

## TRACK 1: Scientific developments in resilience research: resilience thinking as a cross-cutting approach in biological sciences

Understanding how biological systems at different levels of organisation (cells to landscape) respond to stressful perturbations and exploring the mechanisms that determine their resilience is central to biological research. Such understanding is a major scientific challenge and urgently needed to provide the basic knowledge for design and conservation of stable systems in a changing world. Scientists use resilience thinking in subjects as widely different as algal blooms in lakes, stability of global ecosystems, human health, or climate stability of crop production. Approaches used are often based on surprisingly similar theoretical concepts.

In the morning session there will be three presentations on iconic cases of how these concepts are used:

- Tropical rainforest responses to anthropogenic perturbations:  
Marielos Pena Claros (Forest Ecology & Management Group WUR)  
*Understanding resilience of tropical forests to human disturbances*
- The role of entophytic microbiota in determining human and animal health:  
Hauke Smidt (Microbiology group, WUR)  
*How to landscape resilient microbial communities for a healthy host*
- The link between cheating behaviour and ecosystem instability:  
Niels Anten (Centre for Crop Systems Analysis, WUR)  
*Are plants cheating their way to disaster?*

In the afternoon session we will explore in a debate how resilience thinking can be used as a cross-cutting approach in biological sciences.

## TRACK 2: Resilience and regional policies: regional planning and nature policy

Both regional planning and nature policy making are confronted with changes in physical environment, governance, economic returns, societal demands and technological advances at scales that they, regional planners and policy makers, cannot influence. Climate change, global markets, energy transition are examples of external drivers that may result in severe stresses and disturbances at the regional scale. The magnitude of these stresses and disturbances are largely unknown. What is their impact on the region? The challenge for regional planners, policy makers and other stakeholders are to make a planning or policy that is resilient and adequate to meet a multitude of (unexpected) changes. Resilience thinking is pre-eminently an approach to confront unknown futures with the broad spectrum of functions and interests of that region or policy, to improve both.

In the morning session there will be three presentations on how resilience thinking can be applied to regional planning and nature policy development:

- *An historic overview of regional resilience of the pig-industry and the role of institutions in the south of the Netherlands*  
Krijn Poppe (Wageningen Economic Research)
- *The needs and opportunities of resilience for nature policy*  
Paul Hinssen (Wageningen Environmental Research)
- *An approach to improve and test resilience at the regional scale*  
Saskia Werners (Wageningen University)

In the afternoon we will have several clinics. This includes an Agent Based Model (ABM) demonstration that provides insight in decisions of actors and stakeholders and the consequences thereof on resilience, and two hand-on clinics on application of the resilience tools we developed to improve regional planning:

- *Agent Based Modelling of regional resilience*  
Tim Verwaart
- *Clinic: application of Resilience Rosetta to Eems-Dollard estuary*  
Jeroen Veraart, Marjolein Sterk
- *Clinic: application of Resilience Rosetta to Krimpenerwaard*  
Hein Korevaar, Bas Breeman

### TRACK 3: Resilience and social systems

How do social systems deal with challenges? What does this imply for the sustainability goals? How do farms, supply chains, financial institutions and policy makers respond? In this track we show structured approaches to address these questions building on the principles of resilience. In the afternoon, we put science into practice by pitching some concrete applications, followed by a discussion of resilience projects from the audience. The presentations in the morning:

- *Resilience of EU farming systems*  
Miranda Meuwissen (Wageningen University)
- *Resilience and power relations in flood-prone areas*  
Art de Wulf (Wageningen University)
- *A resilience assessment tool to evaluate the Common Agricultural Policy*  
Peter Feindt (Humboldt University at Berlin with team of WUR)

### TRACK 4: Resilience in food production system: resilience of individuals, fields and farms

What makes an individual plant or animal resilient? Is the resilience in the individual itself or is the community of the individuals on field, stable or farm level the main deterrent? In the morning session, different examples will be presented on resilience at individual level and group/farm level. Creating resilience in pigs with artificial intelligence, a study of resilience of aquatic systems to biotic stress, resilience in crops by means of crop diversity and predicting resilience of farms to various stress factors. The different examples in the morning session will broaden the view on resilience and will give new inspiration and insight in the possibilities of combining these different views to strengthen the resilience of production systems. Then the question arises of how can we turn this knowledge into practical applications? These application could for example be in breeding for resilience, designing resilient cropping systems and predicting risks for production losses of a farm caused by extreme stress like drought or flooding. This will be part of the debate in the afternoon session. The morning presentations:

- *Creating Resilience in pigs through artificial intelligence*  
Maikel Timmermans (Wageningen Livestock Research)
- *Resilience of aquatic systems under biological invasions: From ecosystems to genomes*  
Leo Nagelkerke (Aquaculture & Fisheries Group, WUR)
- *Can we be resilient and robust at the same time? Enabling diverse cropping systems in space and time*  
Dirk van Apeldoorn (Farming Systems Ecology WUR)
- *Stress test for farms for physical, biological and economical resilience by*  
Daan Verstand (Wageningen Plant Research, Field Crops)

### TRACK 5: Resilient supply chains

Chain resilience is a multi-dimensional and multidisciplinary phenomenon related to supply chain vulnerability and supply chain risk management. It is the ability of a system to return to its original state or move to a new, more desirable state after being disturbed. The phenomenon is making a transition from the ability to manage risk towards the opportunity of a supply chain that is better positioned than the competition and possibly even gain advantage from disruptions. In the morning session, we will start with presentations on resilience in 4 very different chains. In the afternoon, we will continue with a discussion on the differences and similarities of several chains, by analyzing the morning topics. In the morning session there will be four presentations on iconic cases of how these concepts are used:

- *Information resilience in agro-food domain*  
Ioannis Athanasiadis (Wageningen University & Research)
- *Supply chain resilience measuring methodology for a pig meat supply chain*  
Don Willems (Wageningen University & Research)
- *Cascading instabilities: quantifying resilience*  
George van Voorn (Wageningen University & Research)
- *Grass biorefinery for resilience*  
Marieke Bruins (Wageningen University & Research)