



Measurement enhances the operationalization of resilience concept applied to livestock farms

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Session 41. Resilient livestock farming systems in the context of climate and market uncertainties

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Introduction : what is resilience ?

Ten classes of definitions of resilience

(Brand and Jax, 2007. *Ecology and Society* 12: 23)

*“There is a tension between the **original descriptive concept of resilience** ... in ecological science and a ...malleable **notion of resilience used as an approach or boundary object** by different scientific disciplines”.*

From Metaphor to Measurement: Resilience of What to What?

(Carpenter et al., 2001. *Ecosystems* 4: 765–781)

*“Resilience is the **magnitude of disturbance** that can be tolerated before a socioecological system (SES) moves to a different region of state space controlled by a different set of processes”*

Rangelands in Australia (NSW)

Resilience of the wool production, based on grazing by sheep

Of what : grass + shrub state

To what : Short-term change in climate, herbivory, fire

Measure : distance between stable point and unstable threshold in units of grass root biomass (mass/area)

Introduction

Two conceptualisations of resilience

conservative notion of **return to equilibrium** versus **transformability**
(Darnhofer, 2014. *European Review of Agricultural Economics* 41: 461–484)

Resilience in the context of farm management

- **buffer capability**, assimilating a perturbation without changes
- **adaptive capability**, adjusting in the face of changing external drivers and internal processes (incremental changes)
- **transformative capability**, implementing radical changes, transition to a new system

Capability (rather than capacities ?)

is an iterative, reflexive process (to identify opportunities, to mobilise resources, to implement options, to develop processes, to learn)

is not an asset or an automatic response that can be deduced from the characteristics of the farm

Introduction

How to operationalise the notion of resilience for Livestock Farming Systems?

Hypothesis:

Quantification, through on-farm studies on practices and performances, enables highlighting the three capabilities proposed by Darnhofer

Mean:

Apply the conceptual framework to two previous case studies,

- identifying the resilience of what,
- sorting the levers used by the three capabilities

Two mid-term case studies in sheep farming

French Mediterranean sheep farmers

South of *Massif Central*, in agropastoral context (*Causses, Cévennes...*)

Farm orientation	Meat sheep	Dairy sheep
Farm sample (n)	8	11
Years studied	2009-2013	2015-2018
Issue addressed	Marketing as lever of flexibility	Coping with drought
Methods	Repeated surveys, monitoring ongoing changes	One survey (2018) depicting current and past changes
<i>References</i>	<i>Nozières, 2014 PhD</i>	<i>Sodre, 2018 Master thesis</i>

Resilience of What ?

Farmers' goal : to get an income consistent with their values, combining the selling of products and CAP subsidies

Mid-term changes of the marketing pattern

Products	<i>Various live lambs</i> <i>Butchered half-lambs</i> Diversified / Stable	<i>Milk</i> Specialized / Stable
Annual quantity	Variable according to the lamb types and buyers	Stable
Seasonal delivery pattern	Variable	Stable
Buyers	One to several / Stable	One or two dairy enterprises / Stable
Marketing pattern	Flexible	Stable

Buffer capabilities for stability

Excess capacities, reserves		<ul style="list-style-type: none">• Fodder stock in advance• Feed purchases• Rangelands
Redundancy in resources	<ul style="list-style-type: none">• Provisory shifting between established marketing channels	
Shifting input combinations for the same function or level of production		<ul style="list-style-type: none">• Substitution between stored forage and grazing, and use of concentrates
Resilience to what?	Economic hazards or opportunities Climatic hazards	Climate hazards

Adaptive capabilities for flexibility

- Permanent change of the lambing pattern leading to changes in
 - balance between marketing channels
 - feeding practises

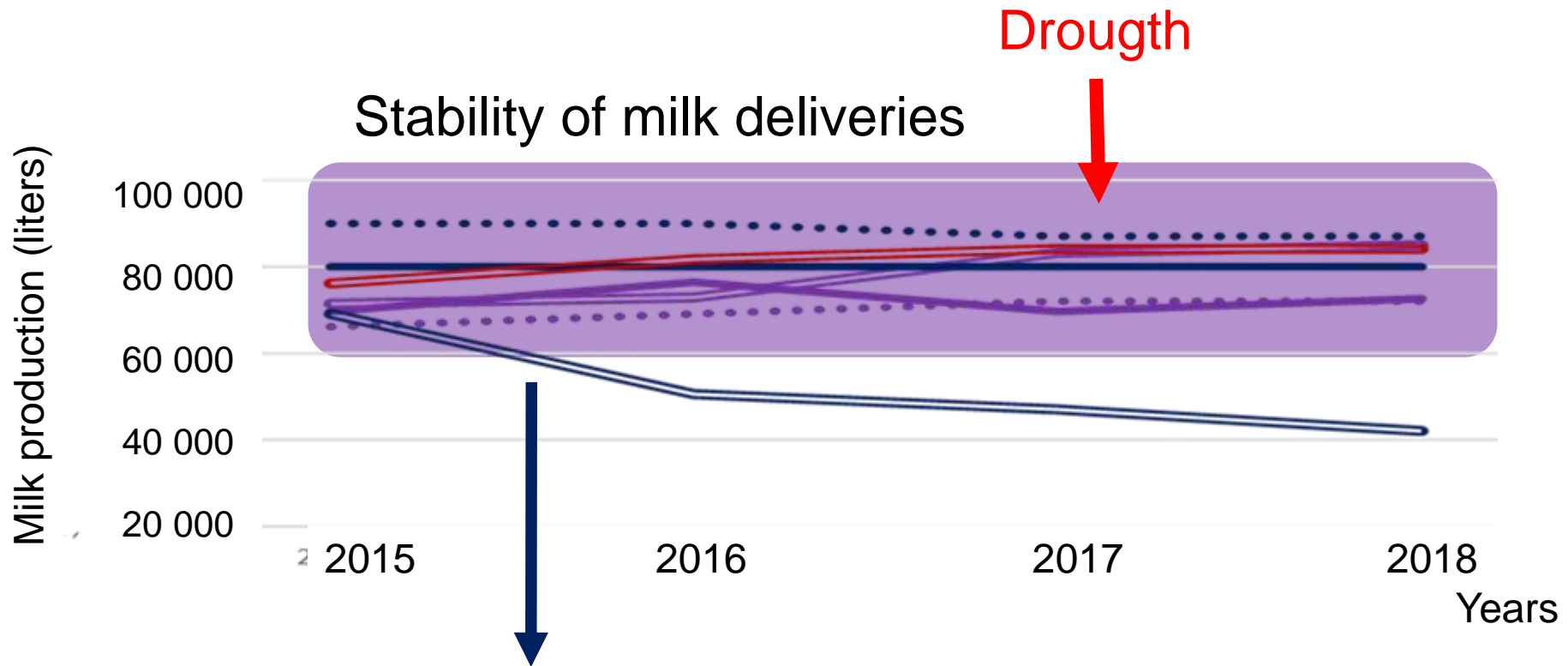
following a provisory shift of marketing channels after an unexpected result during a mating session

- Mixture of species to sow meadows (forage) or crop (concentrates), to enhance the capacity of the vegetal cover to resist to drought
- Use of round bale silage, to harvest forage in earlier

Price opportunities

Climate hazards

Transformative capabilities for change



Changes of LFS strategy

- Decrease of ewe numbers and stocking rate (for a better balance between flock and lands, to cope with climate hazards)
- On-farm cheese processing, to maintain family income

Resilience of what ?

Comprehensive interviews with farmers could be useful to elicit what are their goals, but not always easy

The systematic qualification of inter-annual stability or variability for a set of characteristics (here, the components of the marketing pattern) is relevant to highlight what is at stake for farmers

Qualification: through measurements, available on-farm data, farmers declaratives

Notion of production objectives

Key notion for farm management

Which are the objectives for the production of the flock ?

Ewe productivity (milk per lactation, lambs per year), seasonal lambing pattern...

Which are the means (practices) to implement in order to reach these objectives ? Which are the capabilities to maintain these objectives ?

- Relevant in some situations (seeking of stability for a majority of dairy farms here, but also for one meat farm case)
- Not relevant in other situations (keeping the flexibility in the marketing pattern for some meat farms)

Discussion

Buffer, adaptive and transformative capabilities

(Darnhofer, (2014)

An applicable framework, when considering specific cases.

Relevance of this framework :

- Encompassing the various dimensions of resilience, from stability to changes
- There is no need to specify the « to what », the capabilities are processes that enable stability, incremental adaptation or radical change, in regard of various changes of the external farm environment
- What are transformative capabilities ? If we found a situation of transformation, we did not identify the capabilities that enable this family to handle changes: values, capacity to learn, capacity to maintain and enlarge social network? To take in account in new studies.



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Thank you for your attention

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