





Strategies to improve livestock system robustness:

moving toward diversity

E. Ollion, B. Dumont, S. Ingrand and F. Blanc

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⇒ Current systems raises concerns



Current systems raises concerns



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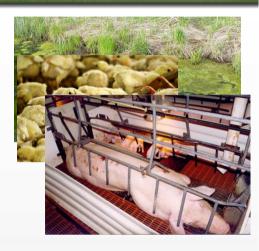
Current systems raises concerns



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Current systems raises concerns

⇒ Instability of productions contexts



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→ Current systems raises concerns

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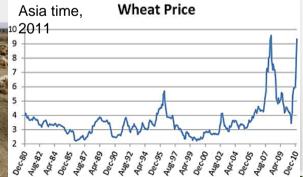


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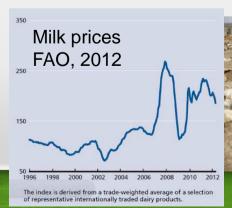


Current systems raises concerns

⇒ Instability of productions contexts







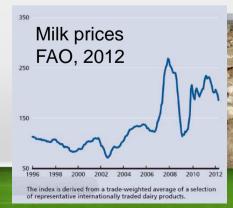


⇒ Current systems raises concerns

⇒ Instability of productions contexts

⇒ But essential roles: proteins, jobs income, draught power, social role







→ Current systems raises concerns

⇒ Instability of productions contexts

⇒ But essential roles: proteins, jobs income, draught power, social role



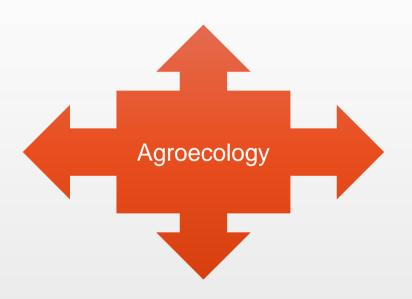
Wheat Price

Asia time.

A change of paradigm is needed to develop sustainable and socially acceptable robust livestock systems in a changing world

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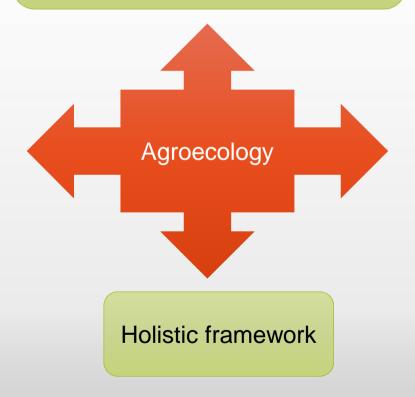




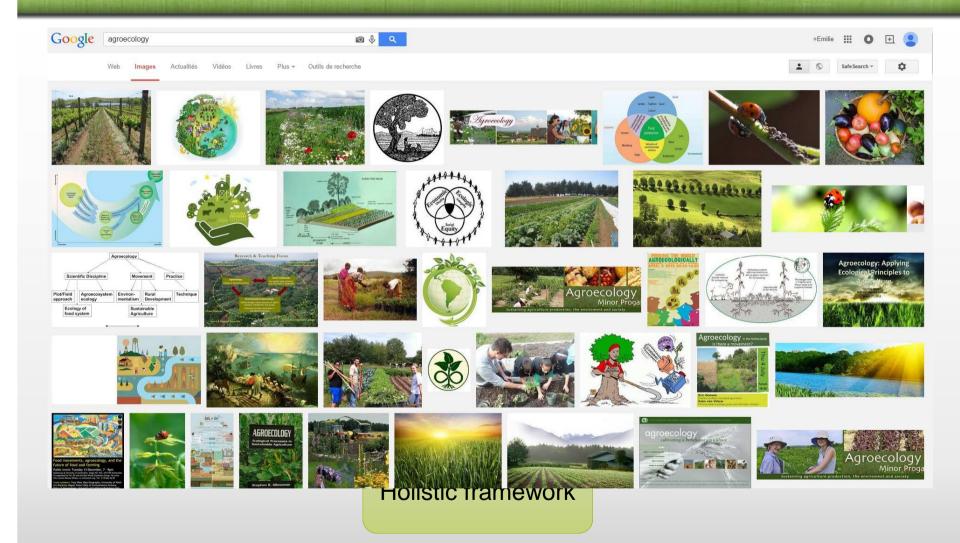
Scientific discipline that applies ecological theory to the design and management of sustainable agroecosystems (Altieri, 1987)



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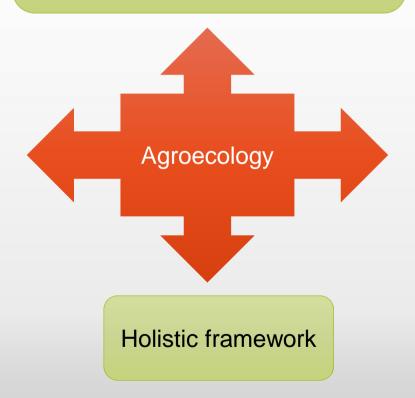




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Crop productions

Agroecology



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Crop productions

Agroecology

Livestock?





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Crop productions

Agroecology

Livestock?



Agroecological transition of livestock farming system is an option

Agroecology in livestock farming systems: 6 case studies (Dumont et al. 2013)

5 principles

Integrated health managmt

↓ inputs

↓ pollution

Diversity to ↑ resilience

Preserve biodiversity



Agroecology in livestock farming systems: 6 case studies (Dumont et al. 2013)

5 principles













Intensification

Integrated health managmt

↓ inputs

↓ pollution

Diversity to ↑ resilience

Preserve biodiversity

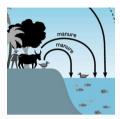


Agroecology in livestock farming systems: 6 case studies (Dumont et al. 2013)

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Diversity to ↑ resilience

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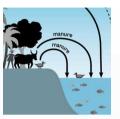


Agroecology in livestock farming systems: 6 case studies (Dumont et al. 2013)

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Integrated health managmt

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Diversity to ↑ resilience

Preserve biodiversity Intensification

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Agroecology in livestock farming systems: 6 case studies (Dumont et al. 2013)

5 principles













Integrated health managmt

↓ inputs

↓ pollution

Diversity to ↑ resilience

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Preserv biodiversity Which form and use of diversity?



Livestock



Rice, fruits, sugar cane





Nhan et al. 2006 Phong et al. 2010 Karim et al. 2011



Fish (carp, tilapia)

Livestock

Rice, fruits, sugar cane



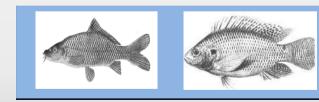
Fertilization

Feed co-products





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Fish (carp, tilapia)

Livestock

Rice, fruits, sugar cane



Fertilization

Feed co-products





Rentilization Nater





Fish (carp, tilapia)

Nhan et al. 2006 Phong et al. 2010 Karim et al. 2011



Livestock

Rice, fruits, sugar cane



Fertilization

Feed co-products





reed and water





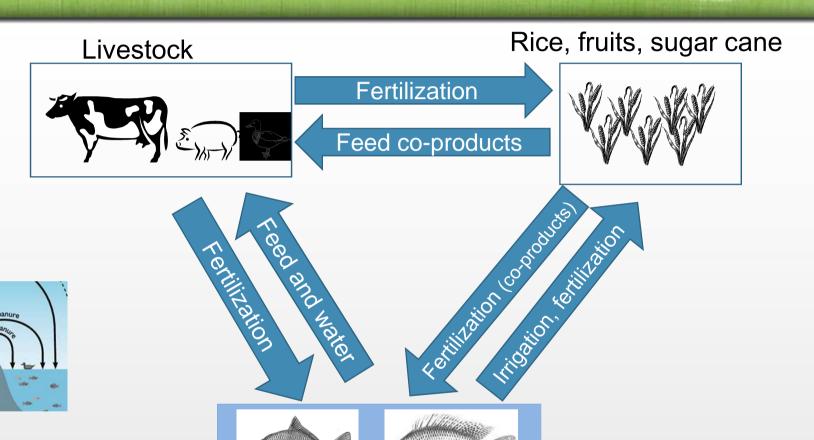


Fish (carp, tilapia)

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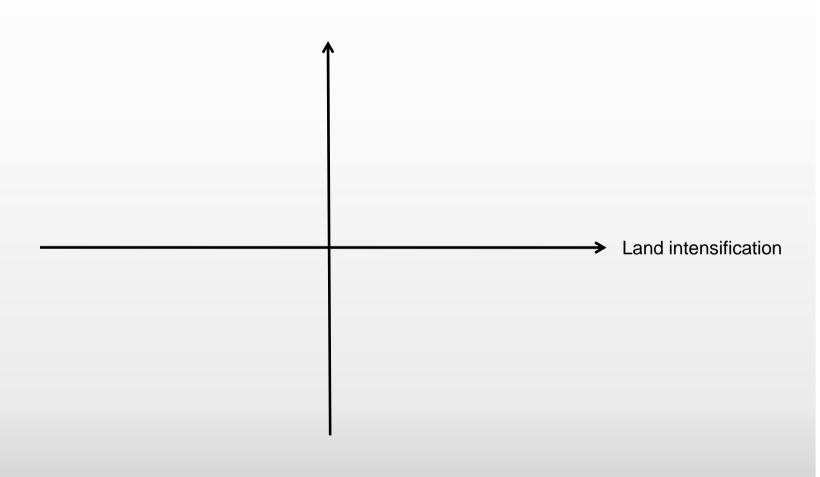
Productions diversity (Dumont et al., 2013)



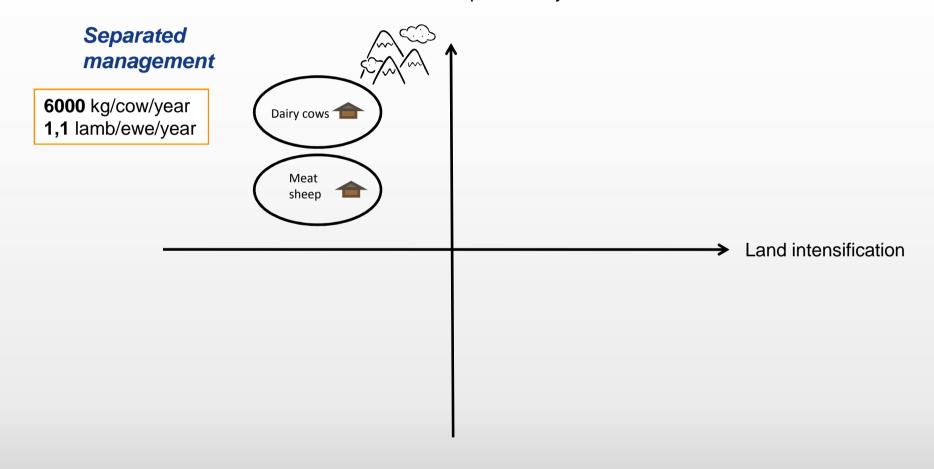
Nhai Phor Karir Diversity secures income and autonomy reduces vulnerability and environmental burden, increases productivity

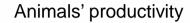


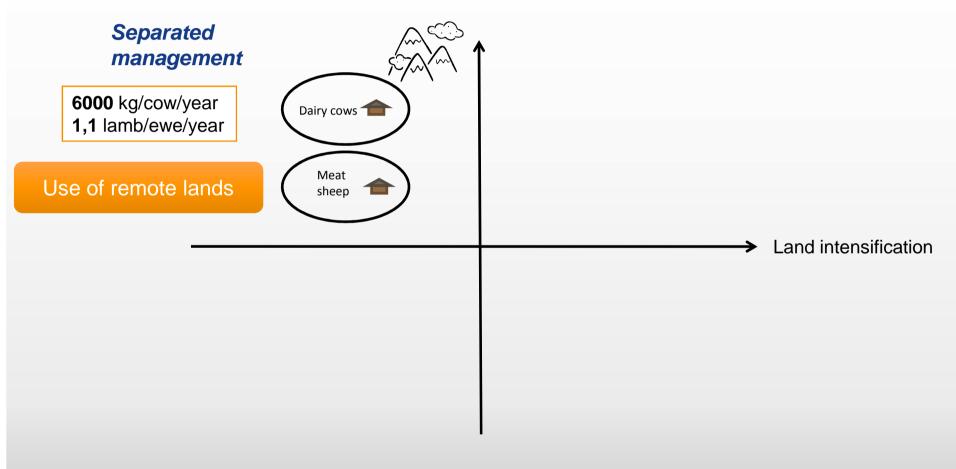


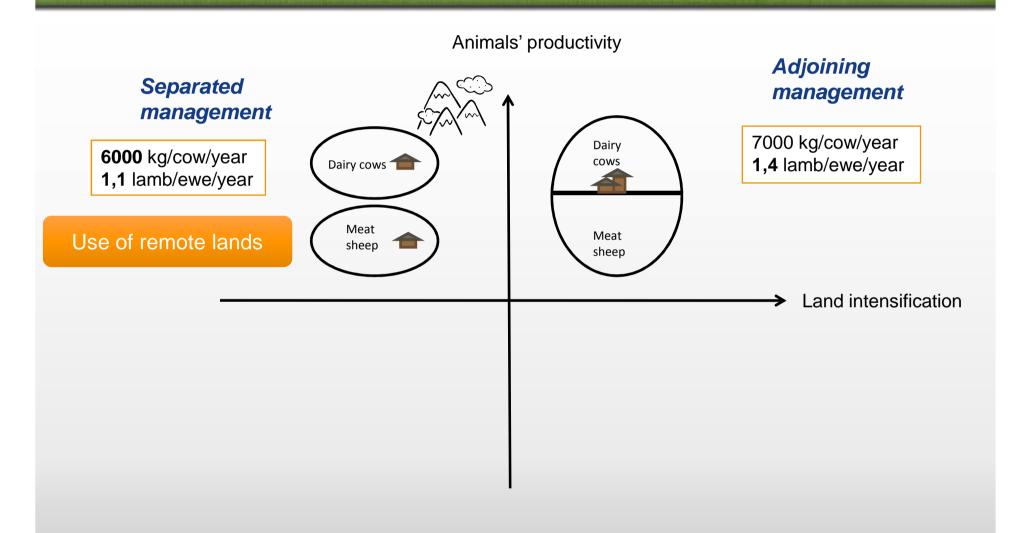


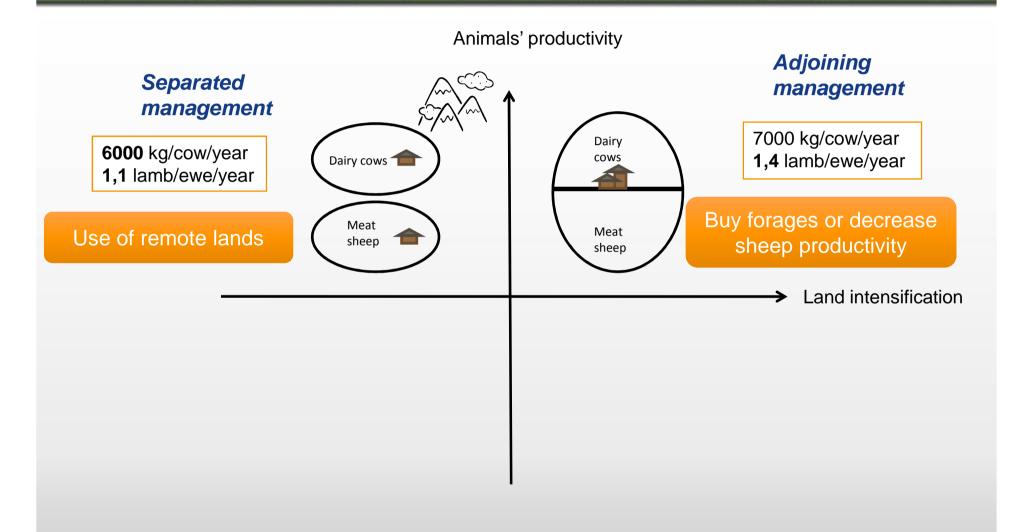
Animals' productivity

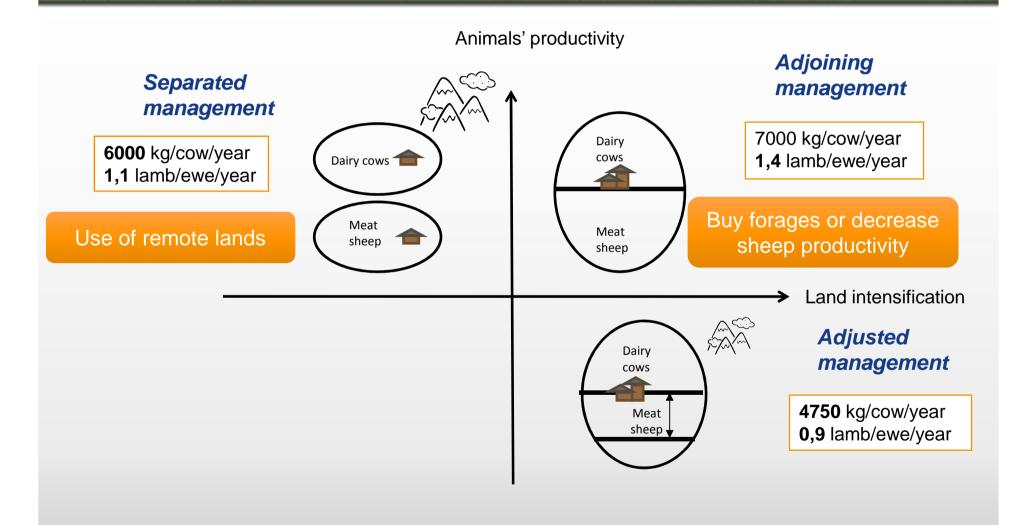


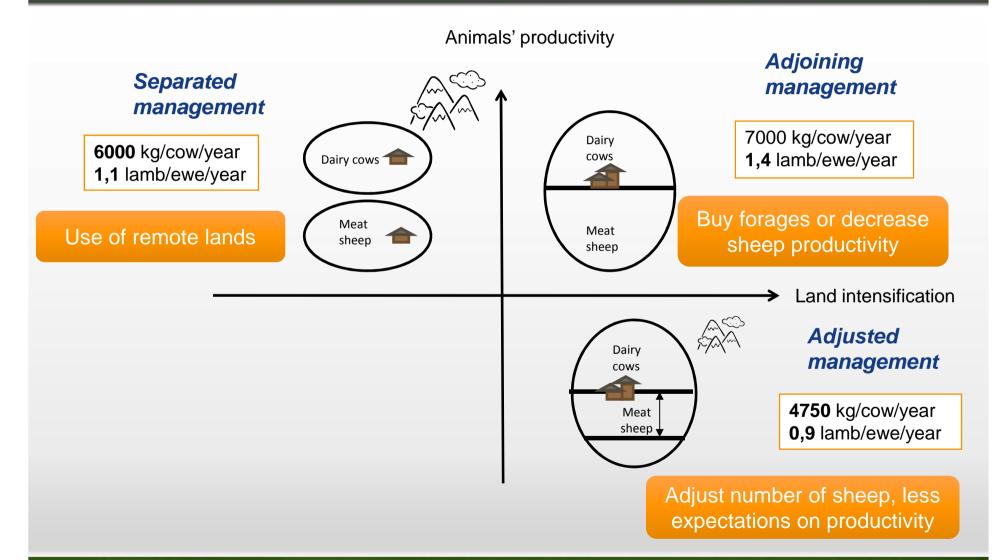












Animals' productivity

Dairy

cows

Meat

sheep

Dairy

cows

Meat sheep

Separated management

6000 kg/cow/year **1,1** lamb/ewe/year

Use of remote lands

Dairy cows Meat sheep

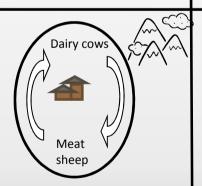
Adjoining management

7000 kg/cow/year **1,4** lamb/ewe/year

Buy forages or decrease sheep productivity

Interlinking management

5500 kg/cow/year **0,9** lamb/ewe/year



Land intensification

Adjusted management

4750 kg/cow/year **0,9** lamb/ewe/year

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Adjust number of sheep, less expectations on productivity



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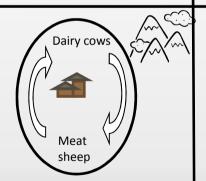
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Land intensification

Adjusted management

Sharing resources and playing with species complementarity

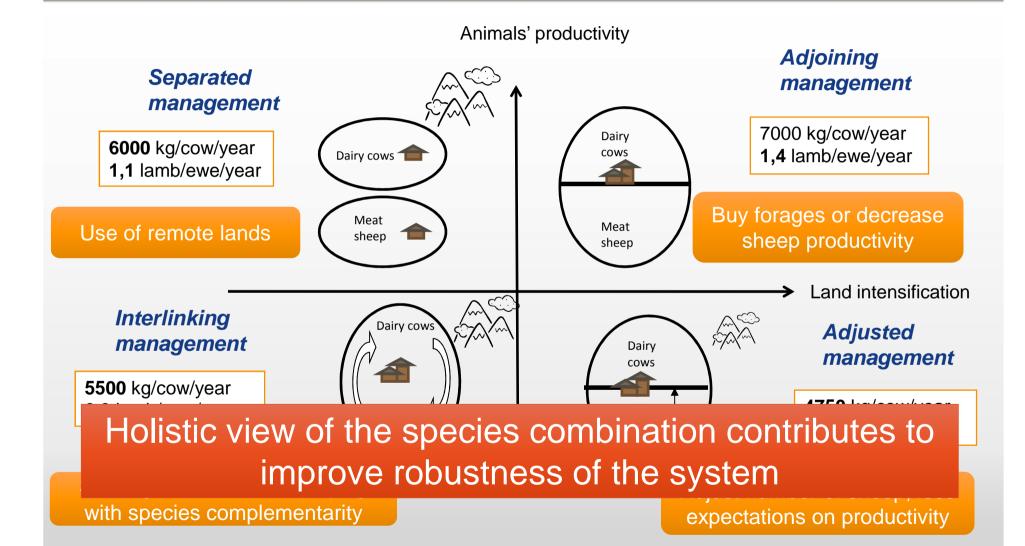
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Adjust number of sheep, less expectations on productivity



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Physiologic status



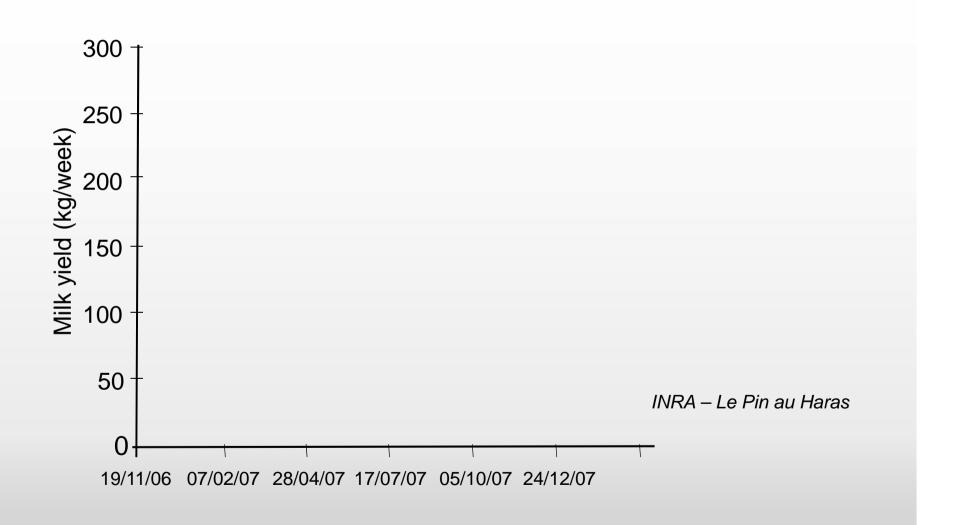
- Physiologic status
- ⇒ Diversity of individual capacities to face disturbances → robustness



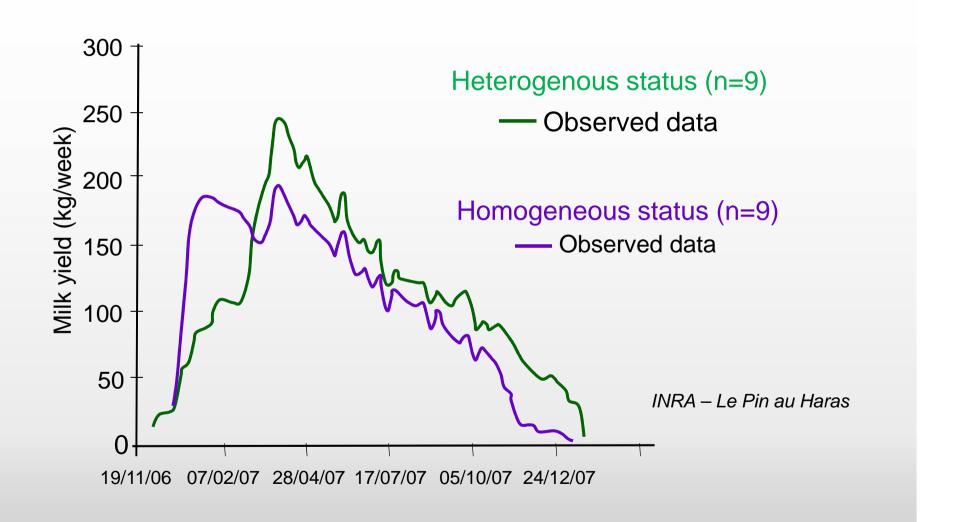
- Physiologic status
- Diversity of individual capacities to face disturbances → robustness
- ⇒ Case study: dairy cows



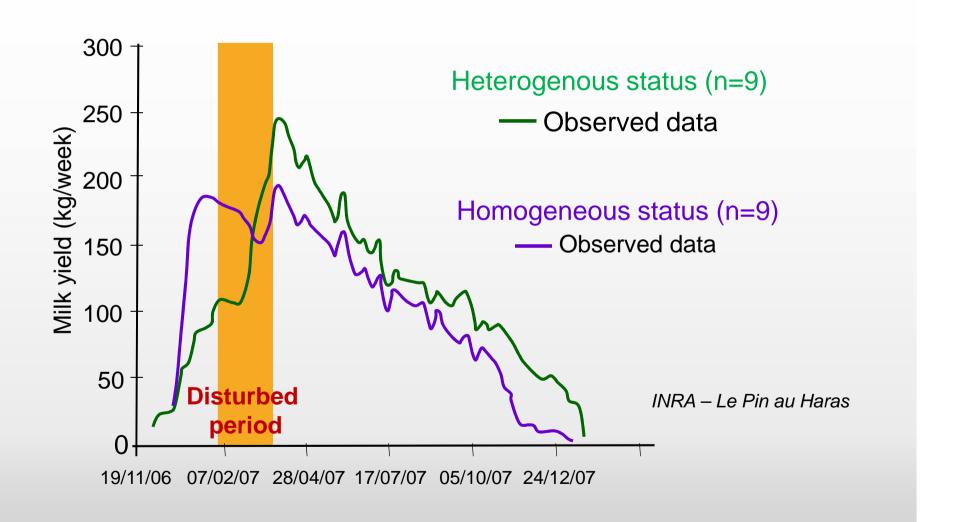




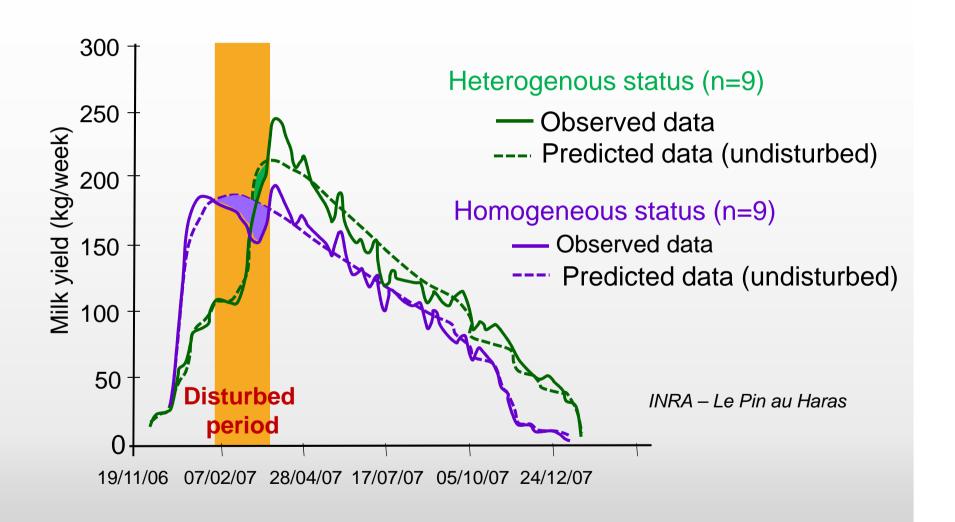




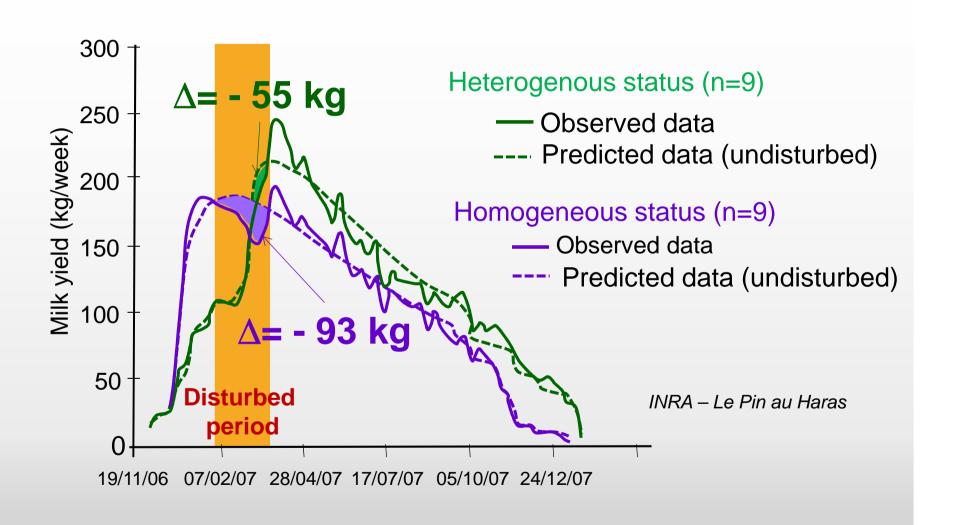




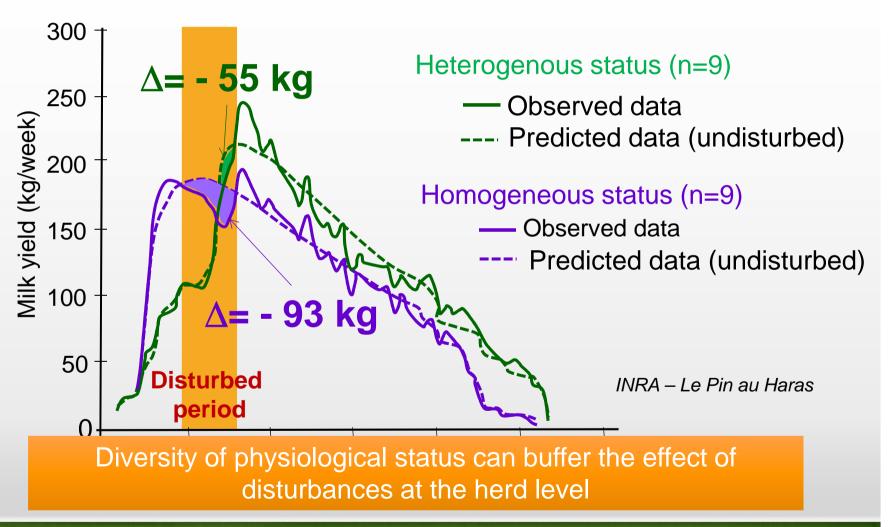
















⇒ Robust cows:

 Able to produce and reproduce in a wide range of environments (Knap, 2005)

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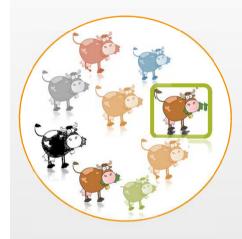


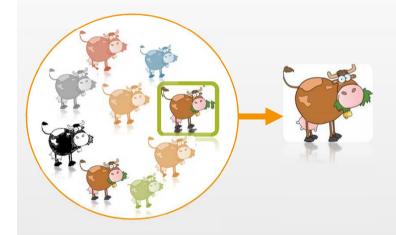
⇒ Robust cows:

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A robust cow gives **adaptive answers** to disturbances maintaining her in the range of farmer's expectations and so contributing to her longevity

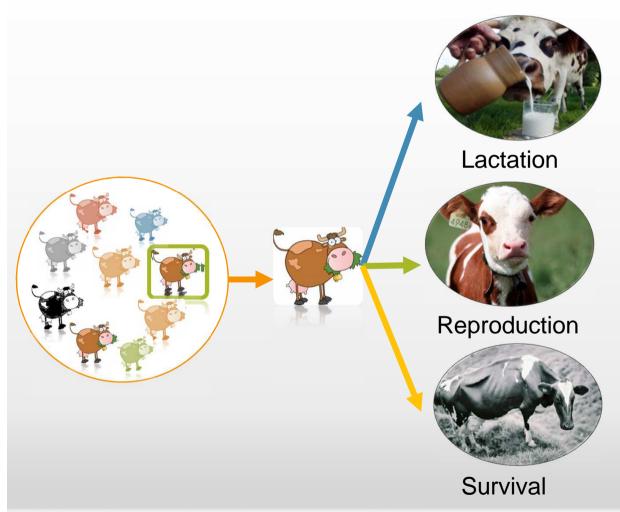


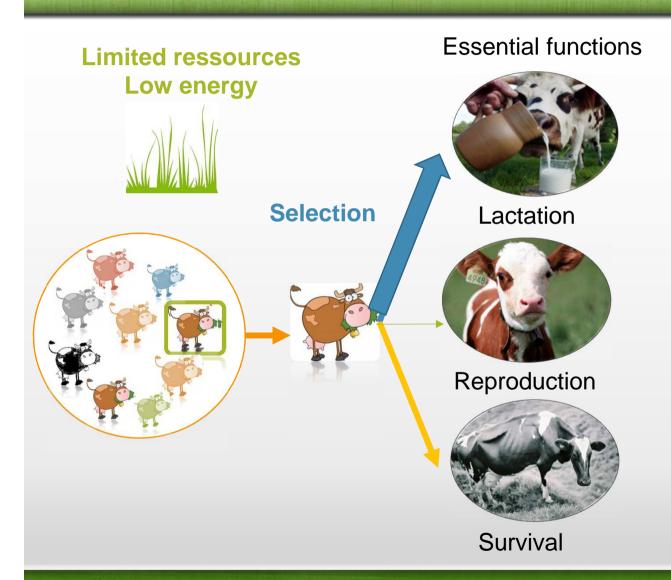




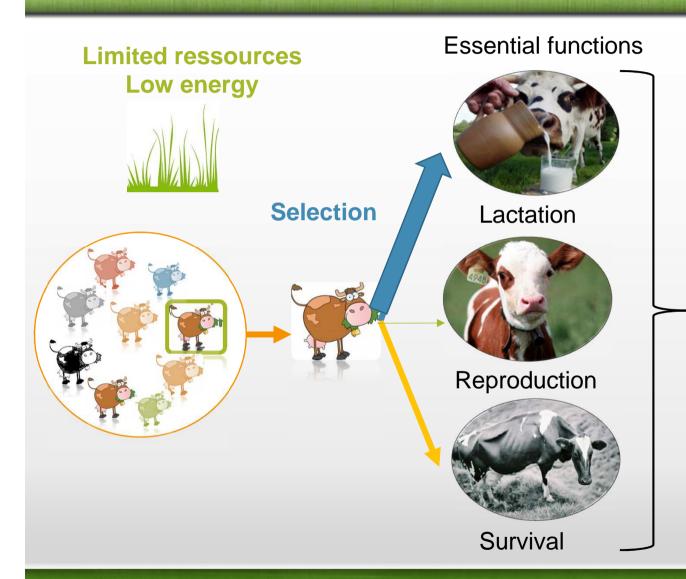


Essential functions







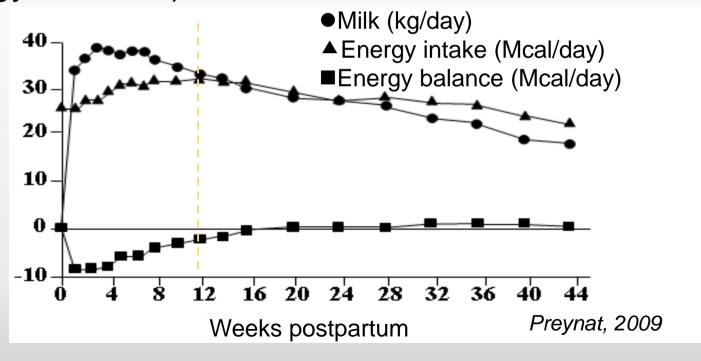


Trade-off profiles

 Used the period 0-90d postpartum: suboptimal nutritional period (negative energy balance)



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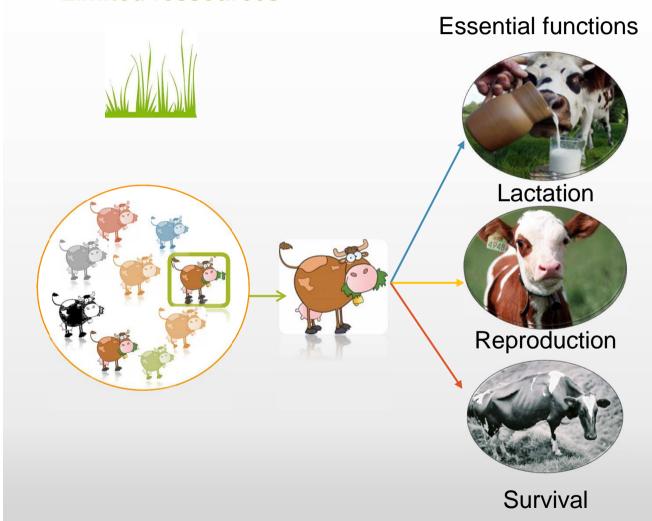
- Used the period 0-90d postpartum: suboptimal nutritional period (negative energy balance)
- Data from Inra experimental units of Mirecourt (2002-2012) et du Pin-au-Haras (2006-2011)

Data on milk yield, BCS, reproduction, individual characteristics (number lactation, âge at 1st calving...)

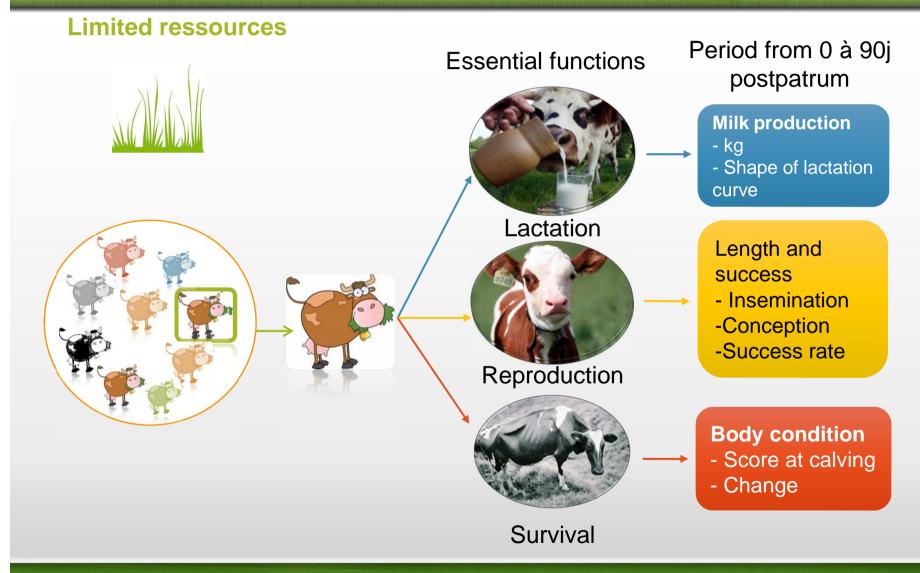
→ 334 validated lactations



Limited ressources

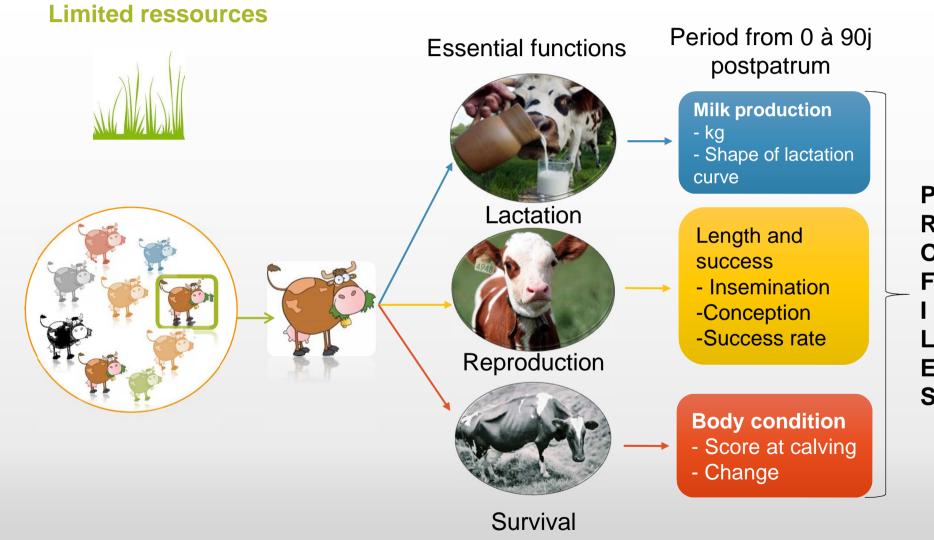






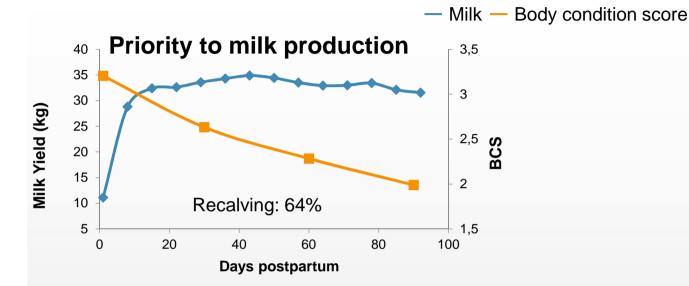
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Diversity of individual robustness

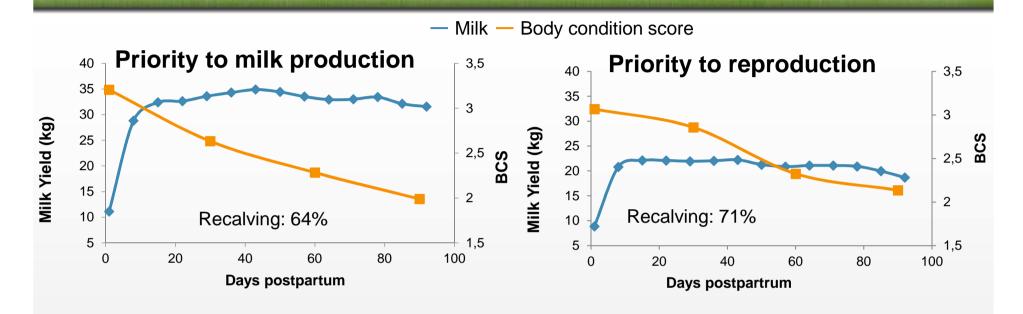


Milk — Body condition score

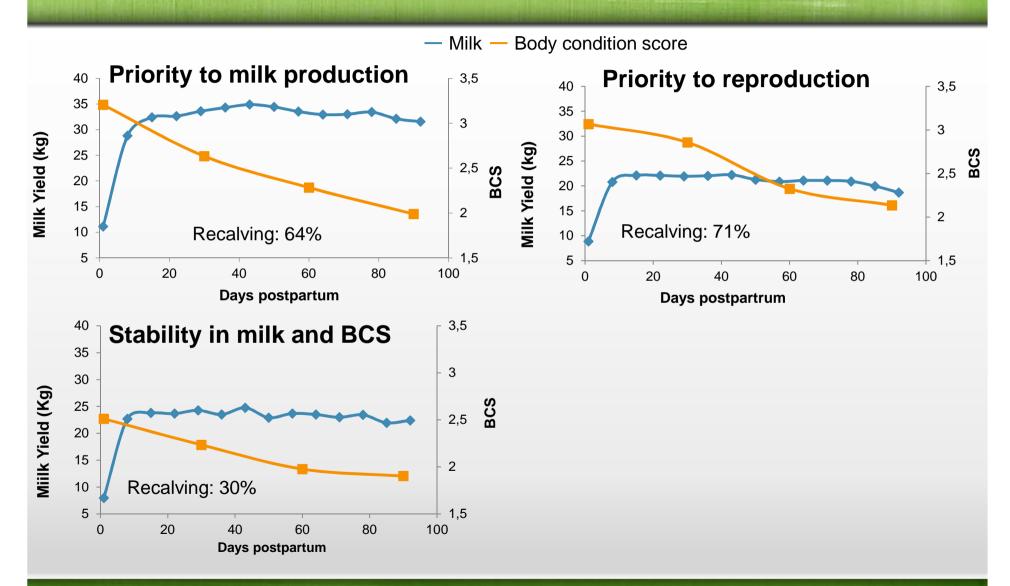








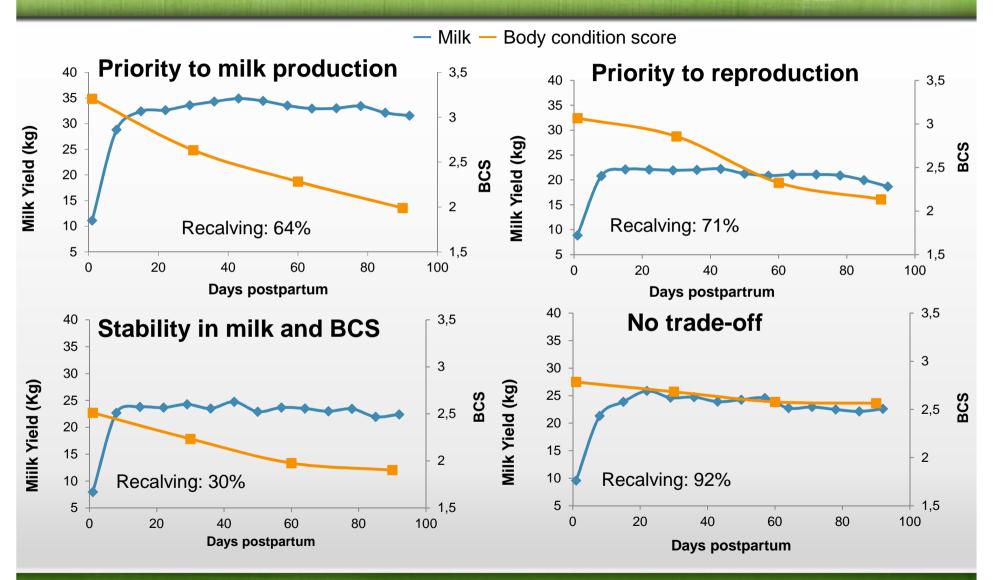




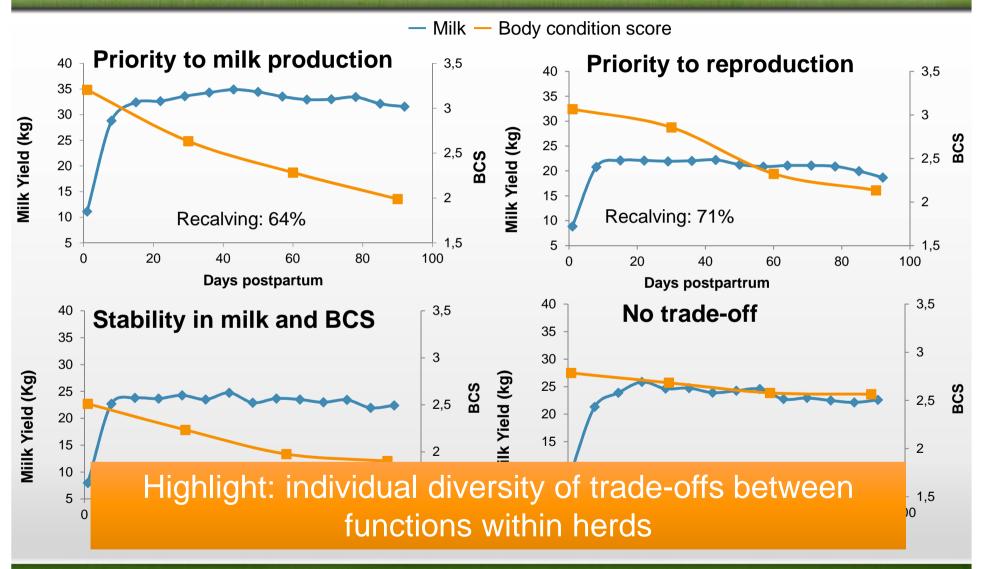


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Profile 1



Profile 2



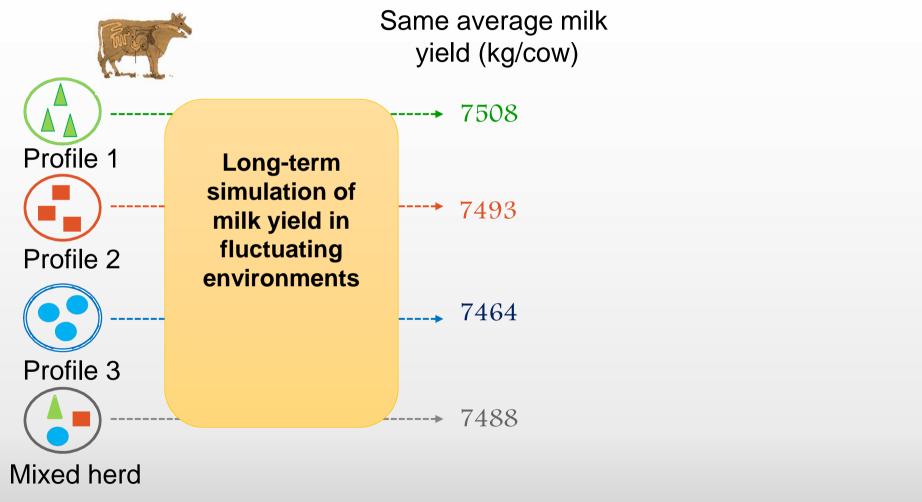
Profile 3



Mixed herd

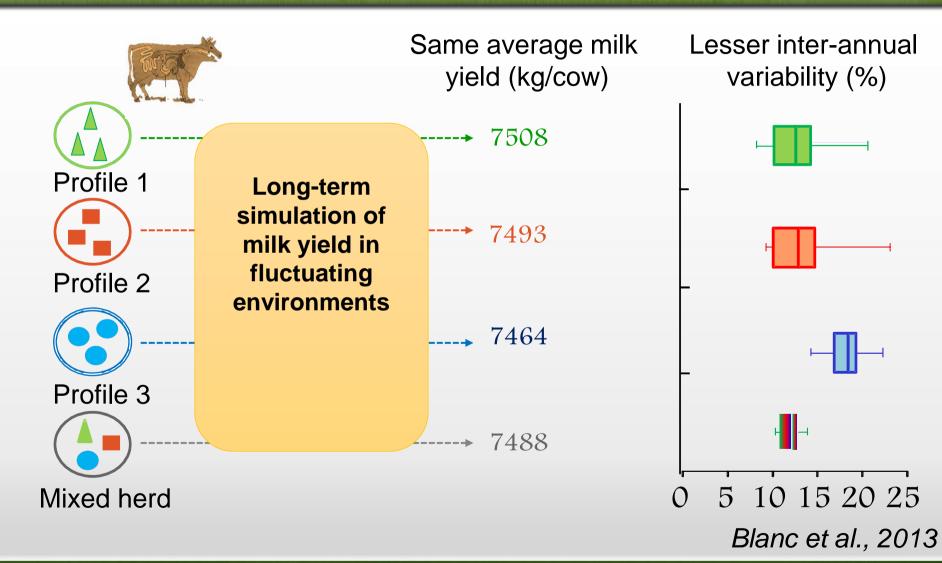
Long-term simulation of milk yield in fluctuating environments

Blanc et al., 2013

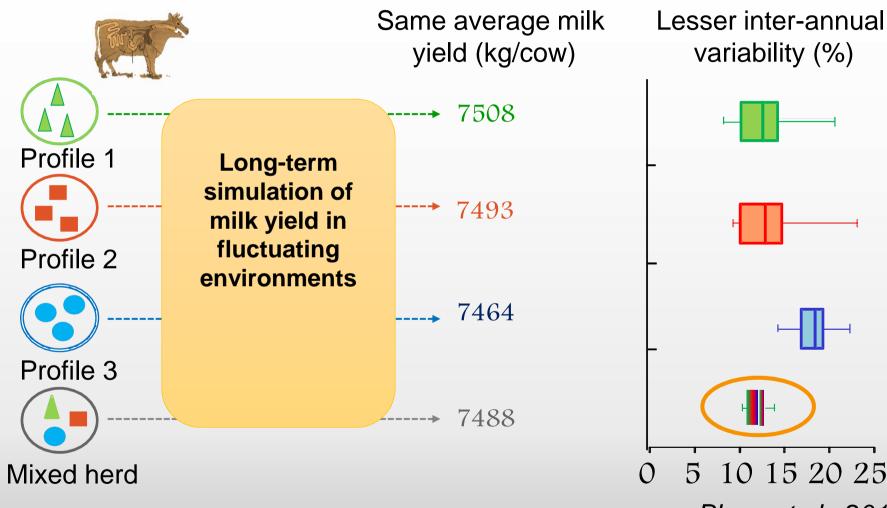


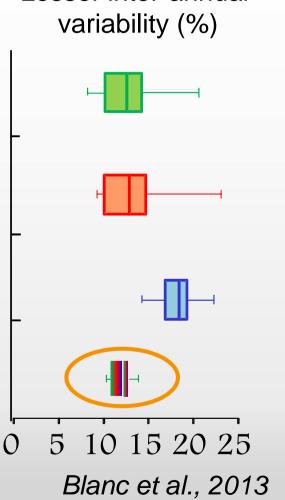
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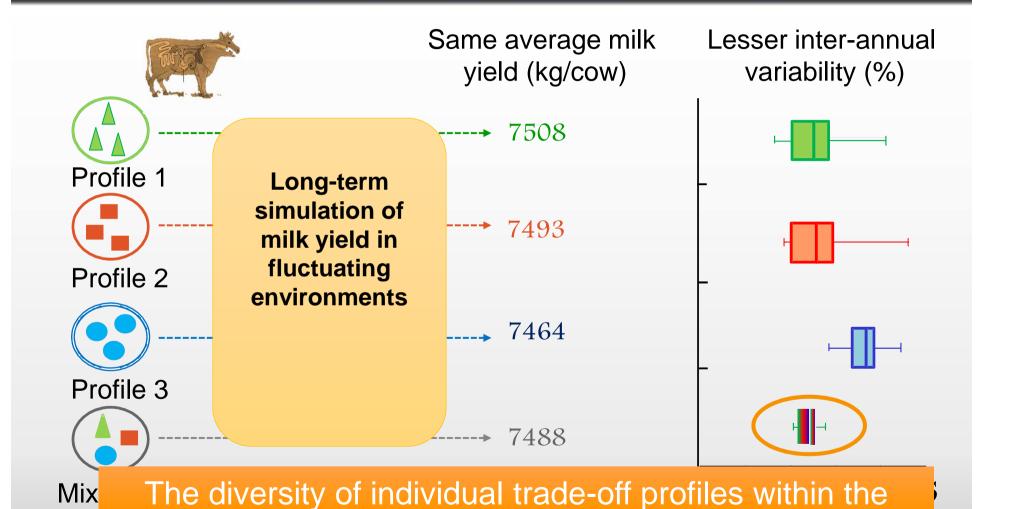












herd does not increase production but brings stability



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ELEVAGE

L'homogénéité du troupequ chez les ruminants

L'une des premières causes de mauvaise santé animale en bâtiment vient d'une inadaptation de la ration. Il n'est pas rare que pour faire face à l'hétérogénéité le production des animaux les individus les moins erformants soient suralimentés et les plus performants pient sous alimentés. L'homogénéité du troupeau est ne étape indispensable pour adapter au mieux la ration.

our vérifier que son lot (gestation, mise bas...). Le nécessaire que le troupeau soit

"Herd homogeneity is an essential step to optimize animal feeding"

ins. Devant un groupe ment, il précise les généité du troupeau. ectivement, sur les aphies qui défilent, la stration est frappante.

aysans des alentours dizaine de jours (les ruminants troupeau doit également offrir n'aiment pas les changements). ents objectifs de 11 n'est en revanche pas qui concerne l'état d'entretien, de se débarrasser des

doivent se dérouler sur une du comportement social, le une homogénéité visuelle en ce

présentent des symptômes. Il serait contreproductif

tormation

La Maison des Paysans vous prop former. L'objectif est de redécouvrir la ph de la digestion des ruminants et la mét Obsalim[®]. La présentation de quelque situations permet à l'éleveur de change ses animaux et de s'interroger sur l'effe alimentaires. Les prochaines formation C le 13 janvier dans le secteur de Giat et secteur de Thiers. Plus d'infos : 04 7

la propreté, la vitalité des anima Sur un troupeau homogène qui présente un ensemble d'animaux maigres, sale ou fatigué, le paysan aura tout intérêt à adapter l'alimentation de son troupeau afin d'améliorer sa qualité. En revanche, un troupeau hátérogène, quec quelques



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39 surveyed dairy farms in three distinct dairy areas

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39 surveyed dairy farms in three distinct dairy areas



RECOAd Wintering 3011

39 surveyed dairy farms in three distinct dairy areas

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- 39 surveyed dairy farms in three distinct dairy areas
- Already existing diversity:
 - Herd size: from 25 to 200
 - 72% one breed, 18% two breeds, 18% crossbred
 - 26% in organic agriculture

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- ⇒ 44% see interest in diversity of physiological status

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- ⇒ 44% see interest in diversity of physiological status
- ⇒ 51% see interest in individual diversity

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- ⇒ 51% see interest in individual diversity
- ⇒ 13% see the link between diversity and robustness



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There is still a gap between farmers seeing diversity and farmers managing diversity



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Agroecology is a transition pathway to move toward more sustainable livestock systems

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- ⇒ Diversity is a resource contributing to systems capacities to face disturbances e.g. climate change



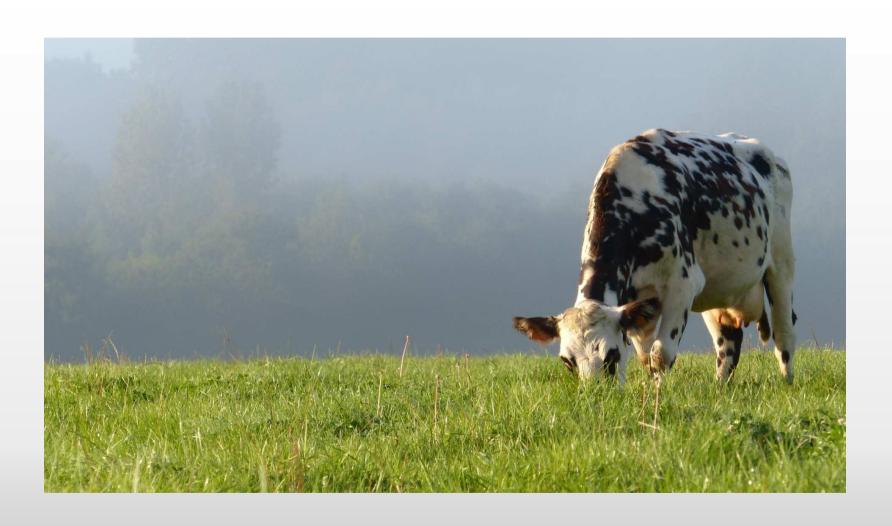
- Agroecology is a transition pathway to move toward more sustainable livestock systems
- Diversity is a resource contributing to systems capacities to face disturbances e.g. climate change
- ◆ A gradient of diversity can be found in livestock production systems: resources, species, physiological status, individual robustness



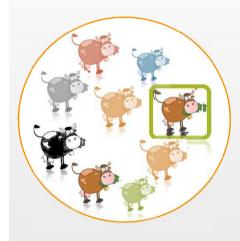
- Agroecology is a transition pathway to move toward more sustainable livestock systems
- Diversity is a resource contributing to systems capacities to face disturbances e.g. climate change
- ⇒ A gradient of diversity can be found in livestock production systems: resources, species, physiological status, individual robustness
- ⇒ These diversities are already experimented on the field. More knowledge is needed to give tools for farmers to manage diversity

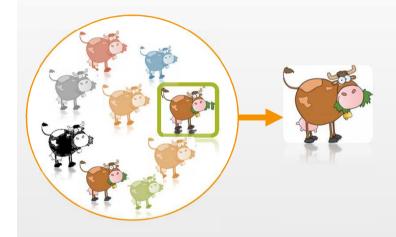


Thank you for your attention



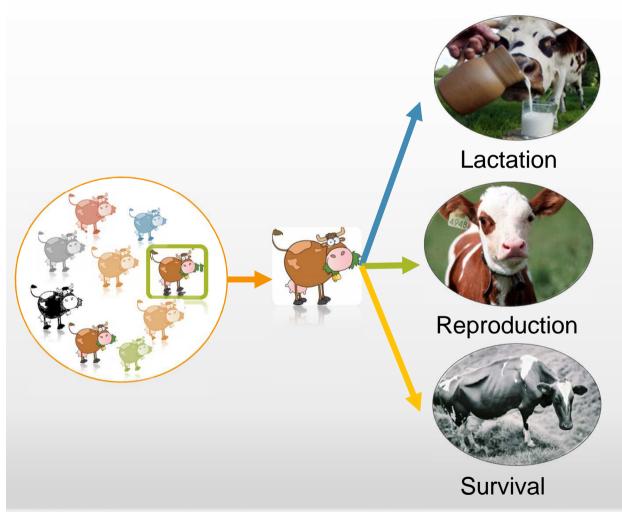




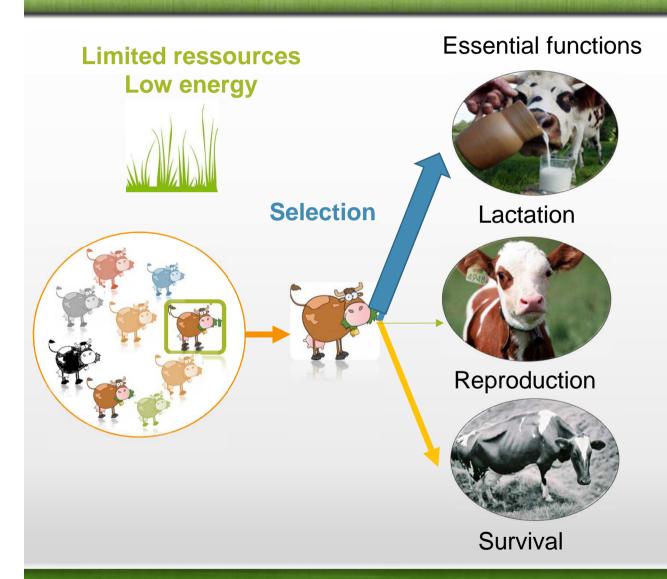




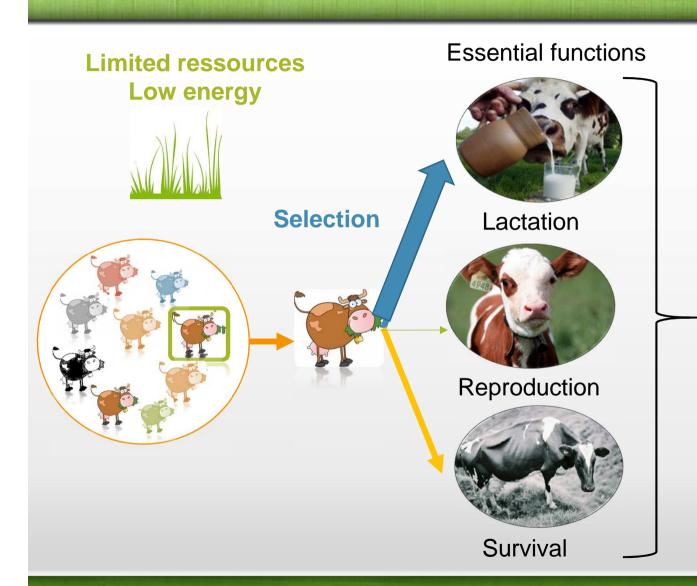
Essential functions







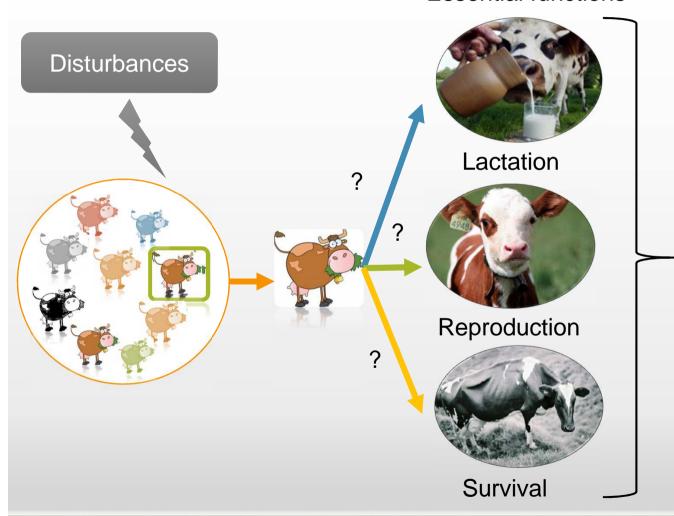




Trade-off profiles

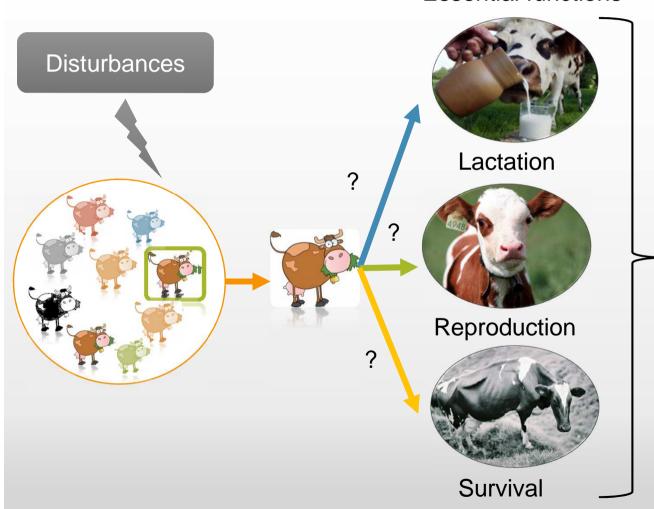
ReColAd Winterhip 2018

Essential functions





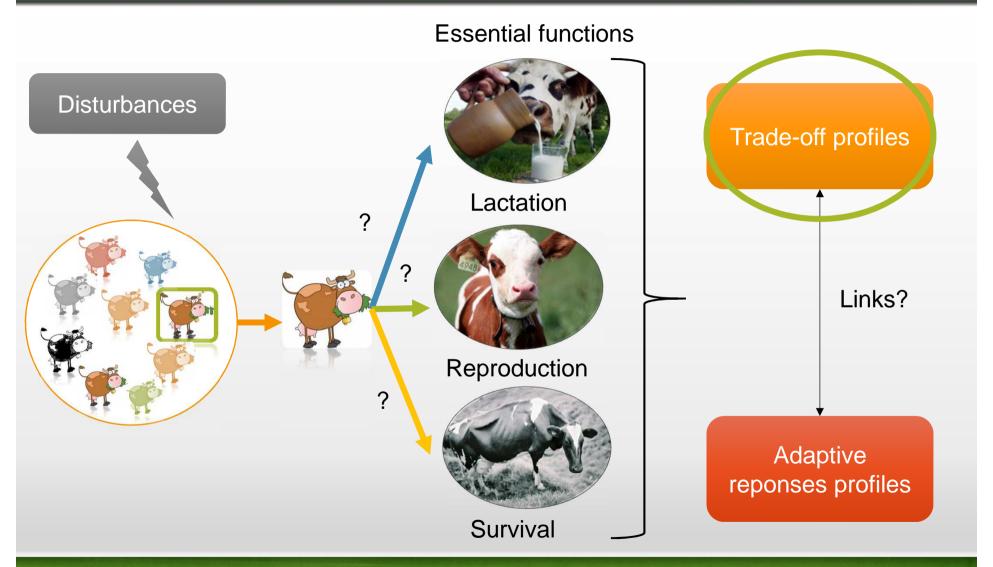
Essential functions



Adaptive reponses profiles



Essential functions Disturbances Trade-off profiles Lactation Links? Reproduction Adaptive reponses profiles Survival



ReColAd Wiletship 2018