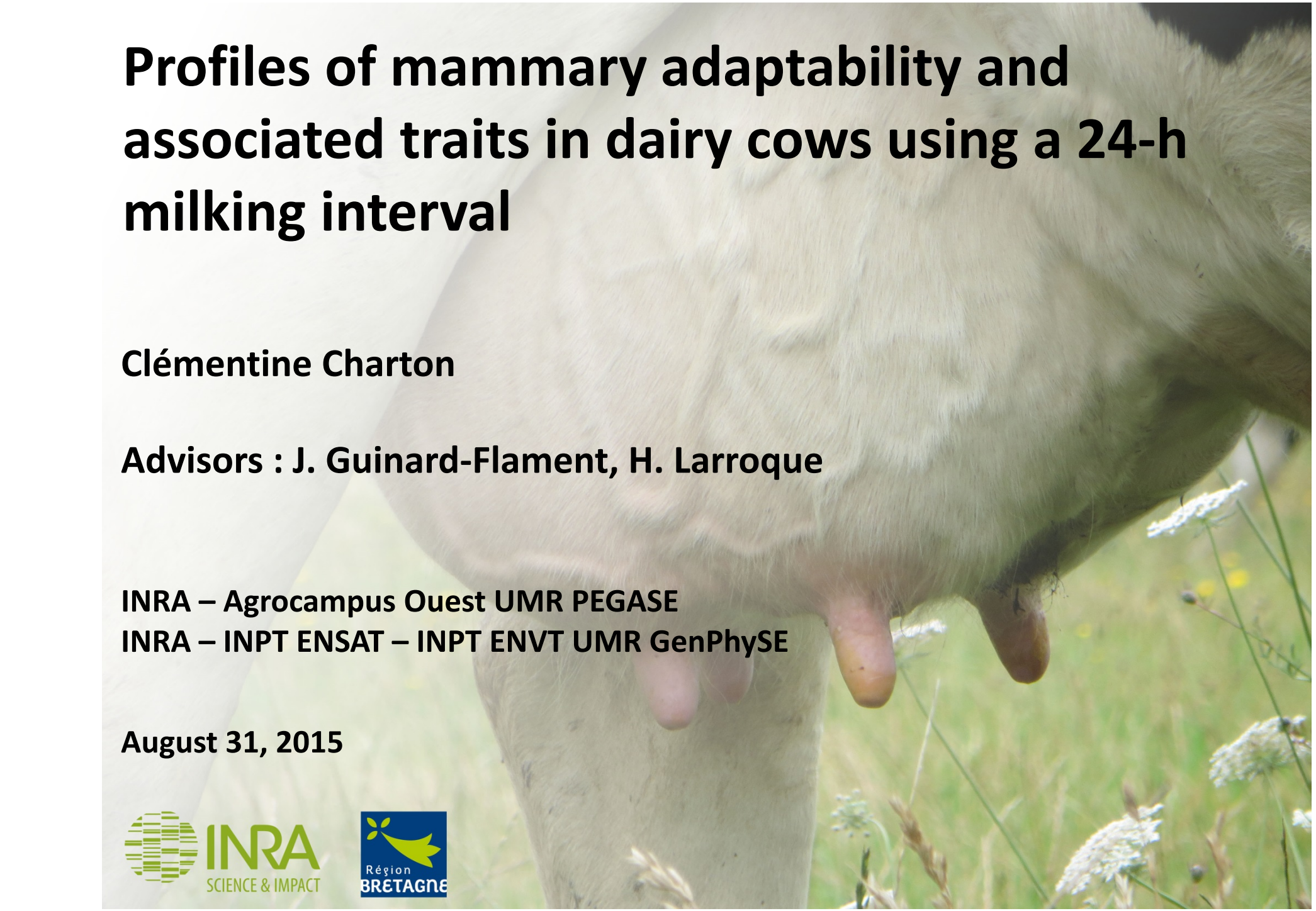
Profiles of mammary adaptability and associated traits in dairy cows using a 24-h milking interval

Clémentine Charton

Advisors : J. Guinard-Flament, H. Larroque

INRA – Agrocampus Ouest UMR PEGASE
INRA – INPT ENSAT – INPT ENVT UMR GenPhySE

August 31, 2015



Cows must adapt to a changing context for the system to survive

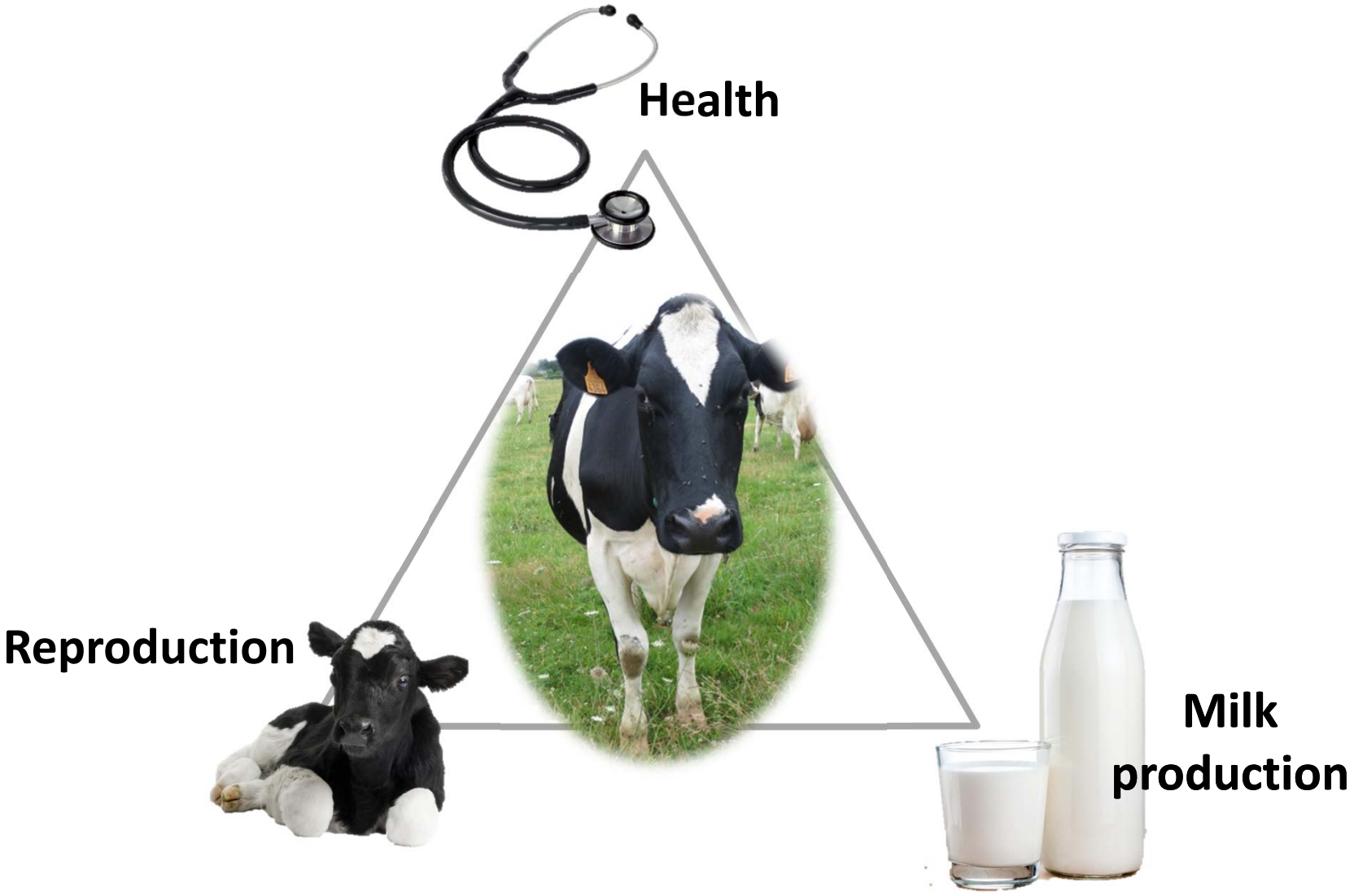
Economics

Environment

Technics

Sociology

What is an adaptable cow ?



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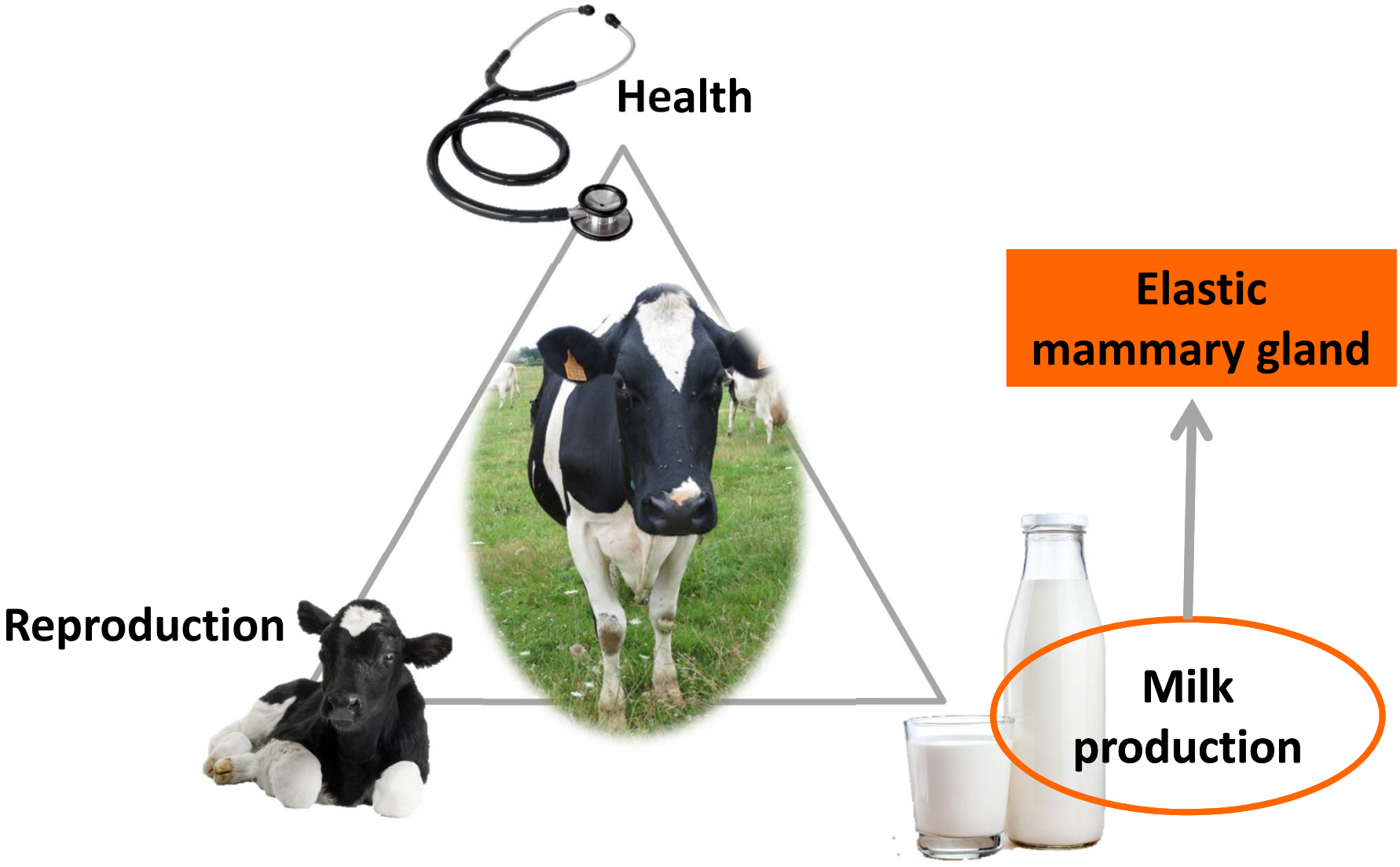
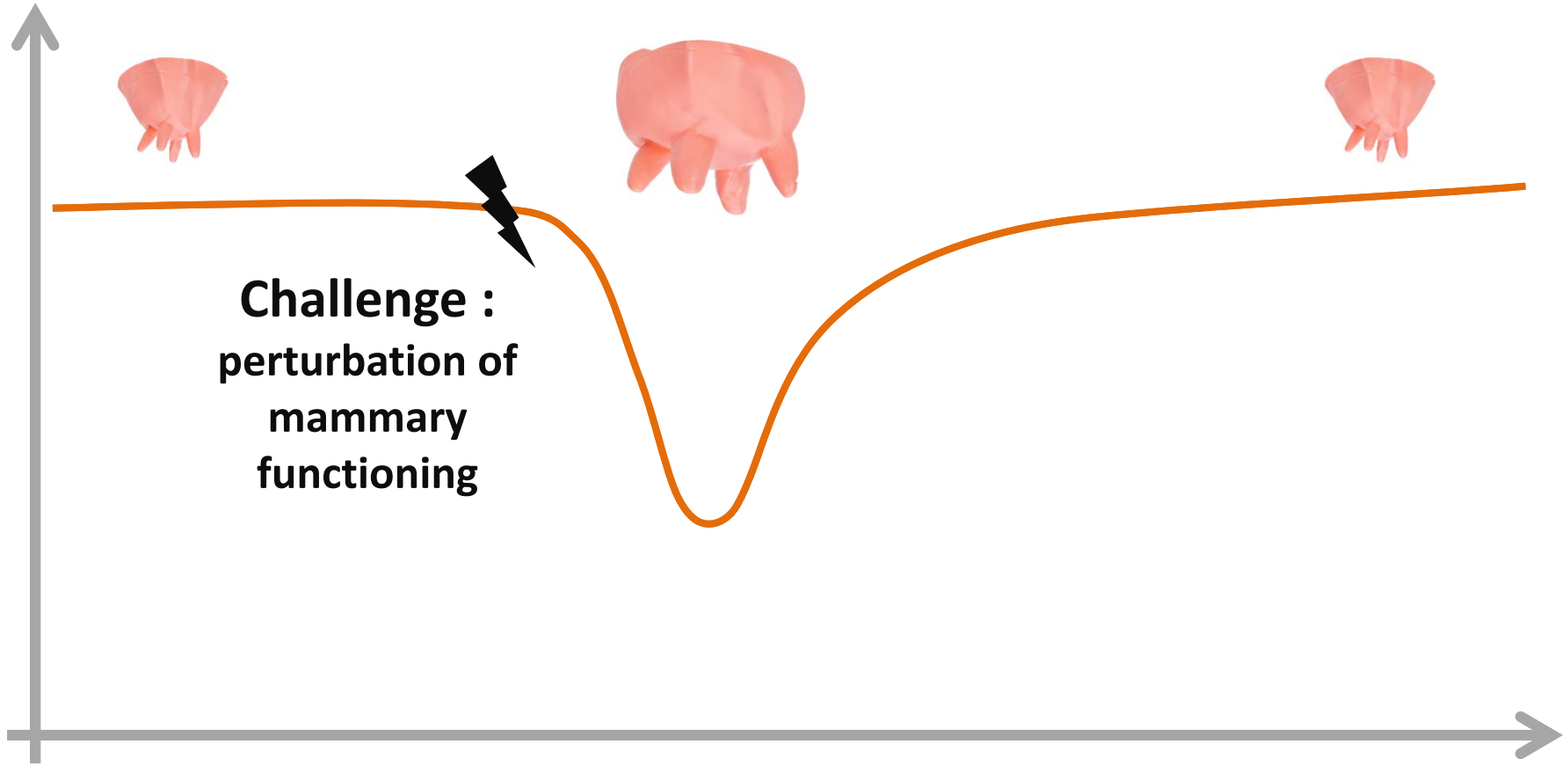


Adaptable cows = cows whose mammary glands are elastic

Elasticity ?



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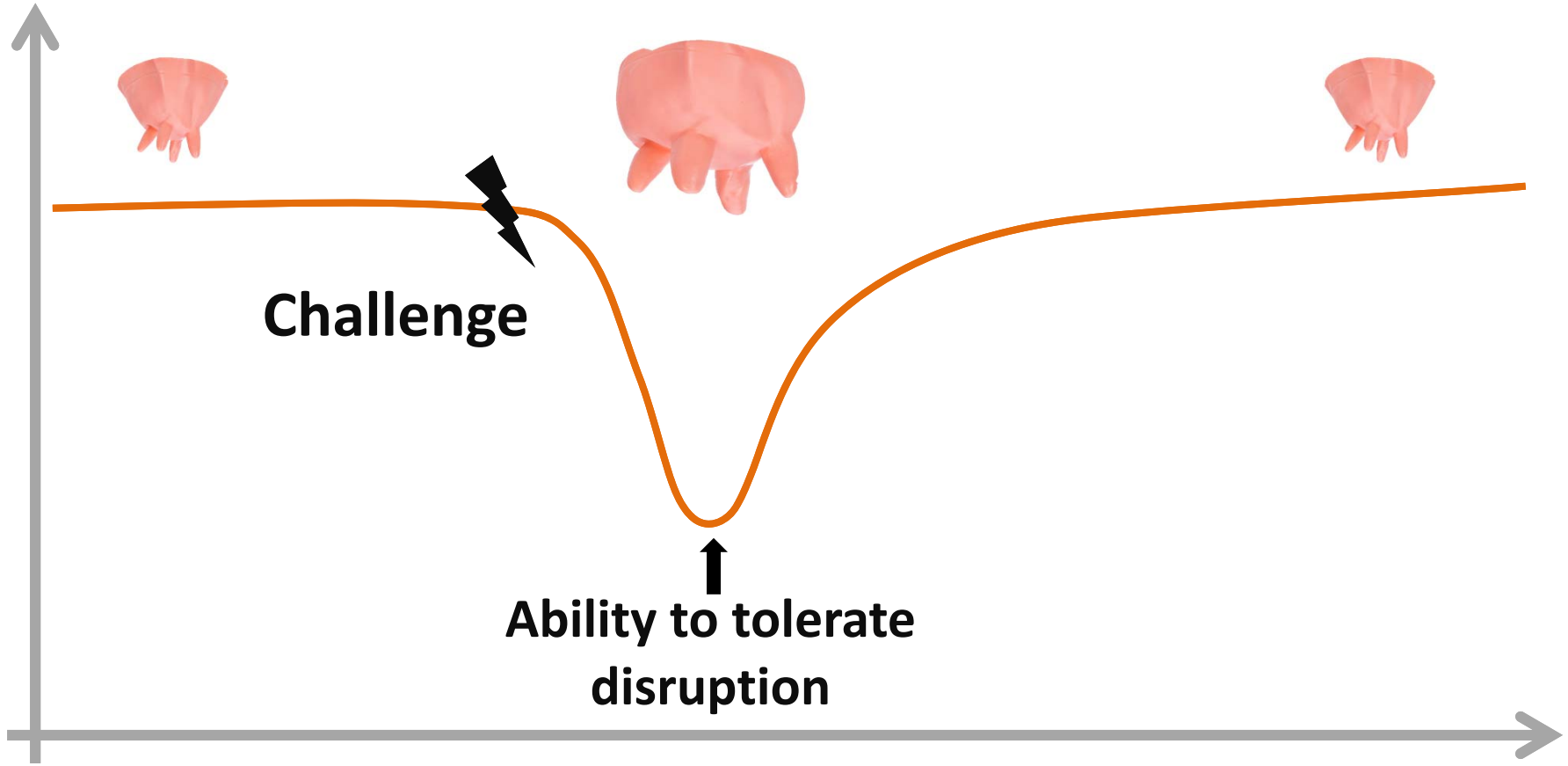

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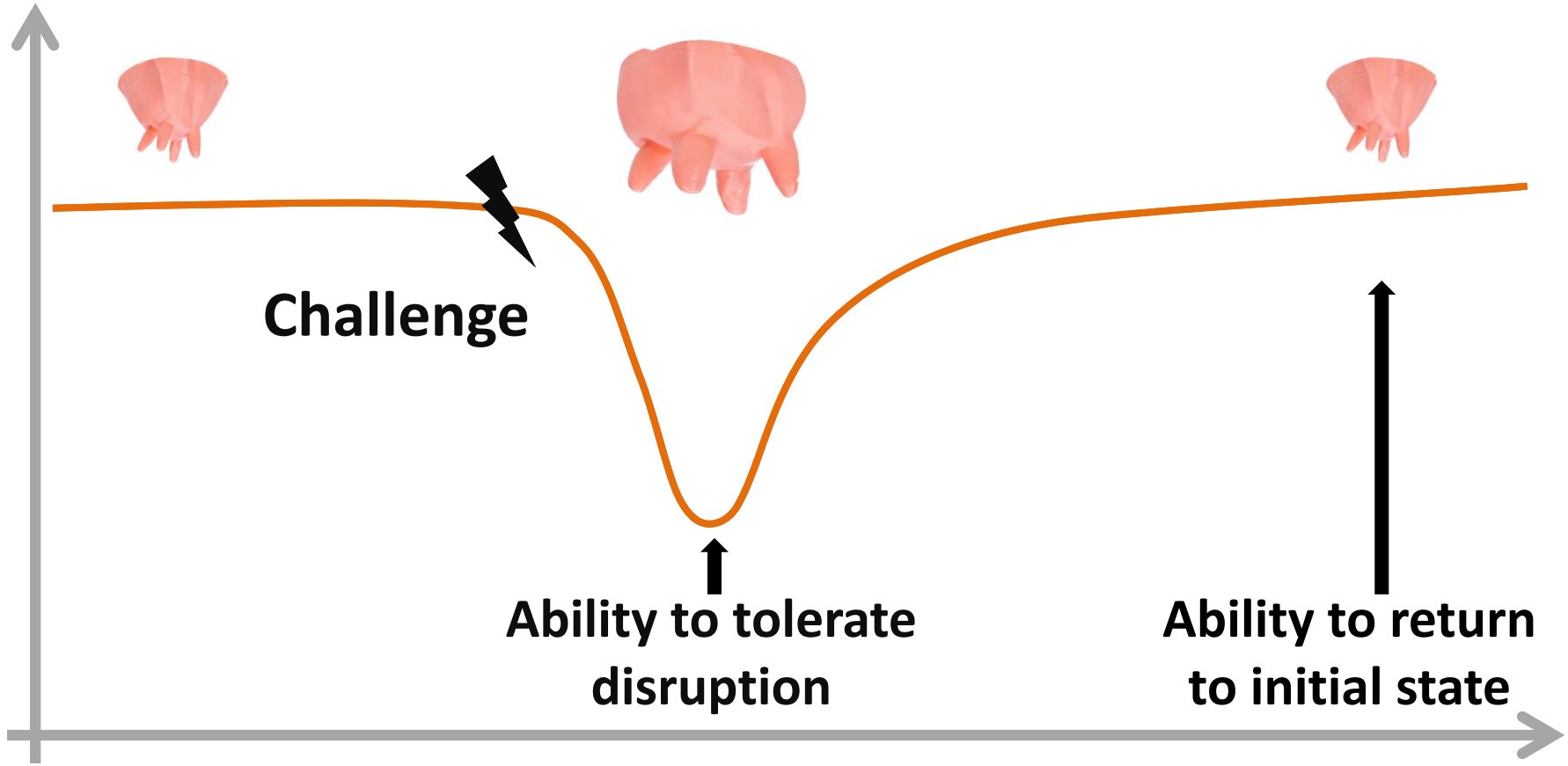
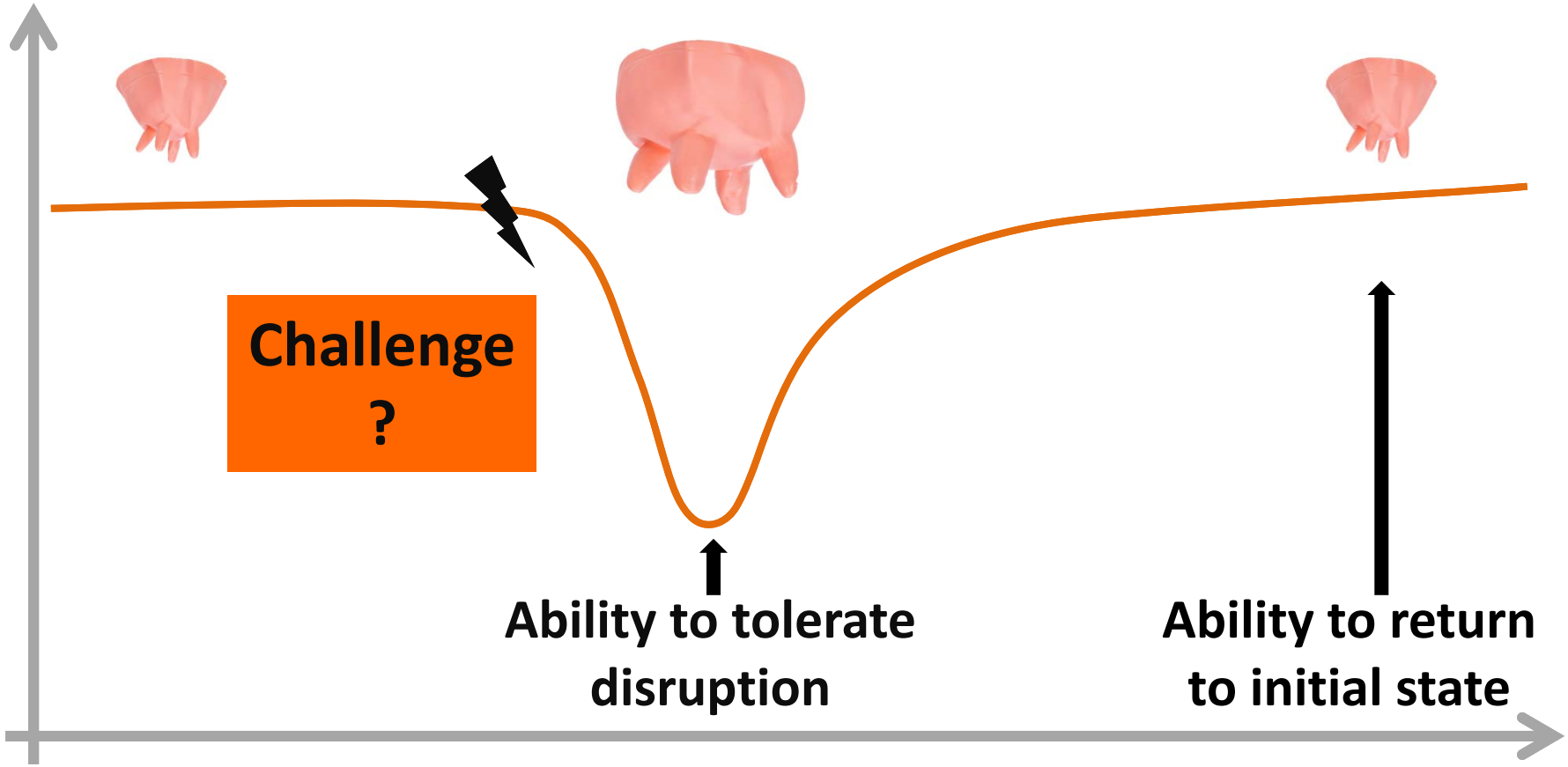


Need to find a challenge to assess mammary gland elasticity



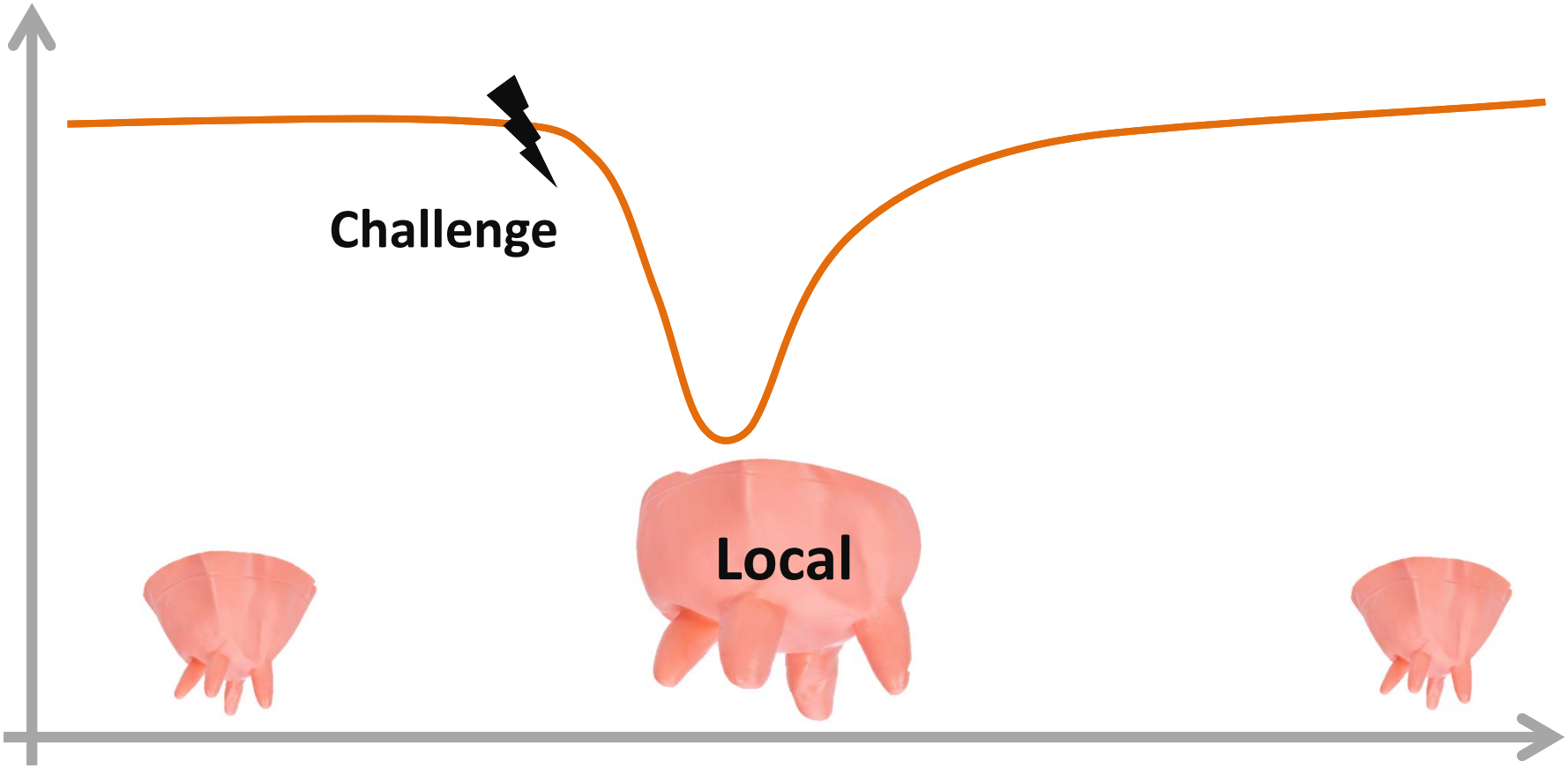
Once-daily milking, a suitable challenge to assess mammary elasticity ?

Once-daily milking (ODM)
= 1 milking / day instead of 2 (TDM)

↘ 20 to 30 % milk yield

Changes in milk composition

Once-daily milking, a suitable challenge to assess mammary elasticity ?



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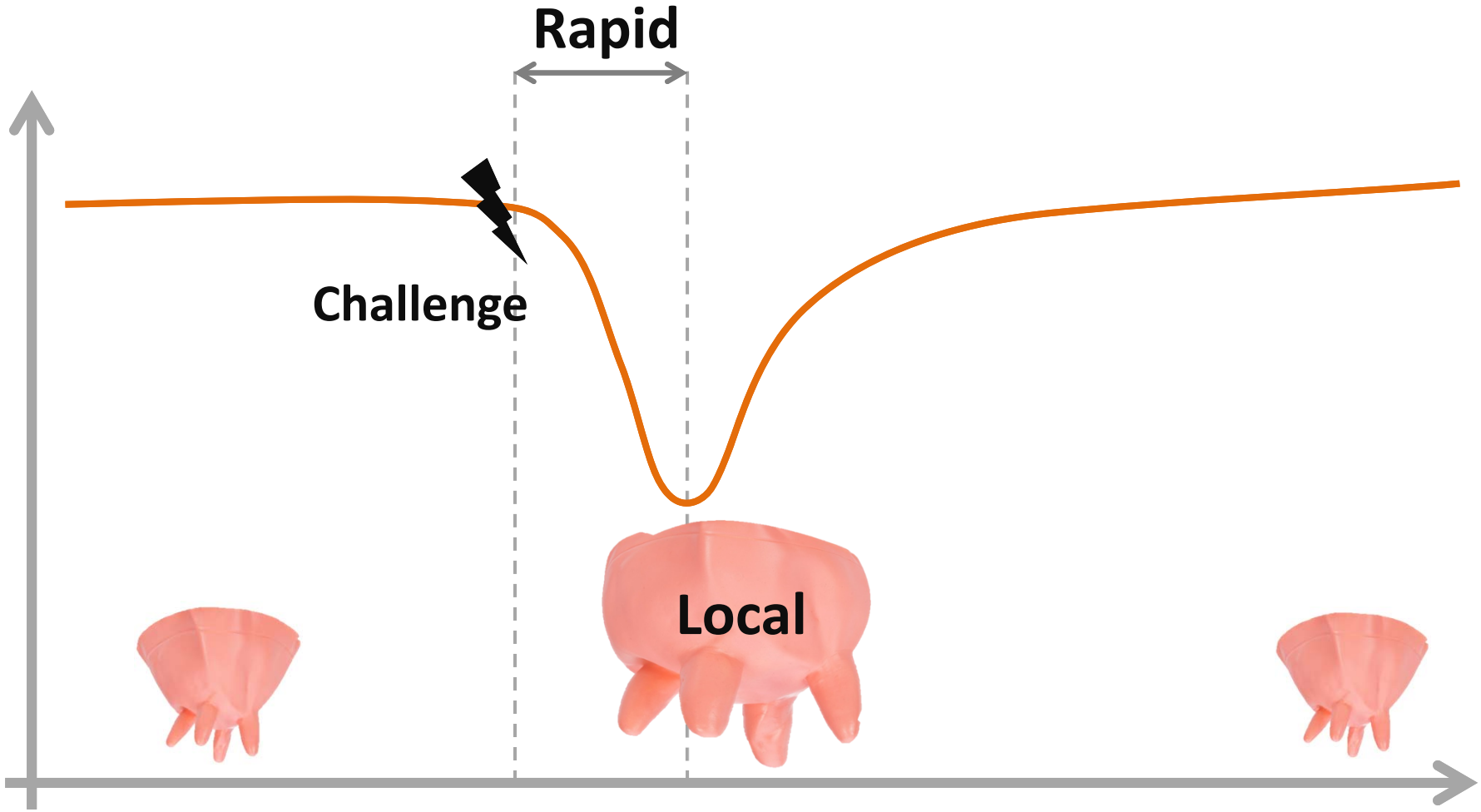

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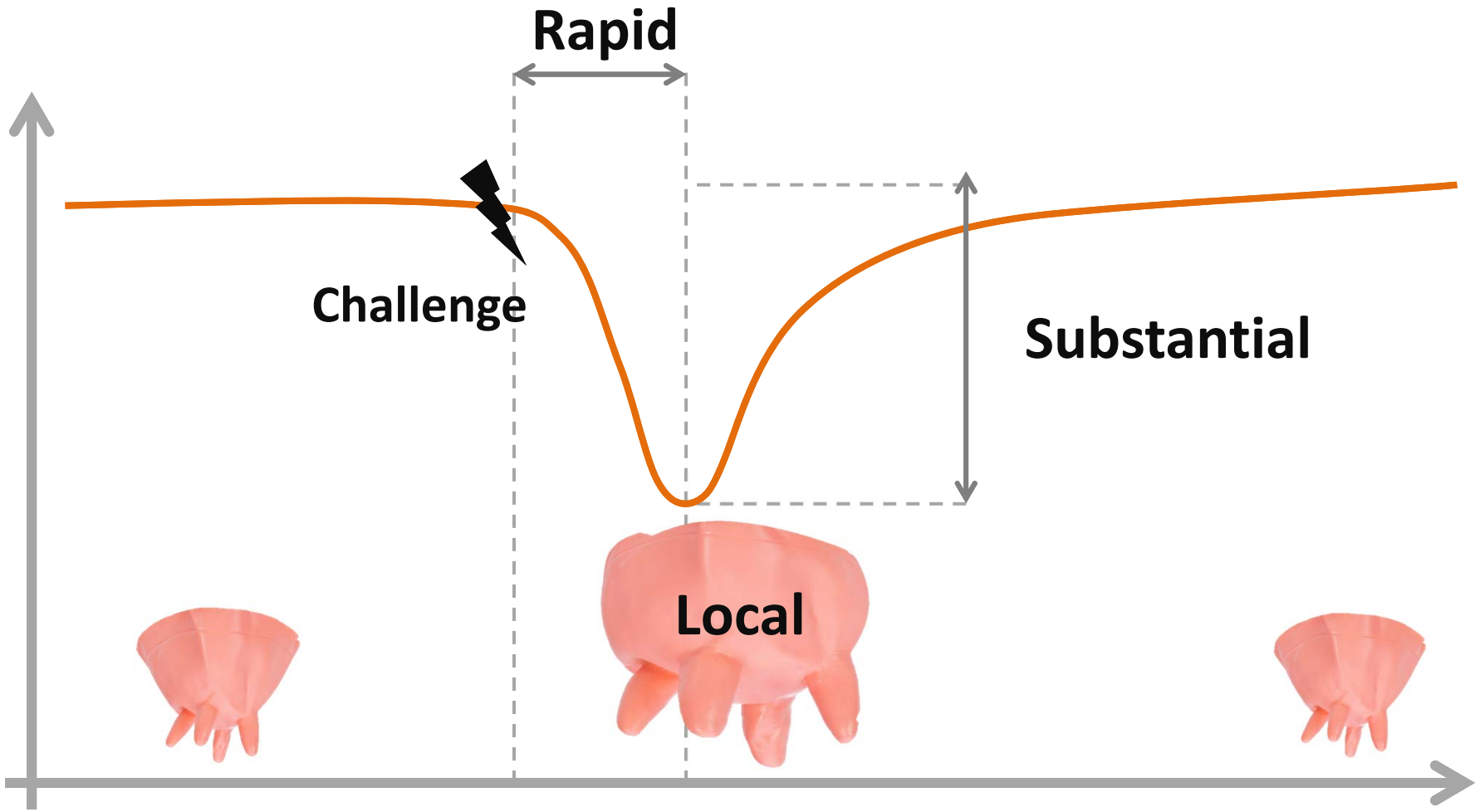

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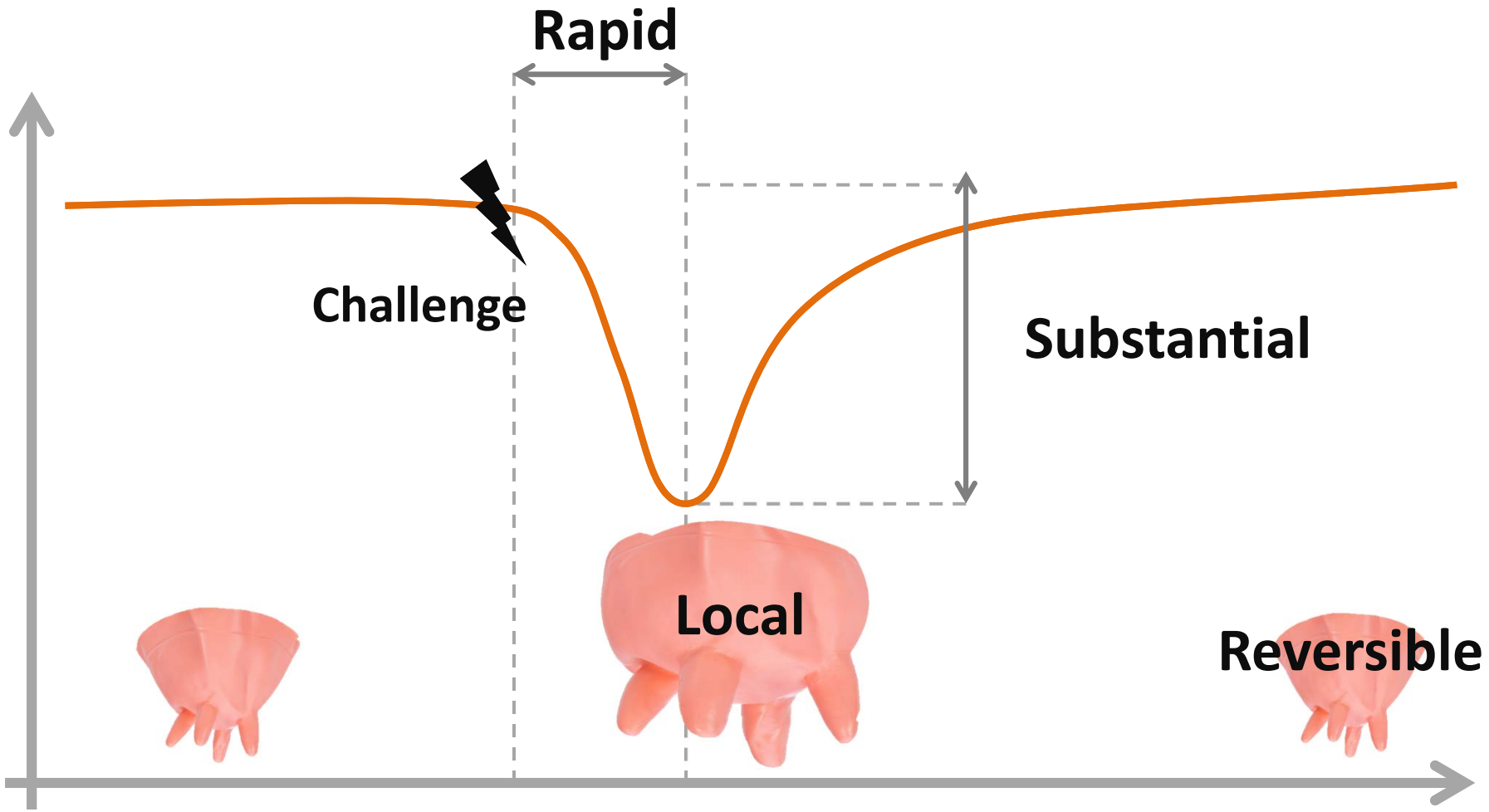

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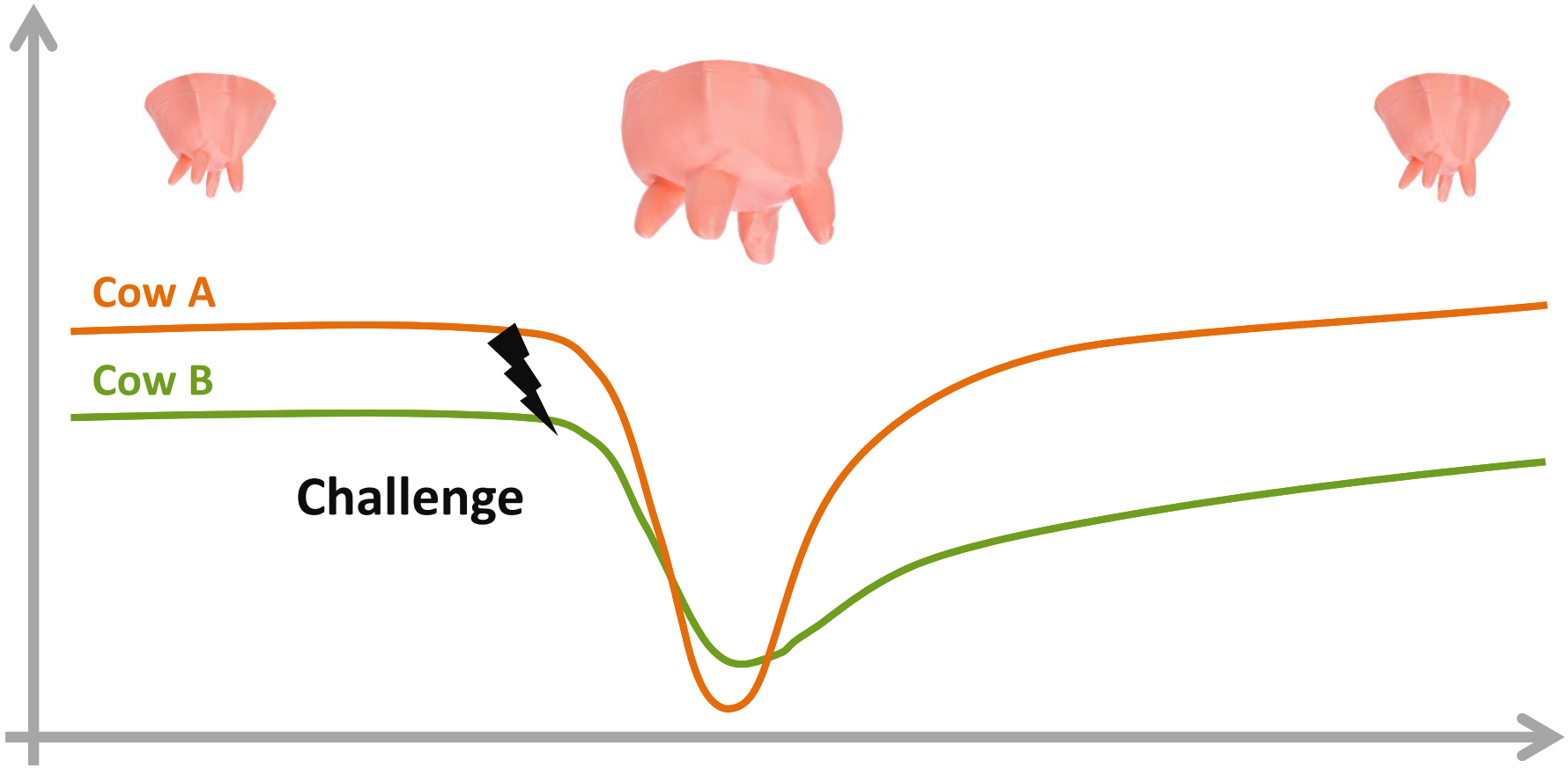
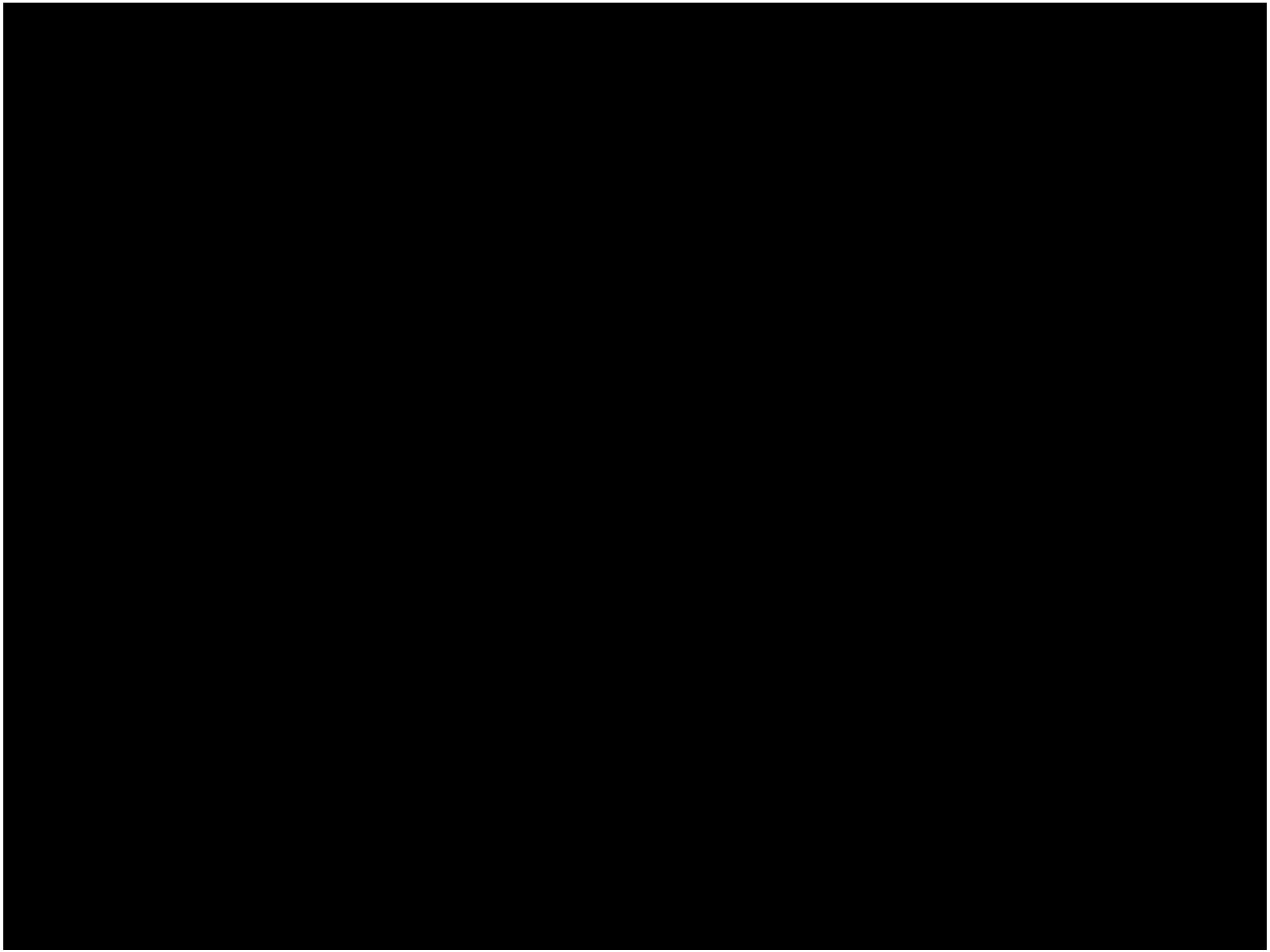


Variability of responses between cows

➔ Discrimination of individuals



Use of 1 day ODM challenge

MÉJUSSEAUME EXPERIMENTAL FARM

5 years

Use of 1 day ODM challenge

MÉJUSSEAUME EXPERIMENTAL FARM

5 years

control wk TDM
(d7 to d1 before ODM)

ODM
(d1)

Post TDM
(d7 to d13 after ODM)

289 Holstein

Use of 1 day ODM challenge

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5 years

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ODM
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289 Holstein

Inter and intra lactation repeated measures
n=724 challenges

INRA SCIENCE & IMPACT

Région BRETAGNE

Use of 1 day ODM challenge

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control wk TDM
(d7 to d1 before ODM)

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289 Holstein

n=724 challenges

Factors: parity, stage of lactation, age at 1st calving

INRA SCIENCE & IMPACT

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(d7 to d13 after ODM)

29 additionnal traits, 56 cows, 93 challenges:

-Mammary compliance: milk flow rate, udder teat ends distance

-Mammary epithelium permeability: blood lactose

-Inflammation: milk IL-8, SCC, blood cell count, blood haptoglobin

-Milk proteolysis: plasmin, plasminogen, « peptide » mapping

INRA SCIENCE & IMPACT

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Could 1 day ODM be used to quantify mammary gland elasticity ?

Elasticity	Tolerate disruption	Return to initial state

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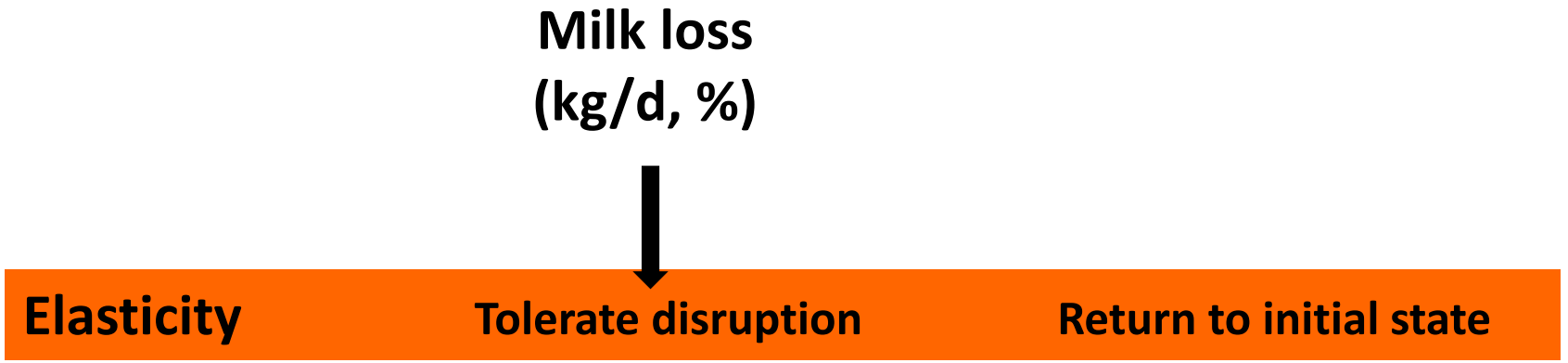

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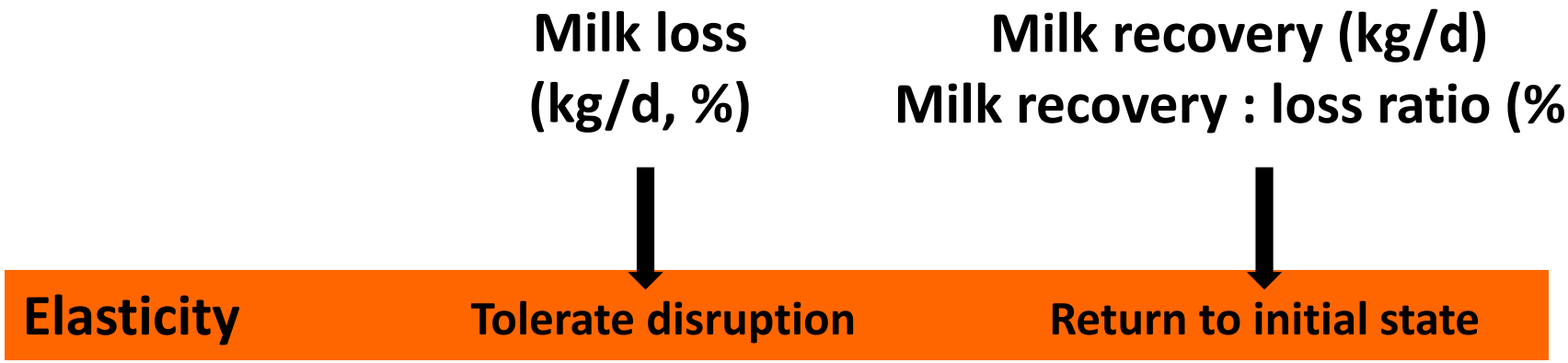

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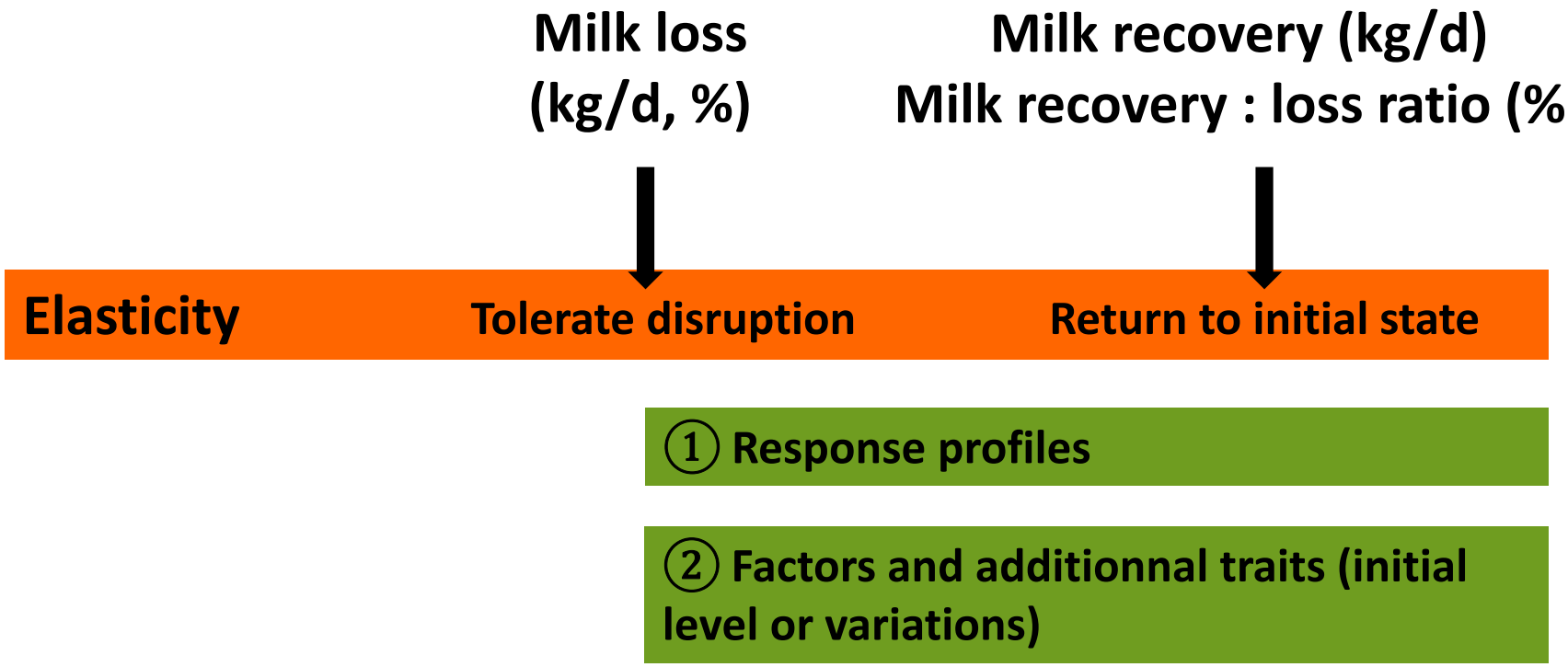

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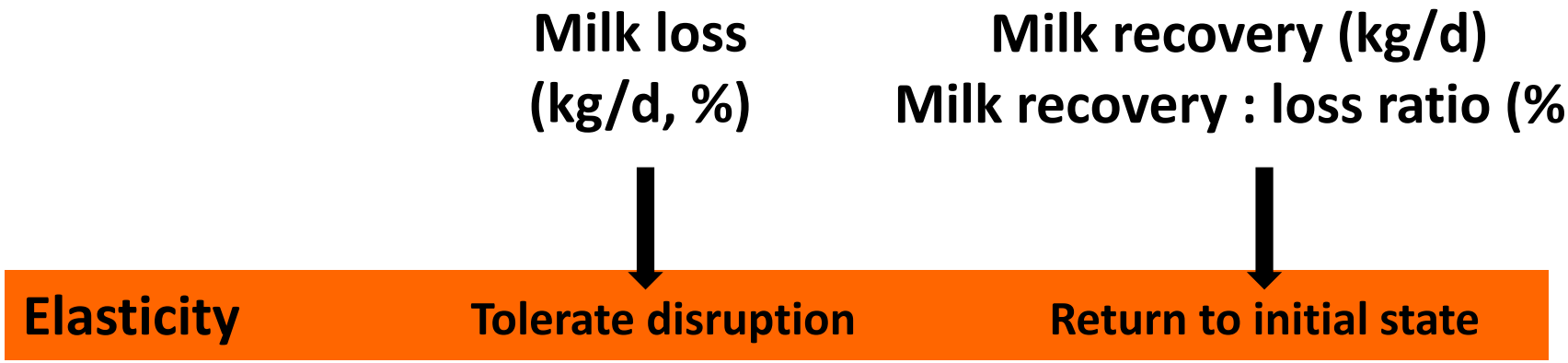
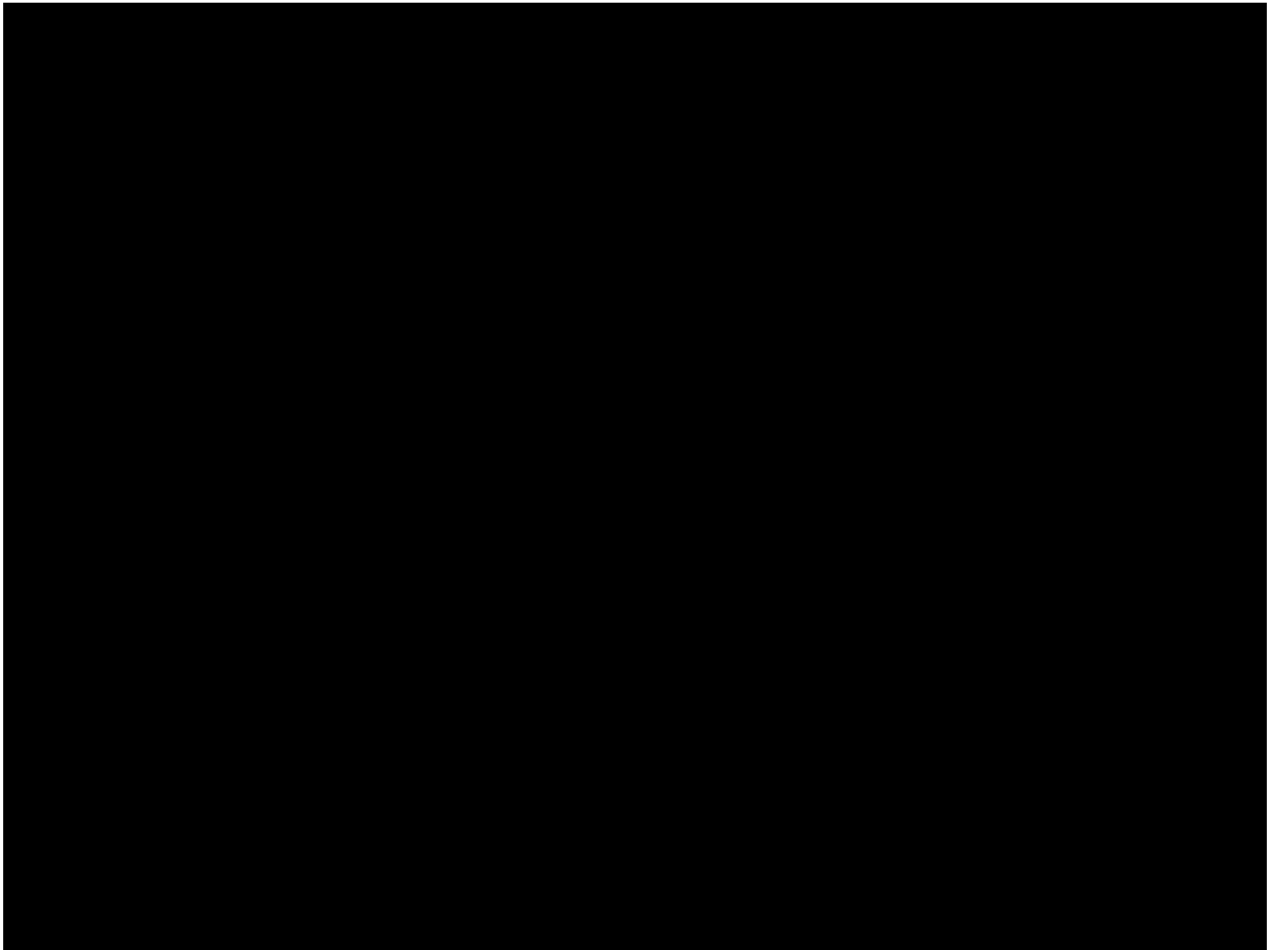


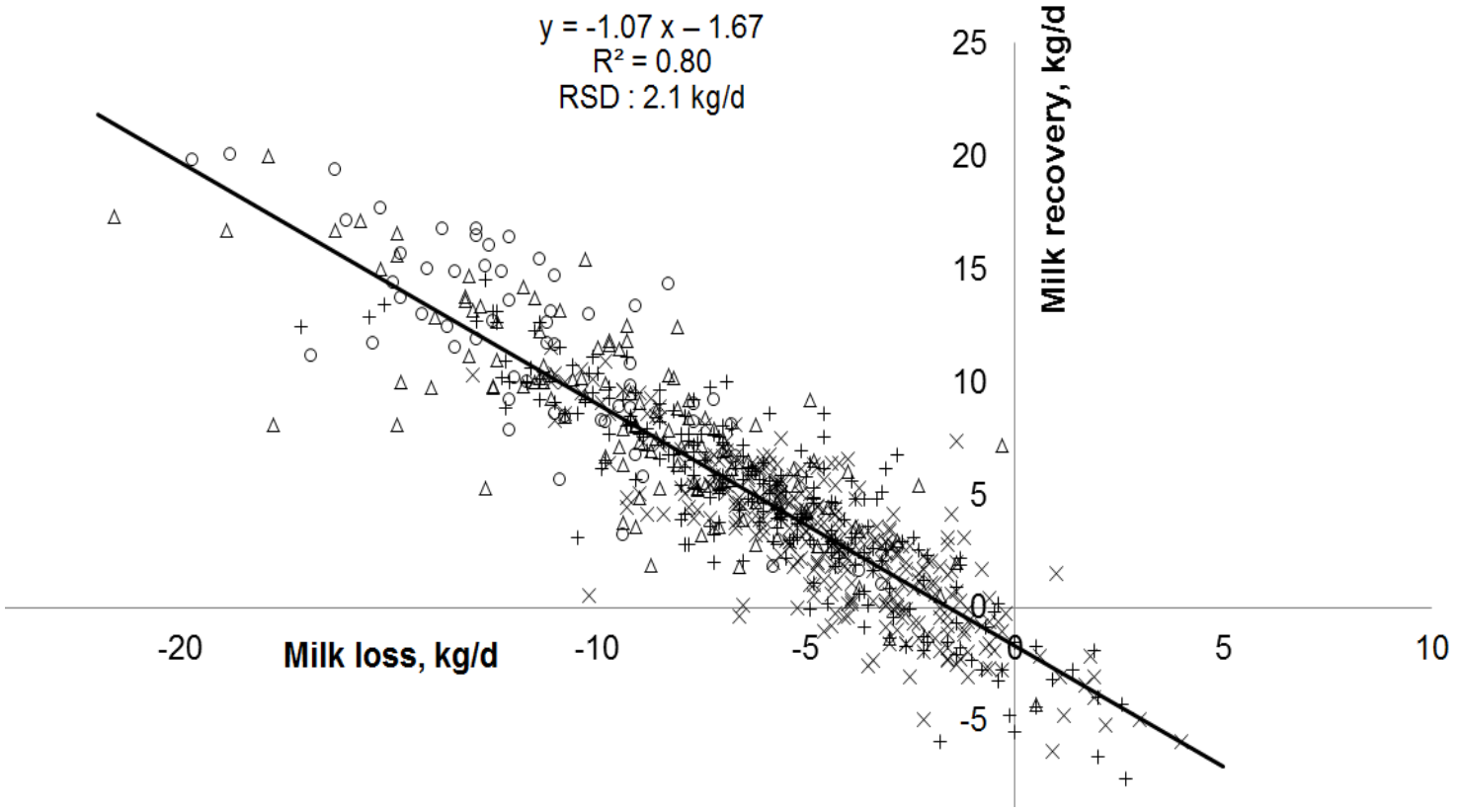
① Response profiles

② Factors and additionnal traits (initial level or variations)

➔ PCA followed by clustering (HCPC)



1 day ODM generates a wide variability of responses



Average milk loss : -6.3 kg/d (-21.3 %)
Average milk recovery : 4.8 kg/d

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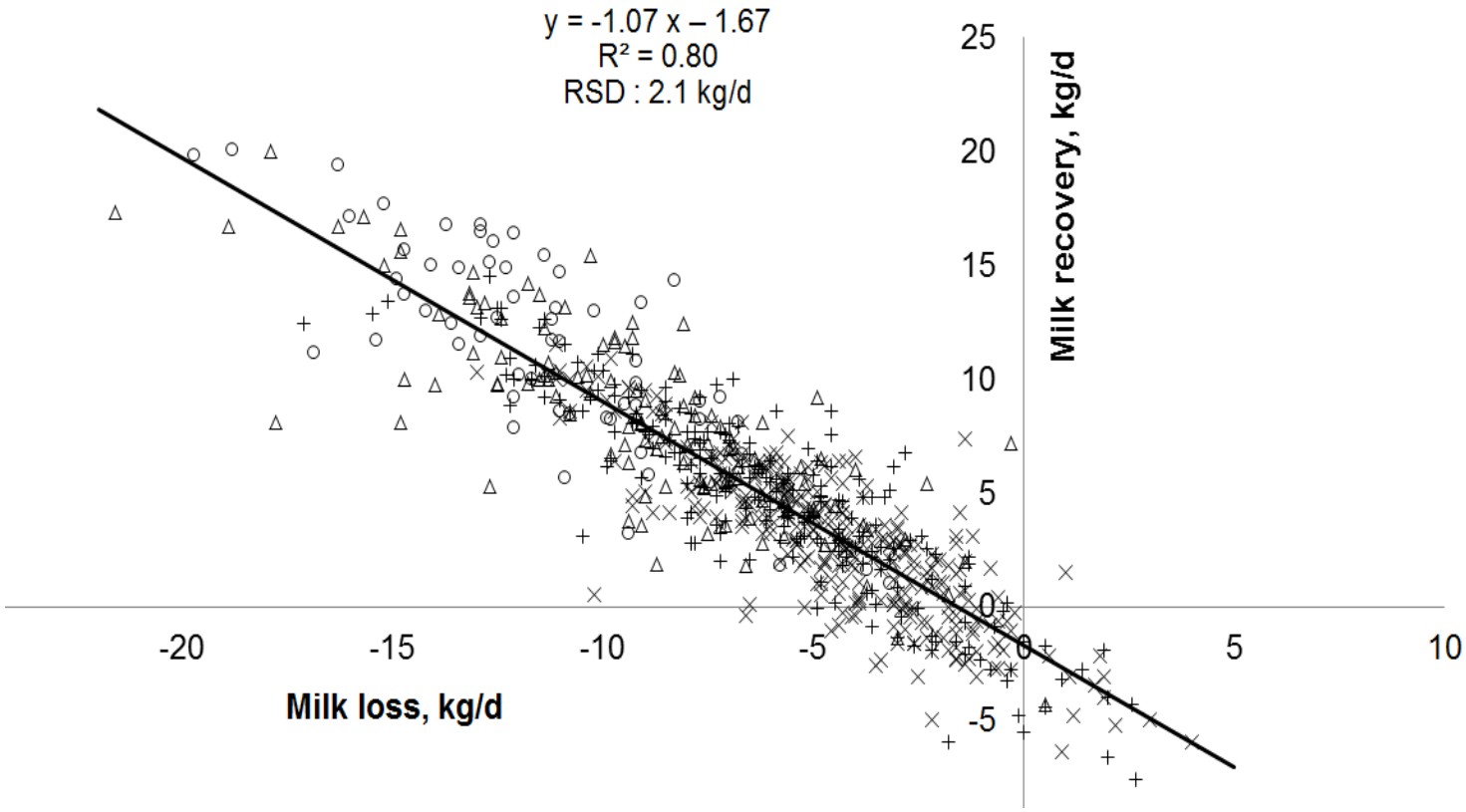

The greater the milk loss, the greater the milk recovery

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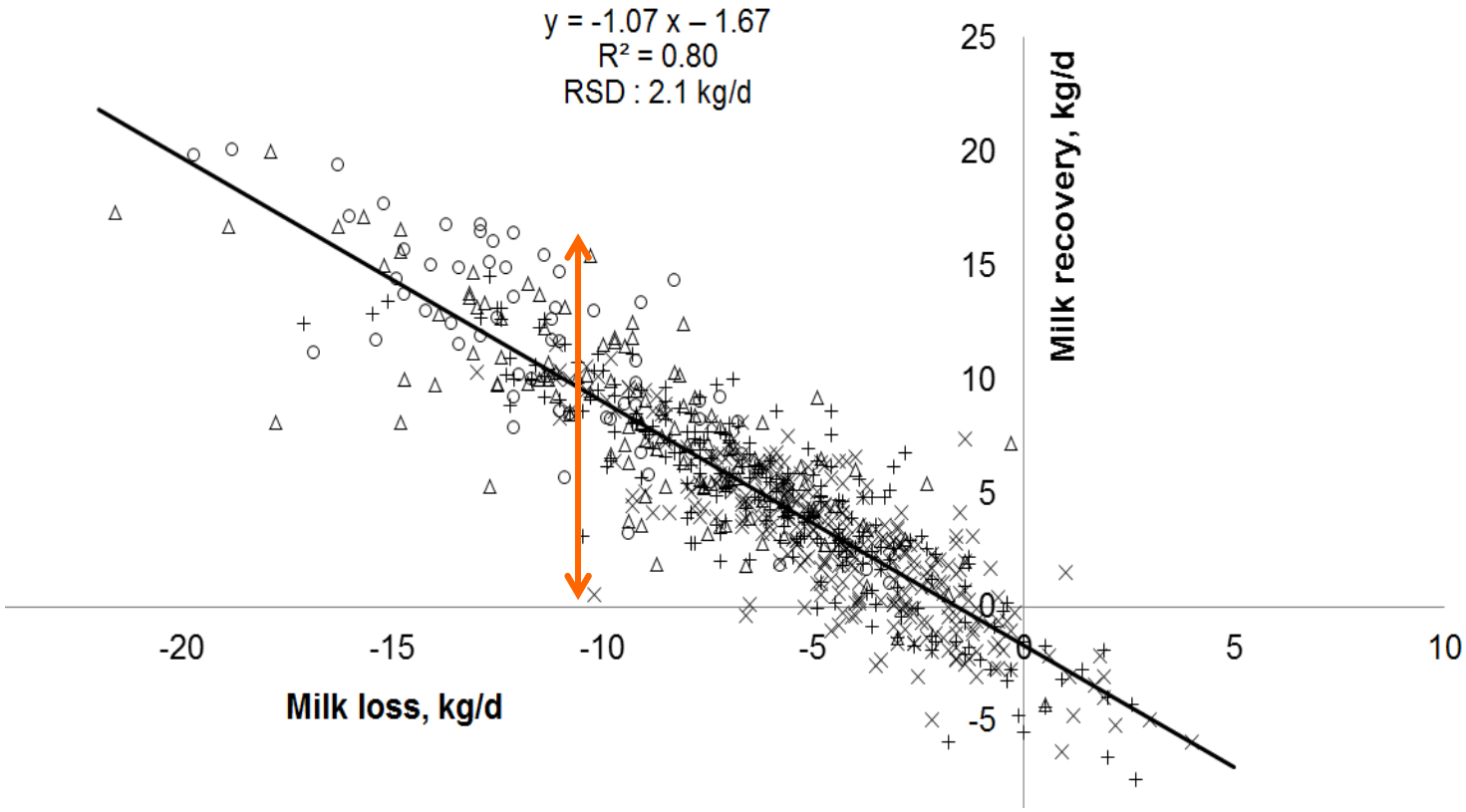

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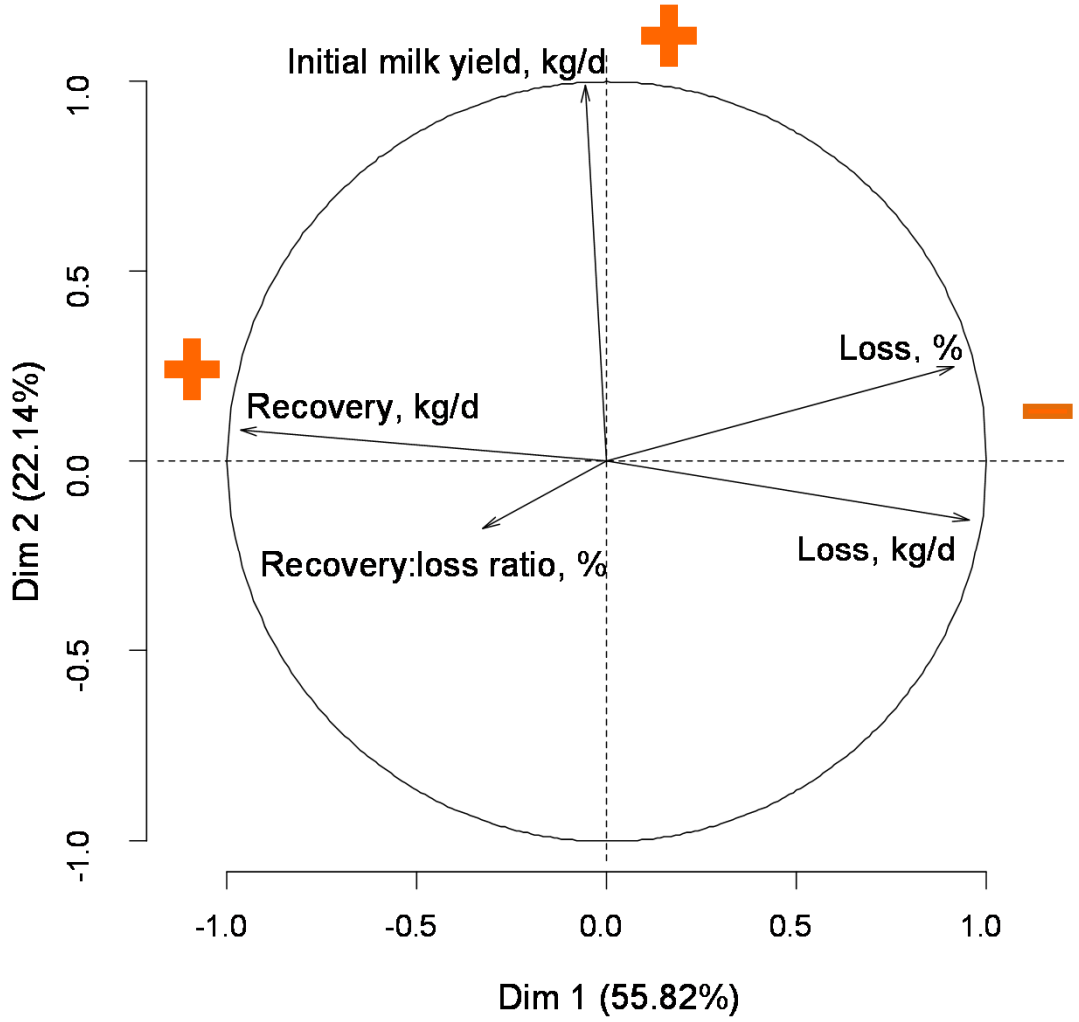
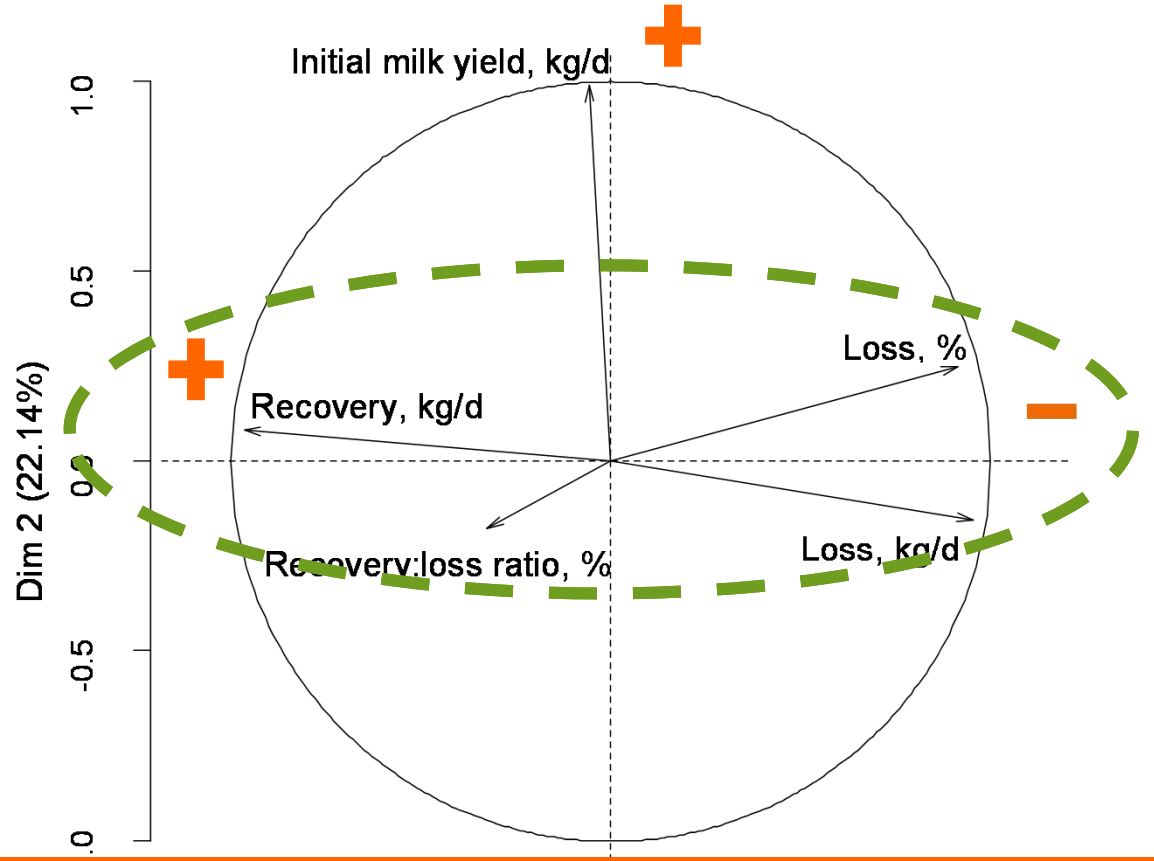
PCA results

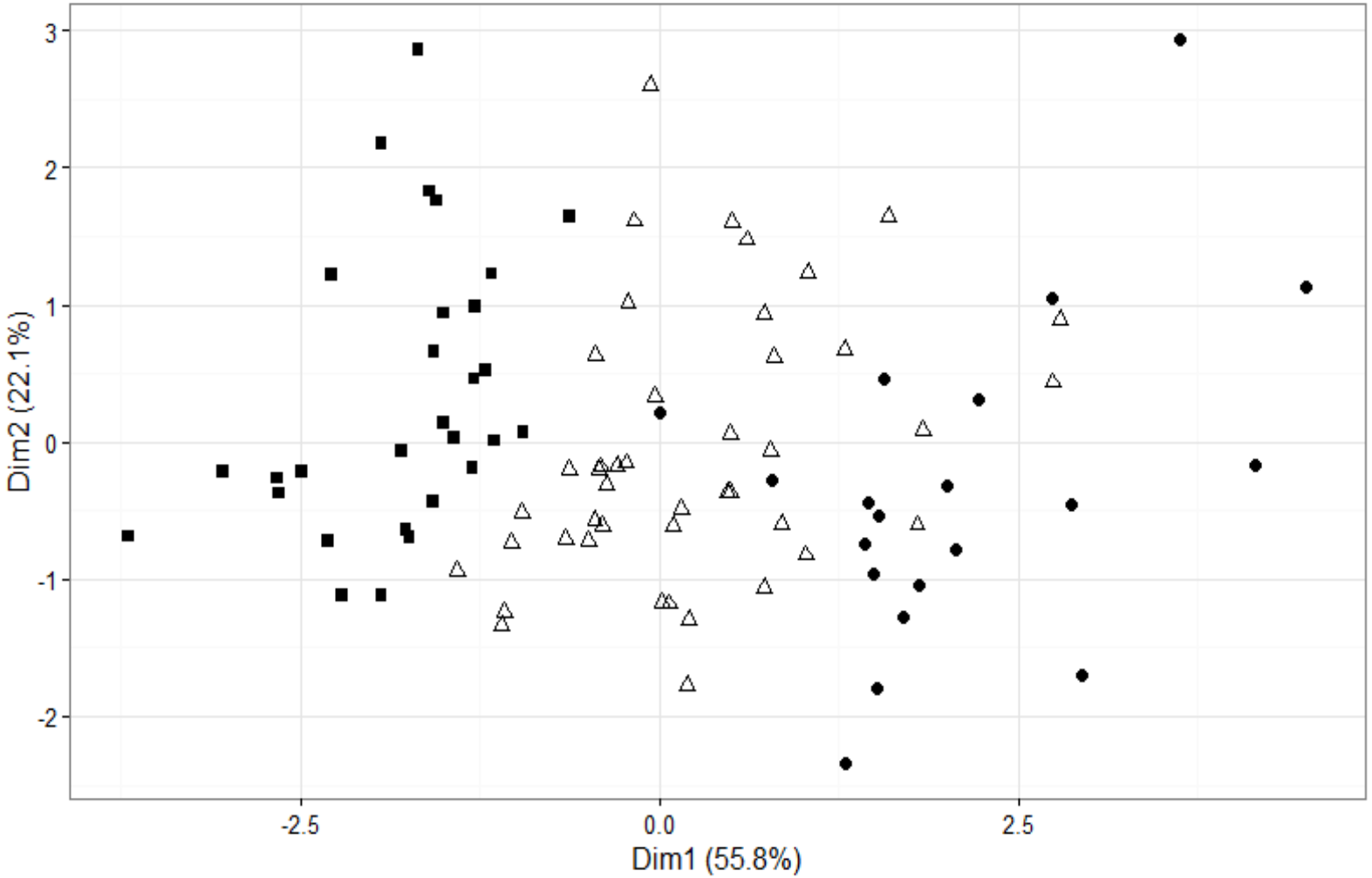

Initial milk yield, kg/d
Loss, %
Recovery, kg/d
Recovery:loss ratio, %
Loss, kg/d
Dim 2 (22.14%)
Dim 1 (55.82%)
1.0
0.5
0.0
-0.5
-1.0
-1.0
-0.5
0.0
0.5
1.0

The greater the milk loss, the greater the milk recovery



Negative correlation between milk loss and milk recovery

1 day ODM generated 3 different response profiles



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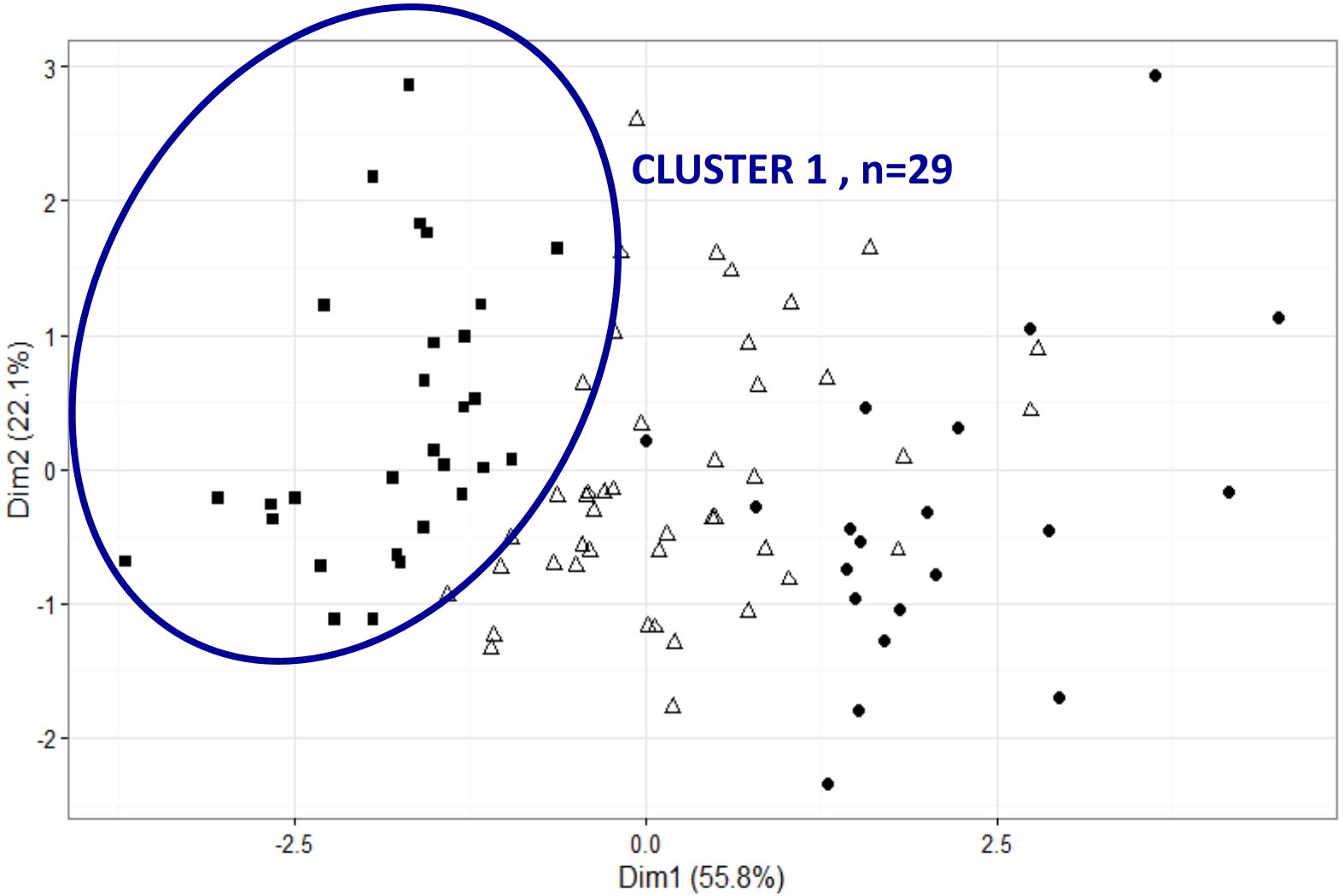

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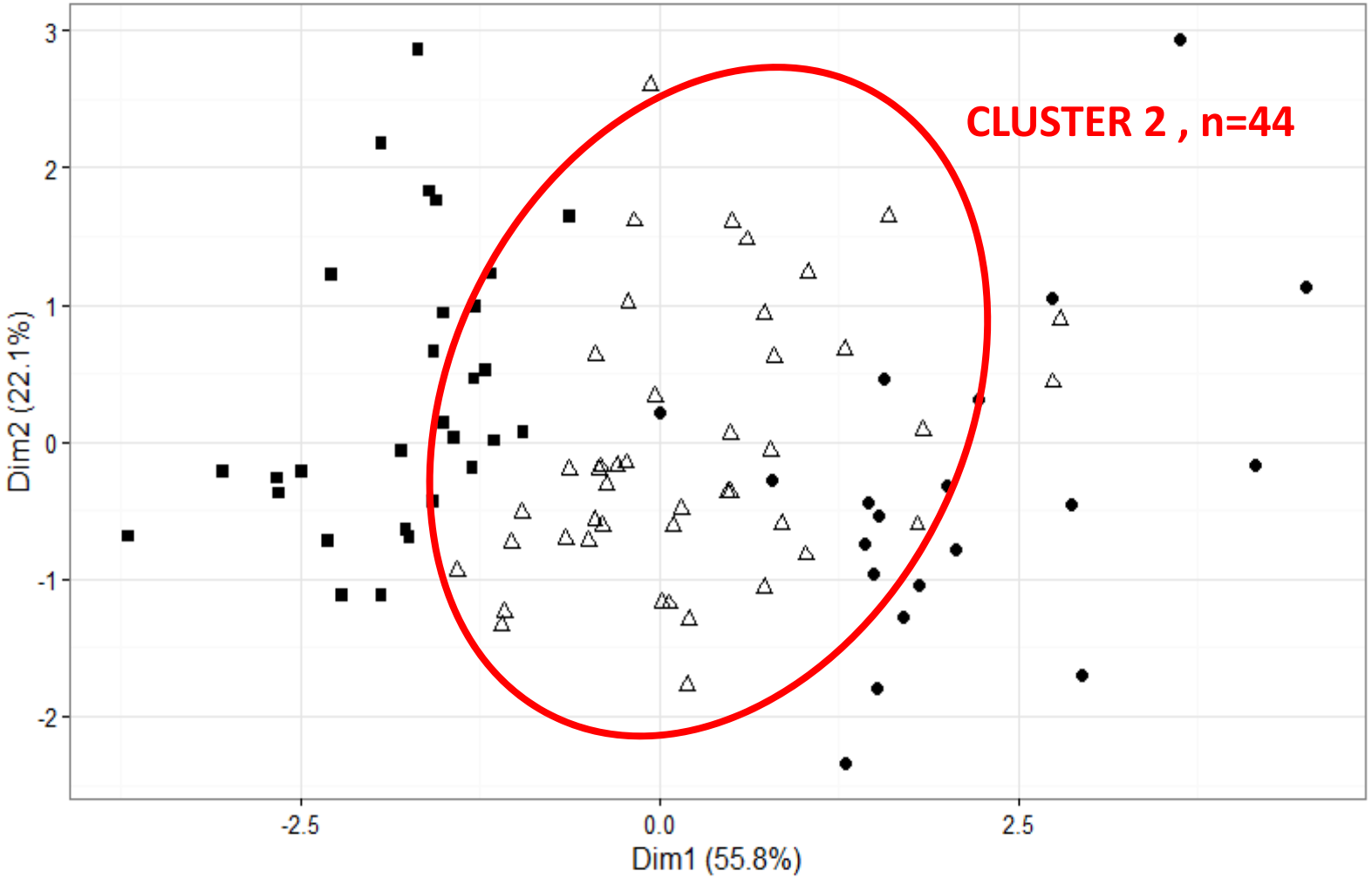

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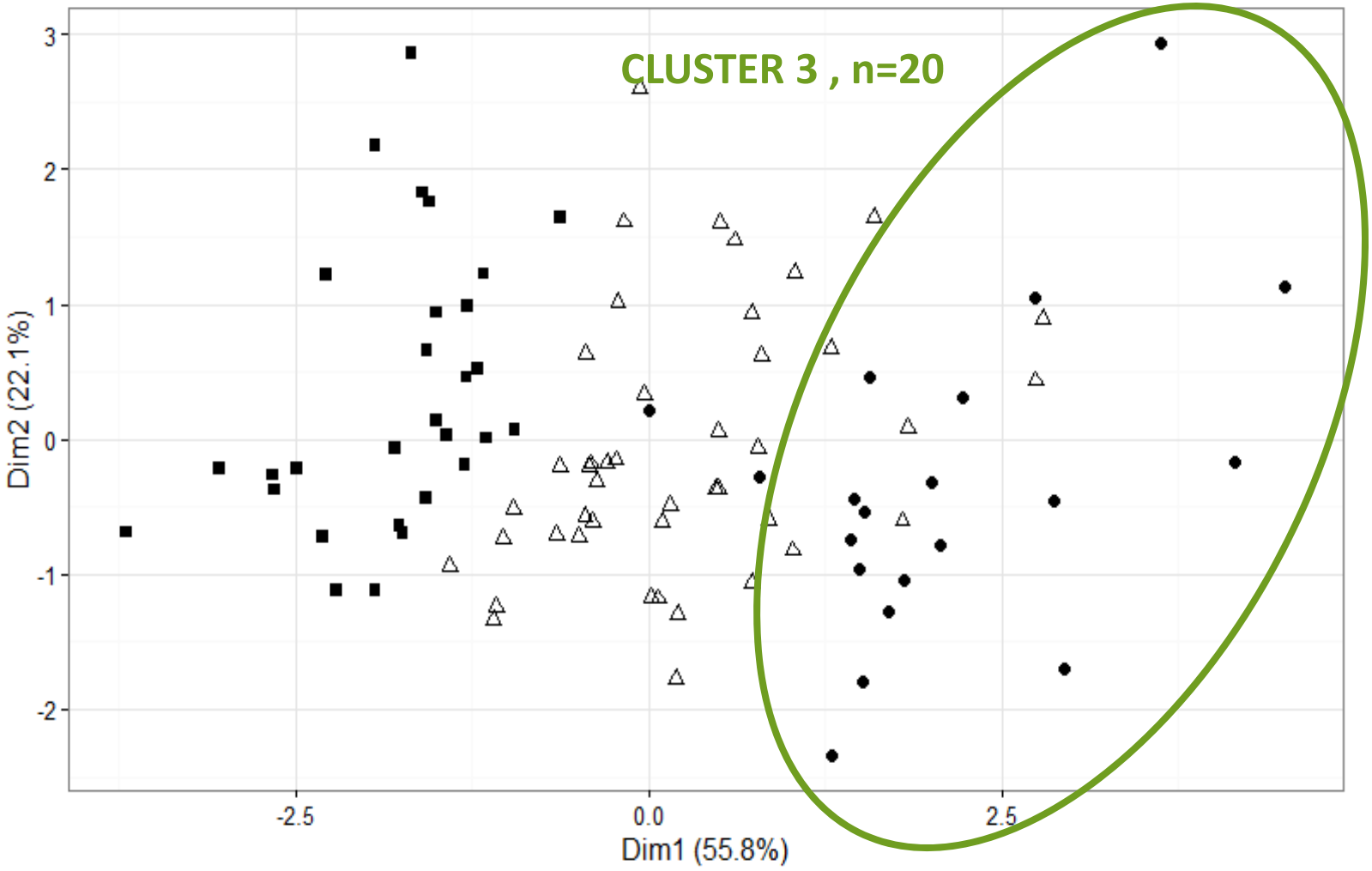

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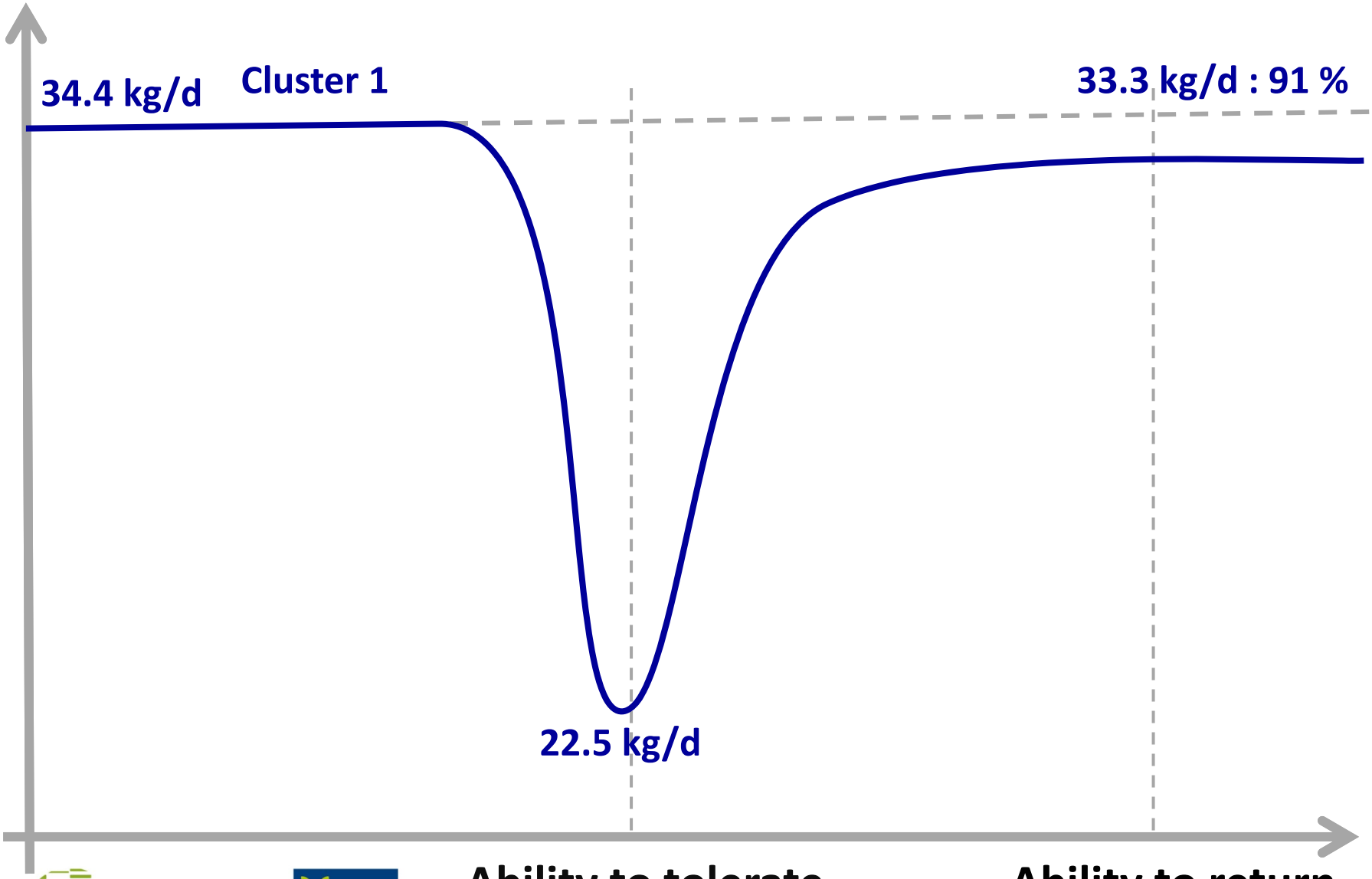

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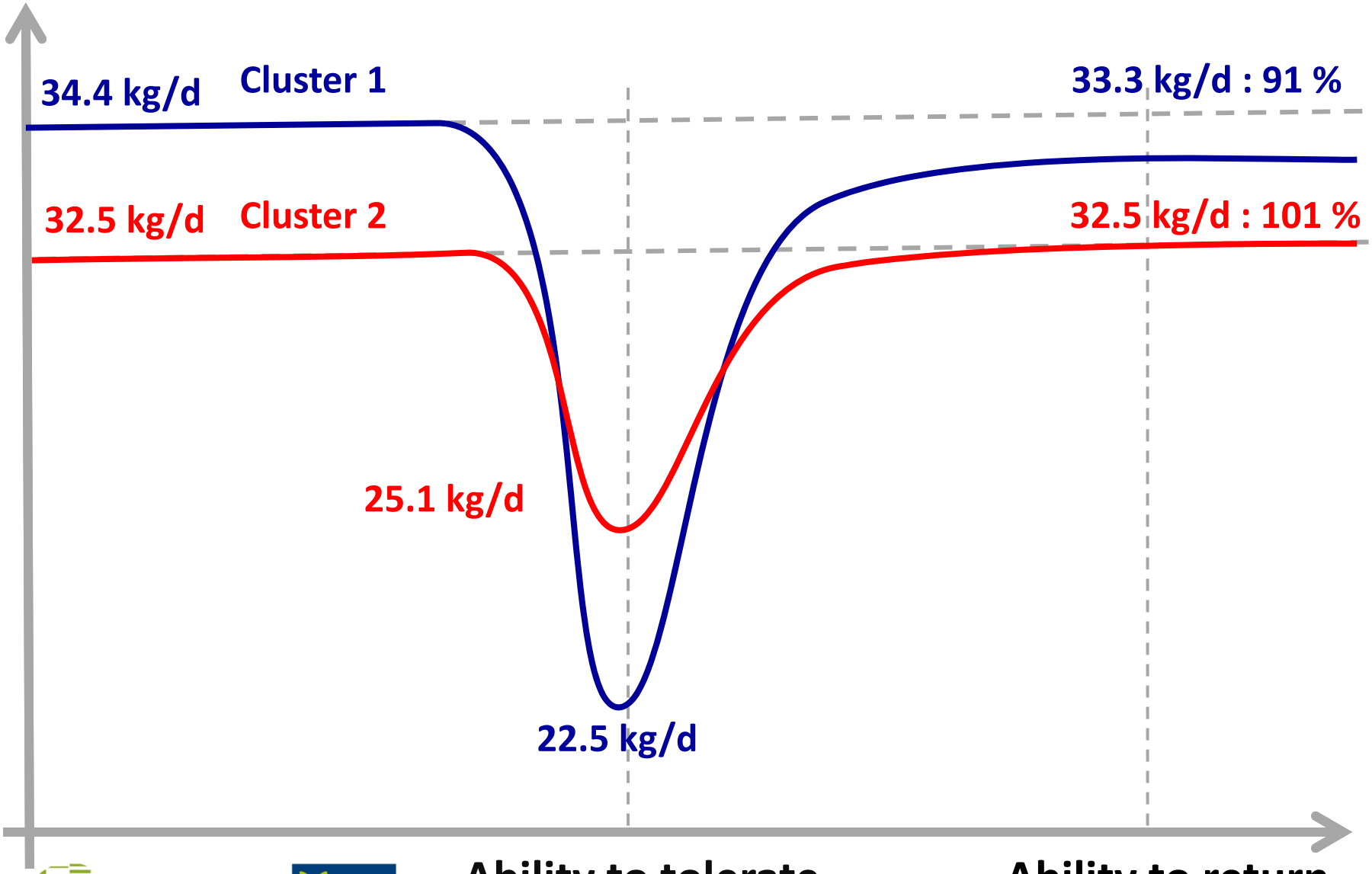

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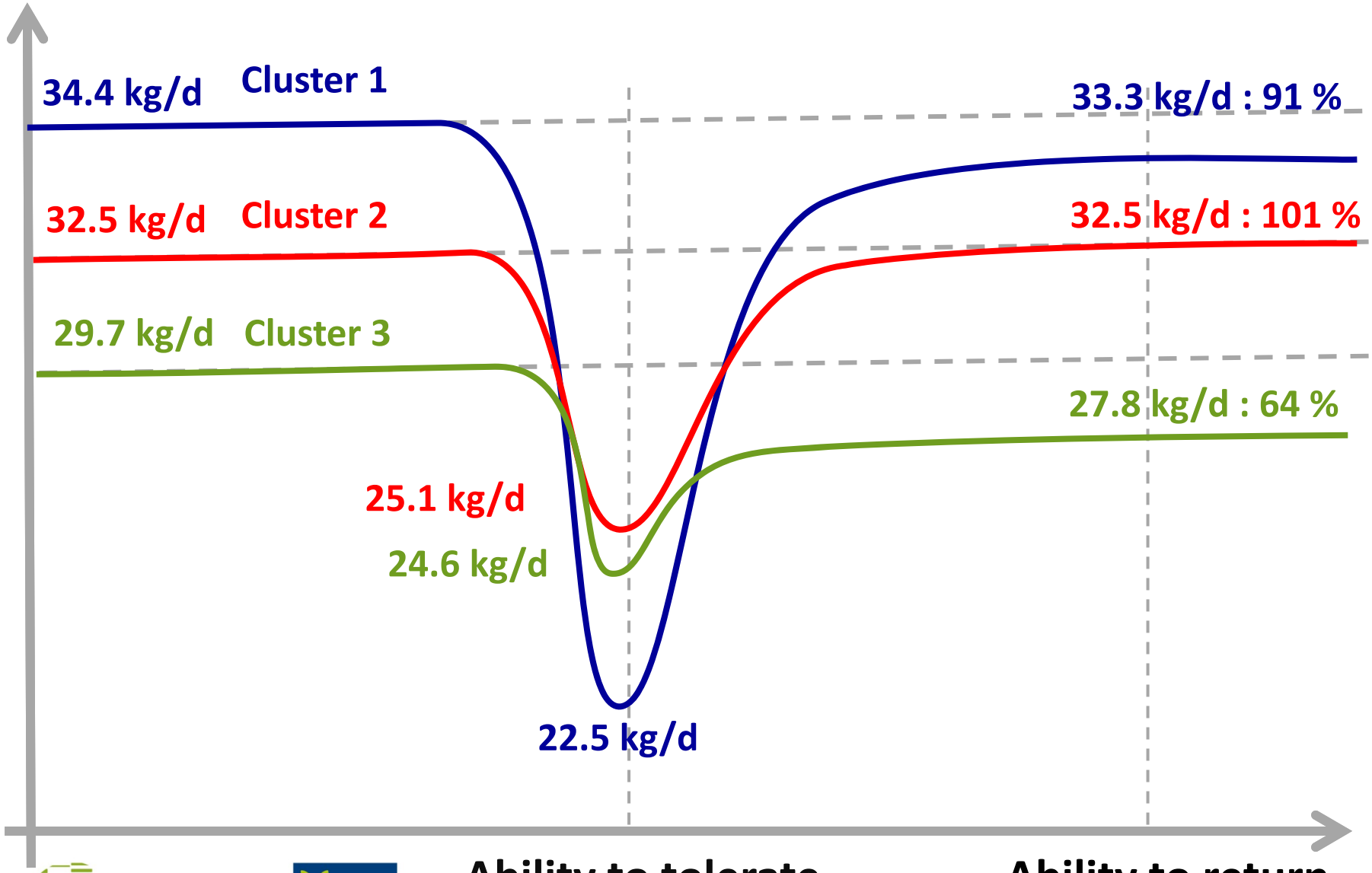

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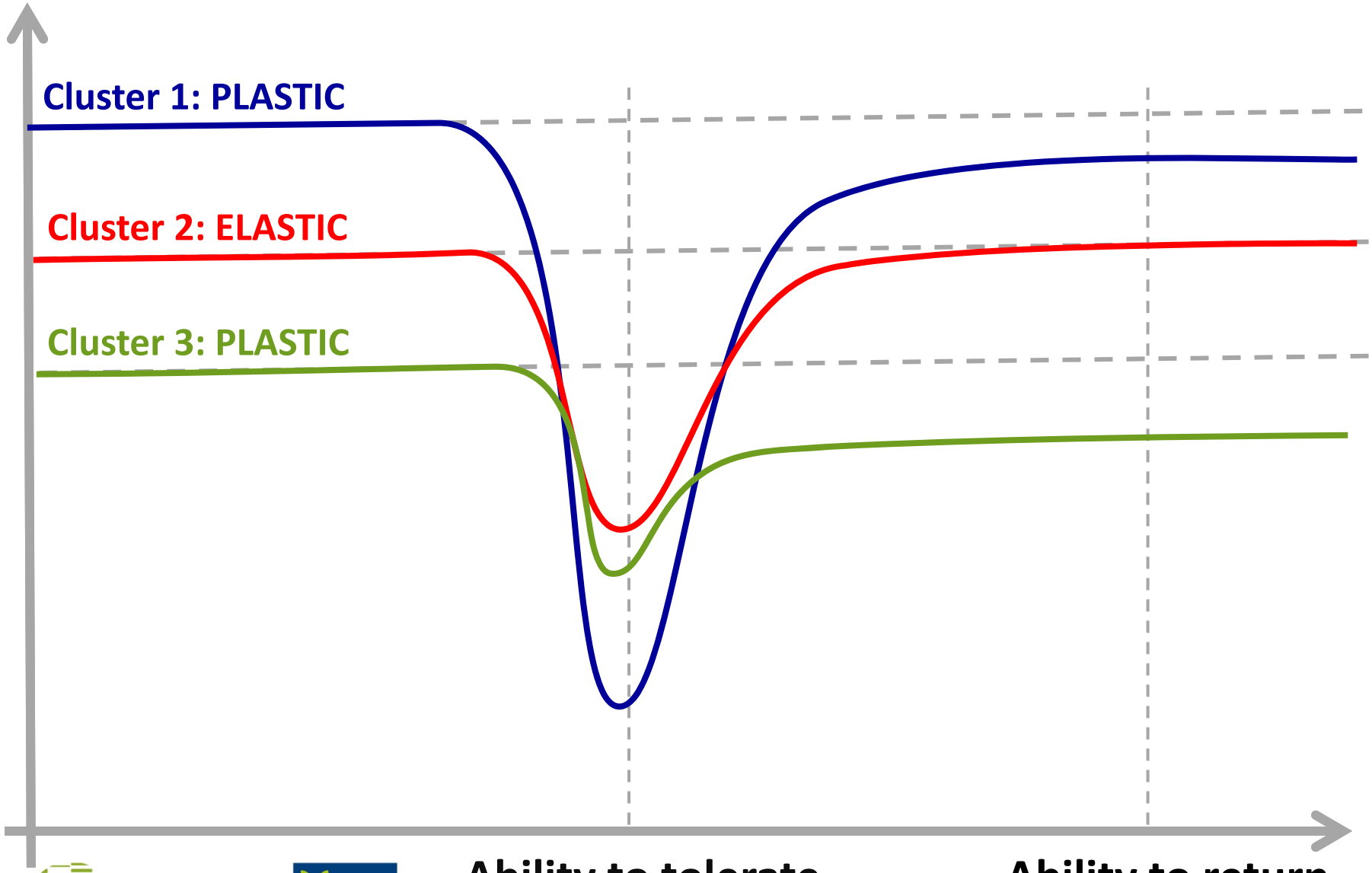
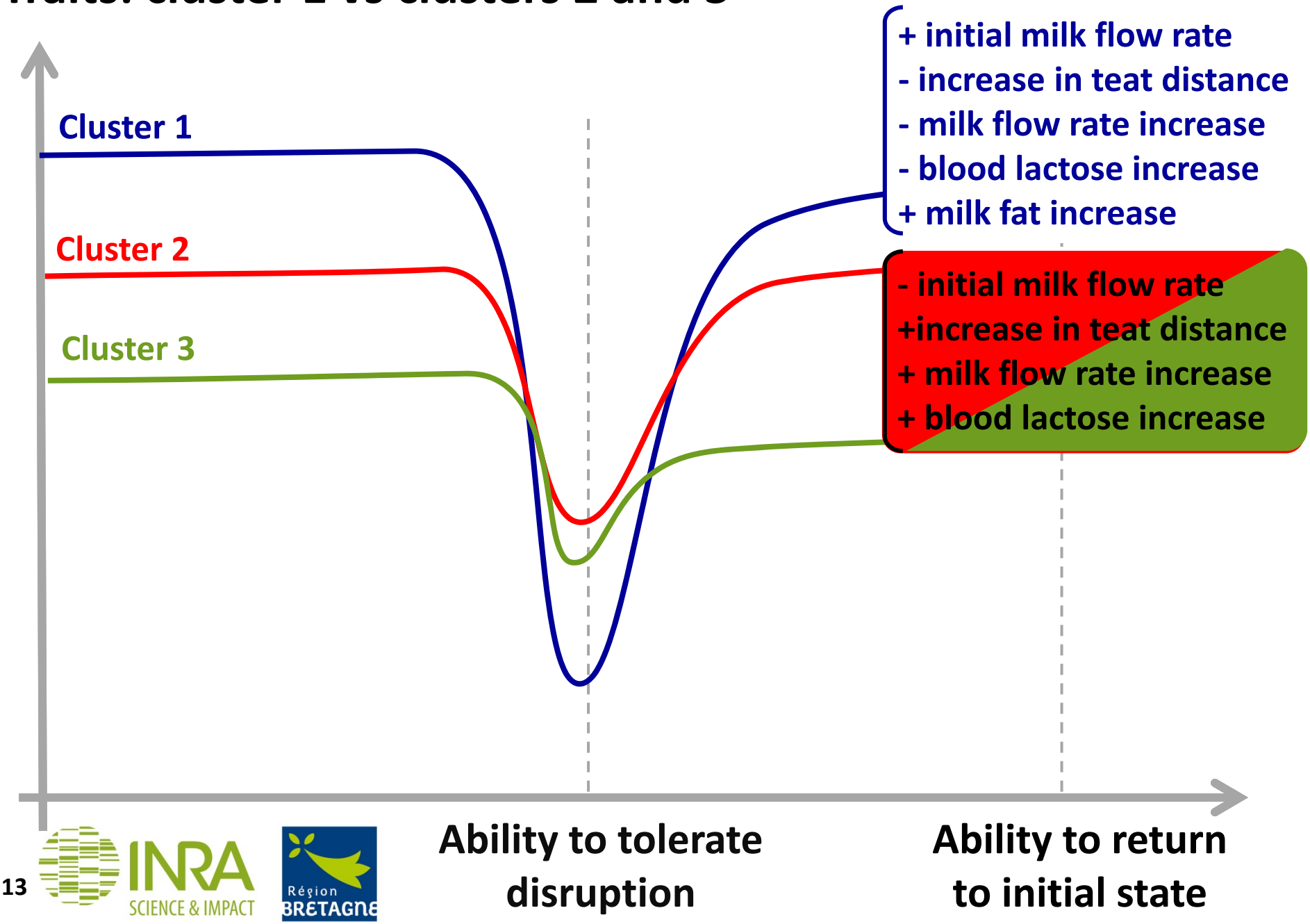


Traits: cluster 1 vs clusters 2 and 3



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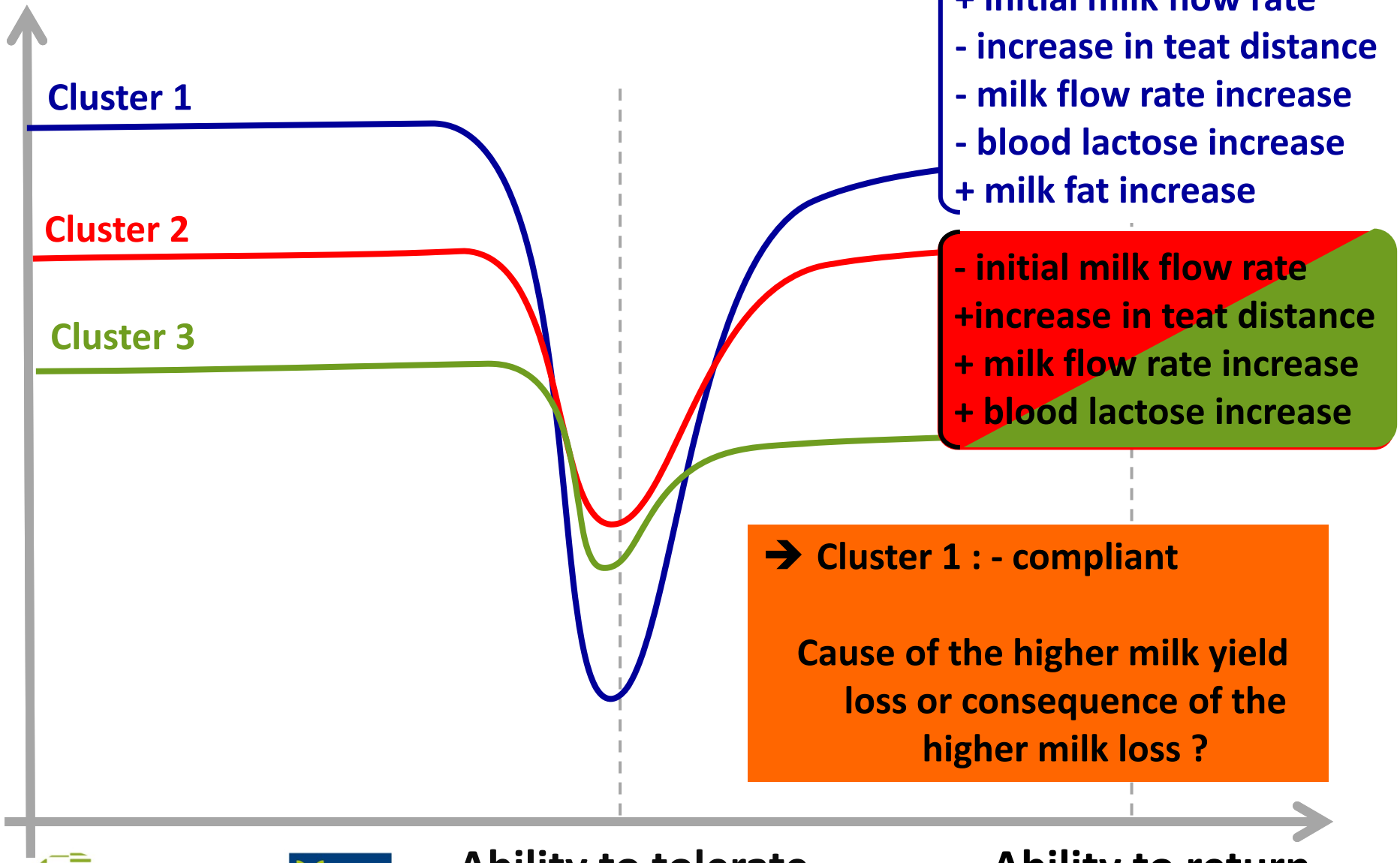
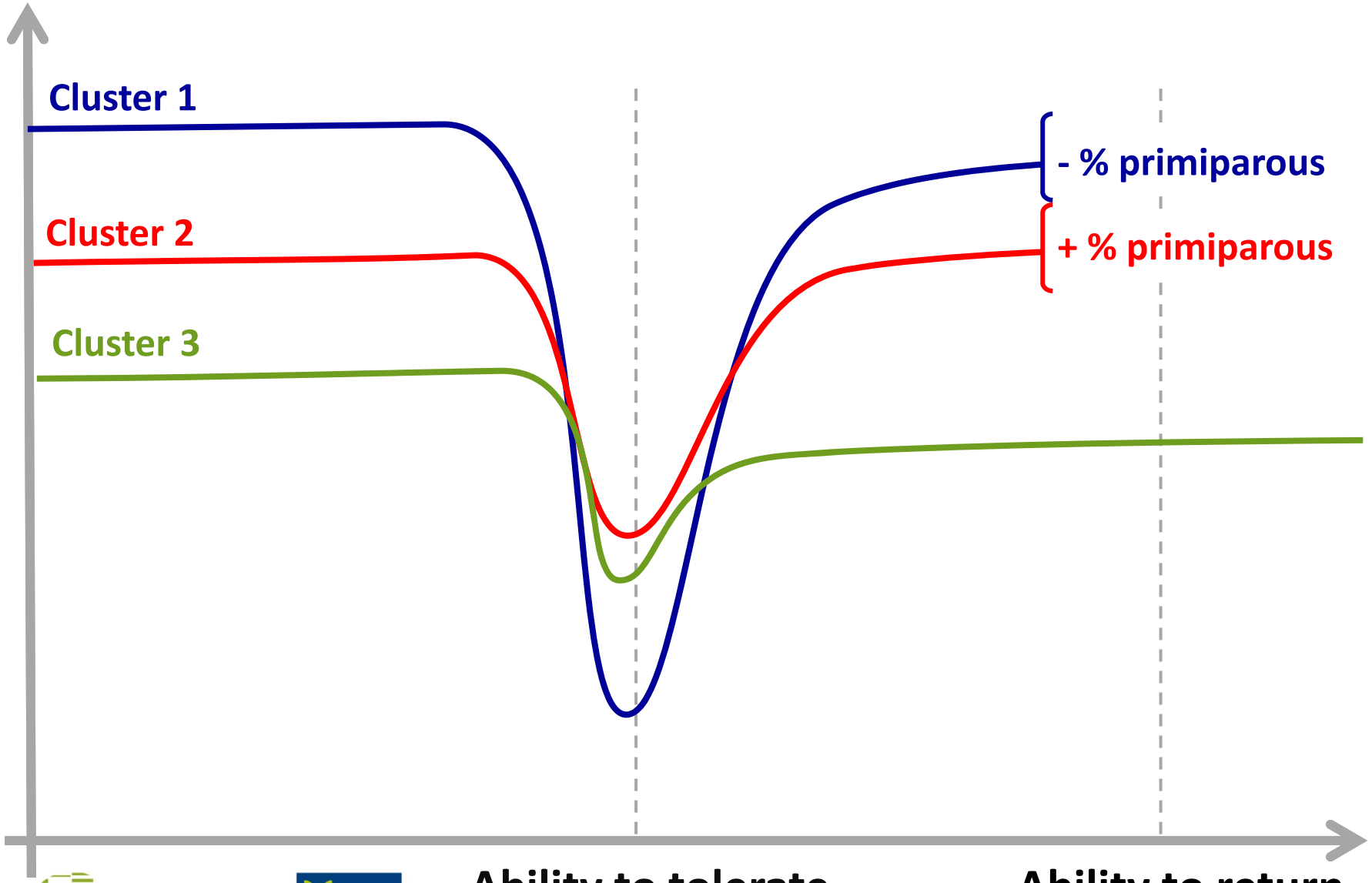
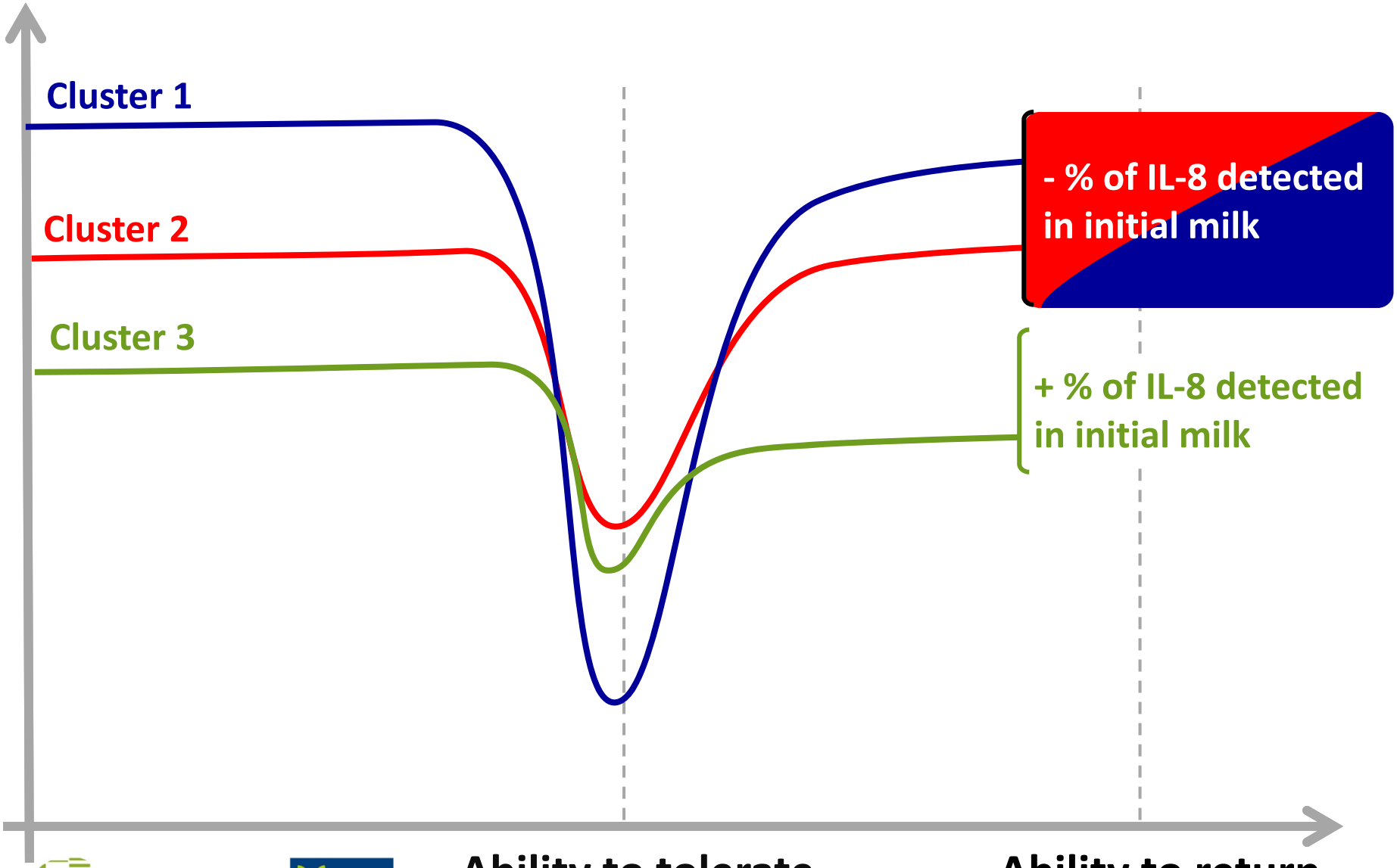


Traits: cluster 1 vs cluster 2



Traits: cluster 3 vs clusters 1 and 2



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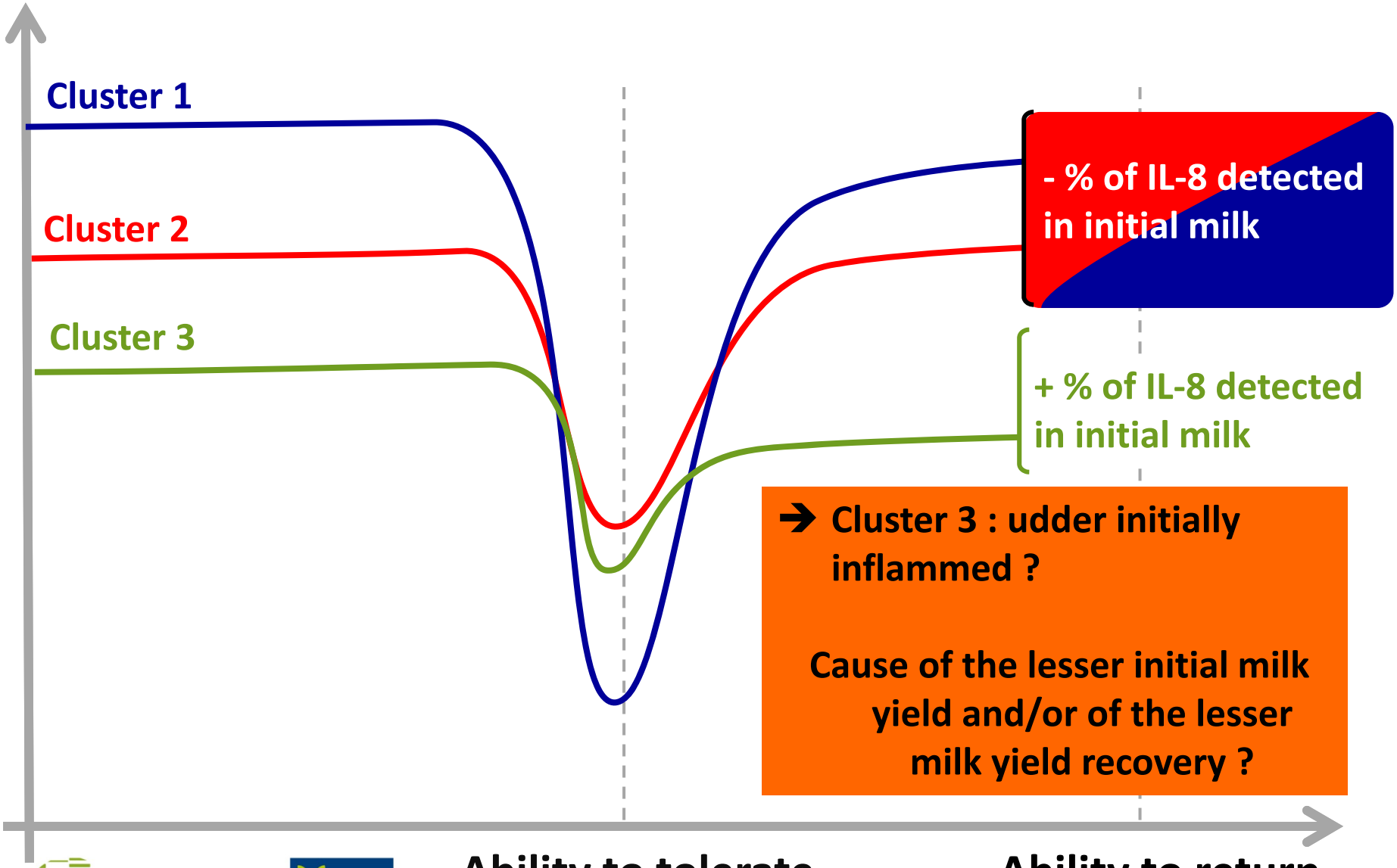
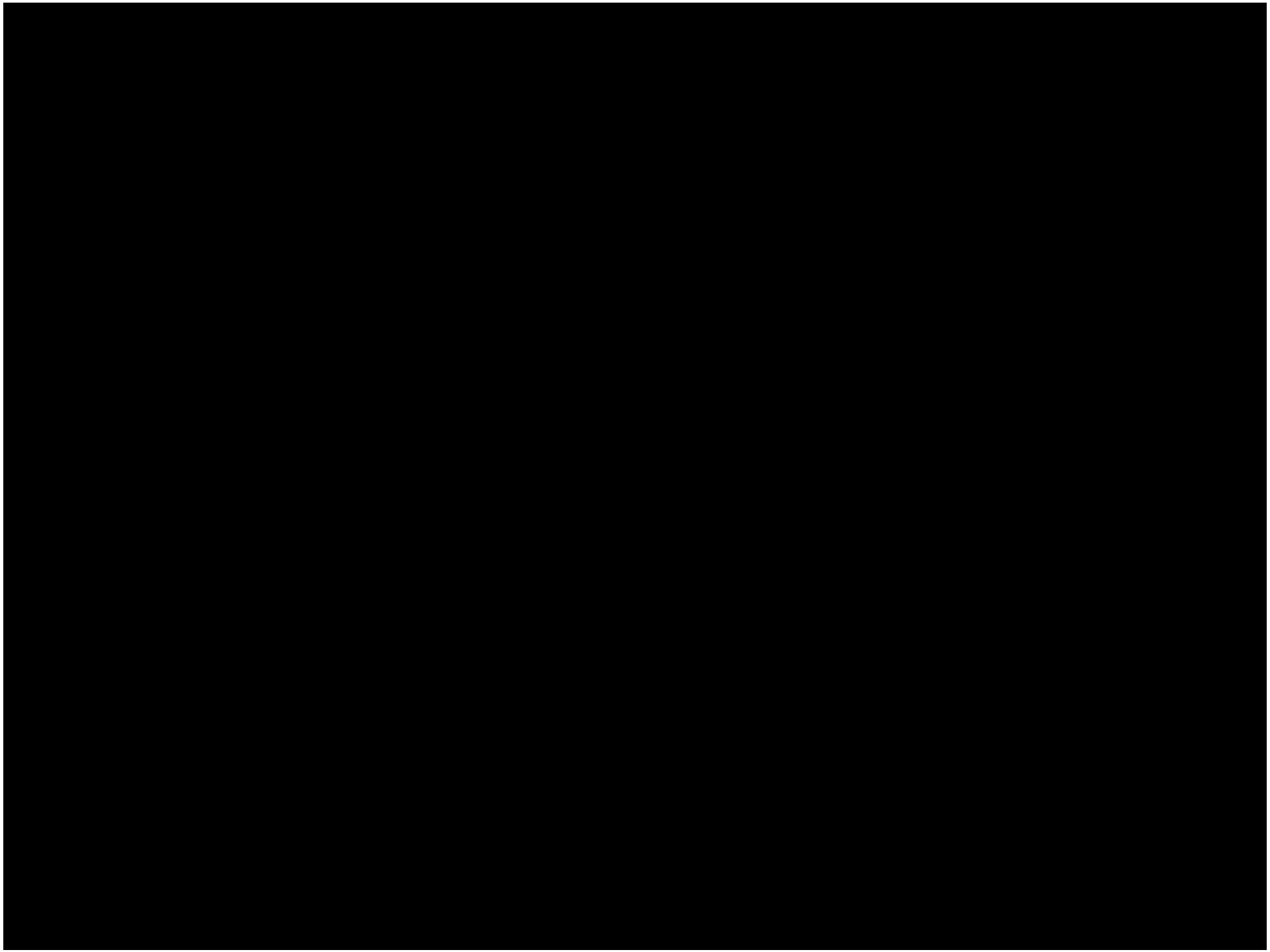
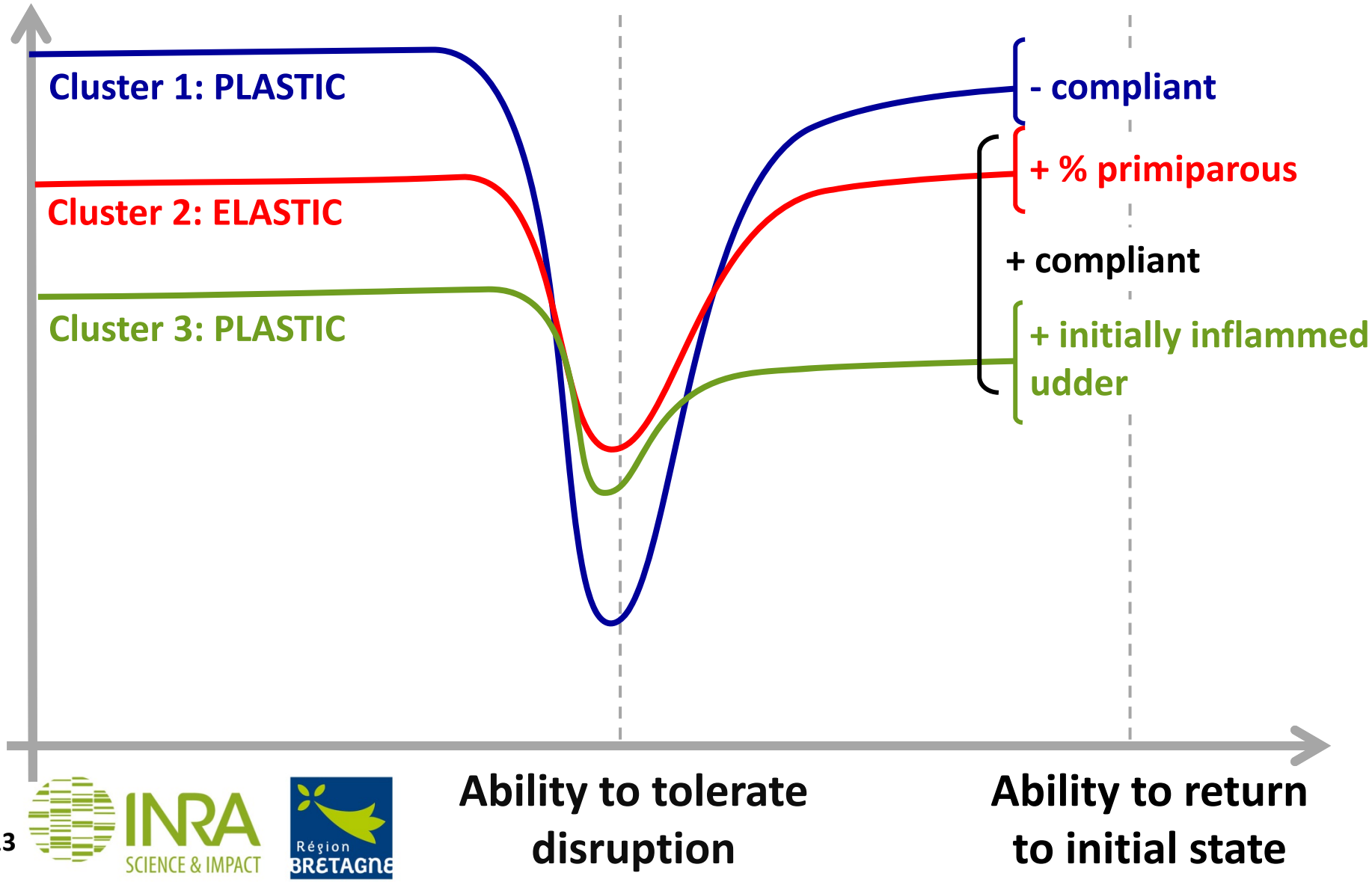




Mammary elasticity profiles can be assessed by using a 1 day ODM challenge



1 day ODM

➔ Are these profiles the same in case of longer ODM ?

1 day ODM

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Is it possible to select animals on these responses ?

1 day ODM

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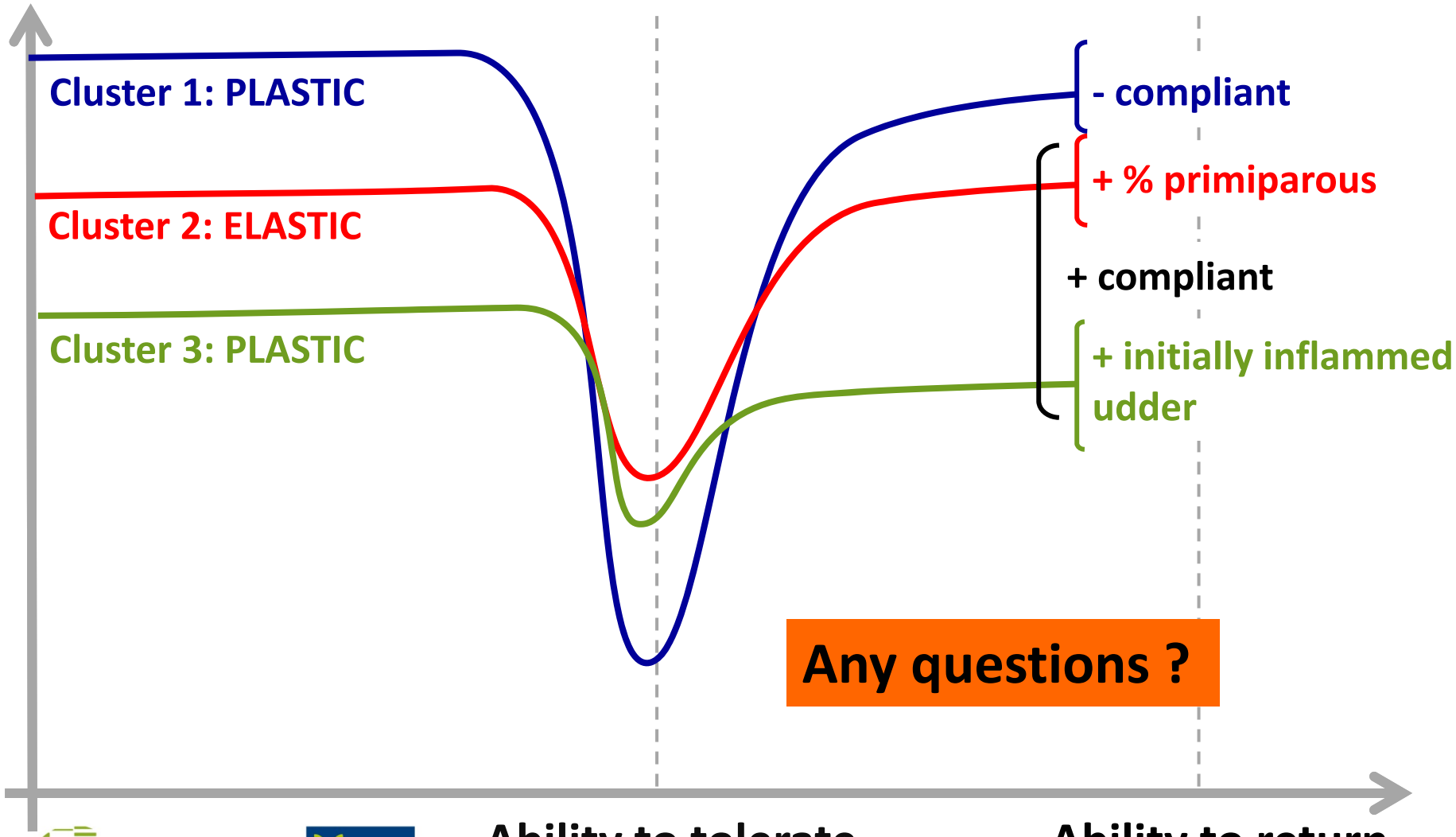
Study of the genetic determinism in case of 3 wk ODM

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