



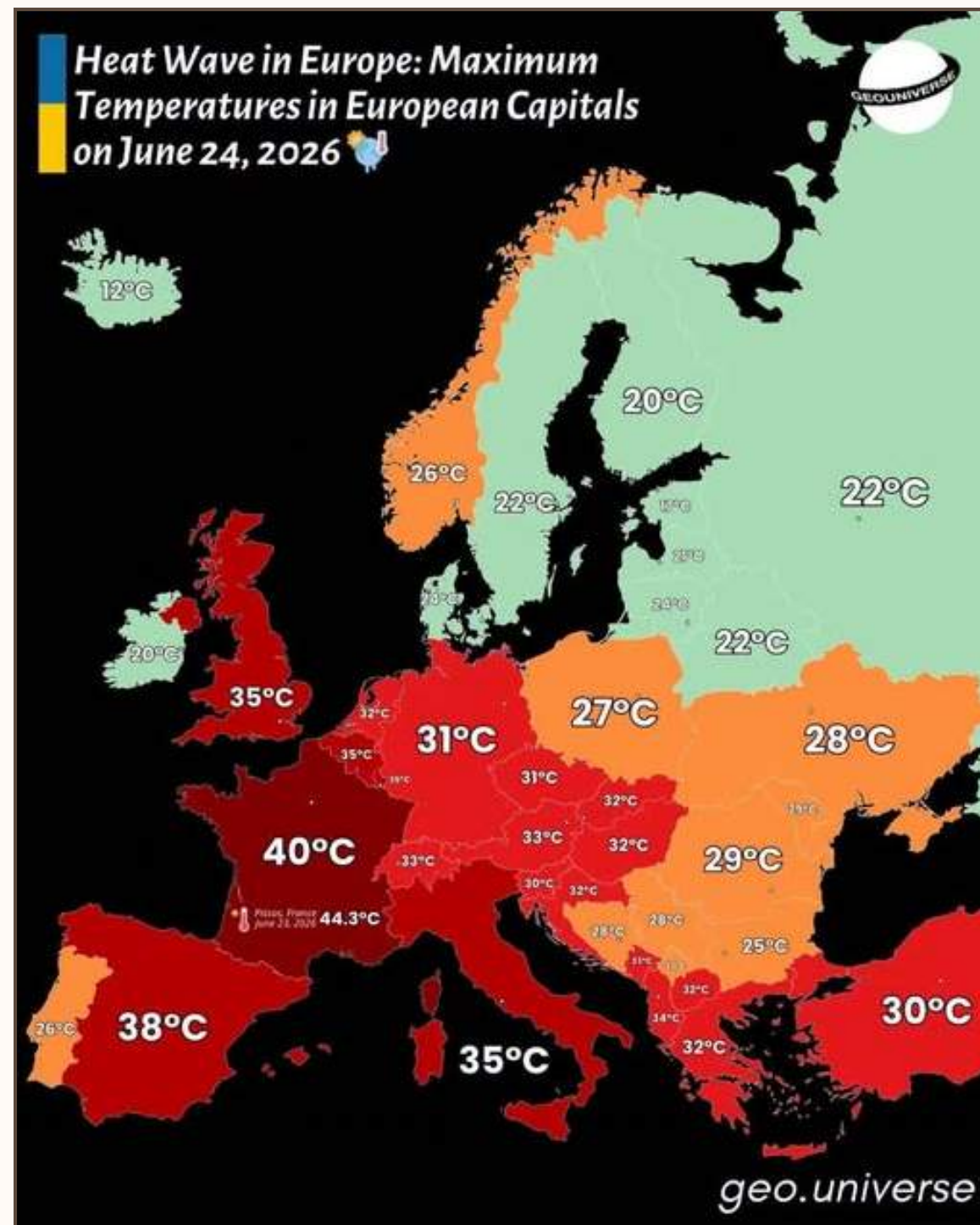
Using extended lactations to shape resilience of goat farming systems: a modelling approach

C. Descheerder^{1,2}, O. Martin², F. Bidan¹, C. Duvaux-Ponter², L. Puillet²

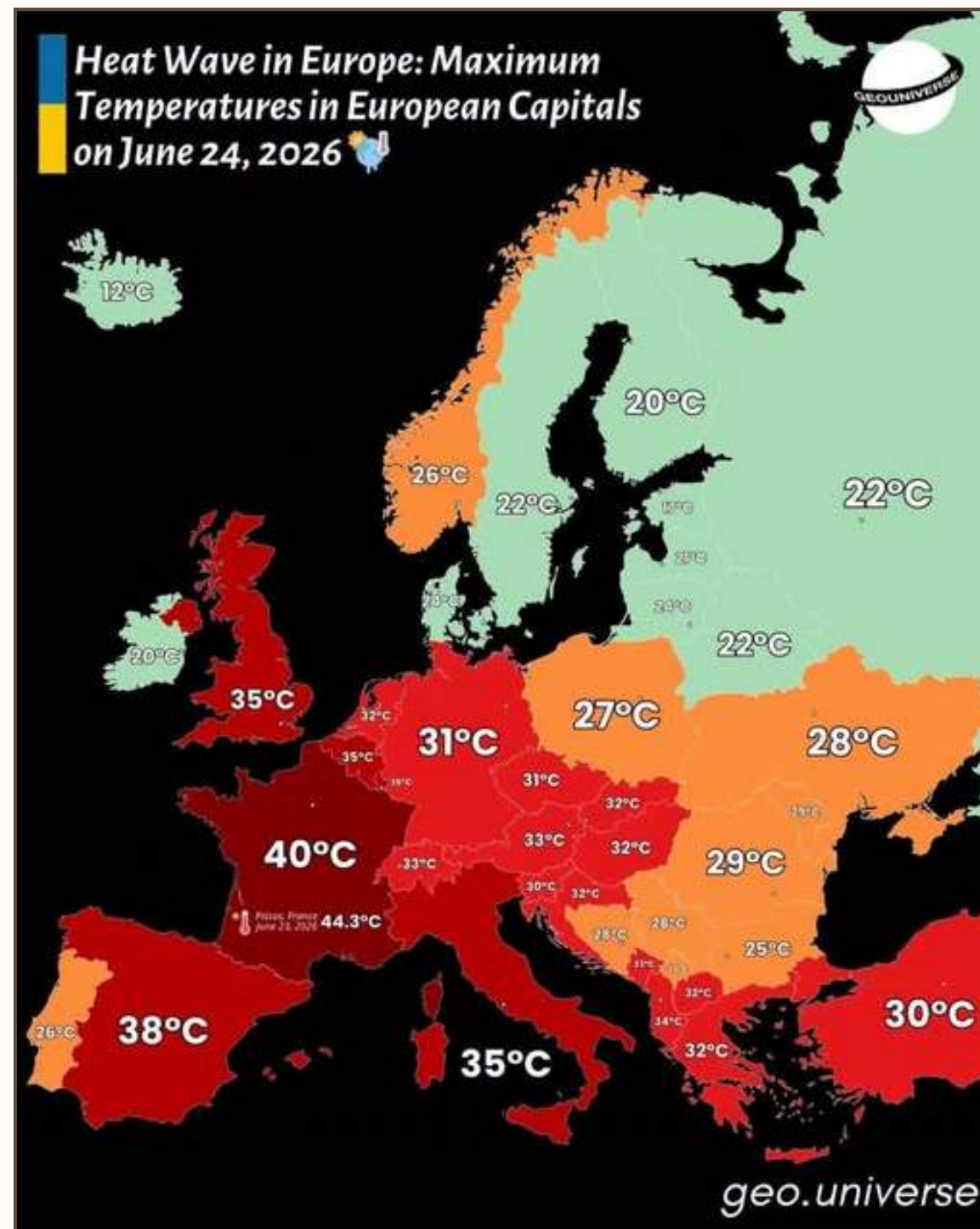
¹ IDELE, MNE, 75595 Paris, France

² Université Paris-Saclay, INRAE, AgroParisTech, UMR Modélisation Systémique Appliquée aux Ruminants, 91120 Palaiseau, France

Dairy goat farm facing hazards



Resilience

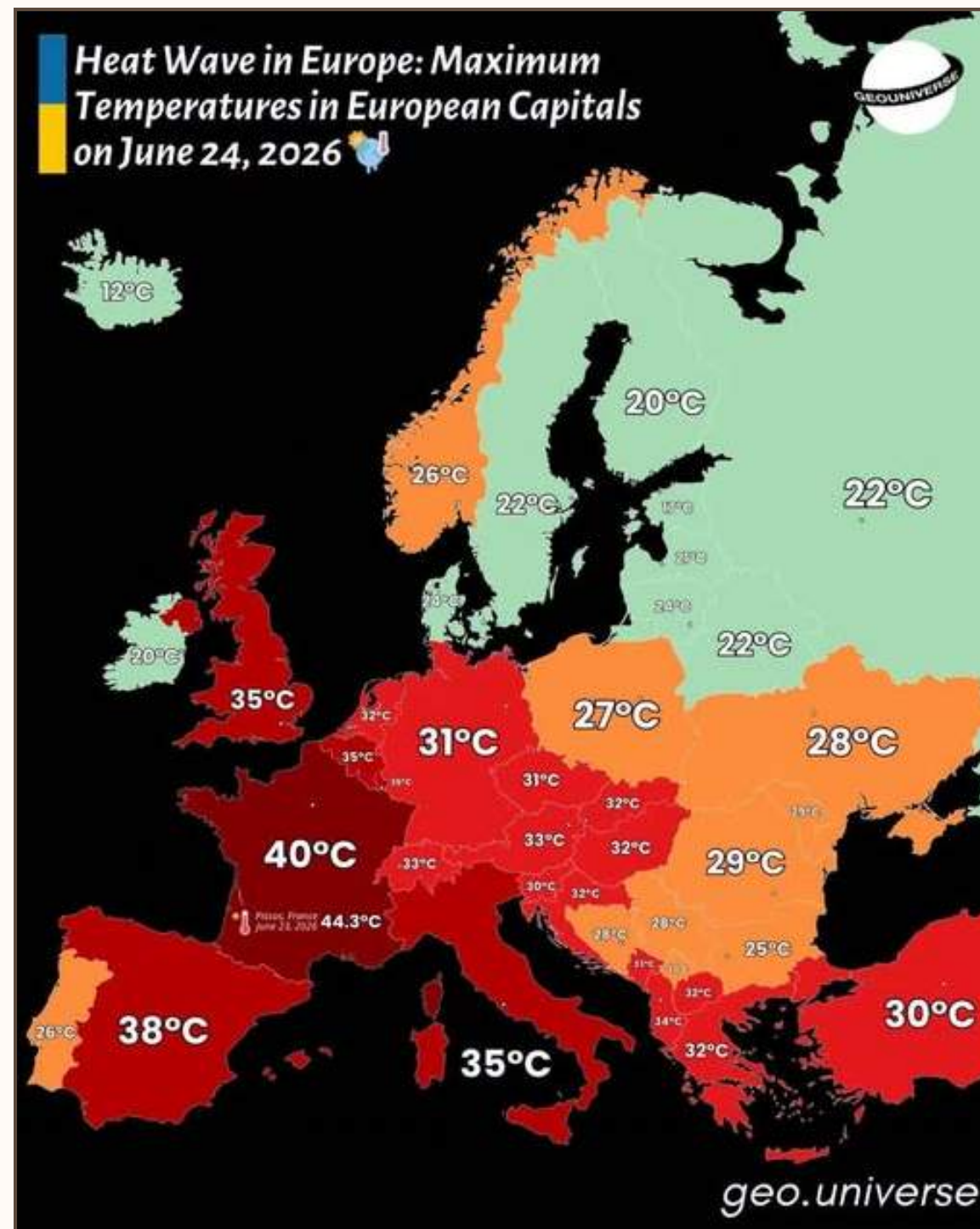


Resilience

Ability of a system to ensure the provision of its functions when facing disturbances

(Meuwissen et al., 2019)

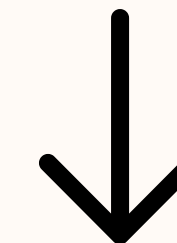
Diversity for resilience



Resilience

Ability of a system to ensure the provision of its functions when facing disturbances

(Meuwissen et al., 2019)

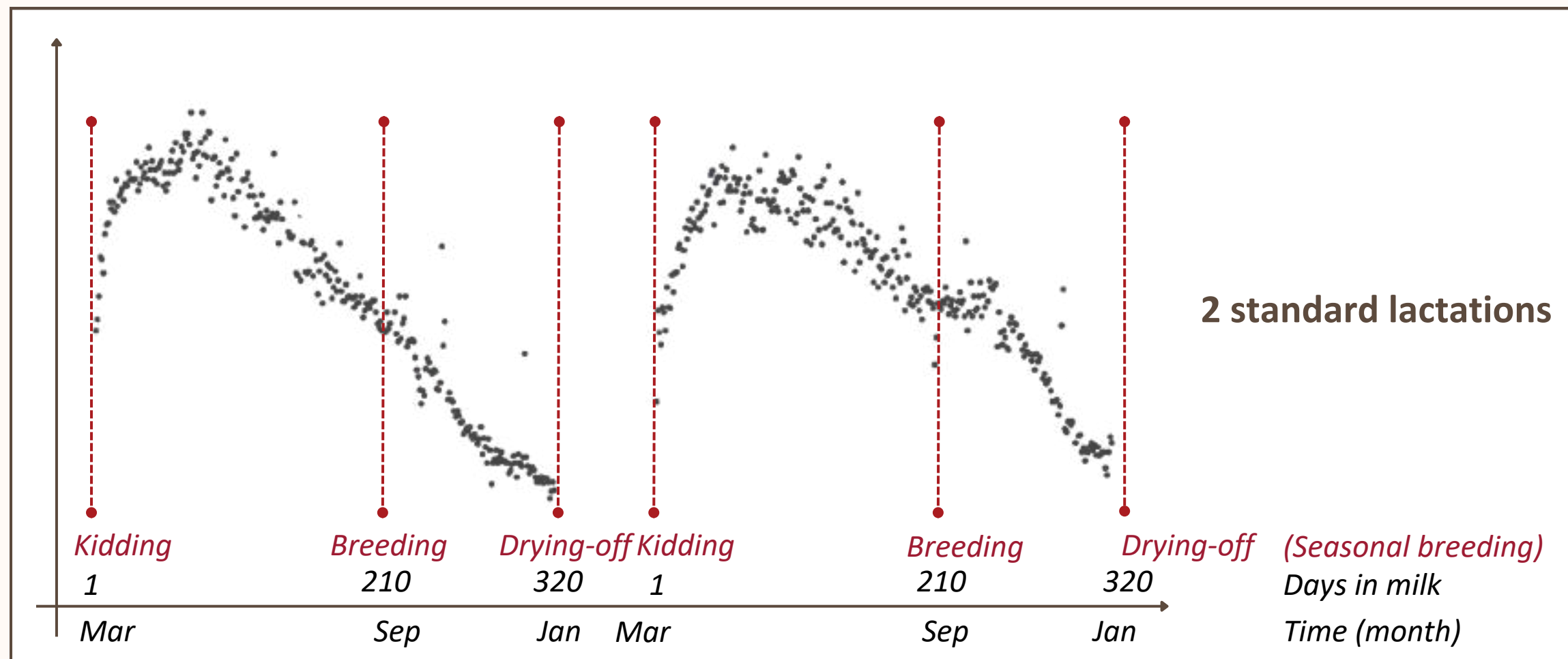


Diversity increases resilience :

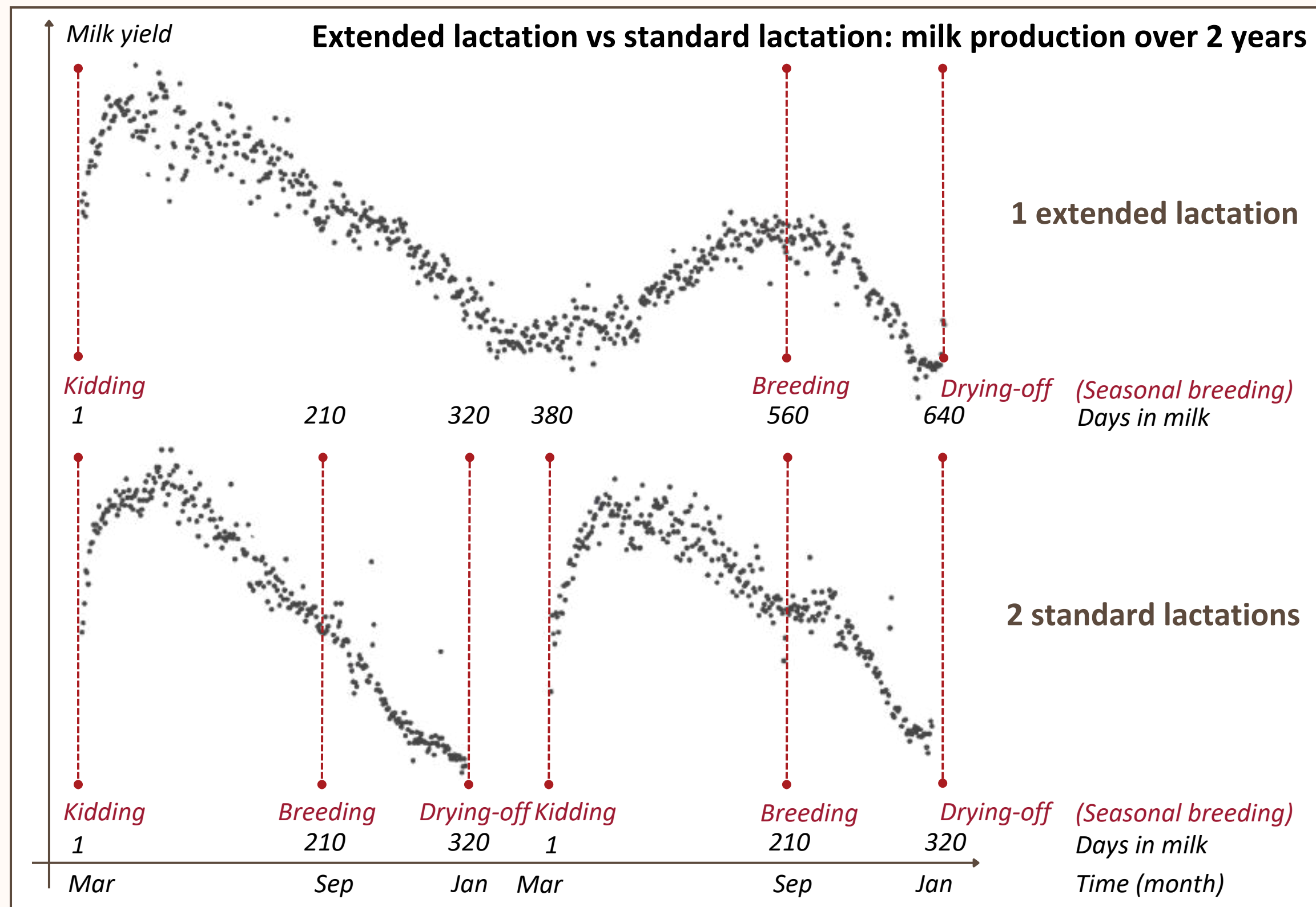
- ↪ buffering capacity
- ↪ adaptative capacity

(Dumont et al., 2020)

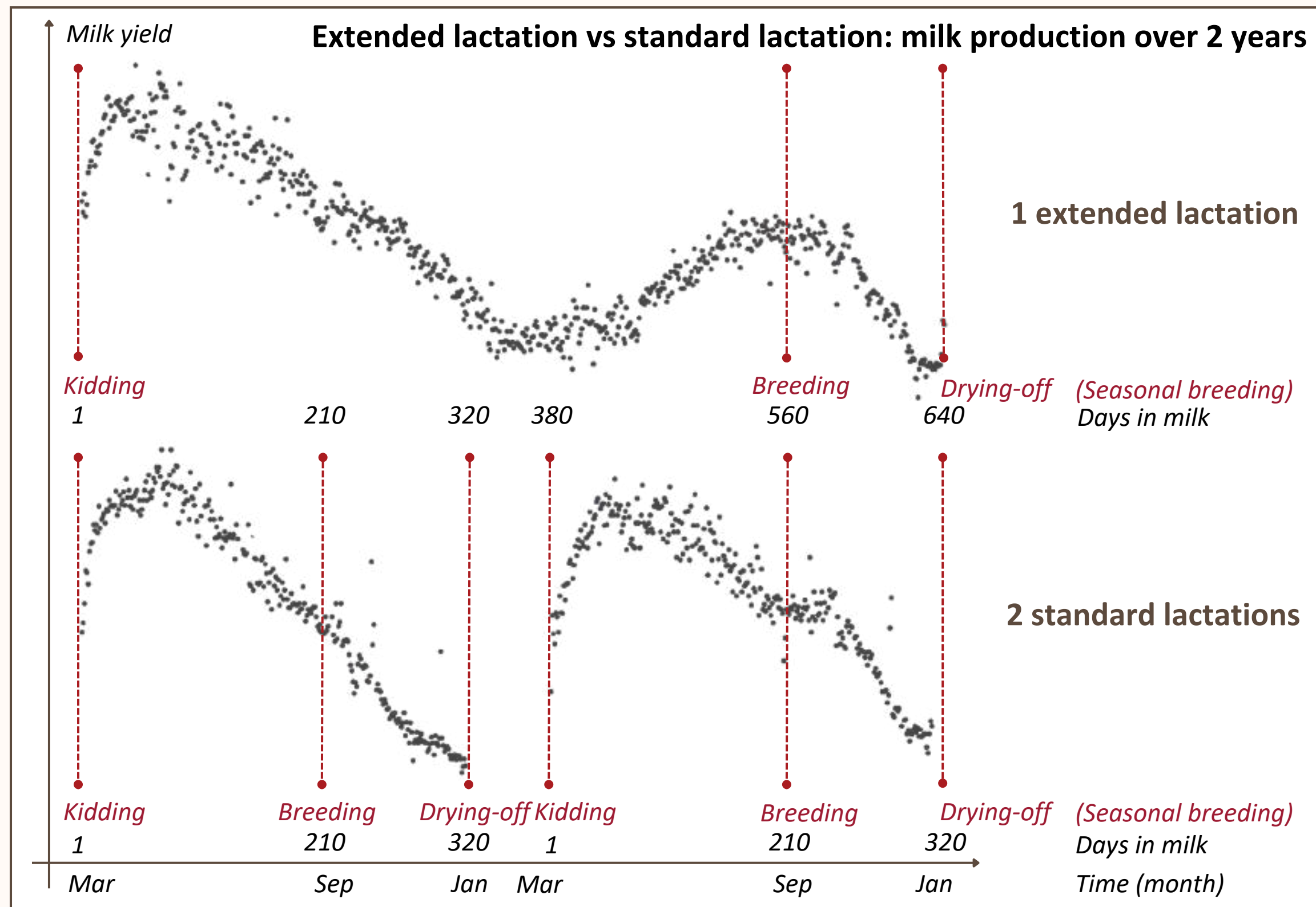
Extended lactation (EL) for diversity in dairy goat farm



EL for diversity in dairy goat farm



EL for diversity in dairy goat farm

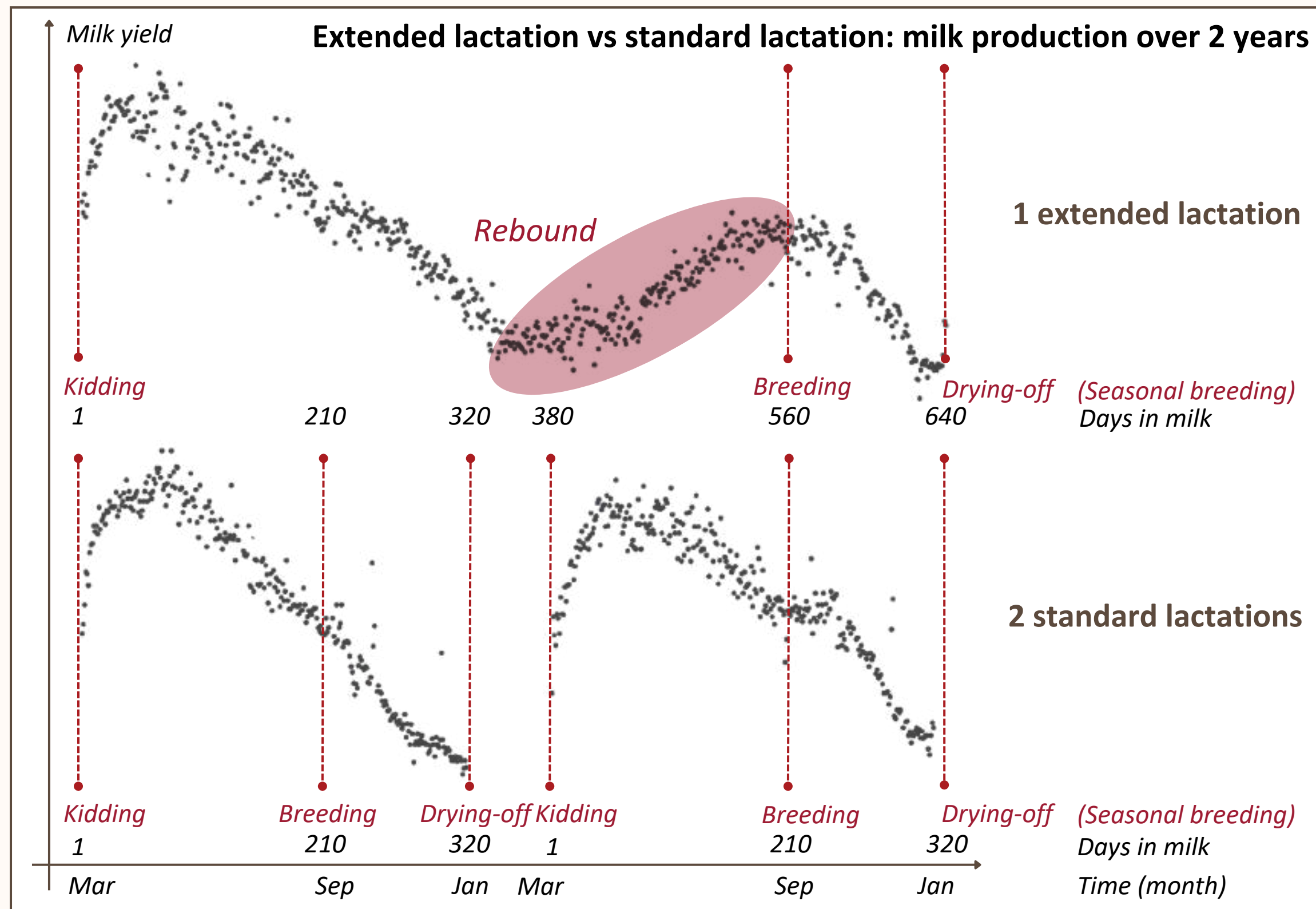


Extended lactation (EL)

a lactation lasting 485 days or more, without an intermediate pregnancy

(Idele, 2024)

EL for diversity in dairy goat farm

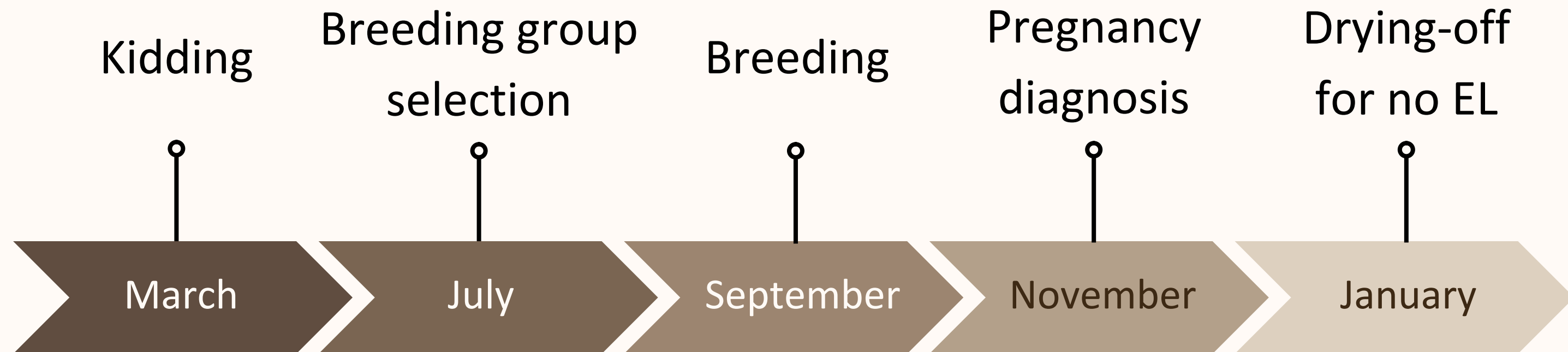


Extended lactation (EL)

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2 EL strategies: voluntary and involuntary EL

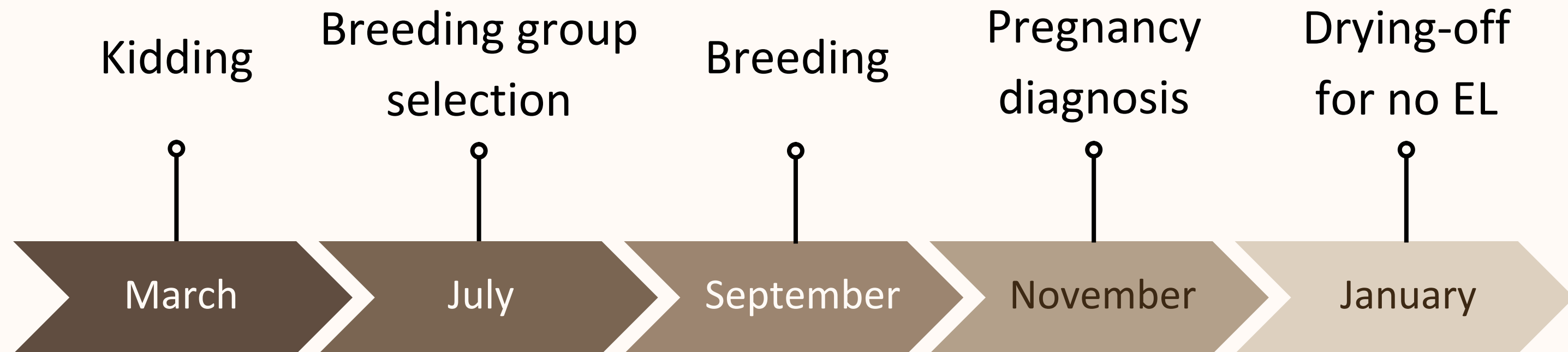


Farmer's choices :

- Breed the goat
- Keep her without breeding to cull
- **Keep her without breeding for EL**

↪ **Voluntary EL**

2 EL strategies: voluntary and involuntary EL

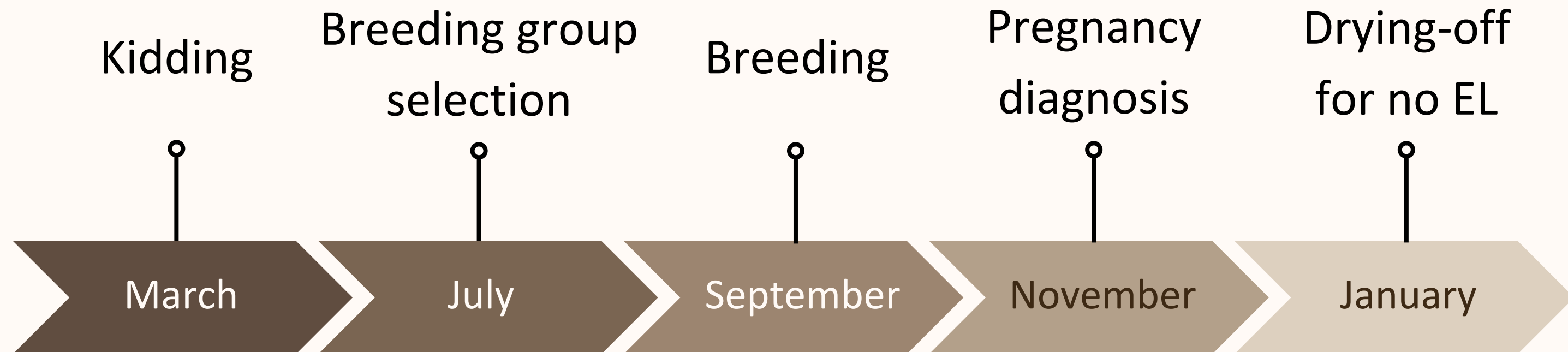


Farmer's choices :

- Breed the goat
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- **Keep her without breeding for EL**

↪ **Voluntary EL** → Buffering role

2 EL strategies: voluntary and involuntary EL



Farmer's choices :

- Breed the goat
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- **Keep her without breeding for EL**

↪ **Voluntary EL** → Buffering role

Farmer's choices :

- Culling goat that failed to conceive
- **Keep her for EL**

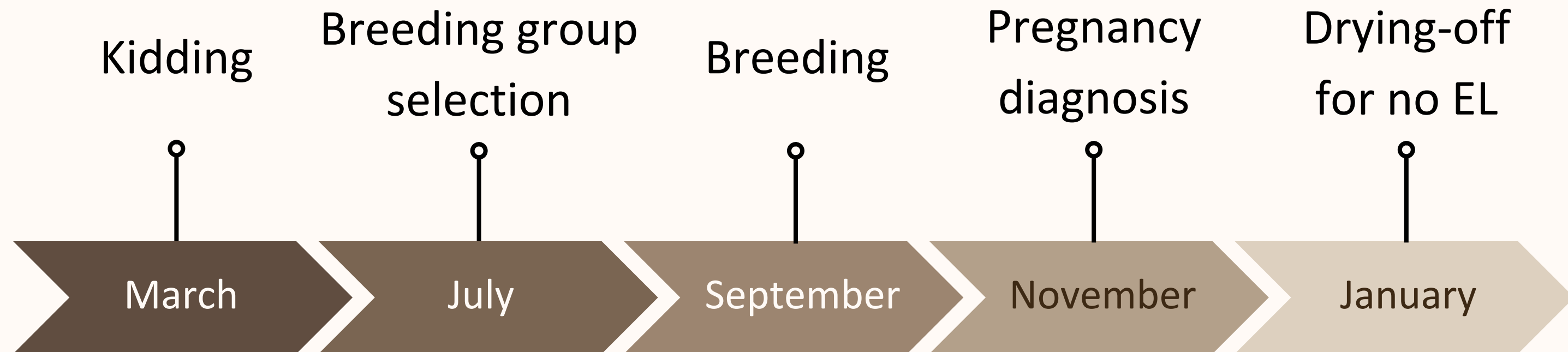
↪ **Involuntary EL**



INRAE



2 EL strategies: voluntary and involuntary EL



Farmer's choices :

- Breed the goat
- Keep her without breeding to cull
- **Keep her without breeding for EL**

↪ **Voluntary EL** → Buffering role

Farmer's choices :

- Culling goat that failed to conceive
- **Keep her for EL**

↪ **Involuntary EL** → Adaptative role



Research question

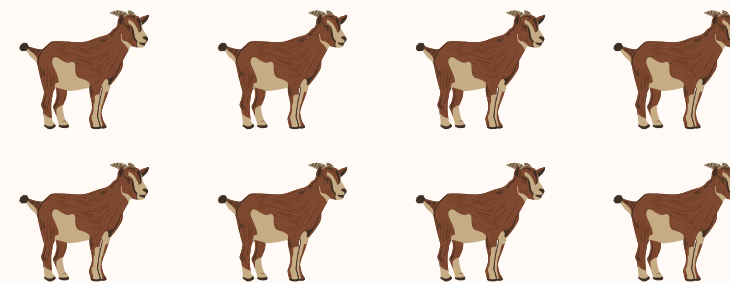
Does using **extended lactation**, through the **diversity** it introduces, constitute a **resilience lever** for dairy goat farms?

A dynamic herd modelling study: how the system reacts to disturbances ?



Herd Demography Model (HDM)

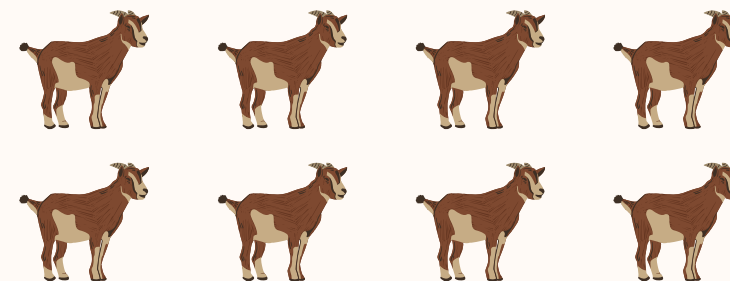
Inputs -----> *Model* -----> *Outputs*



Herd Demography Model (HDM)

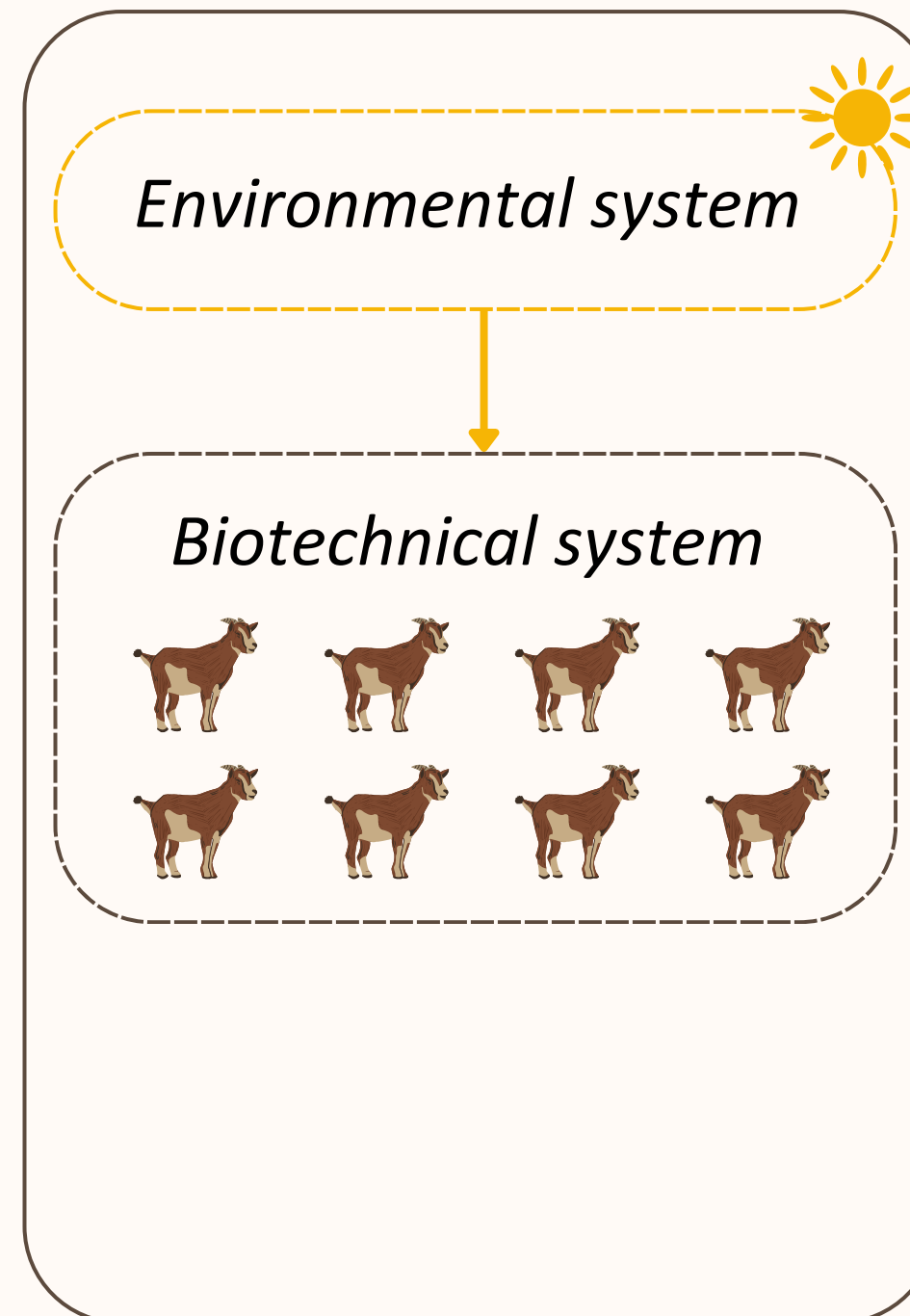
Inputs -----> *Model* -----> *Outputs*

Biotechnical system



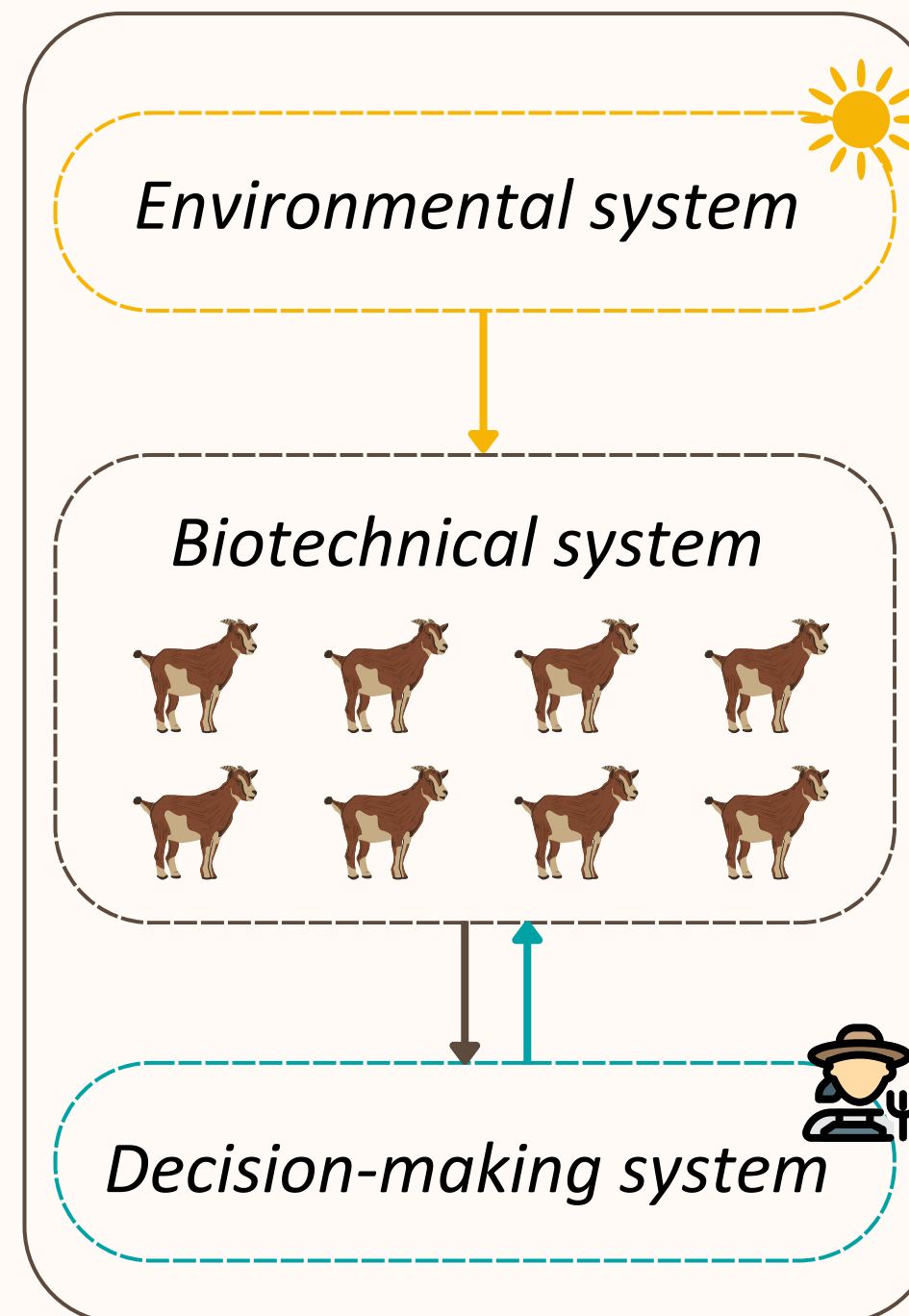
Herd Demography Model (HDM)

Inputs -----> *Model* -----> *Outputs*



Herd Demography Model (HDM)

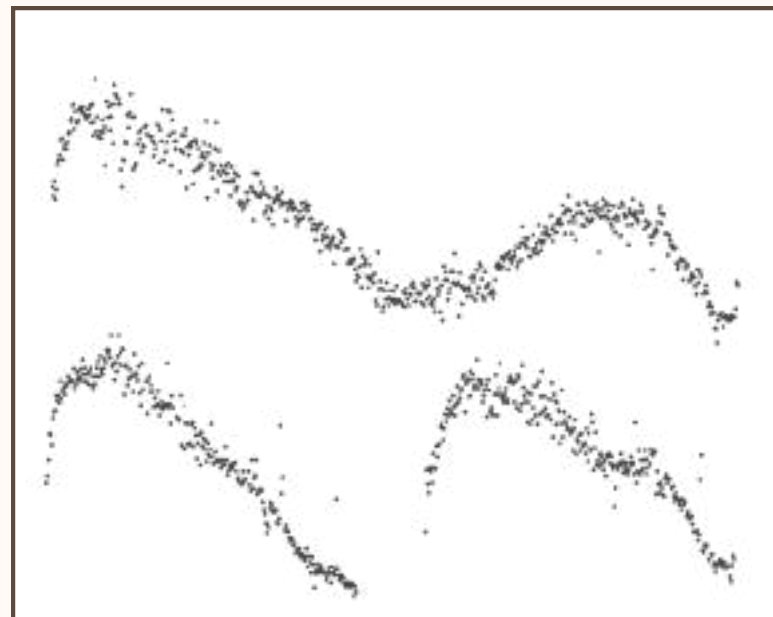
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Herd Demography Model (HDM)

Inputs -----> Model -----> Outputs

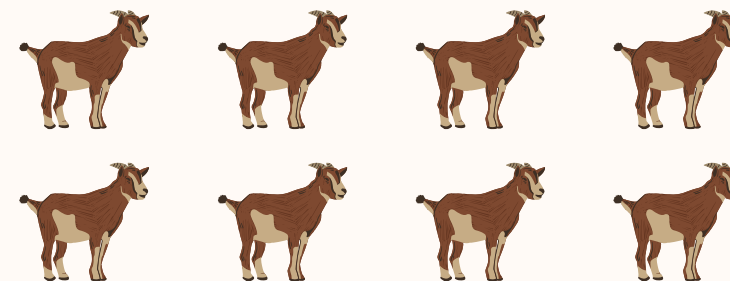
Actual milk equations



Environmental system



Biotechnical system



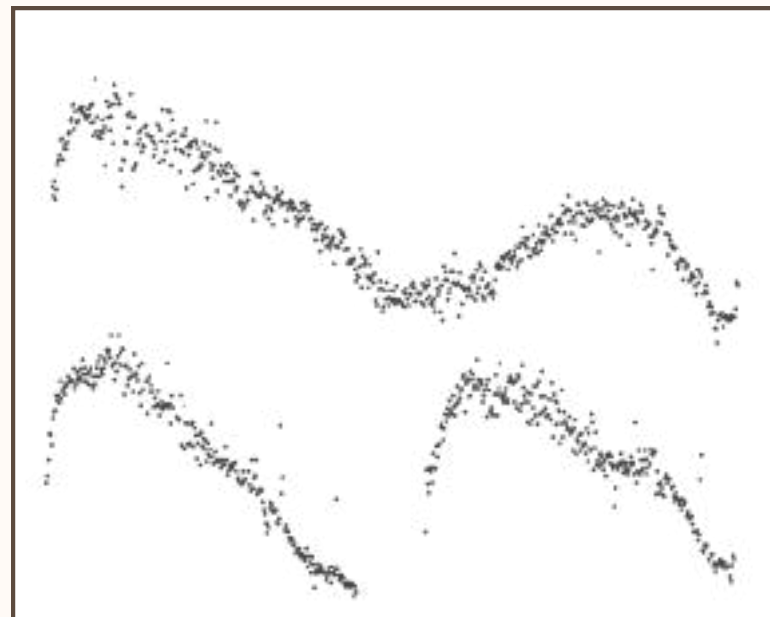
Decision-making system



Herd Demography Model (HDM)

Inputs -----> Model -----> Outputs

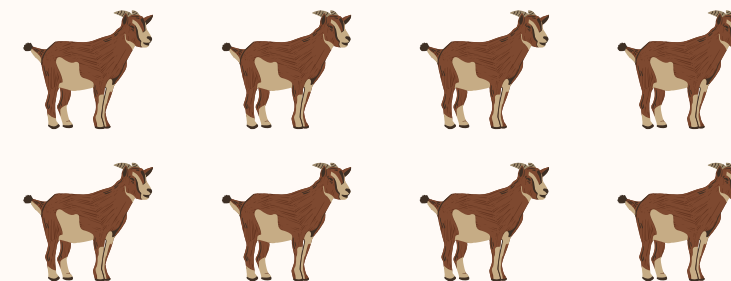
Actual milk equations



Environmental system



Biotechnical system



Decision-making system



2 herd-level variables (Blanc et al., 2013)



Annual average herd size

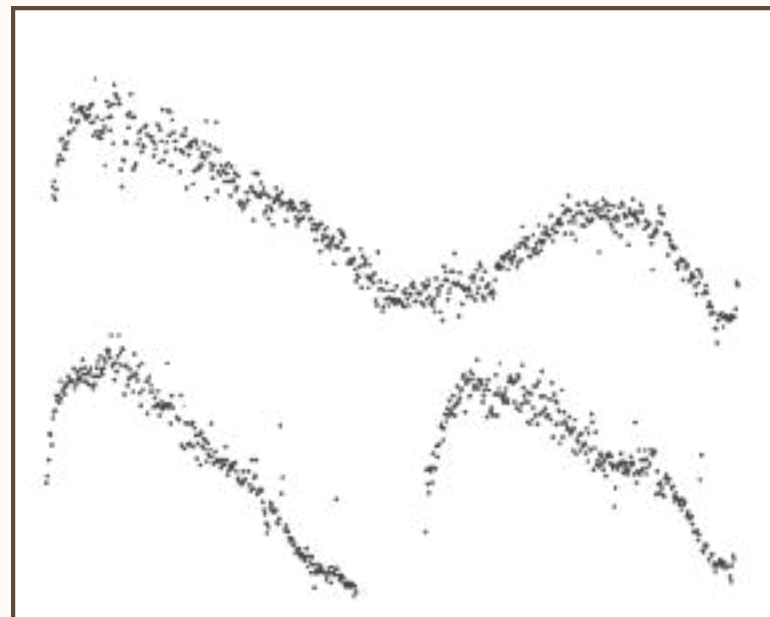


Annual milk production

Herd Demography Model (HDM)

Inputs -----> Model -----> Outputs

Actual milk equations

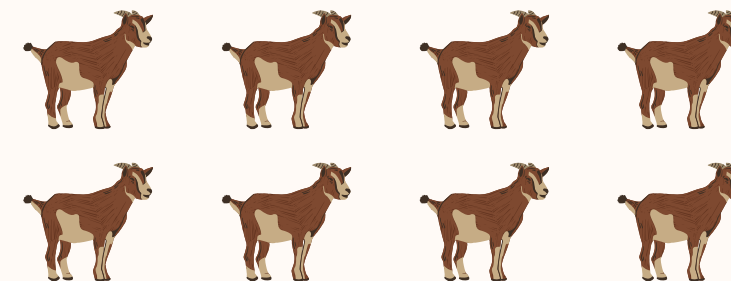


Biological diversity

Environmental system



Biotechnical system



Decision-making system



2 herd-level variables *(Blanc et al., 2013)*



Annual average herd size



Annual milk production

Functional diversity

Simulation plan: 5 farmer's strategies

Farmer's strategy

General management



- 289 goats



- 30% renewal



- Seasonal breeding over a 2-month period



- Gestation rate of 95%



Simulation plan: 5 farmer's strategies

Farmer's strategy

General management



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EL strategies

No EL (EL_no)

0% EL

Simulation plan: 5 farmer's strategies

Farmer's strategy

General management



- 289 goats



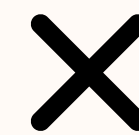
- 30% renewal



- Seasonal breeding over a 2-month period



- Gestation rate of 95%



EL strategies

No EL (EL_no)

0% EL

Only voluntary EL (EL_vol)

20% EL

30% EL

40% EL

Simulation plan: 5 farmer's strategies

Farmer's strategy

General management



- 289 goats



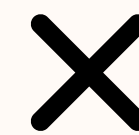
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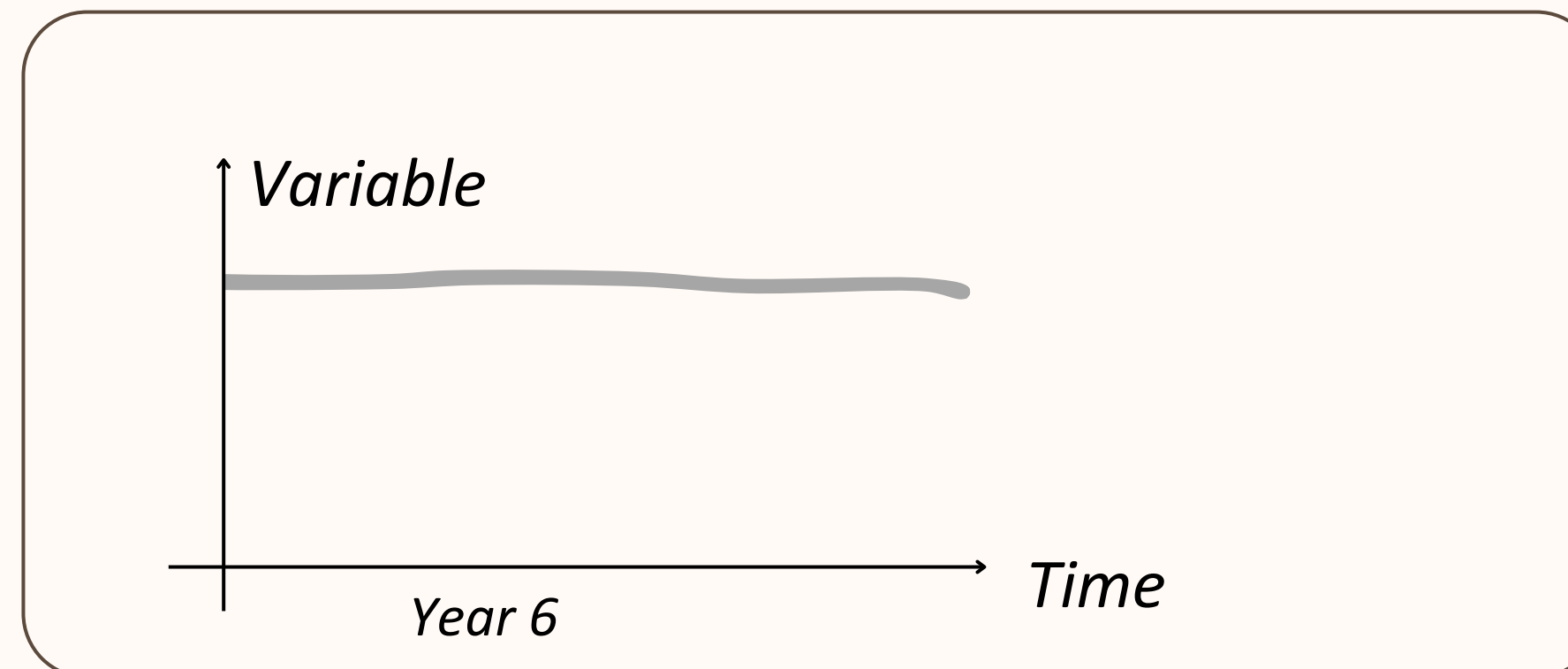
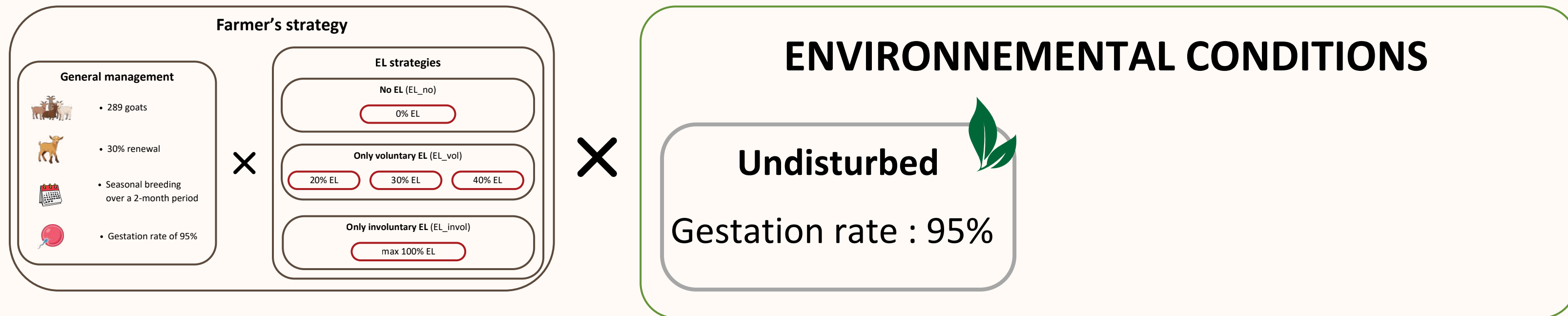
30% EL

40% EL

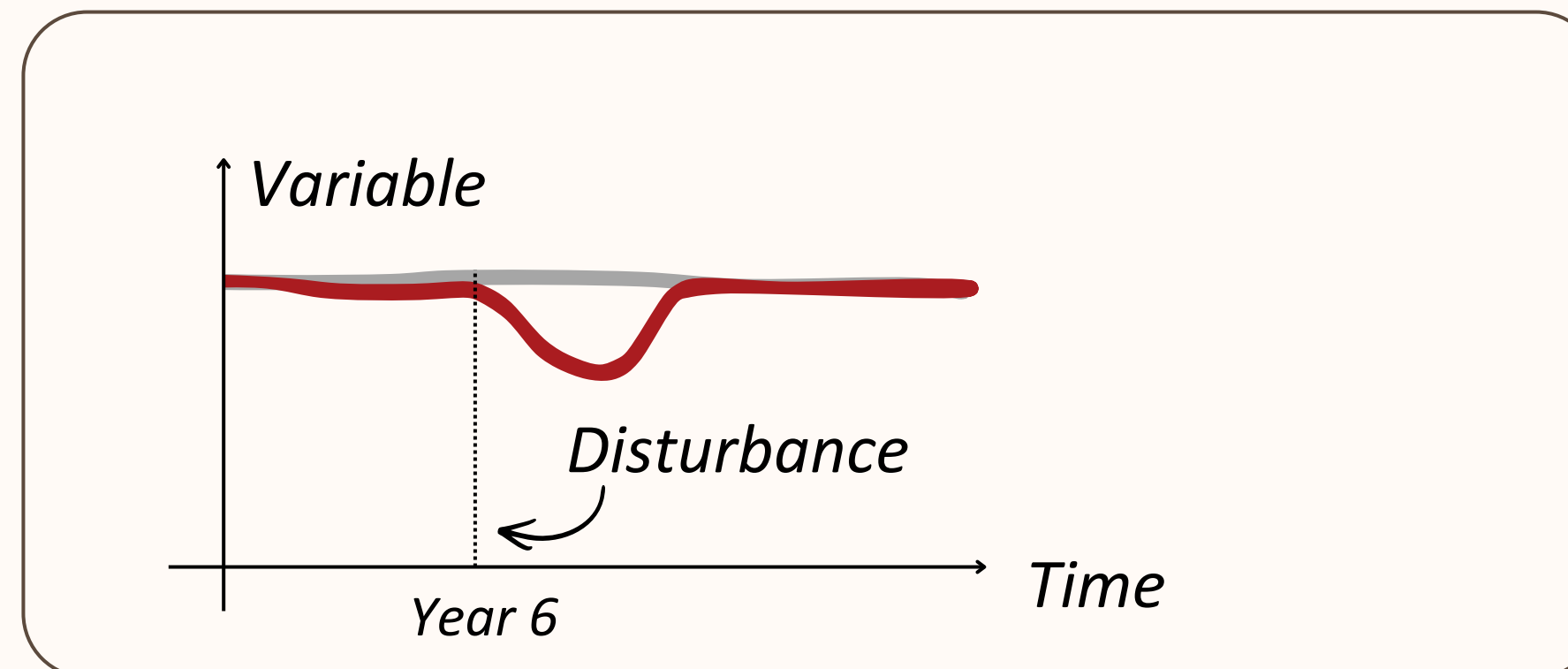
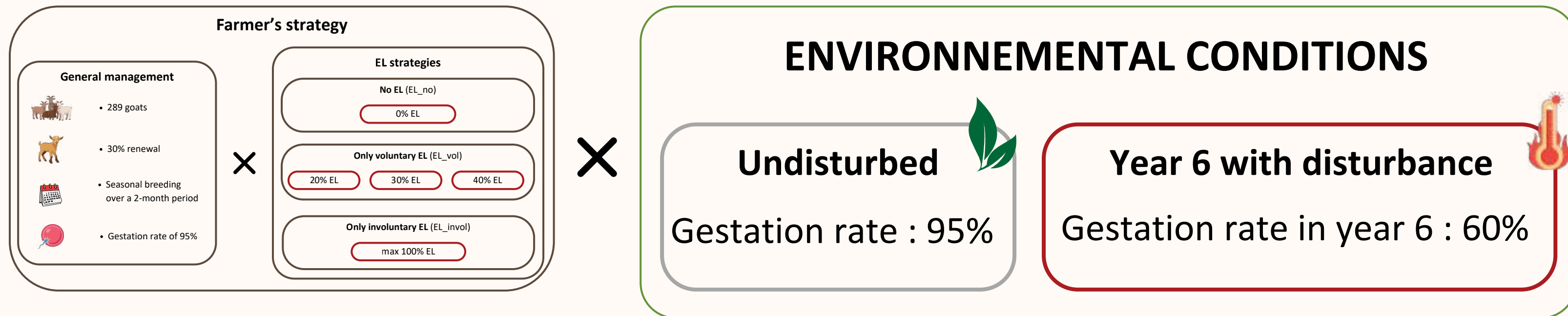
Only involuntary EL (EL_invol)

max 100% EL

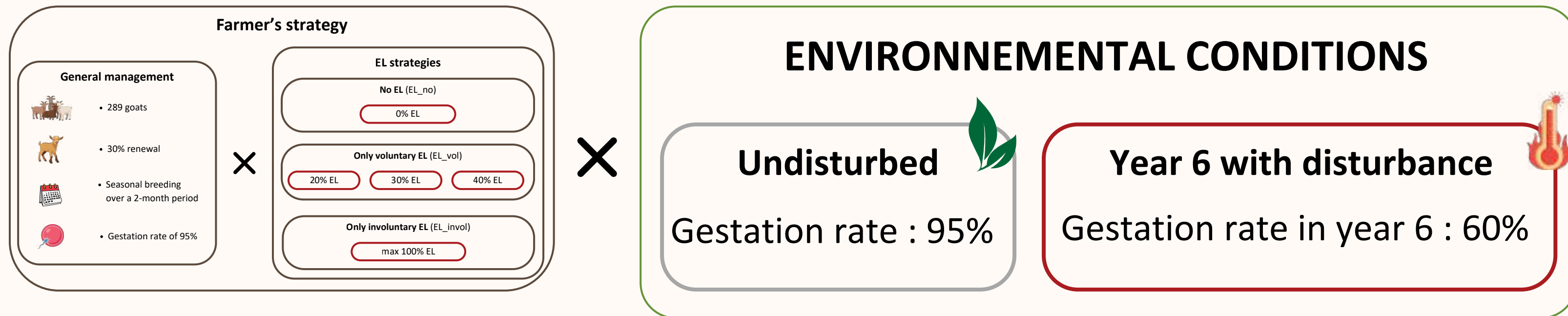
Simulation plan: 2 environmental conditions



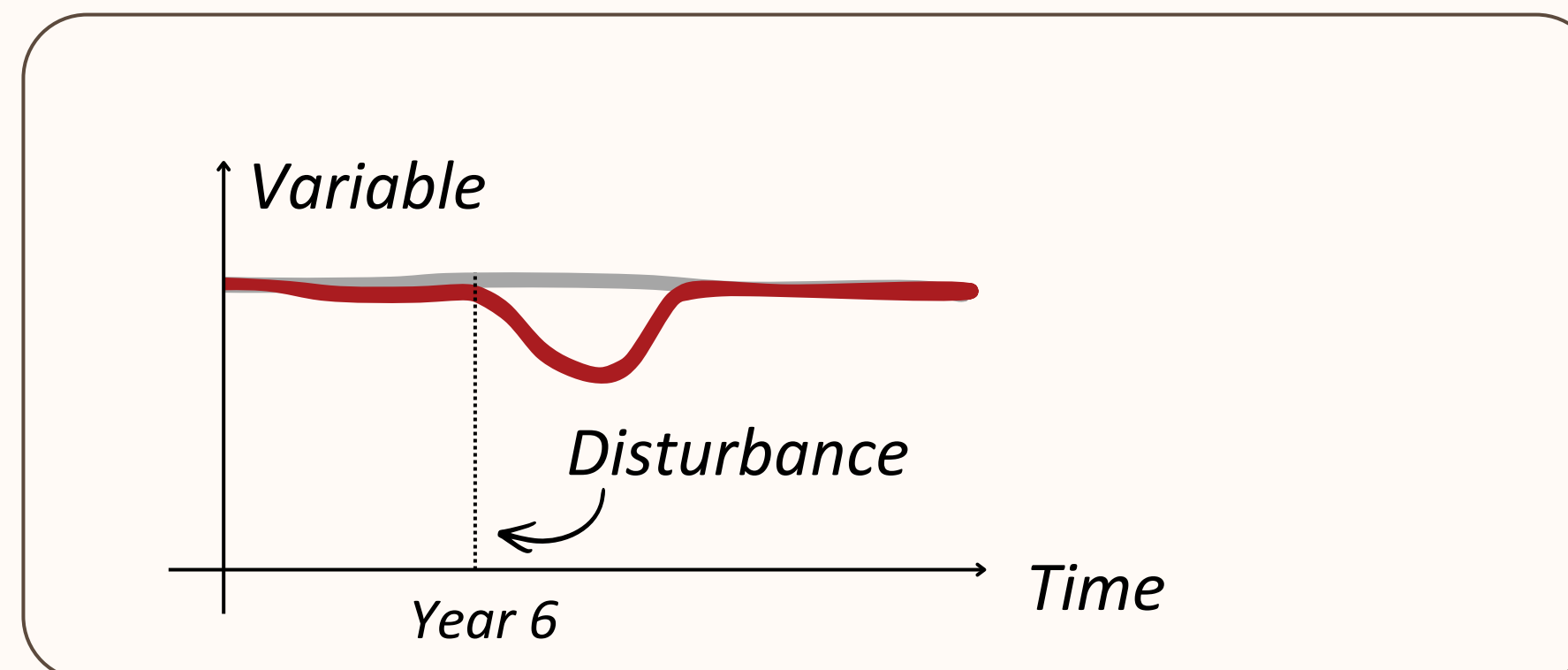
Simulation plan: 2 environmental conditions



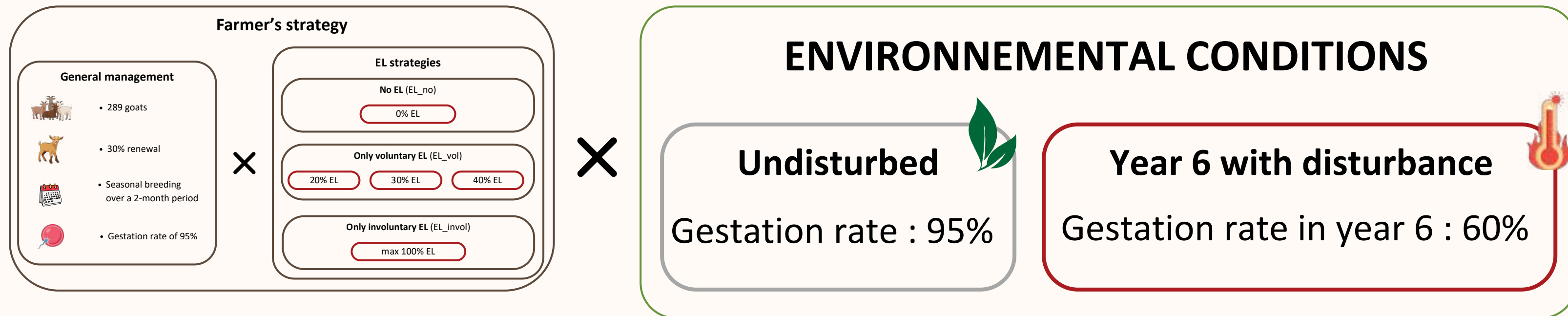
Simulation plan: 2 environmental conditions



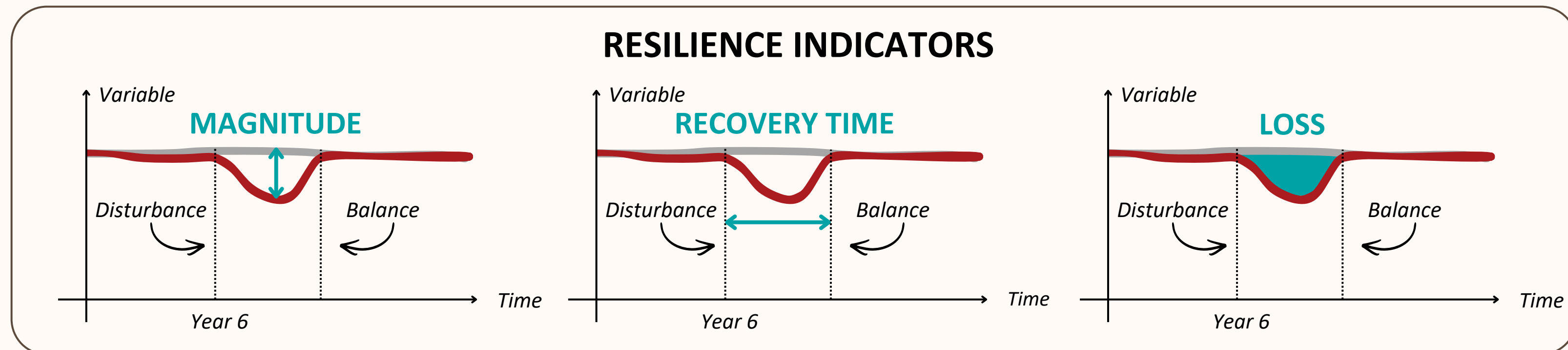
15 years × 15 replicates (*Puillet et al., 2010*)



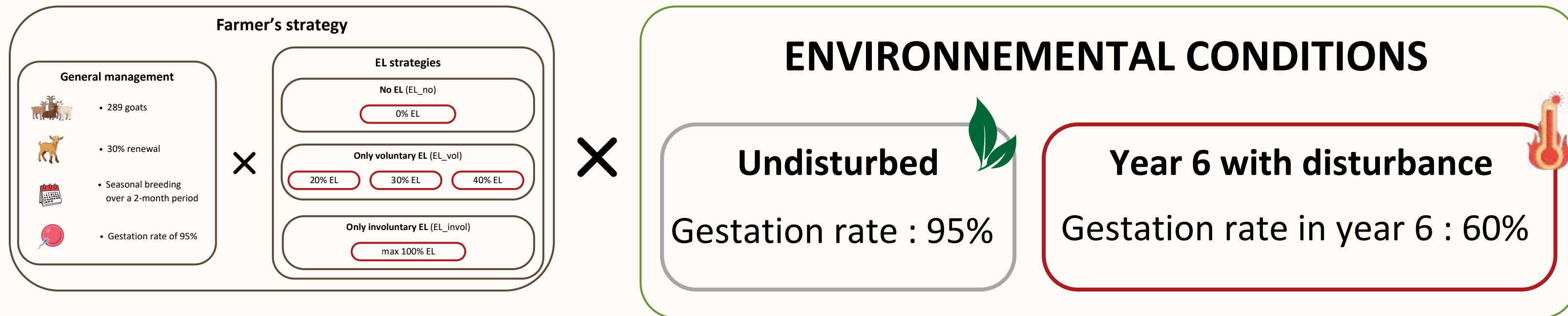
Resilience assessed with 3 indicators



15 years × 15 replicates (Puillet et al., 2010)

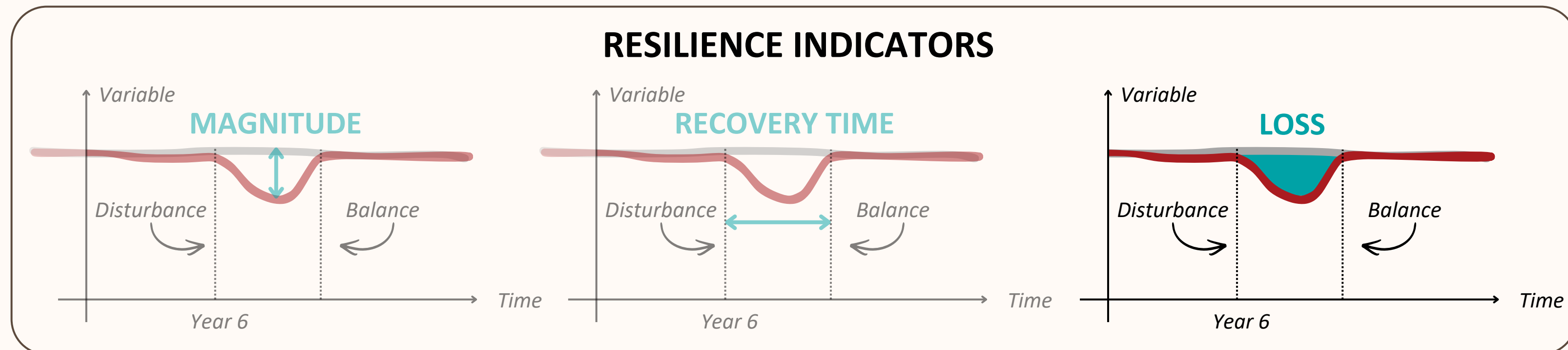


Resilience assessed with 3 indicators

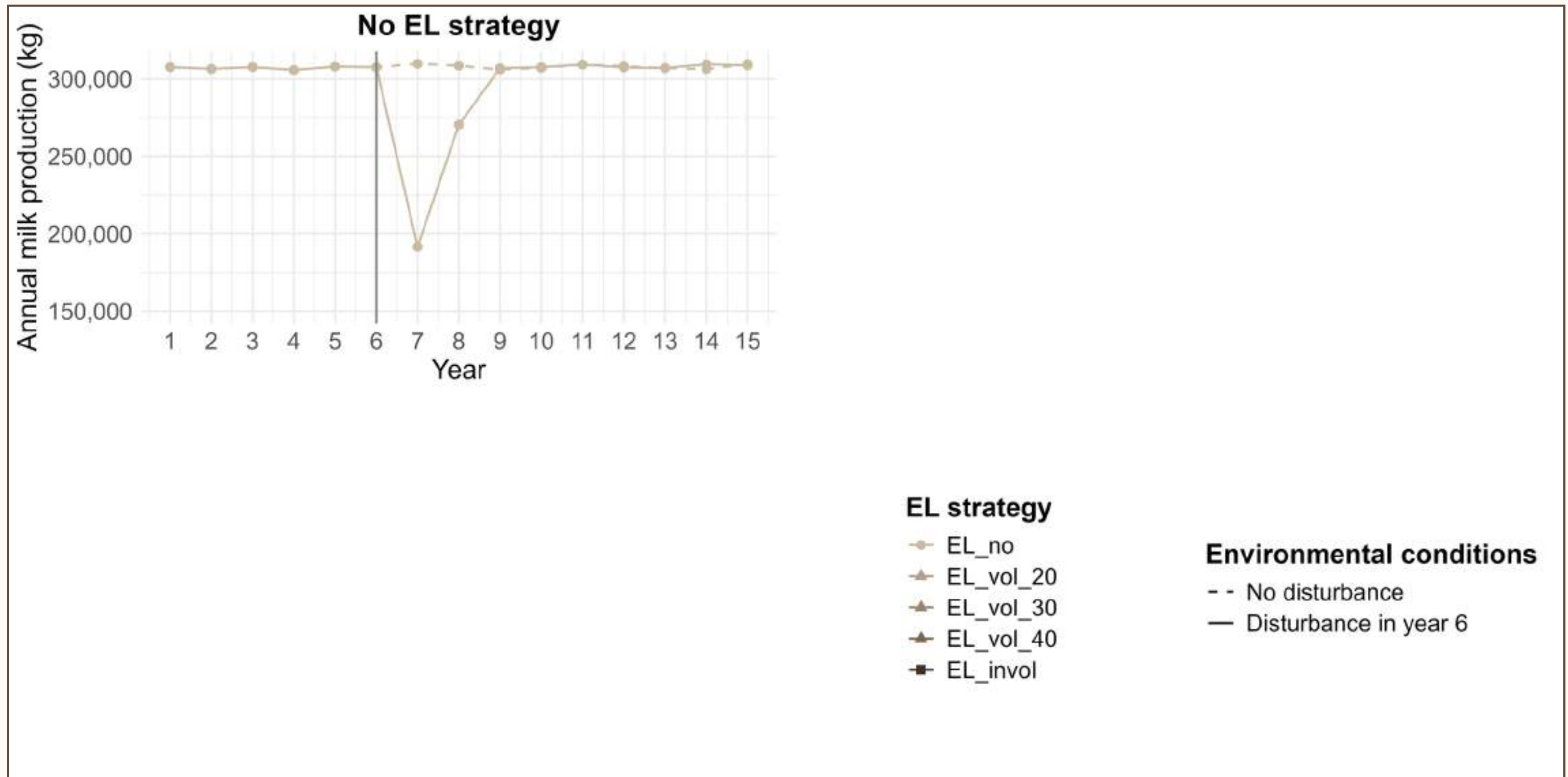


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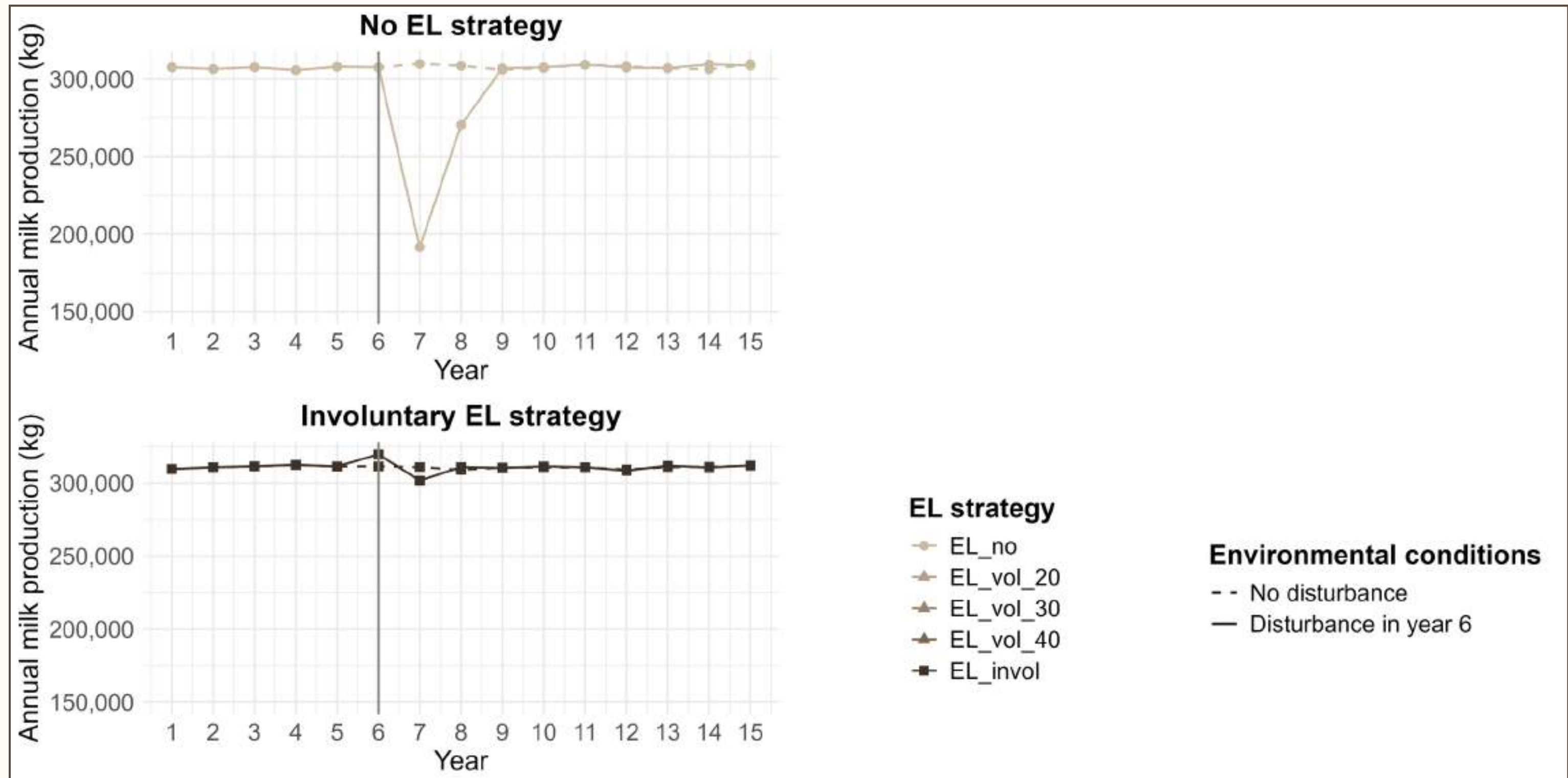
RESILIENCE INDICATORS



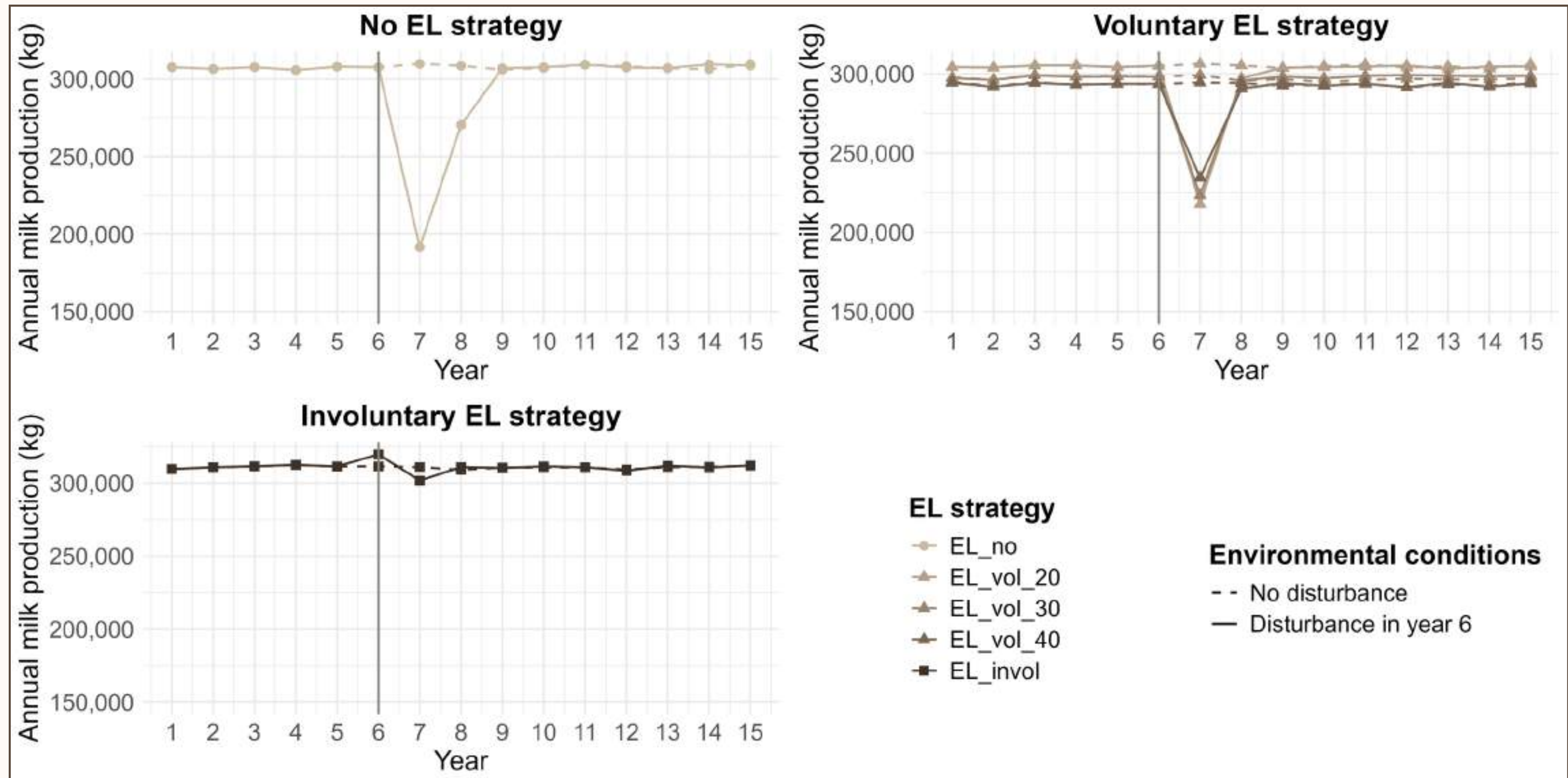
Visible differences in milk production across EL strategy



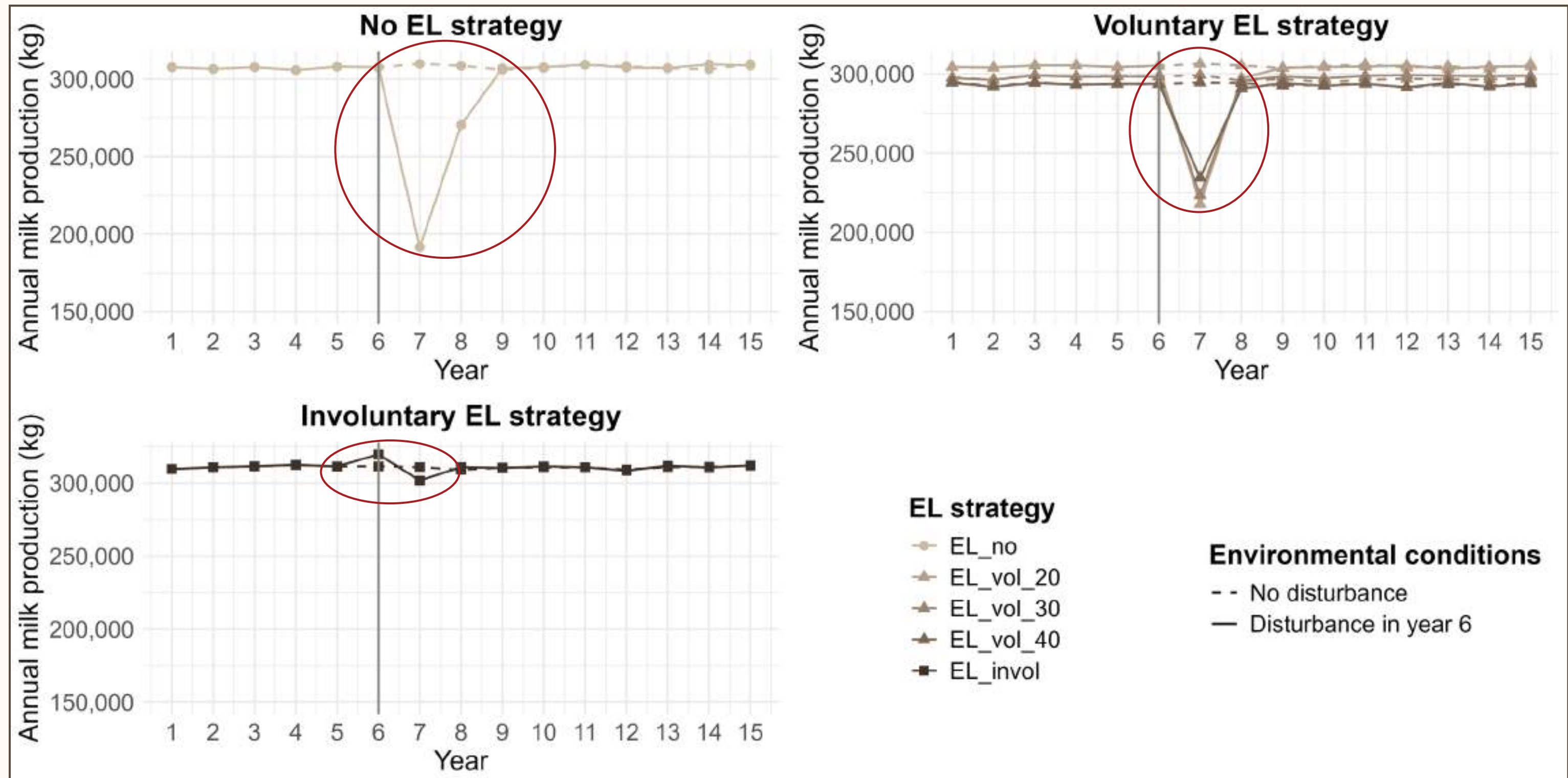
Visible differences in milk production across EL strategy



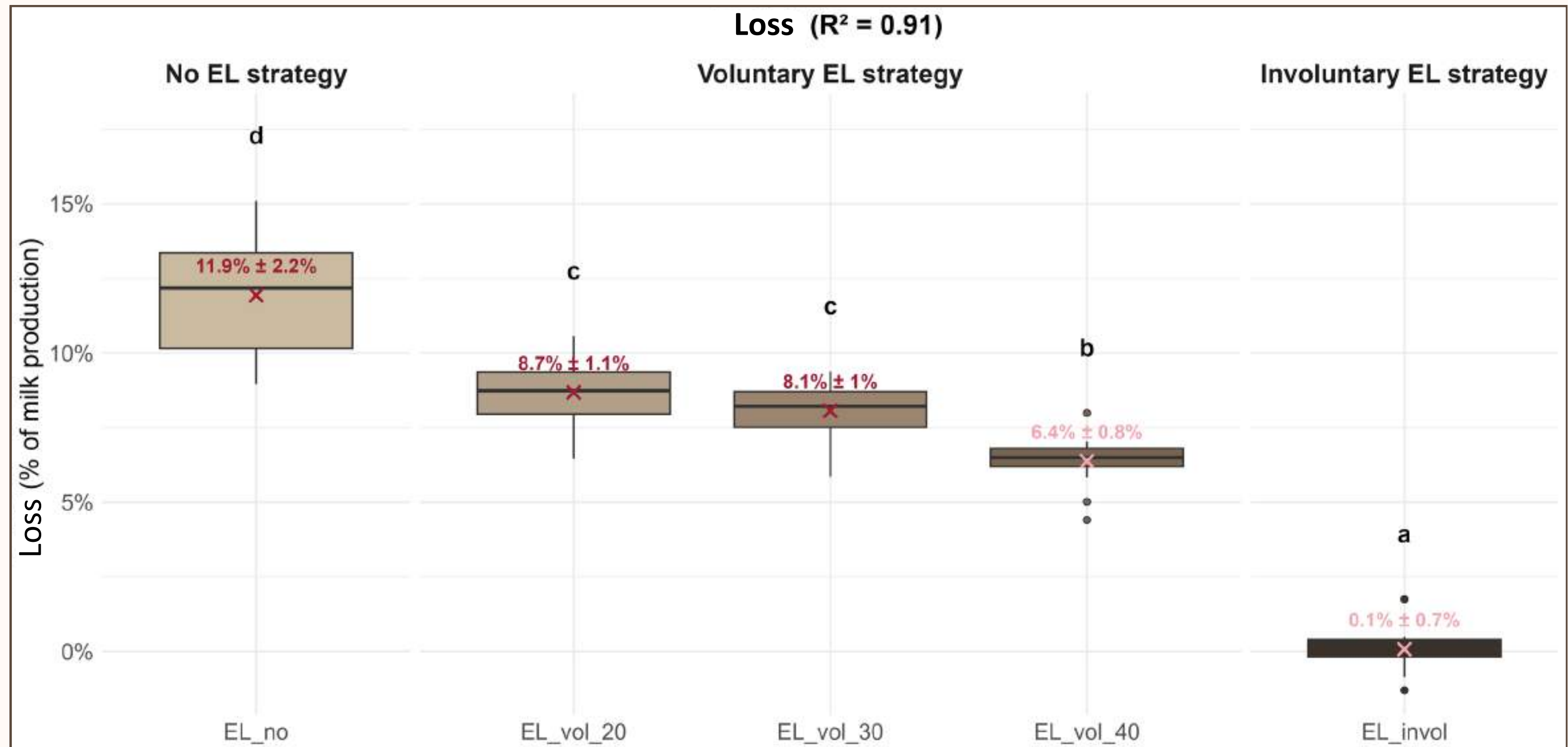
Visible differences in milk production across EL strategy



Visible differences in milk production across EL strategy



Less production loss with involuntary EL strategy



EL as a resilience lever for dairy goat farms

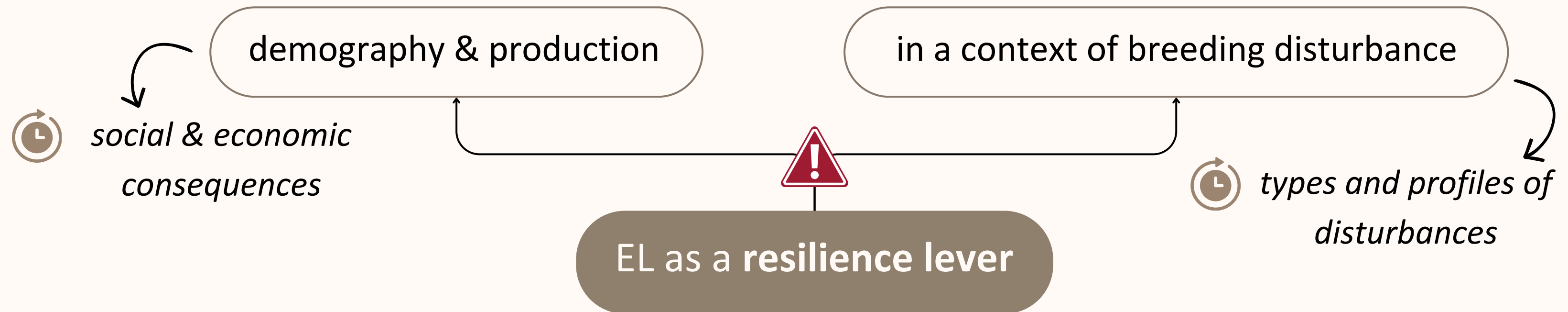
demography & production

in a context of breeding disturbance

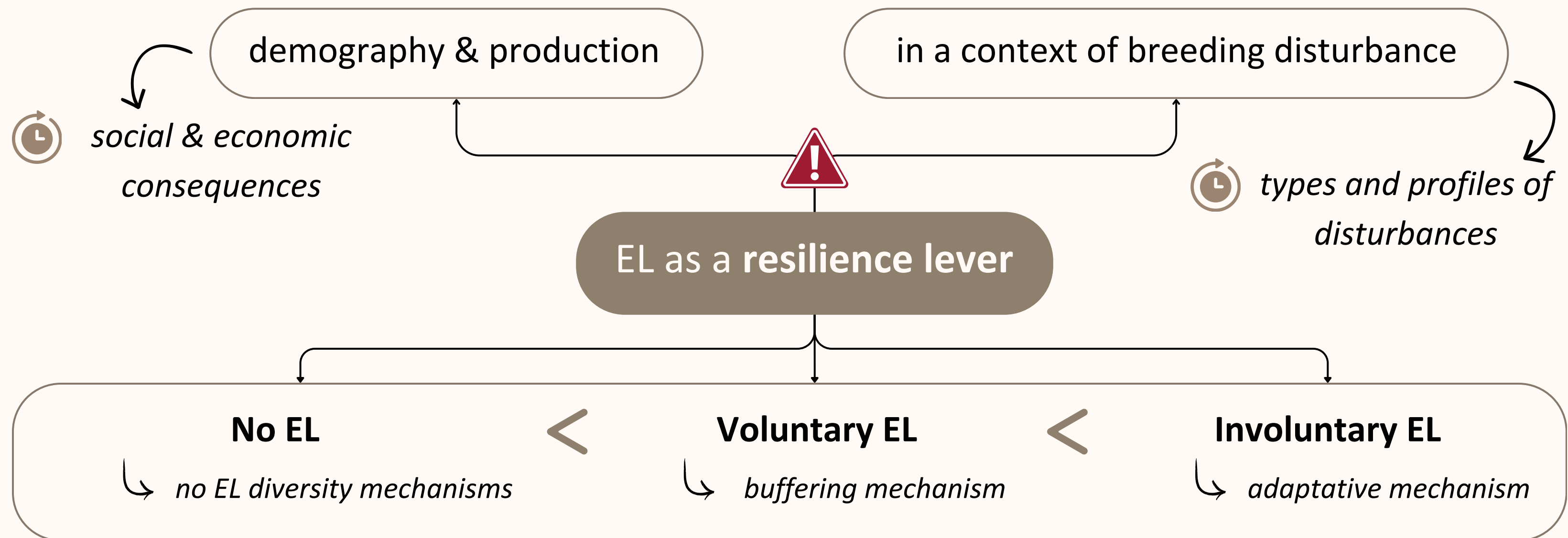
EL as a resilience lever



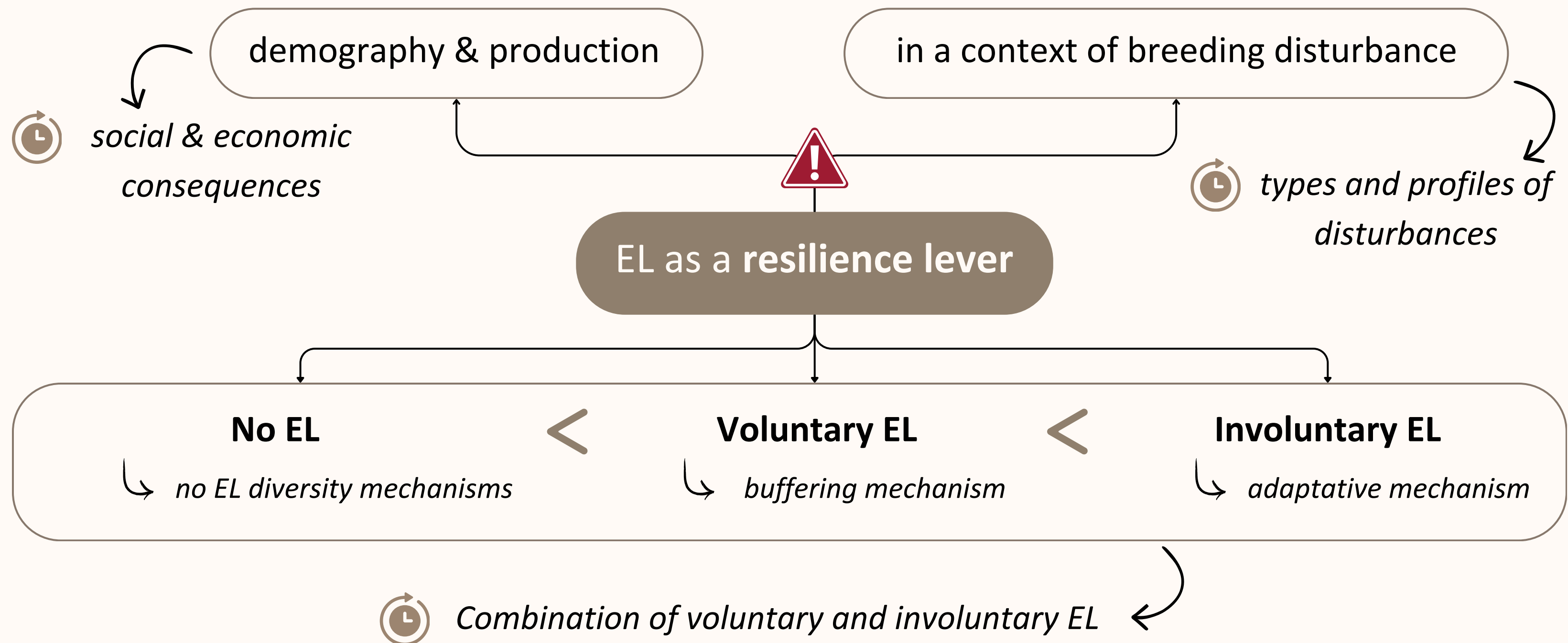
EL as a resilience lever for dairy goat farms



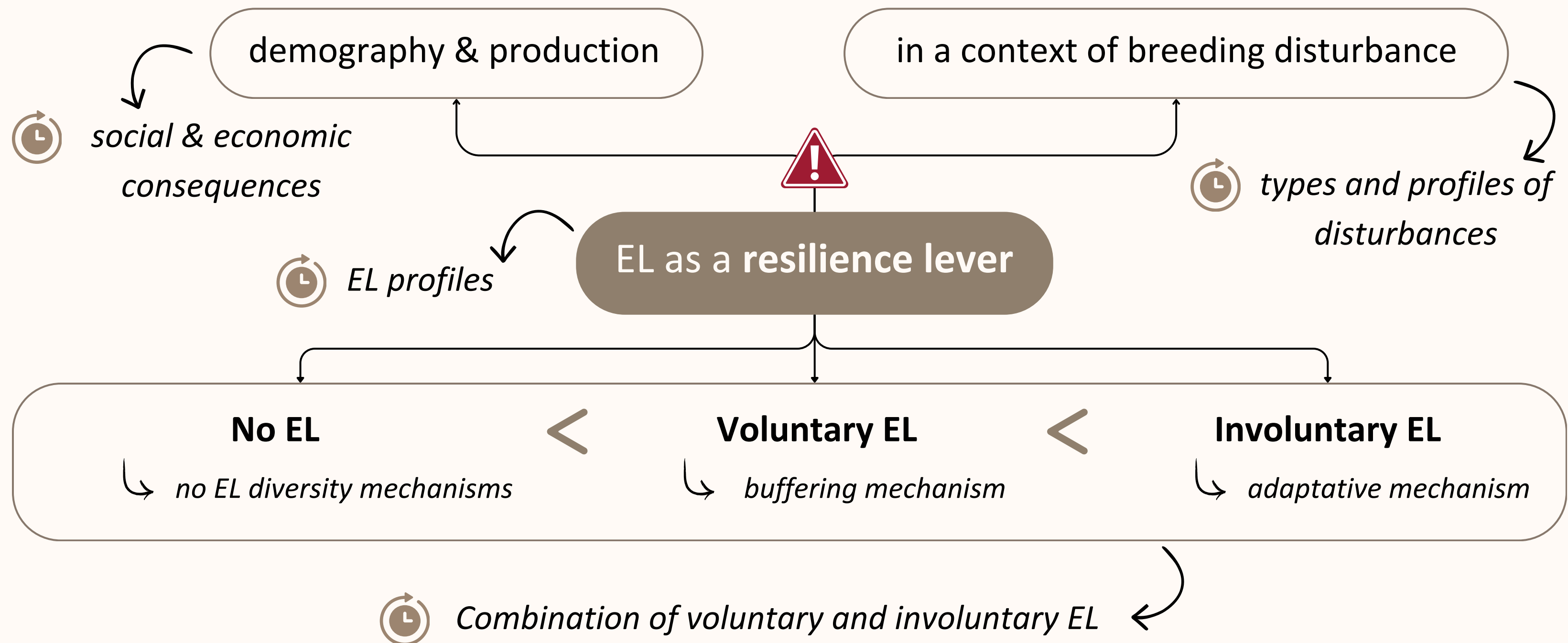
EL as a resilience lever for dairy goat farms



EL as a resilience lever for dairy goat farms



EL as a resilience lever for dairy goat farms





Thank you for your attention !