**Session Biosphere: April 11th 15.45 hrs**

**1S1b Models and tools for estimating circularity of alternative food and agricultural systems**

# African pastoralist systems may be historically resilient, but can they become circular in a climate-changed future?

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Pastoralist agroecosystems have been described as resilient to past climate variations due to human adaptation via movement and resource sharing. Nations with significant pastoralist populations have expressed concerns that these populations may be increasingly vulnerable to climate and socio-economic drivers with increasing uncertainty in the near- and longer-term future. We use a coupled landscape/agent model to test the hypothesis that transformation of pastoral livestock systems to a more circular exemplar will enhance the sustainability and resilience at the production, landscape and community scales. We ask two critical research questions to explore this proposition: (1) What elements of pastoralism contribute to present resilience? (2) What system elements need to evolve into a more resilient and circular future? Achieving circularity, however, requires baseline characterization of carbon, nutrient, and water flows to identify current loss pathways and gaps to 'close' the cycles as well as identification of socioeconomic points where key interventions can improve sustainability performance of pastoralist systems. A grid-based, landscape ecology model (SAVANNA) was linked with an agent-based, pastoralist model (DECUMA) to simulate both landscape-scale and family-level agroecosystem dynamics in the Dire woreda of southern Ethiopia, characterized by high spatial and temporal variability. Simulated results of future climate conditions show that complex, inter- and intra-scale relationships and inequalities present evolving challenges in assessing both resilience and circularity, both now and into the uncertain future. These results challenge simplistic notions as to what and who may be resilient or circular and necessitate clear and unambiguous objectives for agroecosystem assessment.

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