The OpenSavanna Modelling Initiative: Supporting ecosystem modelling for adaptive management

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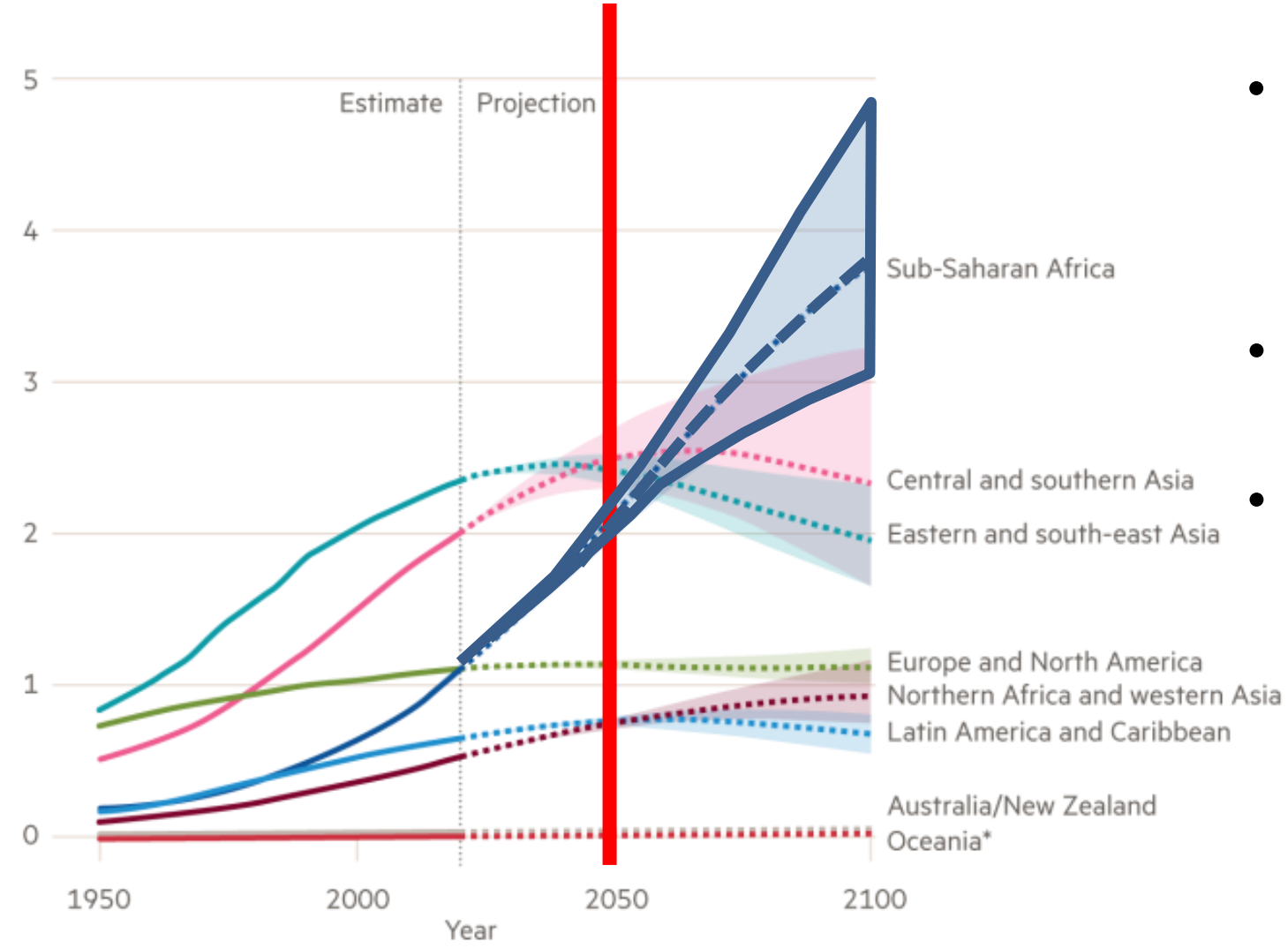
Future Savanna Challenge: Projected Population



*Excluding Australia and New Zealand
Source: United Nations Department of Economic and Social Affairs
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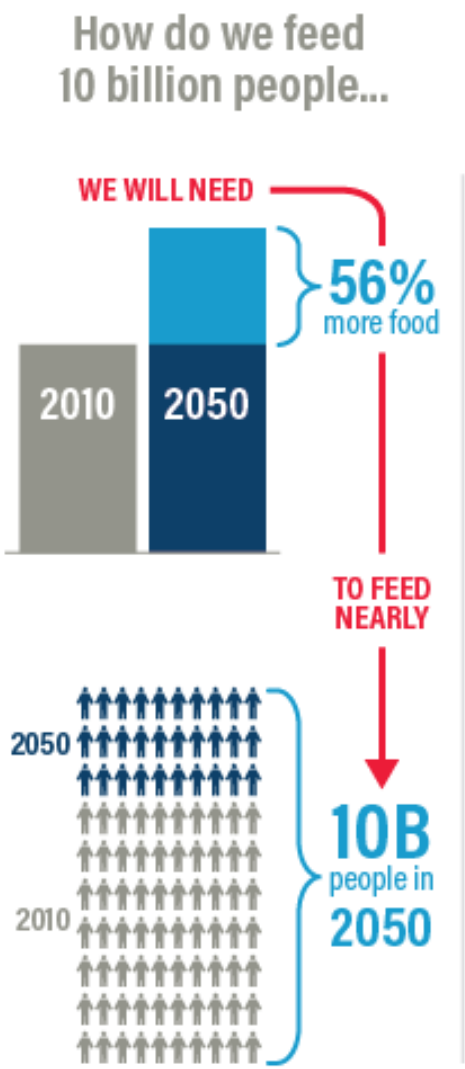
- 2018: 55% is Urban
- 2050: 68% is Urban
- 2050: Nigeria population will exceed USA

Graphic Source: Financial Times https://www.ft.com/content/868e20d0-90ec-11e9-b7ea-60e35ef678d2

CREATING A **SUSTAINABLE FOOD FUTURE BY 2050**



Too Slow!
Too Complicated!
Too Uncertain!
Too Expensive!

and….We have to change our habits?

….

Let's just find more land…

Source: wri.org/sustfoodfuture

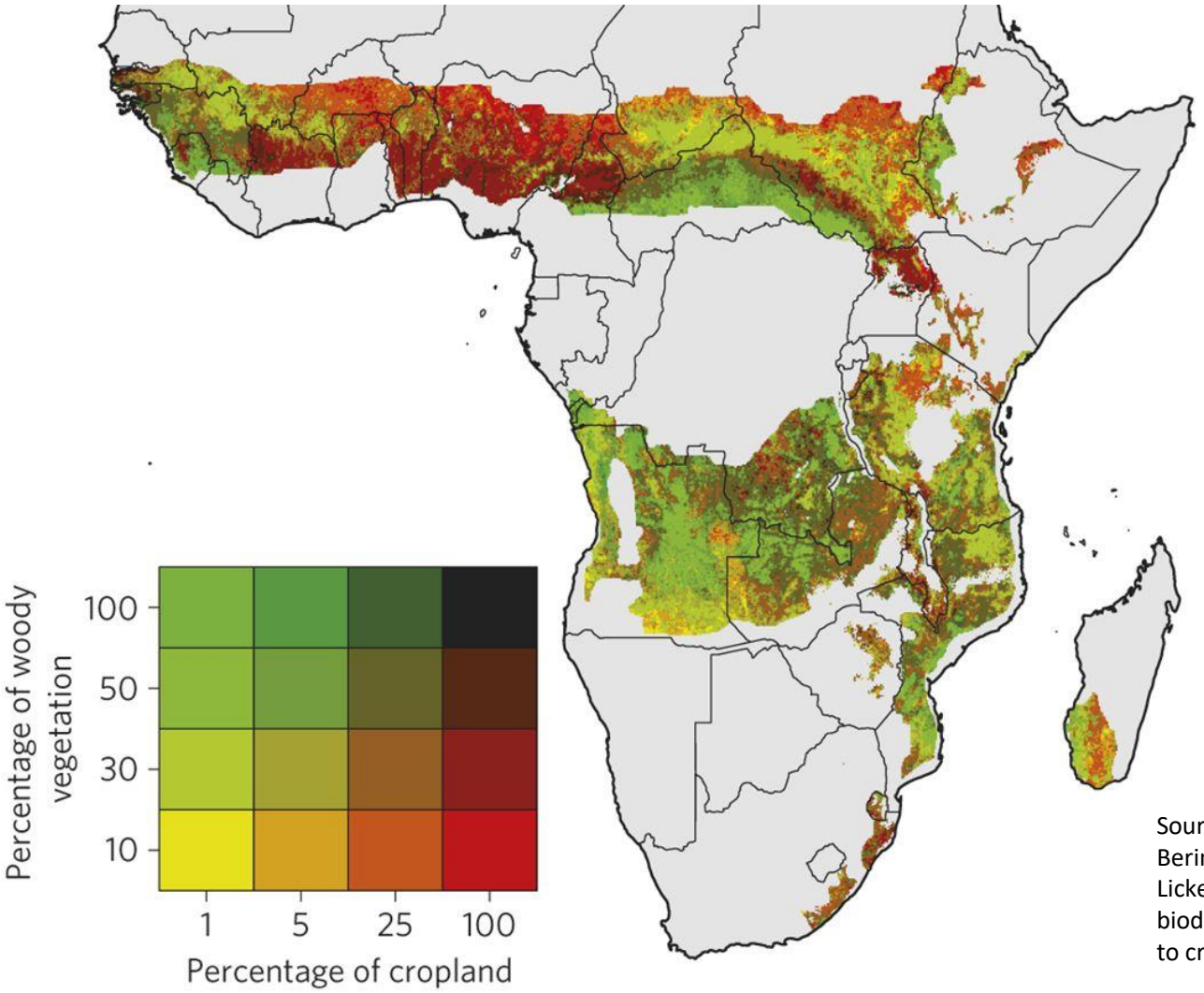
WORLD RESOURCES INSTITUTE

More People, No problem! Plow up the Guinea Savanna! (World Bank)

- Rainfall > 600mm
- 600M ha of which 400M can be used for agriculture
- Low conversion costs
- < 10% is cropped
- **Create "game changers" like NE Thailand and the Brazilian Cerrado!**

Source: Morris, M., Binswanger-Mkhize, H.P. and Byerlee, D., 2009. Awakening Africa's sleeping giant: prospects for commercial agriculture in the Guinea Savannah Zone and beyond. The World Bank.

Not so fast…

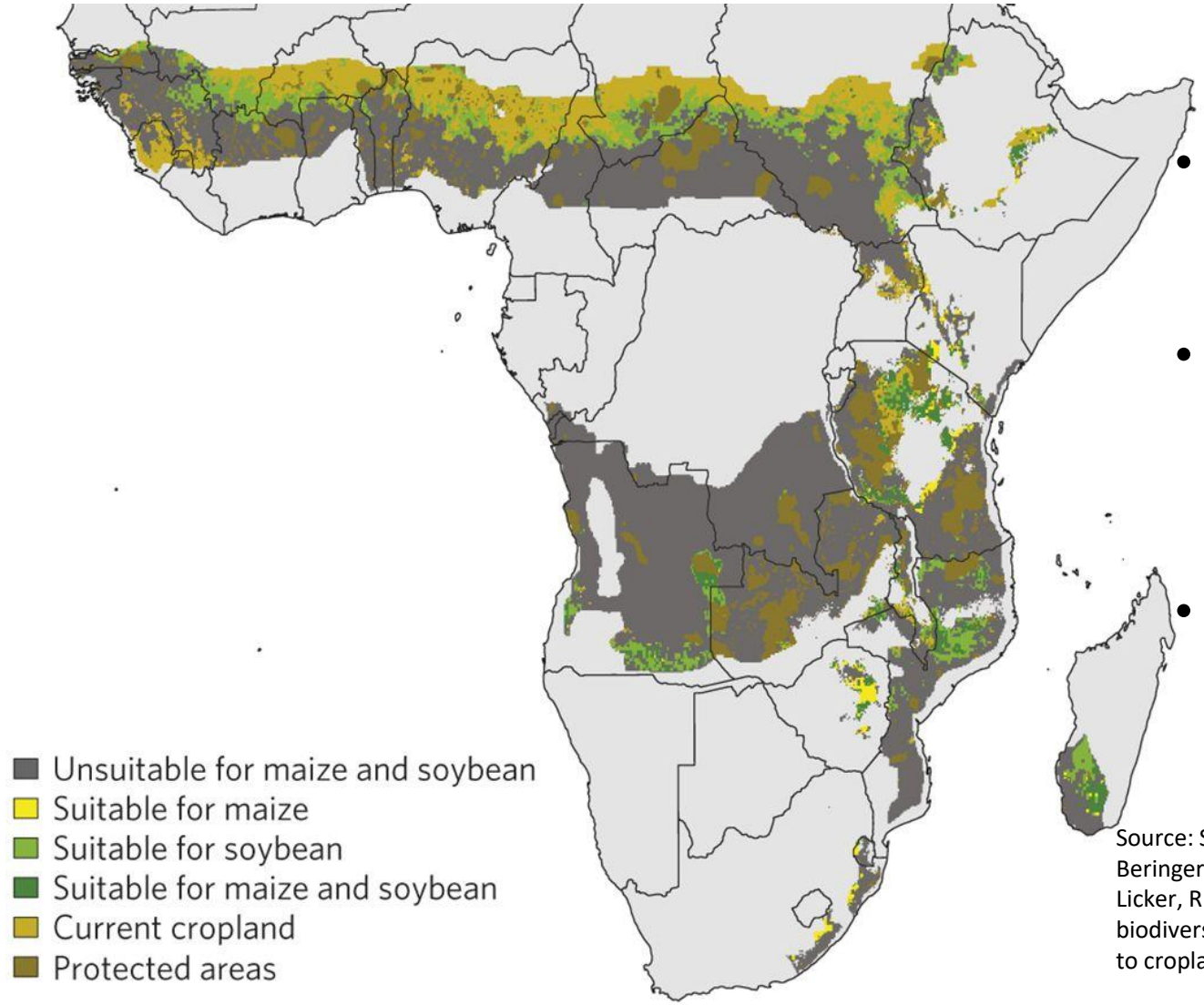


- Significant land uses already (wetlands, protected, crops and grazing..)
- More trees than you think (significant C costs!)
- Very significant biodiversity losses in conversion!

Source: Searchinger, T.D., Estes, L., Thornton, P.K., Beringer, T., Notenbaert, A., Rubenstein, D., Heimlich, R., Licker, R. and Herrero, M., 2015. High carbon and biodiversity costs from converting Africa's wet savannahs to cropland. *Nature Climate Change*, *5*(5), pp.481-486.

Suitable for ? …

- Crop yields not as good as you might think!
- Especially for maize and soybeans!
- And … Did we mention the biodiversity loses?
- Worth it?



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OpenSAVANNA Modelling Initiative

- Model Intercomparison Projects save time, money and break down barriers (both institutional and disciplinary)
  - **AgMIP** (Detailed crop models, similar to DVGMs)
  - **FireMIP** (Large-scale Fire & DVGM models)
  - Climate models (IPCC)
- **Can meso-scale models be intercompared for specific sites?**
  - How can we position our park/region to mitigate adverse changes?
  - What can we control or change?
  - What must we accept as the “new normal”?

OpenSavanna: Free and Available Configured Models and Base Datasets

- Open-source modeling sites, free and prepared
  - **SAVANNA** (Grid-based, mechanistic savanna ecosystem)
  - **QnD** (agent-based model, based on Baxter & Getz, 2005)
  - **MARS ?** Others?

- Sites prepared with open-source spacio-temporal data (CHIRPS, SRTM, HWSD, RS-based LU/TC/NPP, Etc…)
  - Can be checked further with your own detailed/proprietary data
  - **Provides a safe, efficient starting point …**

Free and Available Configured Models and Base Datasets

African Savanna Parks:

1. **Kruger National Park** @1 km grid with fluctuating herbivores and predators (ie more detailed than the current version at @5 km grid and stable herb pops)
2. **Hluhluwe-Imfolozi Park**
3. **Serengeti National Park-**Configured, but needs expanded migration code
4. **Okavango/Chobe/Linyati**
5. **Mpala Research Station + Nearby Game Farms (Laikipia, Kenya)** for wildlife and pastoralist access simulation
6. **Gorongosa NP** @1 km grid, herbivore population recovery + veg dynamics
7. **Itala Game Reserve**

Canadian National Parks: (just beginning)

1. **Elk Island National Park**
2. Prince Albert National Park
3. Grasslands National Park

Livestock Savanna Areas: (through our USAID/ILRI collaboration)

1. **Nkayi District, Zimbabwe** (Communal mixed crop/livestock production)
2. **Dirre/Borana, (southern) Ethiopia** (nomadic/settled pastoral production)

OpenSavanna: Take Home Message

- **Free Stuff!**
  - Freely available model configurations & input data, output data
  - Model Source Code, R scripts, Python code, if you want it.

- Developing open online courses on (a) Landscape-Scale Modeling and (b) Agent-Based Modeling using the OpenSavanna sites as examples

- Collaboration mechanism(s)
  - Graduate Students: Paper/chapter within a PhD
  - PostDocs/Profs/Managers: Part of a funding proposal
- Interested? gkiker@ufl.edu

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Thank You for Your Attention
Questions at the Break???

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