Participatory ensemble modeling for decision-making under deep uncertainty

Decision Making Under Deep Uncertainty 2018

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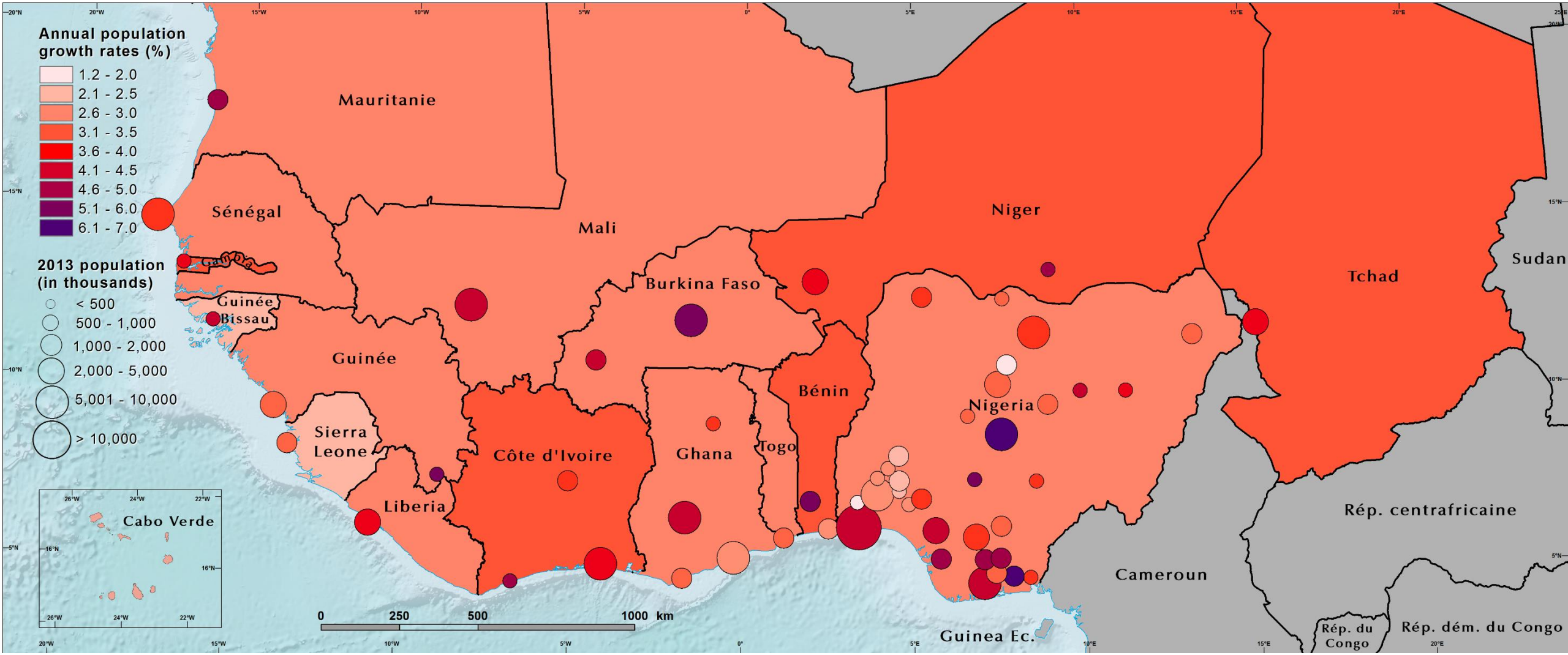
How will West Africa feed itself?



Source: USGS

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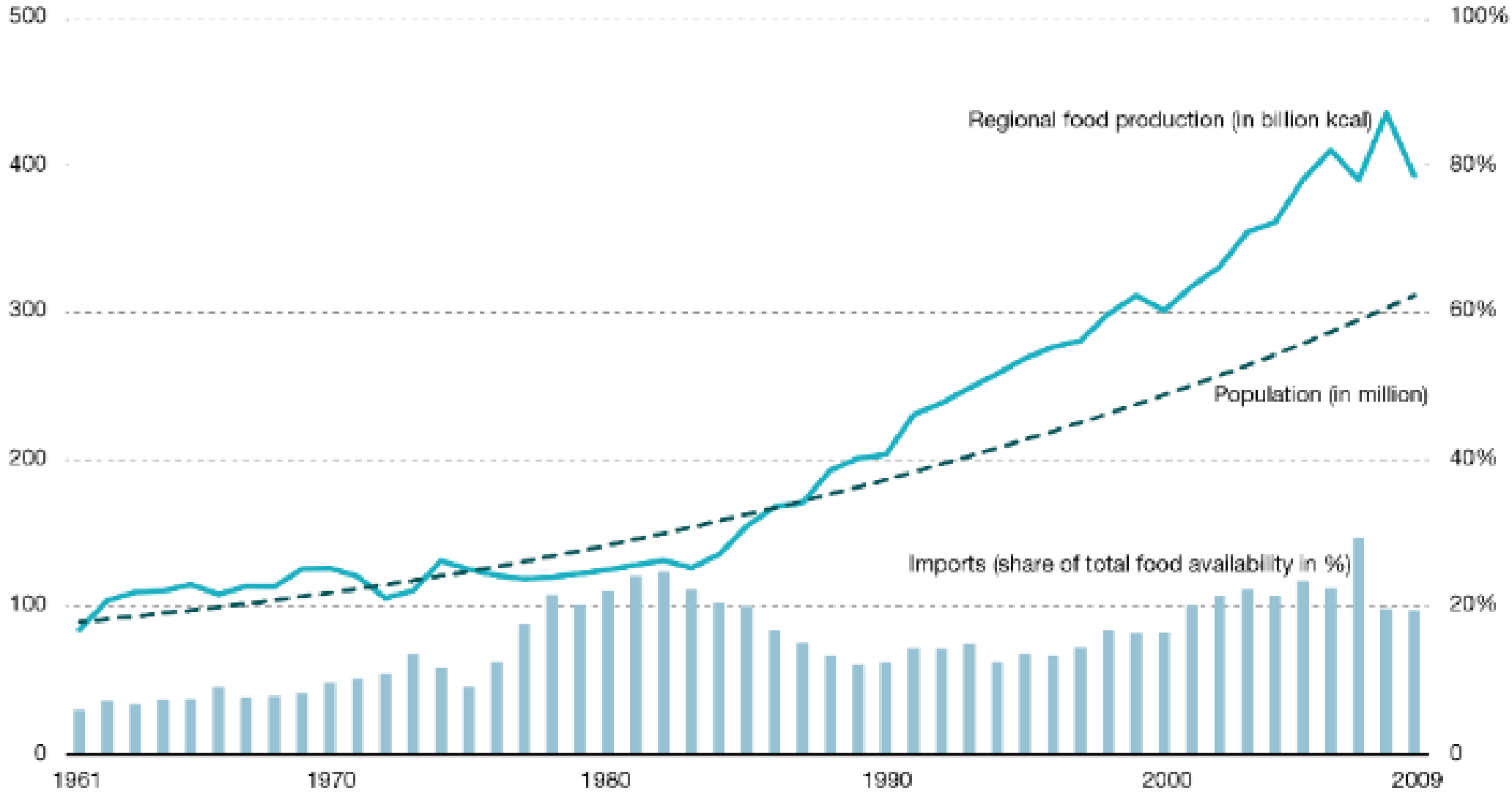

Source: OECD (2013), West African Futures: Settlement, Market and Food Security

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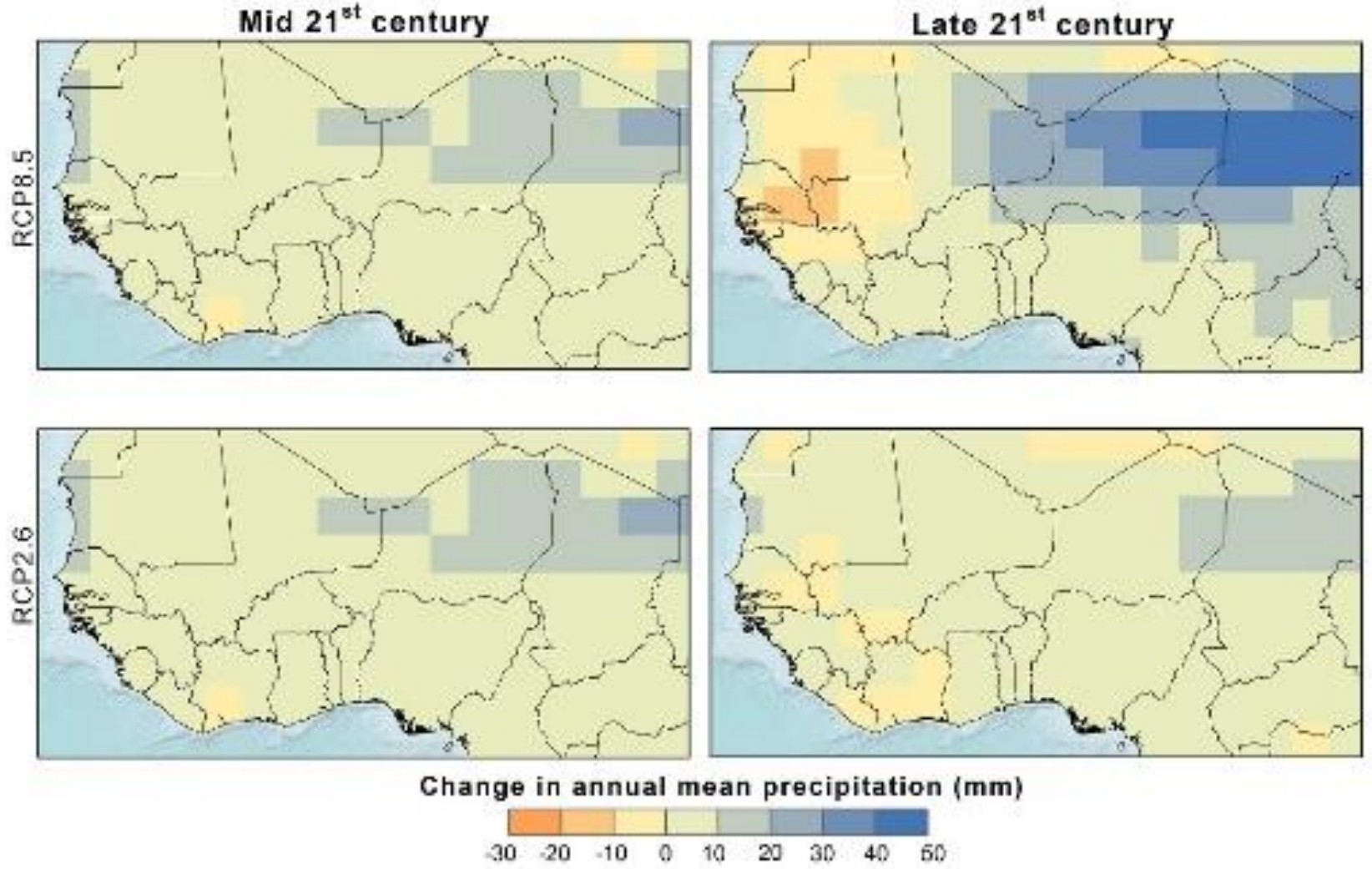
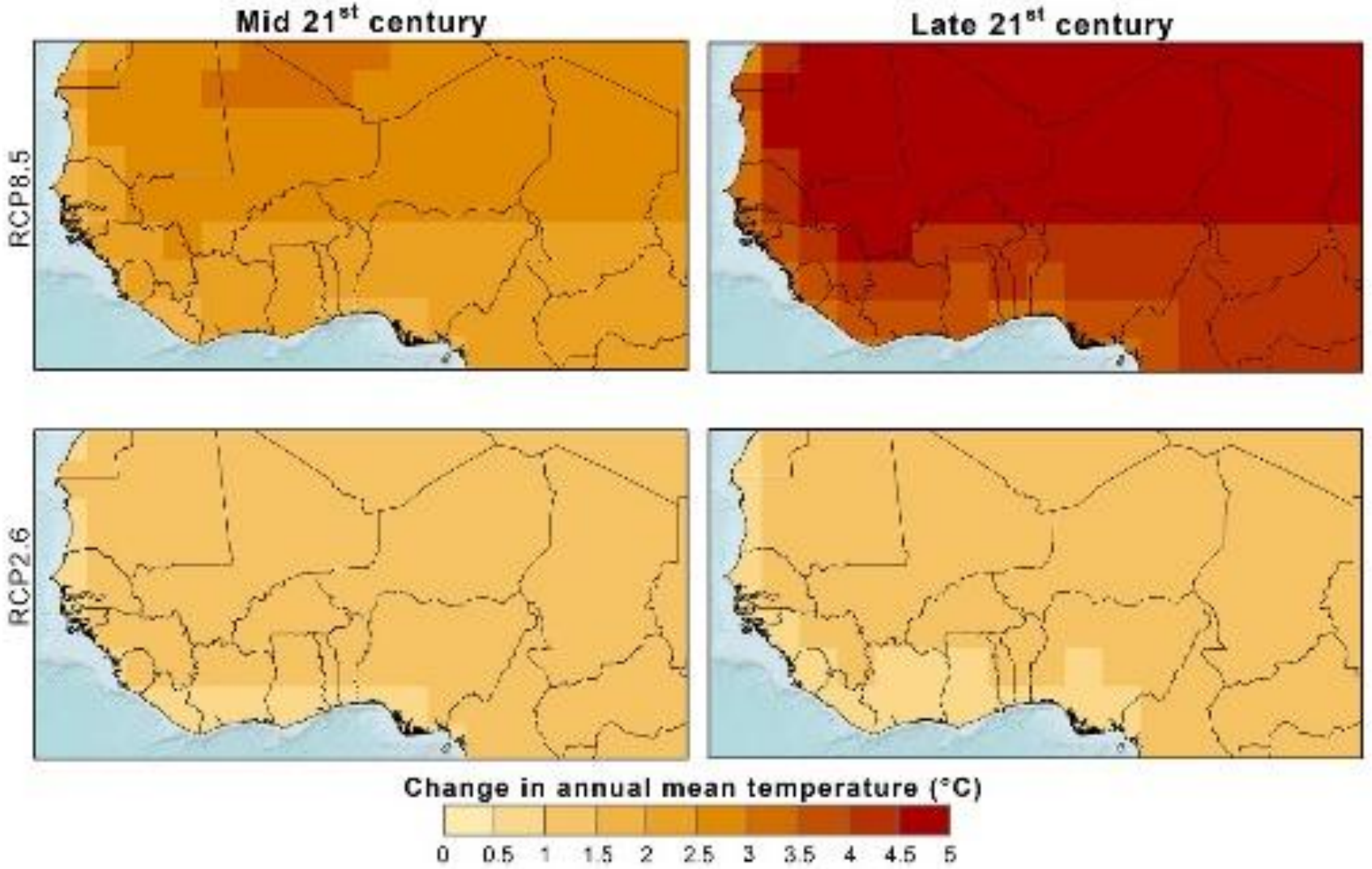


Source: IPCC 5th Assessment

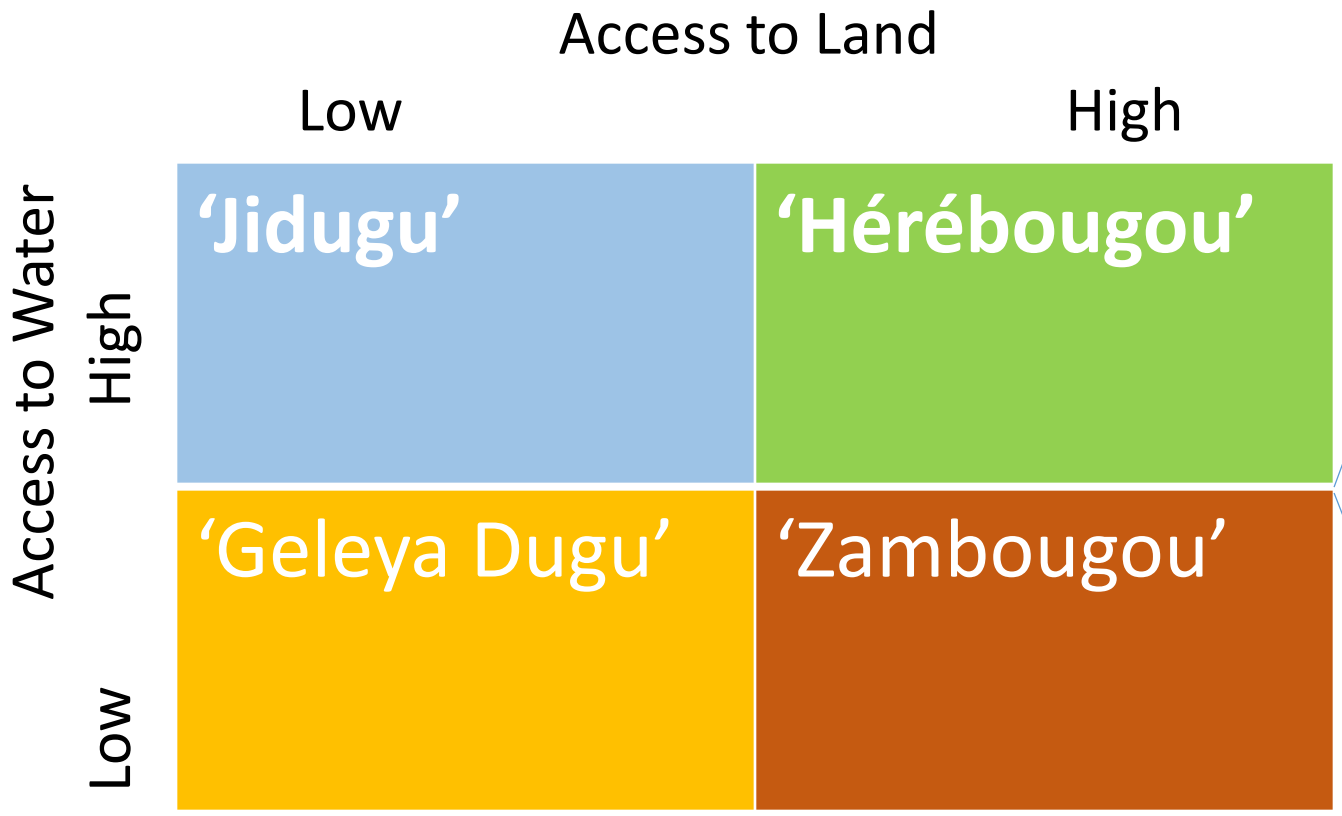
How will West Africa feed itself?



Source: IPCC 5th Assessment

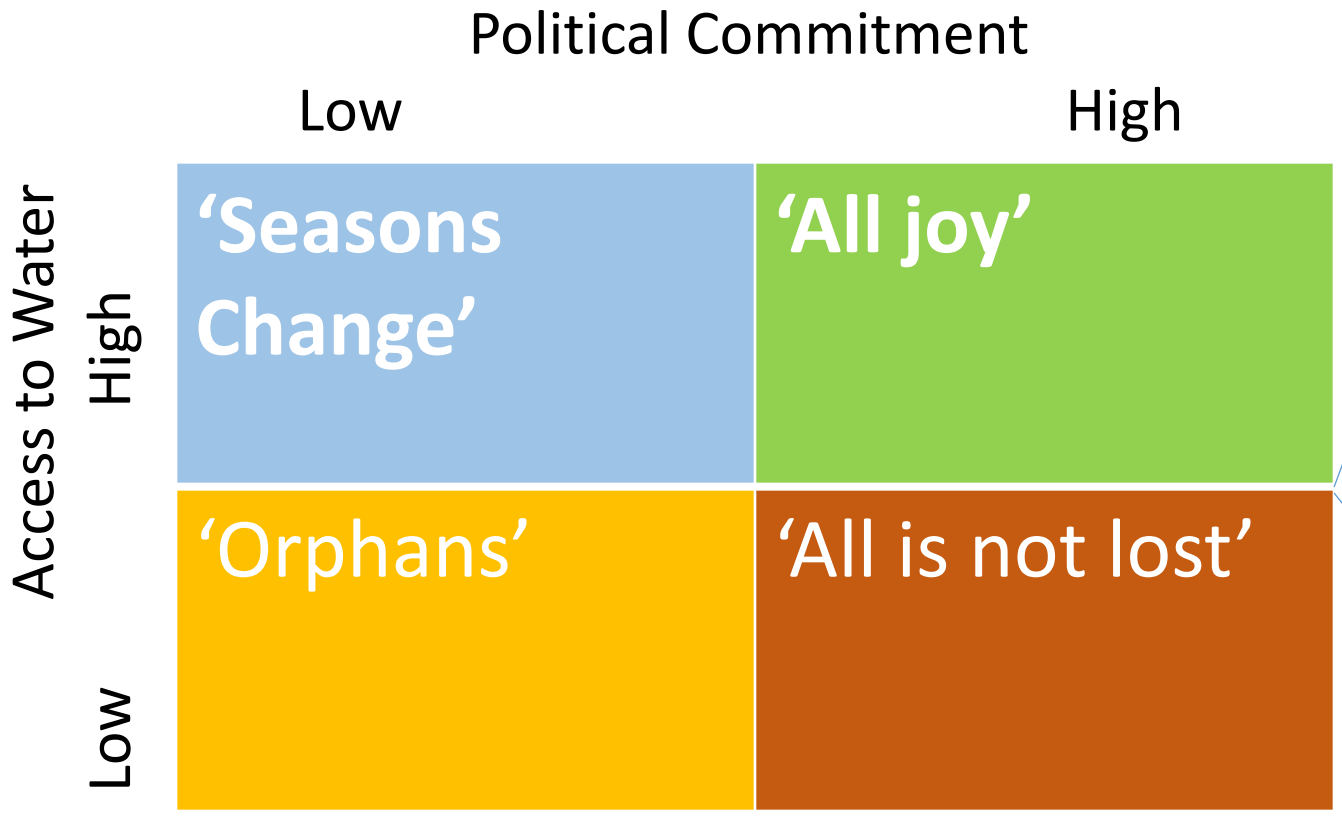
How can we support West African decision-makers to promote food security in the face of high uncertainty and limited data?

Participatory Scenario Analysis: Food Security in Mali



- Winners: Industry
- Vulnerable Groups: Small-scale vegetable producers
- Risks: water pollution, social tension, ↓ ag. production

Participatory Scenario Analysis: Food Security in Ghana



- Winners: Private Sector
- Vulnerable Groups: Smallholder farmers
- Risks: social vices/disputes

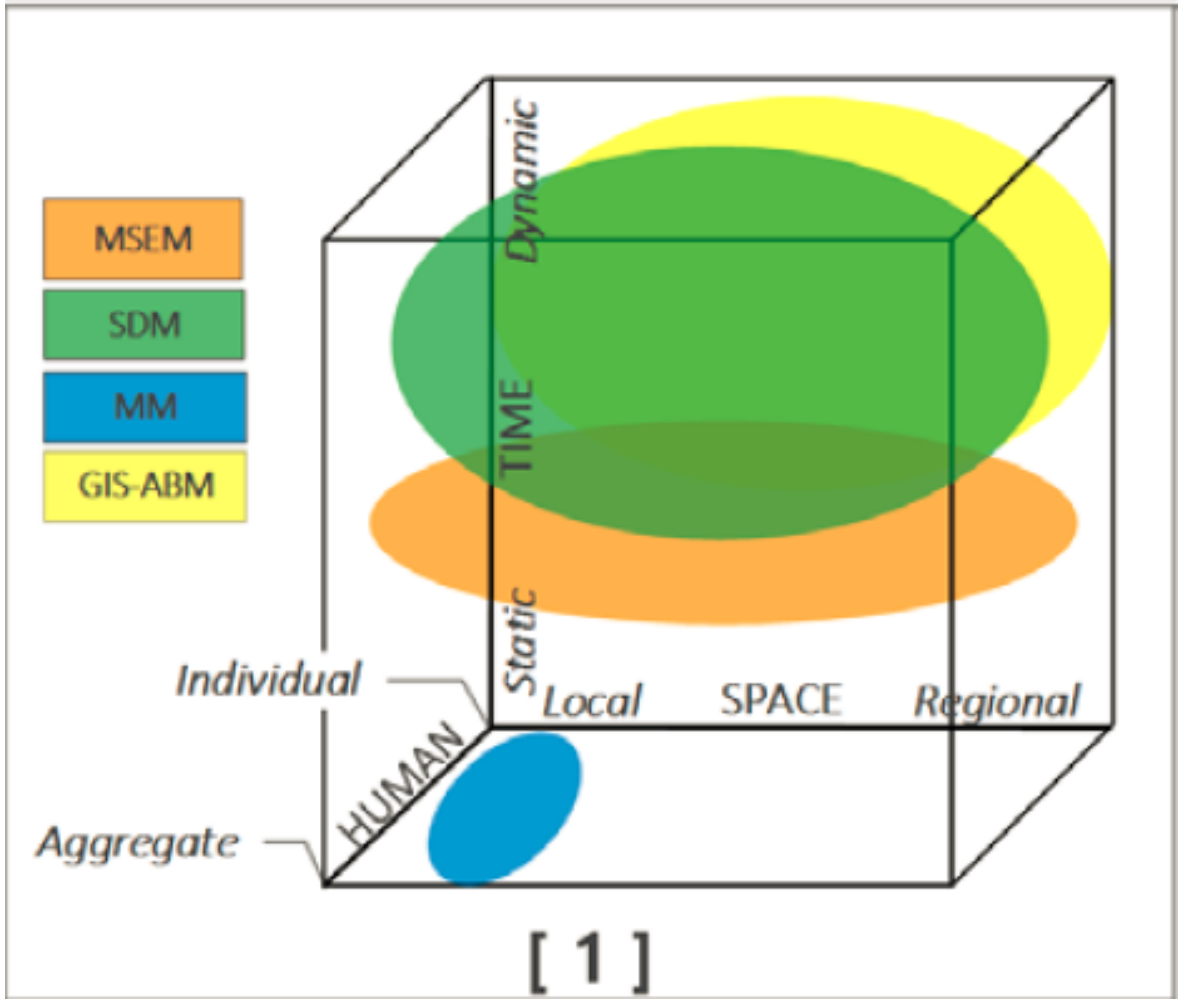
Combining multiple modeling methods to produce a more comprehensive scenario space

Multi-level Structural Equation Modeling

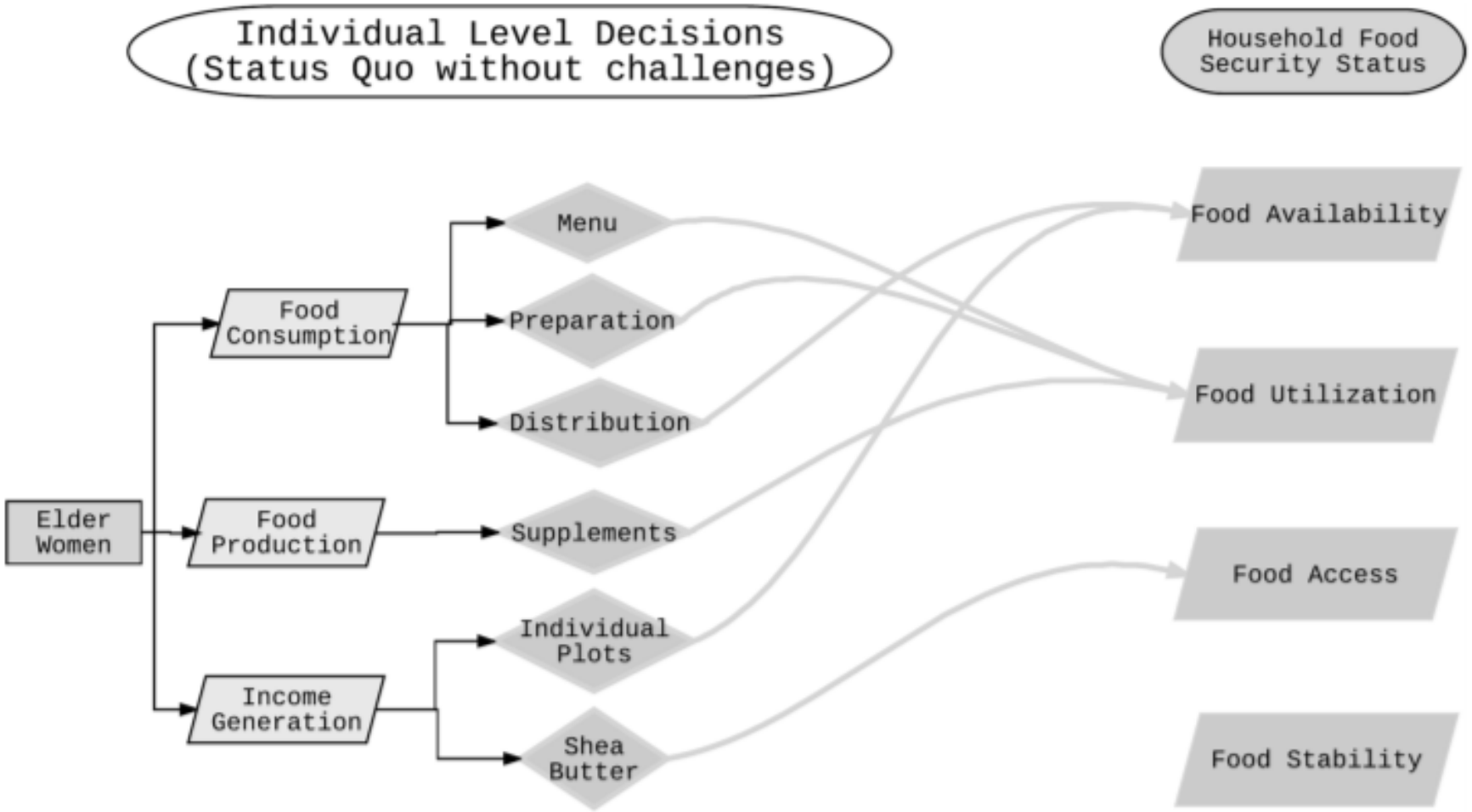
System dynamics modeling

Mental models

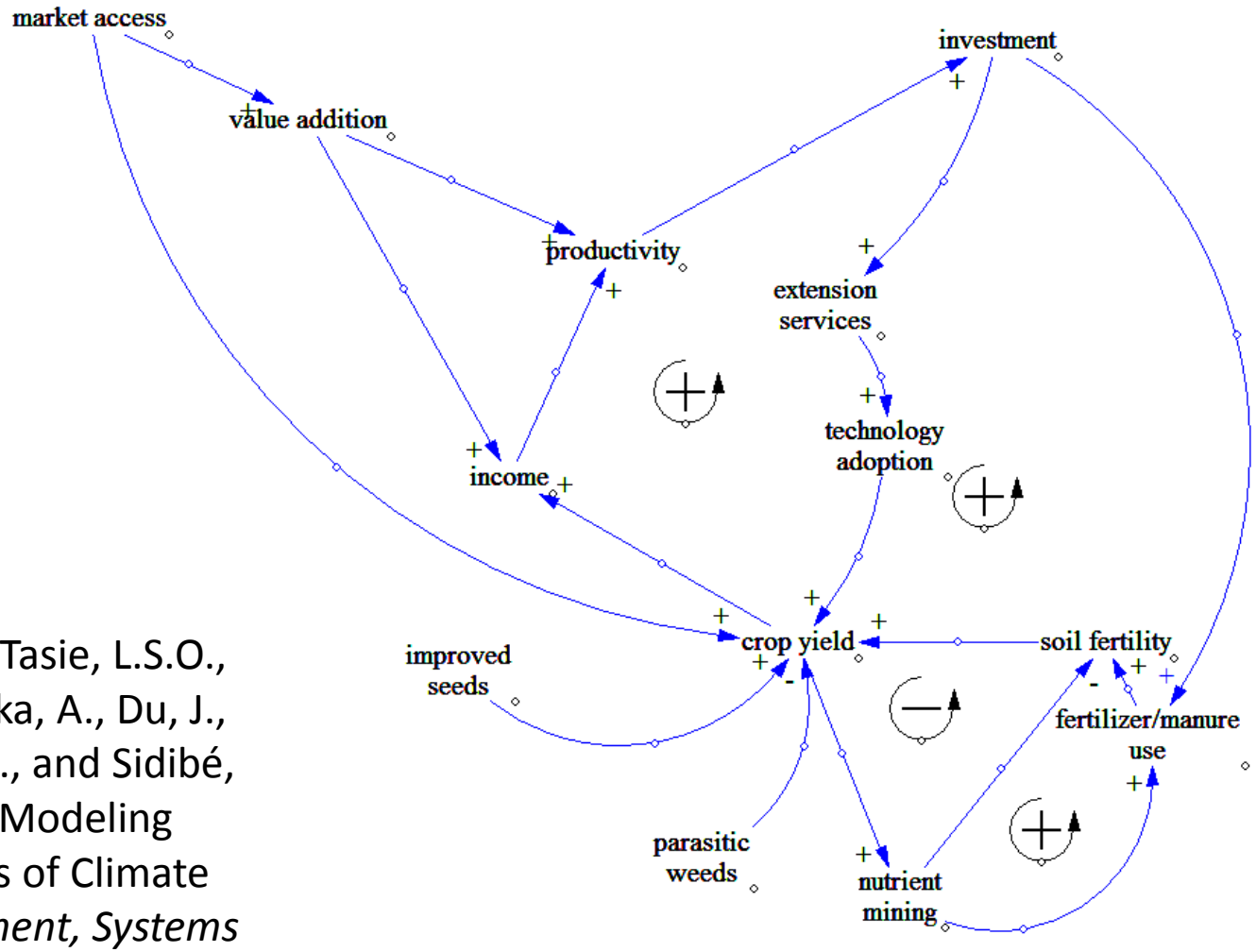
Agent-based modeling



Mental Modeling: Household Level Food Security in Mali

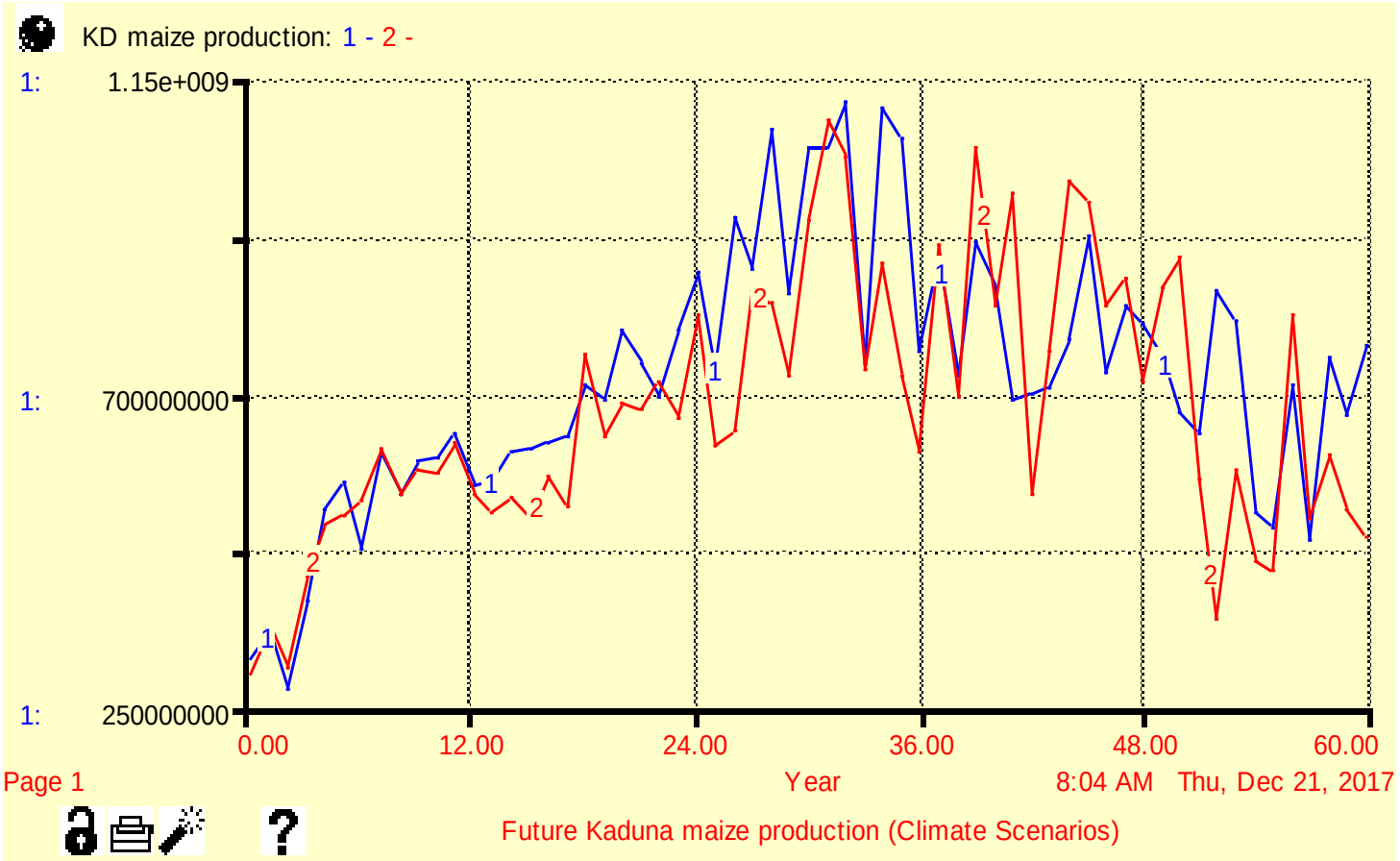


Participatory Modeling: Food Security in Northern Nigeria



Schmitt Olabisi, L, Liverpool-Tasie, L.S.O., Rivers III, L., Ligmann-Zielinska, A., Du, J., Denny, R., Marquart-Pyatt, S., and Sidibé, A. 2017. Using Participatory Modeling Processes to Identify Sources of Climate Risk in West Africa. *Environment, Systems & Decisions* 2017: 1-10

Participatory Modeling: Food Security in Northern Nigeria

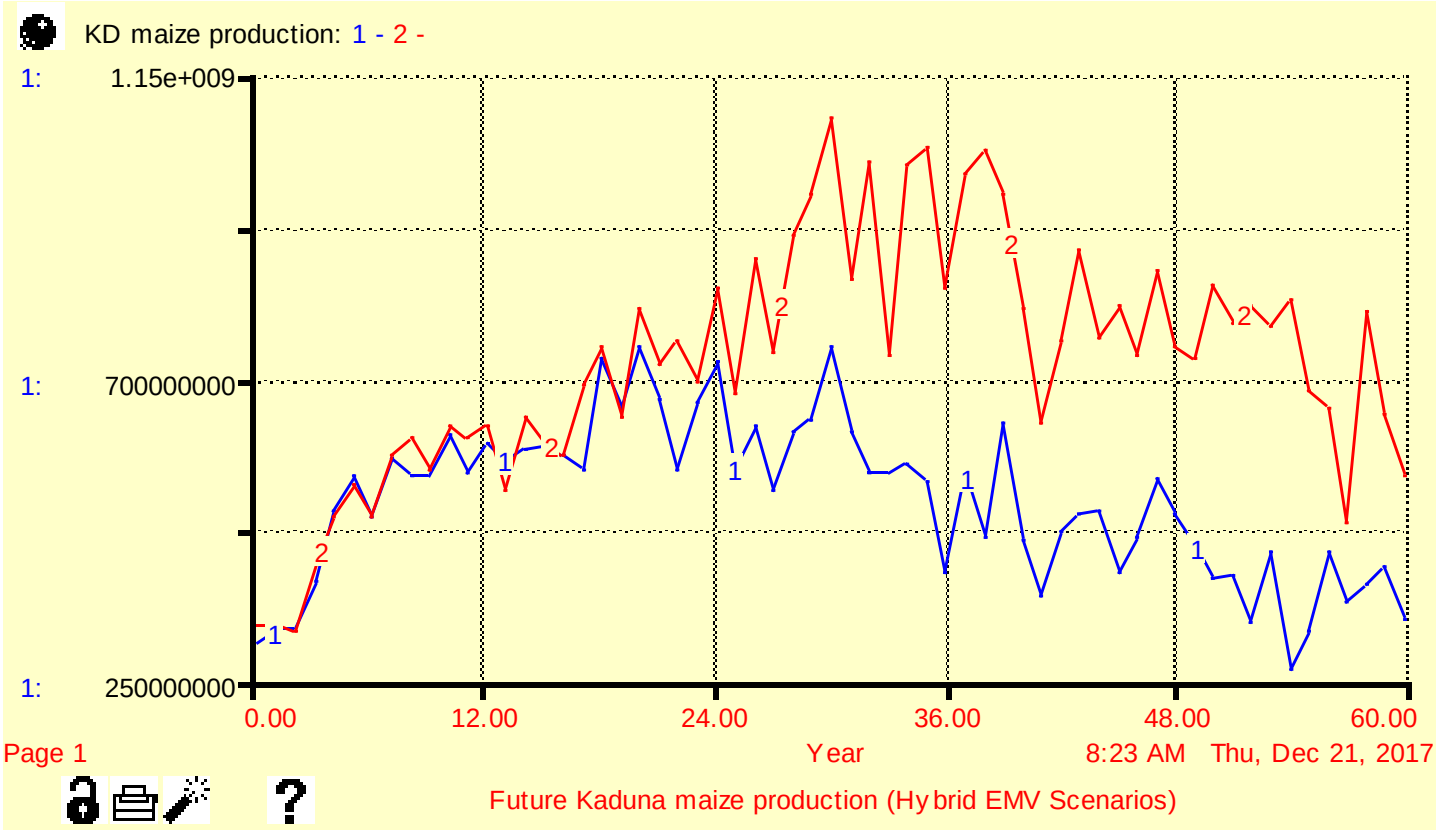


Maize production from 1990-2050 with and without climate change scenarios

- Maize production without climate change scenario
- Maize production with climate change scenario

Schmitt Olabisi, L., S. Liverpool-Tasie, and A. O. Olajide. 2017. Exploring Maize Production in Nigeria Under Climate Change Using System Dynamics. Nigeria Agricultural Policy Project Research Brief 46, Feed the Future Innovation Lab for Food Security Policy

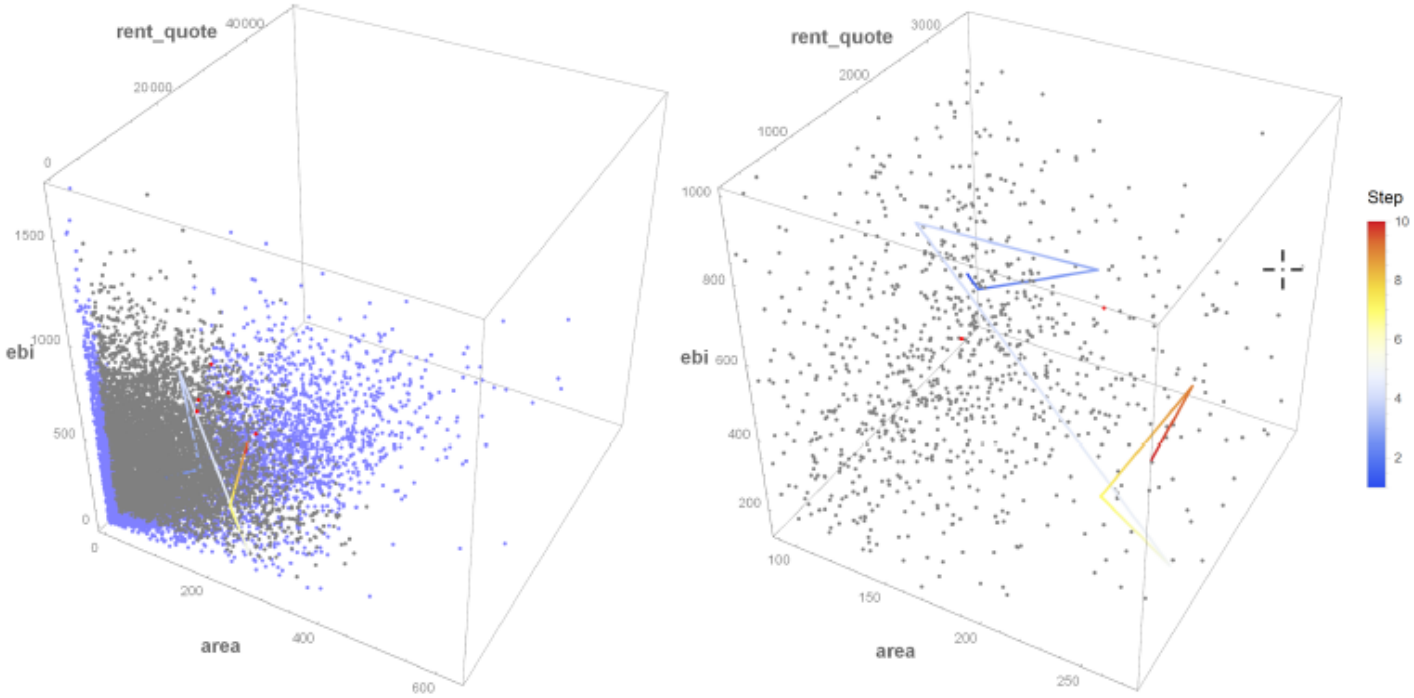
Participatory Modeling: Food Security in Northern Nigeria



- Maize production without adoption of Hybrid Early maturing varieties
- Maize production with adoption of Hybrid Early maturing varieties

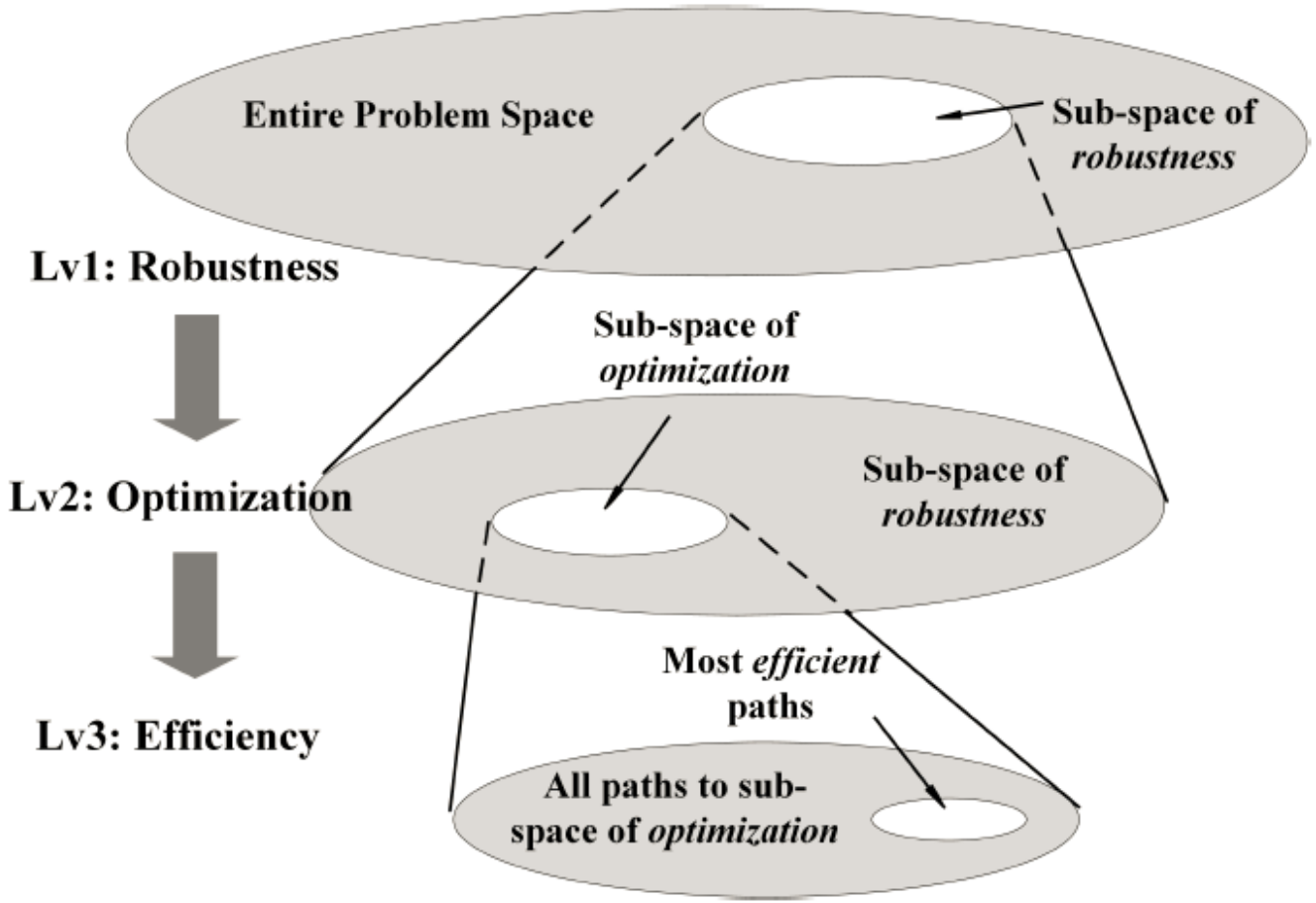
Maize production from 1990-2050 with and without early-maturing hybrid variety adoption

Combining multiple modeling methods to produce a more comprehensive scenario space



Gray = simulated data; blue = ‘forbidden’ space; red = target space

Robustness, Optimization and Efficiency



Translating into stories

“If after the 2020 elections, the current government is not able to retain the seat, what happens? The new government may not prioritise agriculture in its development agenda. As a result, all previous plans instituted to improve agriculture will not be implemented. Farmers will still have to adapt or cope with the situation of poor access to water. There could be the revival of traditional water conserving methods of farming, such as mound preparations camber bed for planting cereals etc, by 2022. In 2024, a different government could be voted in that will try to restore confidence in the people by prioritising agriculture in its national development agenda. In 2025, the government could introduce crop insurance to farmers as a way of curbing the situation created by the previous government. It is also possible that regional conflicts (e.g. in Burkina Faso, Mali) that we have been experiencing, could continue and result in the influx of refugees into the country. There is also the possibility of increasing chieftaincy disputes. Conflict resolutions strategies could be intensified to resolve disputes.”

Conclusion: supporting decision-making around food security that is

- Robust to uncertainty and ‘surprise’
- Optimal while avoiding ‘fail’ zones
- Efficient

Thank You!

Interdisciplinary Behavioral & Social Science Research Program