 100% of requirements. During the CH phase, on these BW days cows seem to speed up both eating and ruminating, as compared to days W0.***



Rest, mins/d



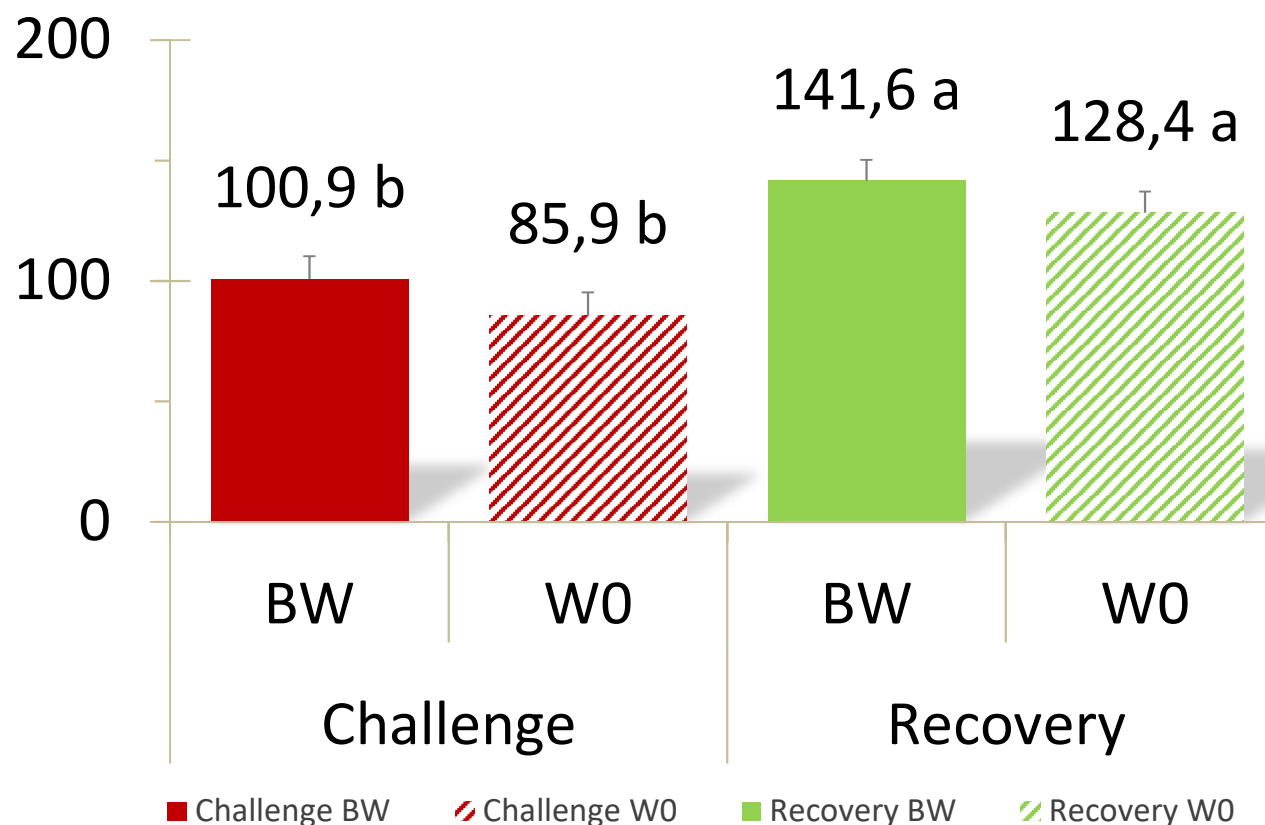
Longer resting time in BW than W0 days during Challenge but not during Recovery

*Weighing management*

*Feeding management*



## Over-activity, mins/d



**Feeding management**  
Shorter in Challenge (93 min) than Recovery (135 min):  $P < 0.001$

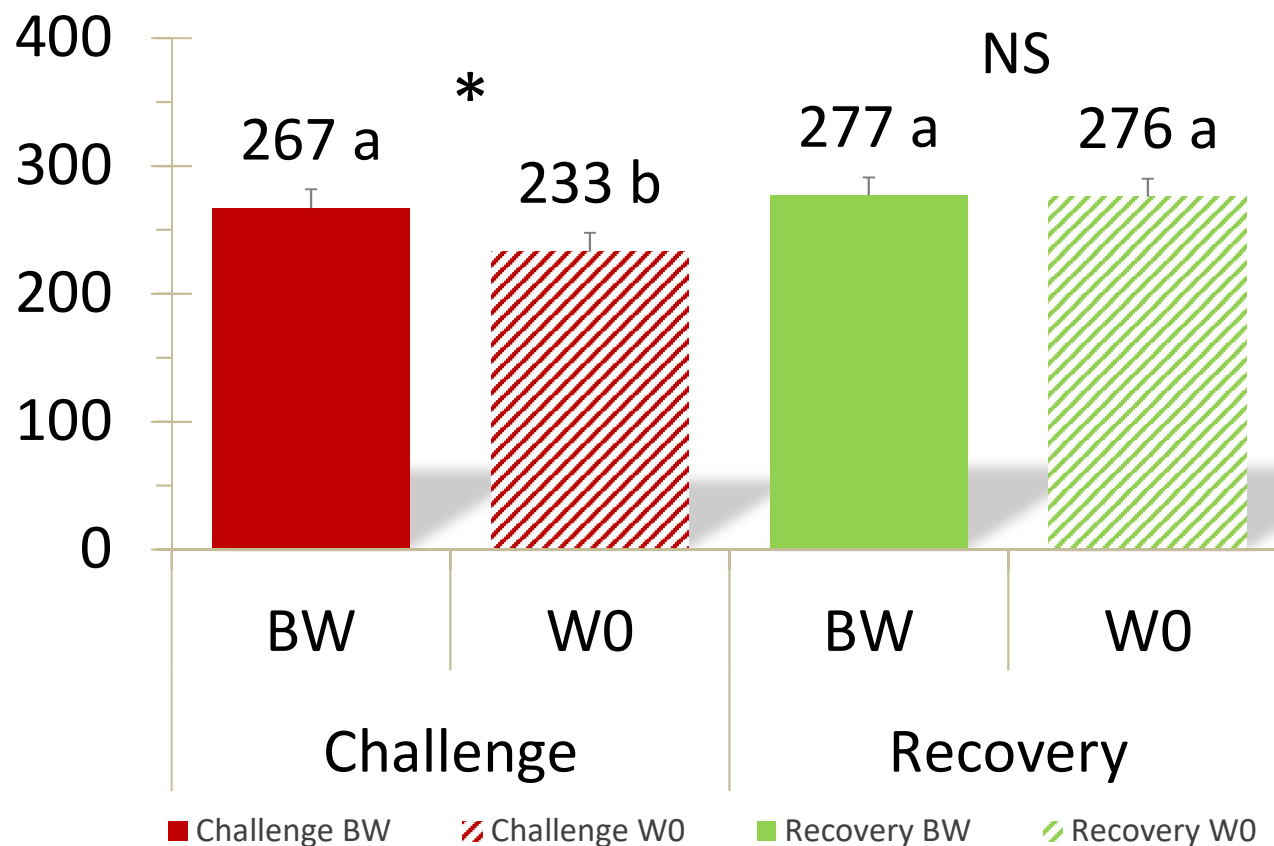
**Weighing management**  
Tended to be longer in BW days (121 min) than W0 days (107 min):  $P < 0.10$

*Weighing management*

*Feeding management*



### Other activities, mins/d



Longer time dedicated to other activities in BW than W0 days during Challenge but not during Recovery

*Weighing management*

*Feeding management*

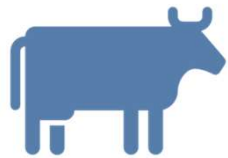


***On BW days during the CH phases, the time the cows saved from fast eating and rumination was spent in longer resting and other activities, as compared to days W0.***





# CONCLUSIONS



Weighing around midday interfered mostly with the time spent by cows **eating, ruminating and resting**, but only when **feed intake was restricted**.



The effects of both factors on **over-activity** and **other activities** were less evident.



These results should be considered in order to **schedule routine management** to avoid and/or minimize interference with cattle natural behaviour patterns.



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# THANK YOU FOR YOUR ATTENTION!

