Climate Variability and Climate Change in Pastoral Systems

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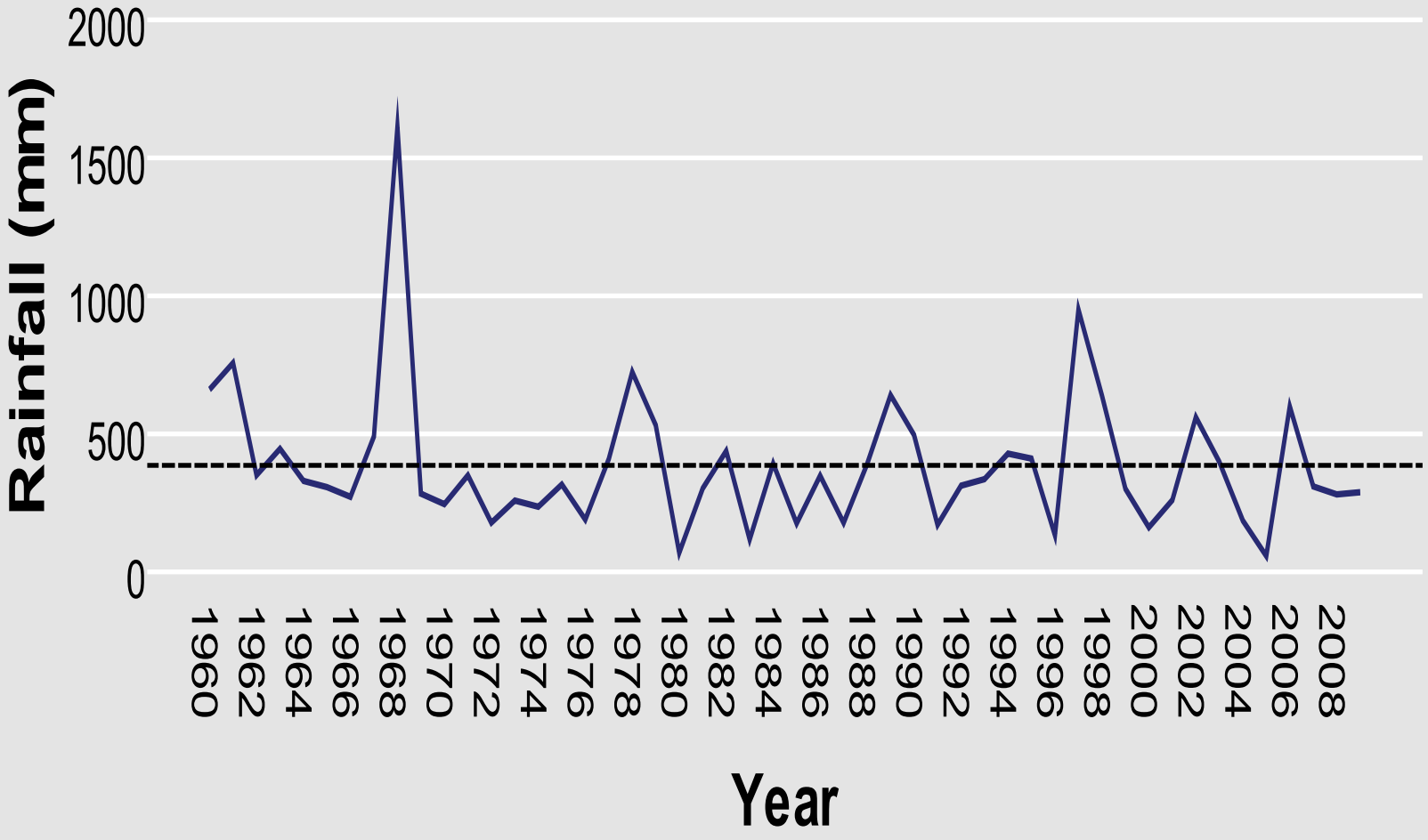
International Livestock Research Institute

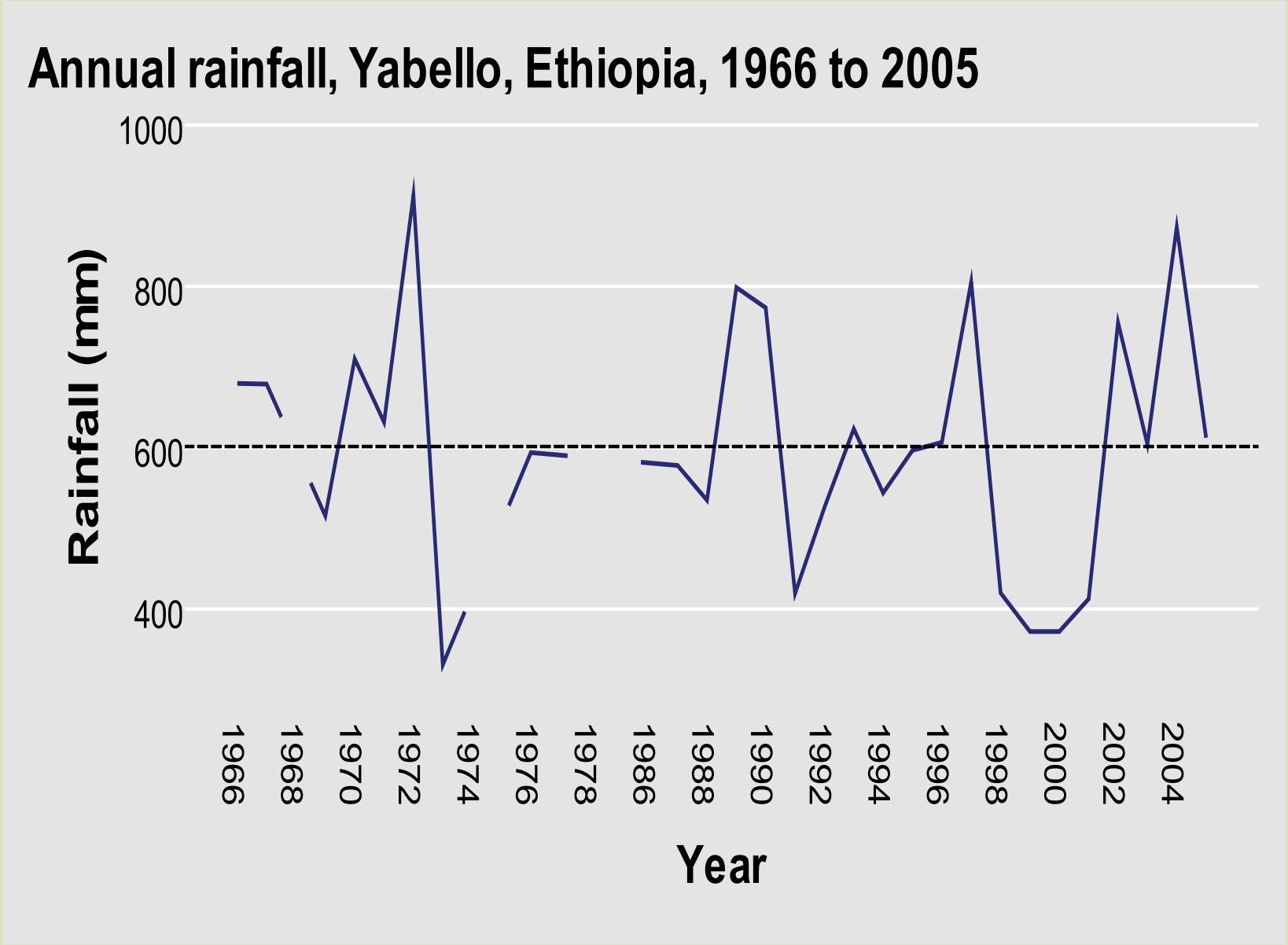
Pastoralists and climate risk

Oromiya Region, Ethiopia by Andrew Heavens

Annual rainfall in Garissa, Kenya, 1960 to 2009



Feinstein Centre, Tufts Univ.



Feinstein Centre, Tufts Univ

Rainfall and NDVI

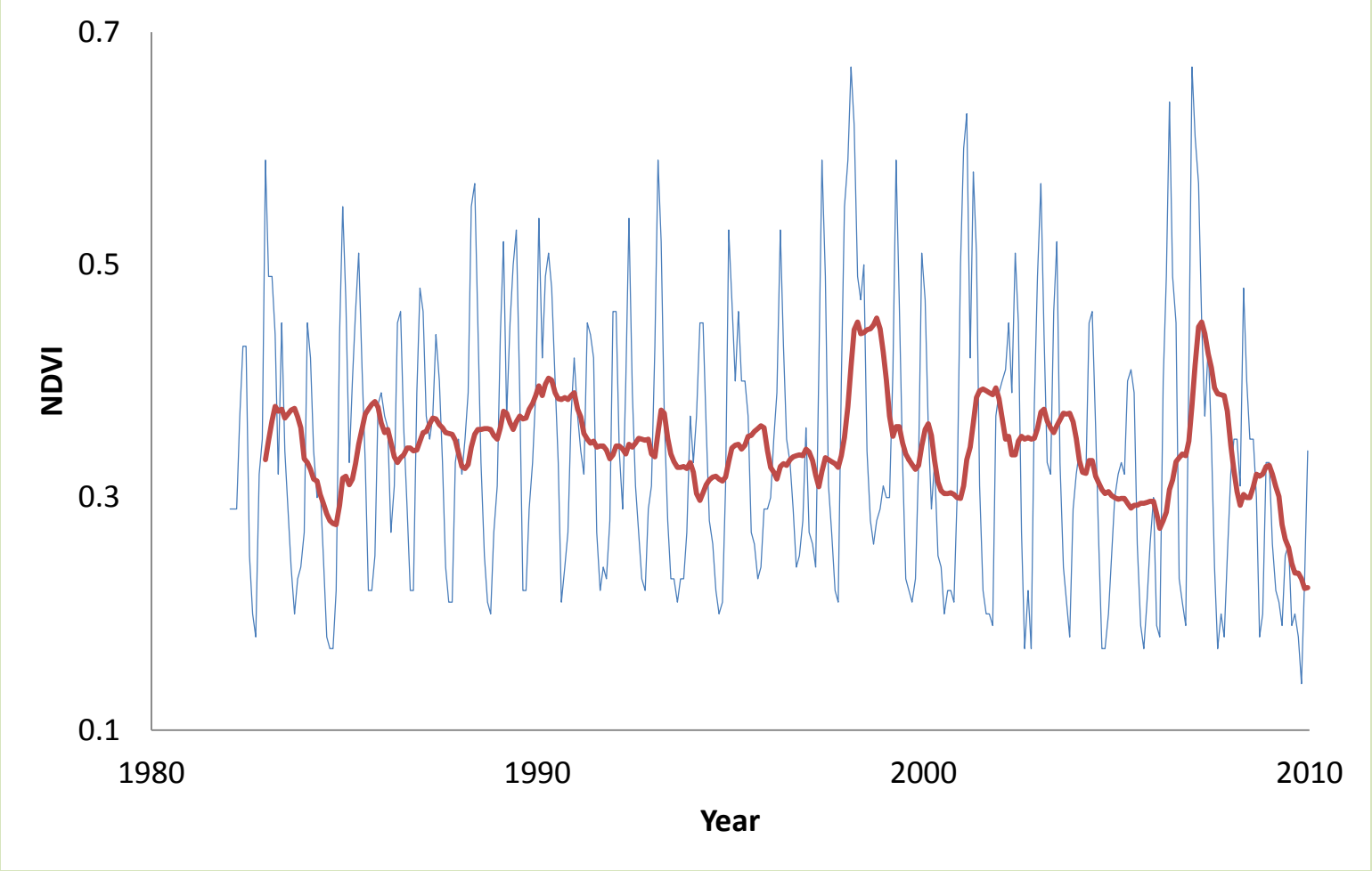
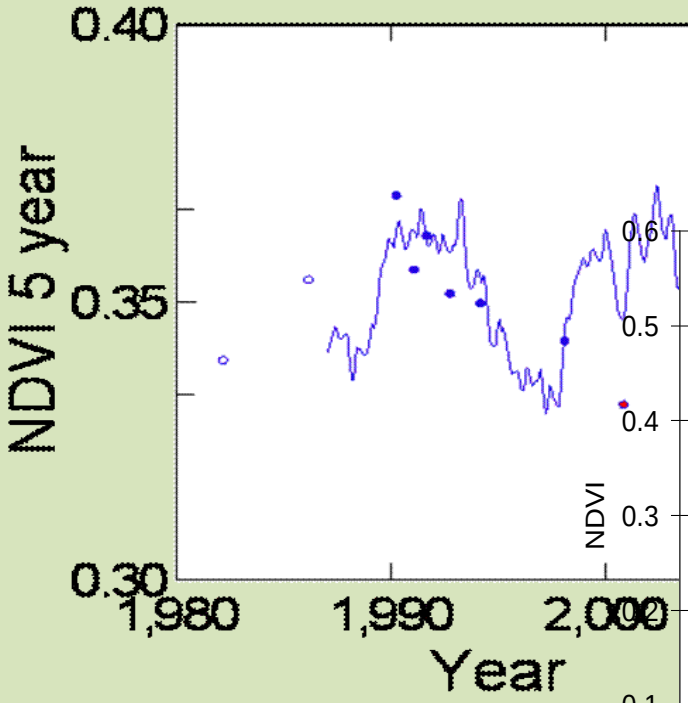
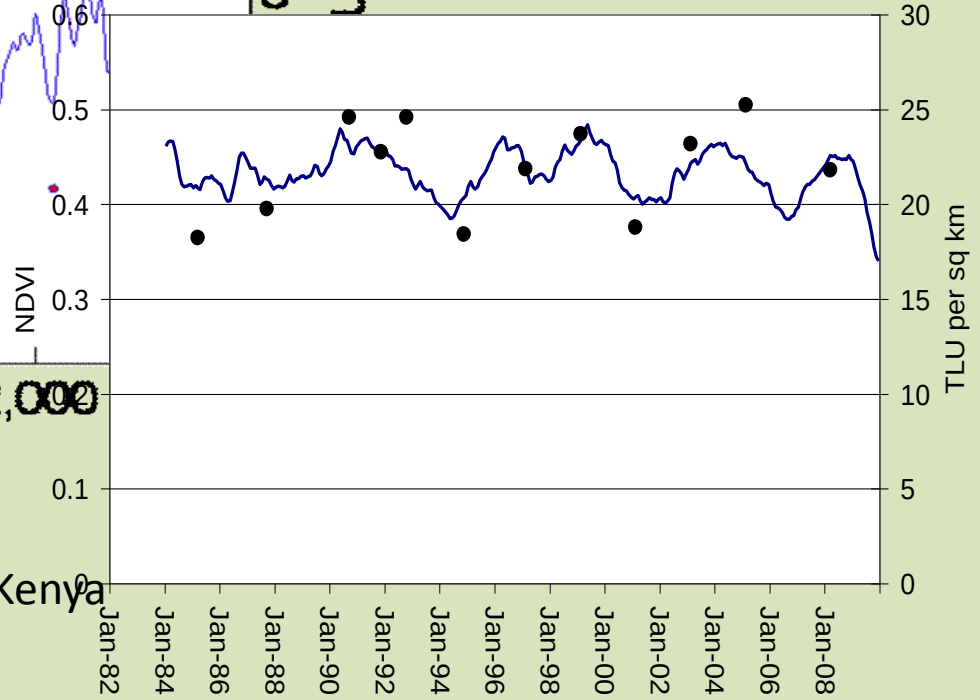


Figure 1: Variation of monthly (blue) and 12 month running average (red) of NDVI for Kajiado district from 1982 to end of 2009. Source: unpublished ILRI analysis.

Vegetation biomass and livestock mortality

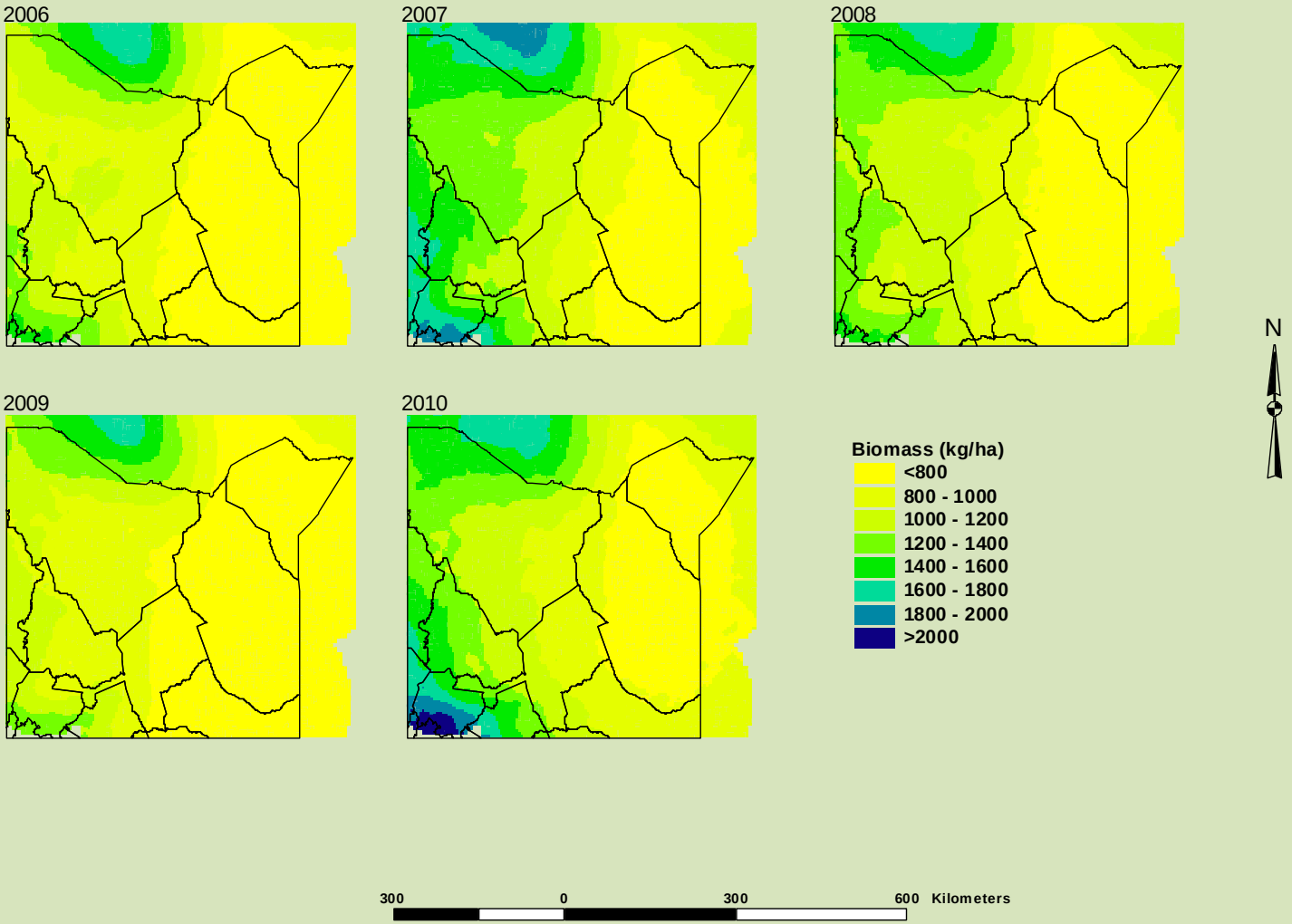


Biomass and NDVI, Kajiado, Kenya

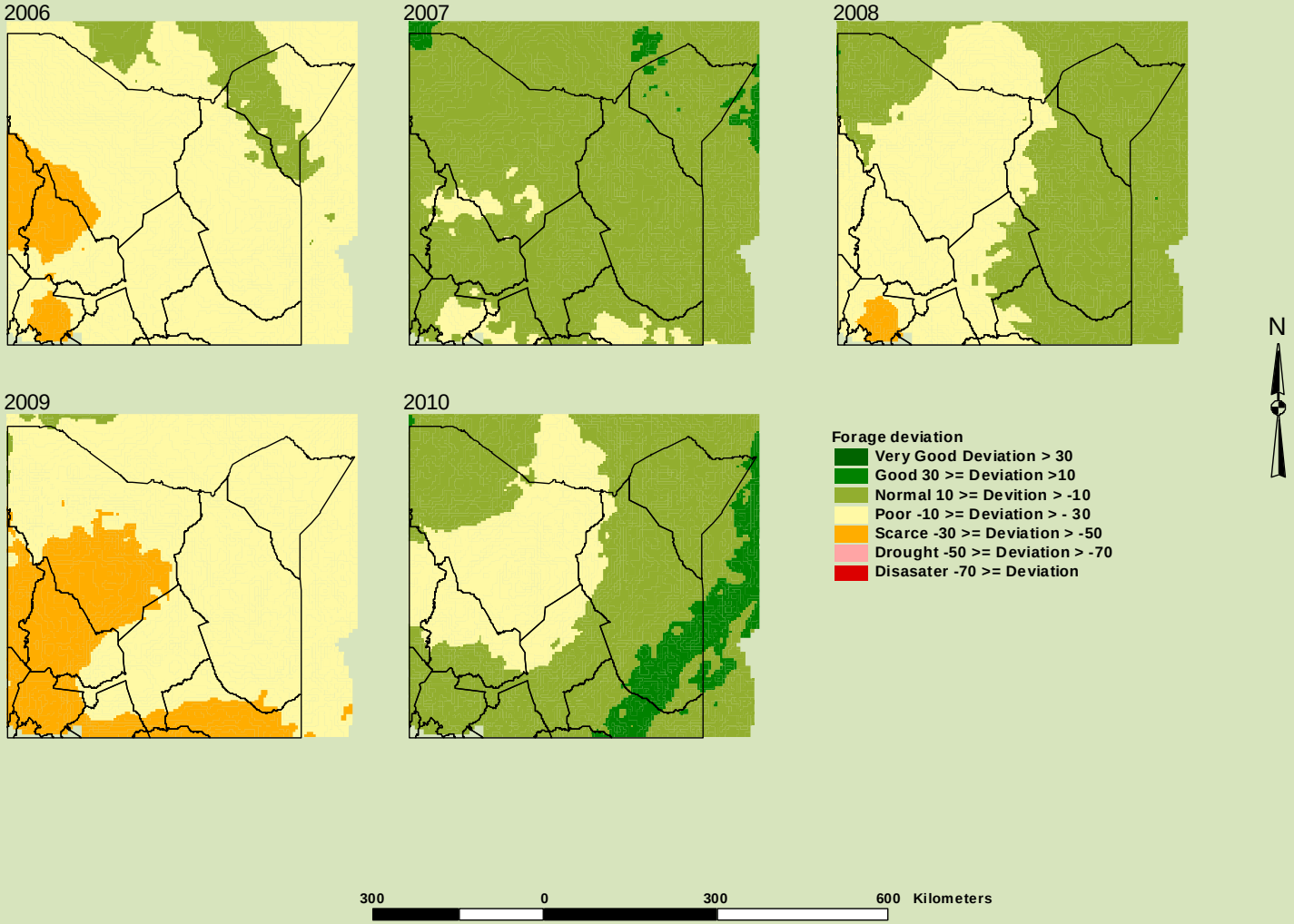


Biomass and NDVI, Laikipia, Kenya

Forage available (kg/ha) for Kenya northern arid lands (2006-2010). Source of information: GL CRSP LEWS

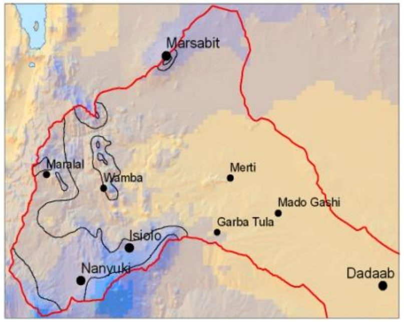


Forage deviation (%) for Kenya northern arid lands (2006-2010). Source of information: GL CRSP LEWS

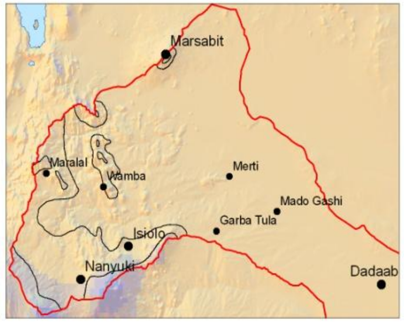


Monthly aridity index

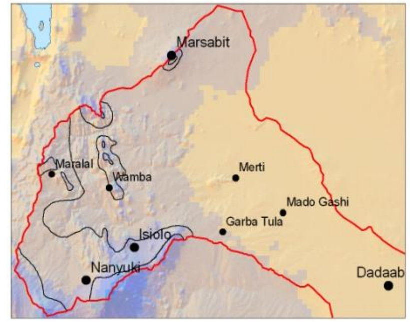
January



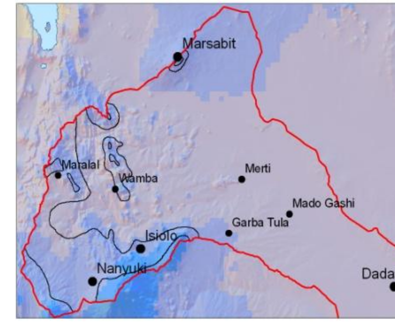
February



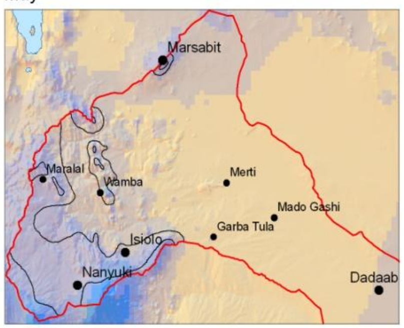
March



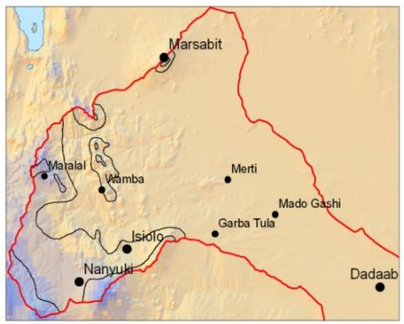
April



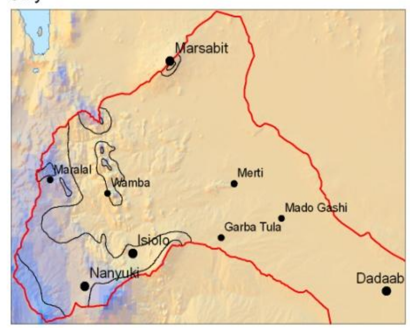
May



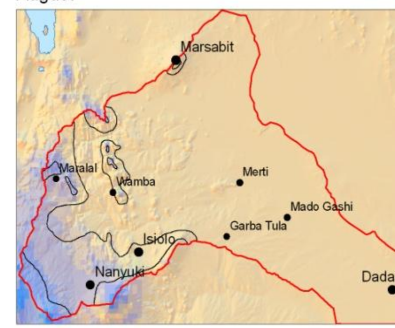
June



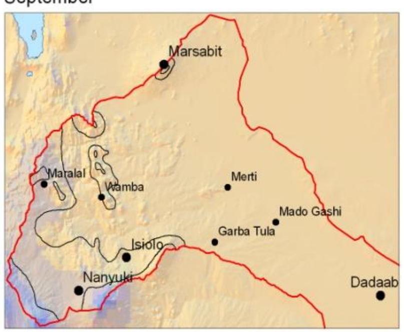
July



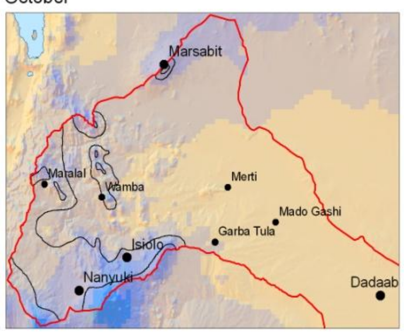
August



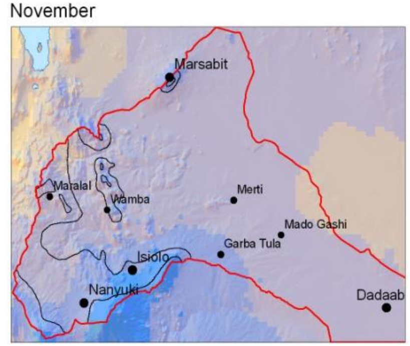
September



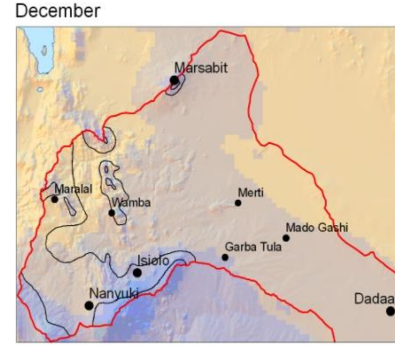
October



November



December



Catchment boundary

Agro-climatic zones boundary

Aridity Index

Very arid ← – – – – – – → Humid

Sources:

- Catchment boundary was generated from ASTER DEM 30m. ground resolution and direction flow lines from hydroSHEDS, 90m. ground resolution
- Towns (SoK topographic maps scale 1:50,000)
- Waterbodies (FAO 2000)
- Aridity index (Mud Springs Geographers, Inc. 2002 AWhere-ACT Database, Kenya 2002)
- Agro-climatic zones (KSS, Sombroek 1982)
- Hillshading was generated from GTOPO30, ground resolution 1 kilometer

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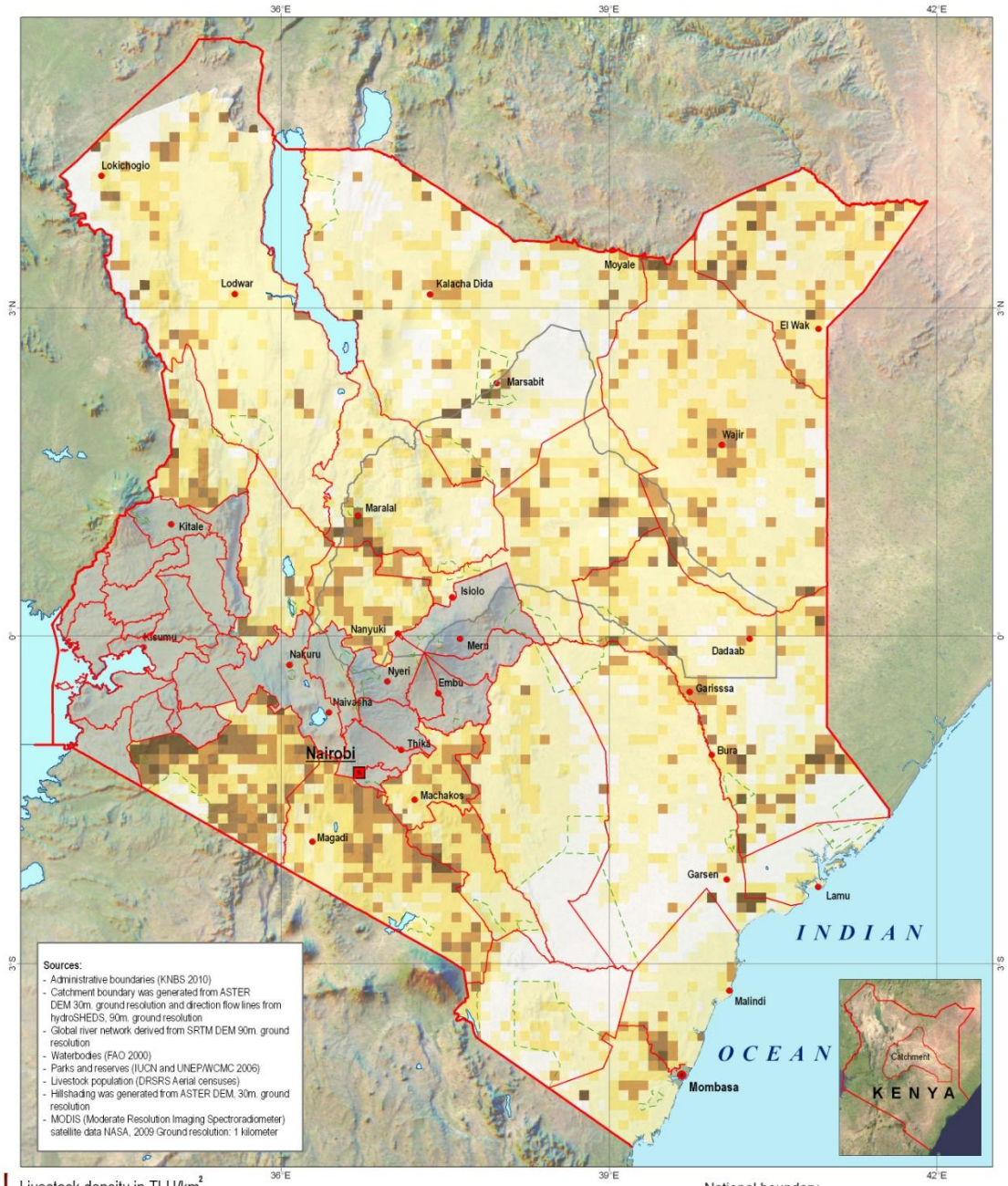
Average livestock density in Kenya, 1978 - 2010



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Livestock density in TLU/km^2

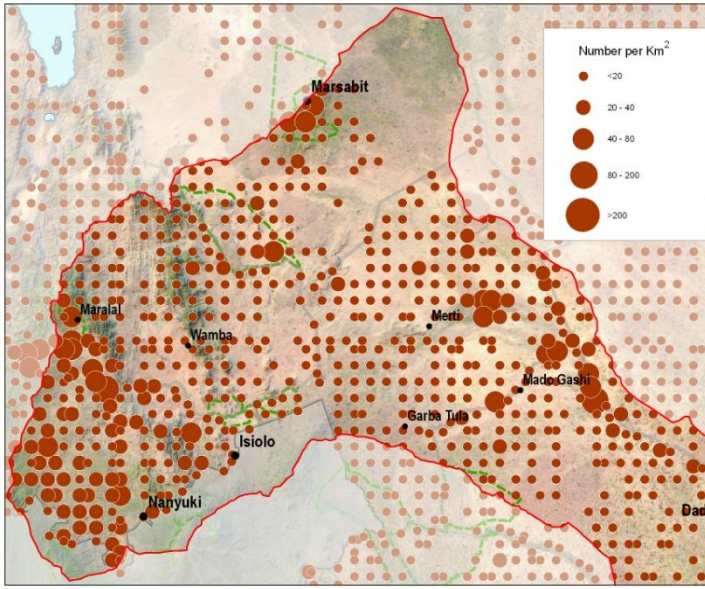
0 | 0.001 | 10 | 20 | 30 | 50 | higher

TLU: Tropical Livestock Unit

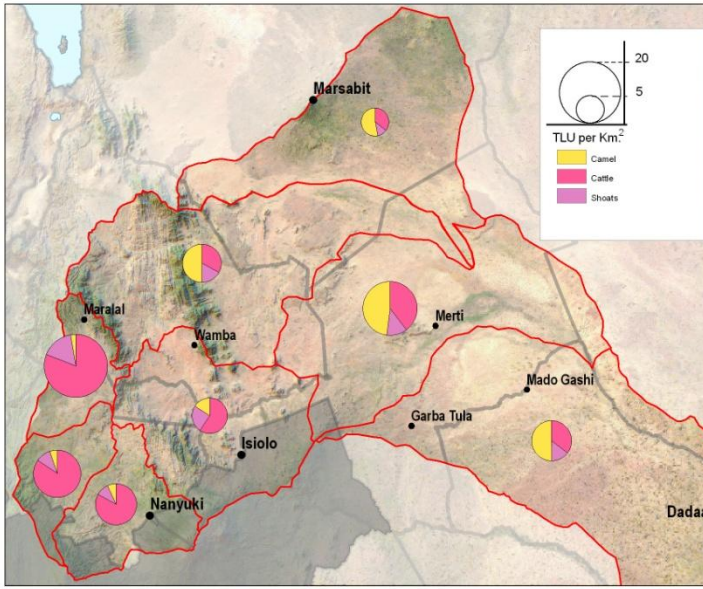
Scale 1:4,500,000

National boundary
County boundary
National parks
Not surveyed

Average cattle density in the catchm

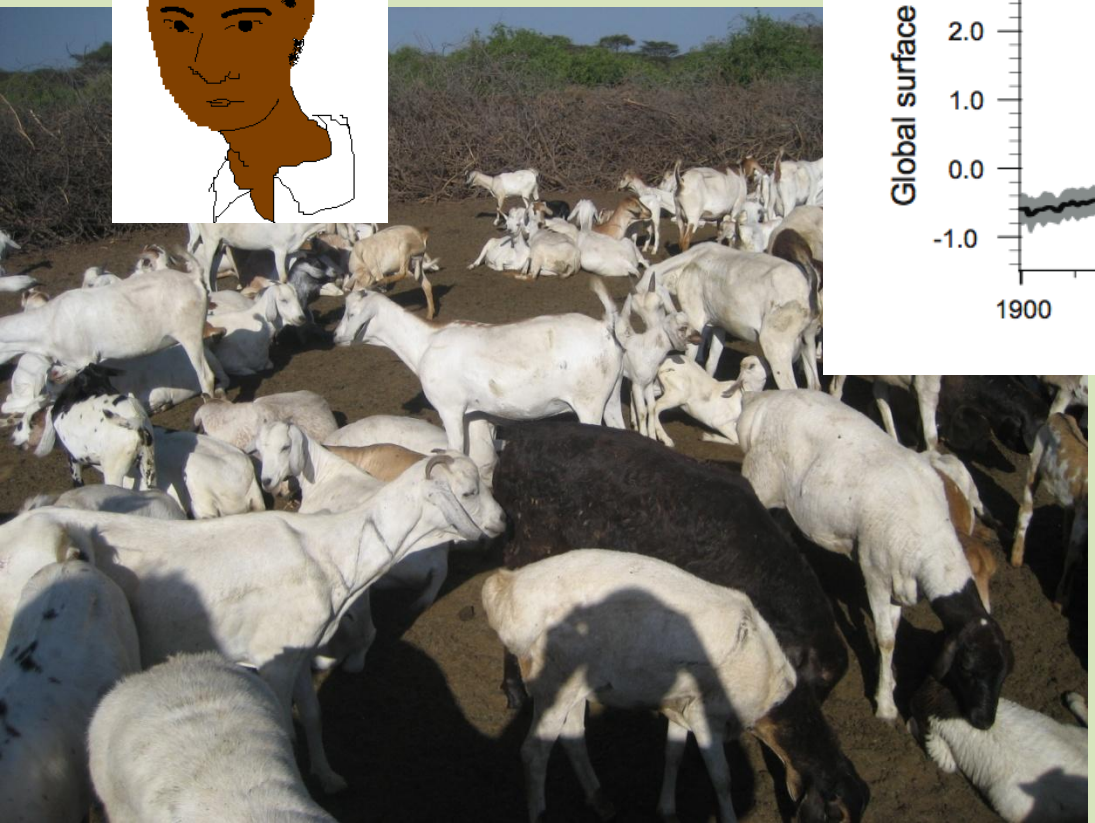


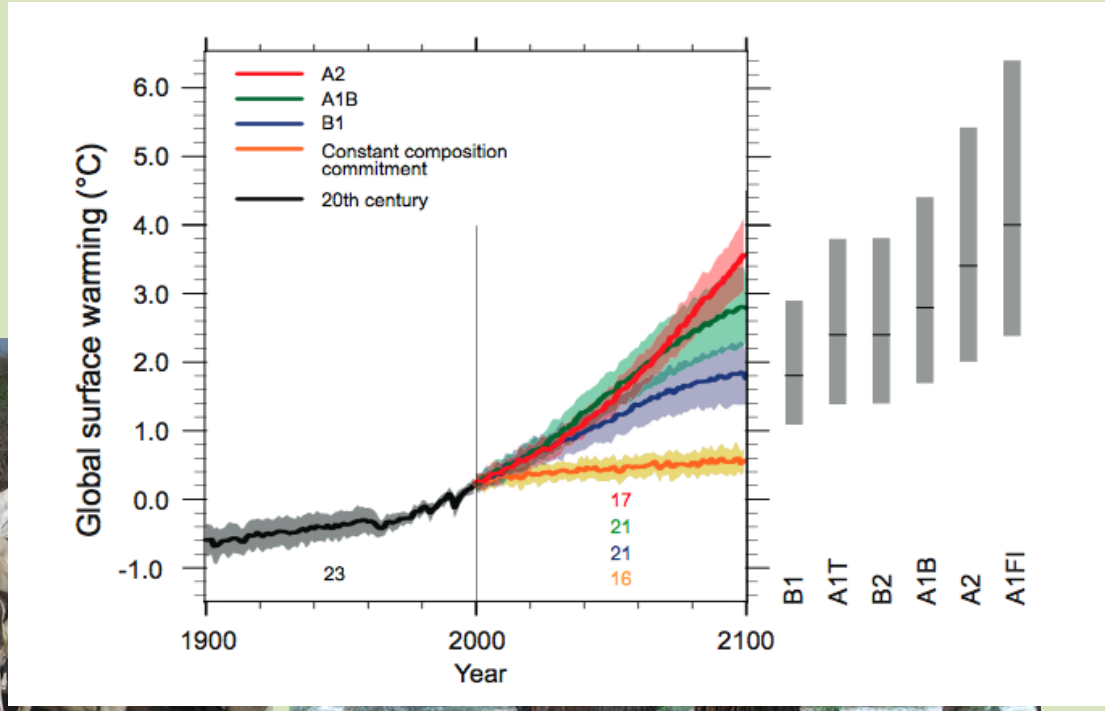
Average livestock density per sub-catchm



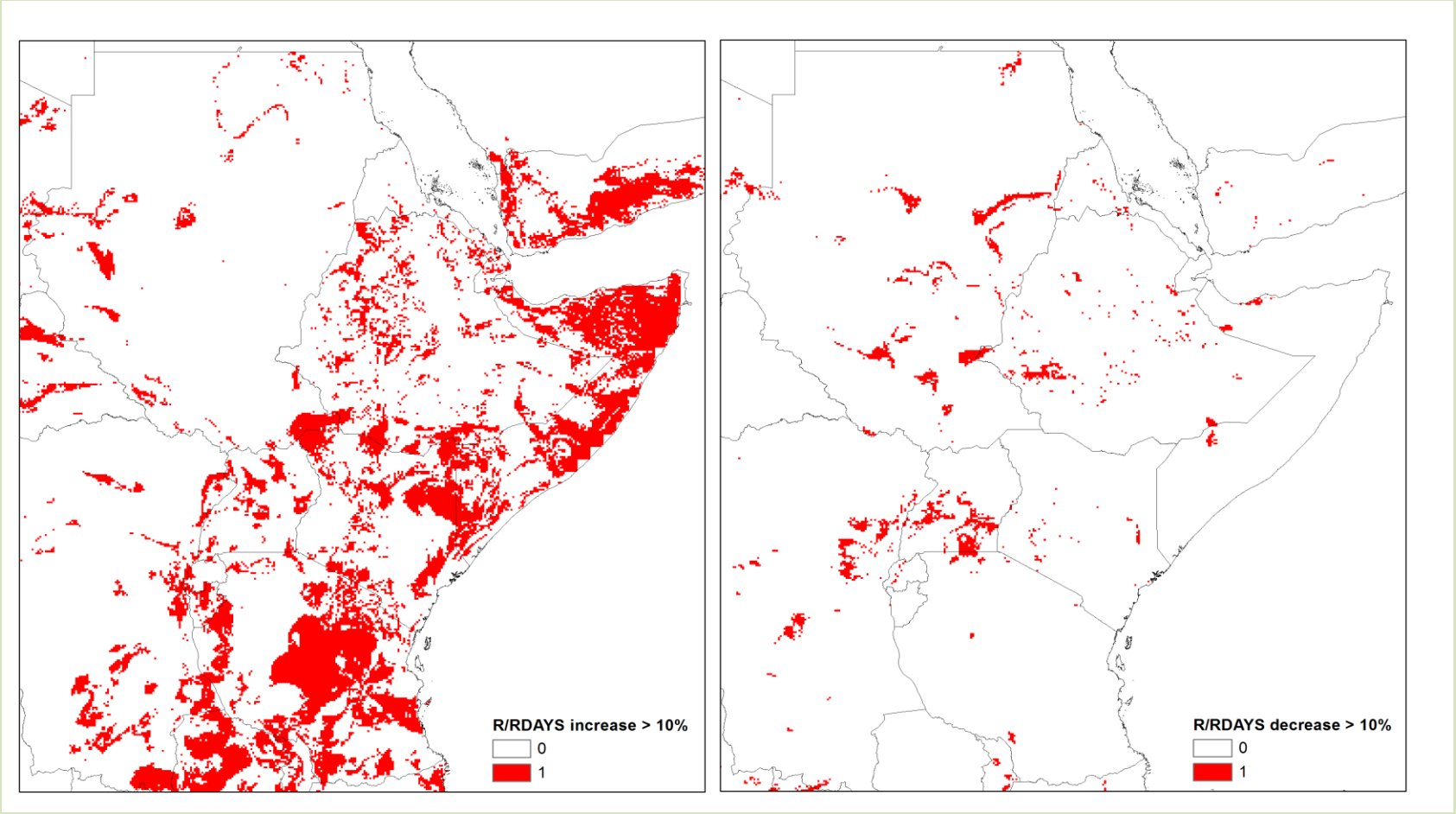
Scale 1:3,000,000

Climate Change

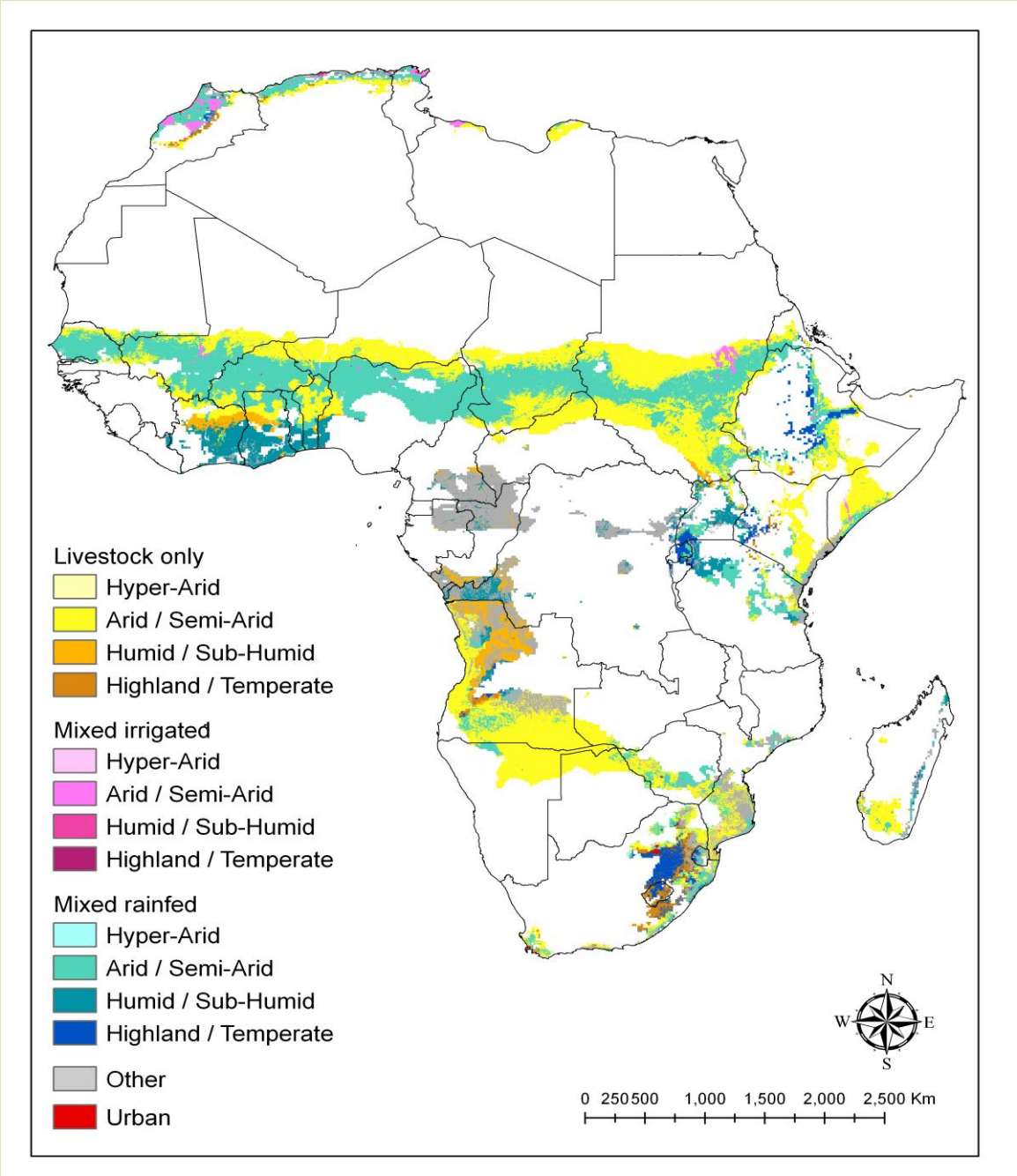




Climate change exposure: changes in rain per rainfall event



Ericksen et al, 2011

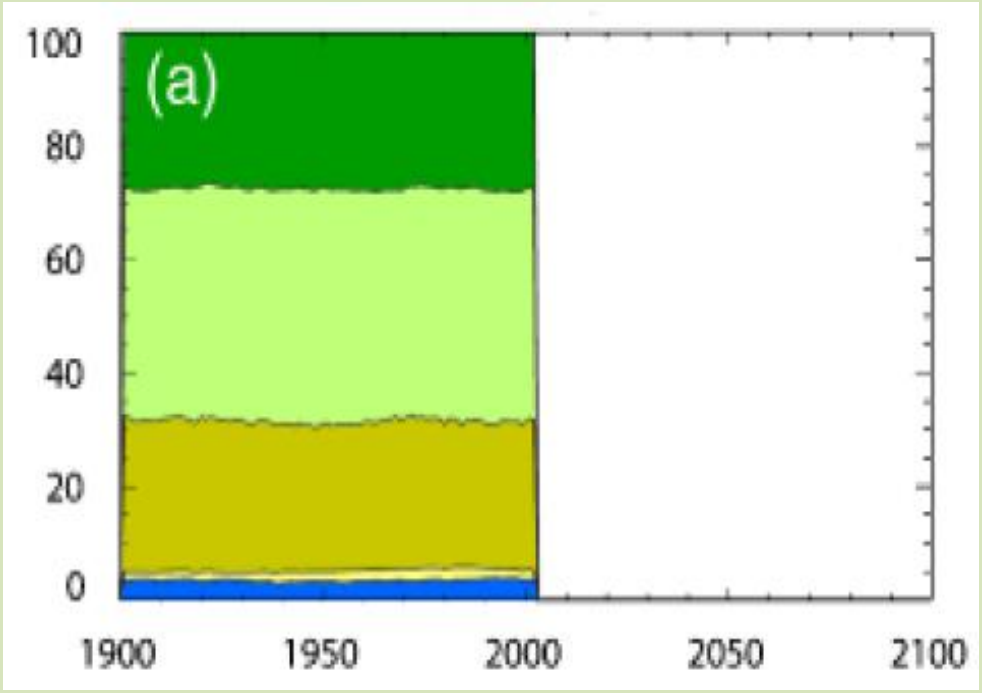


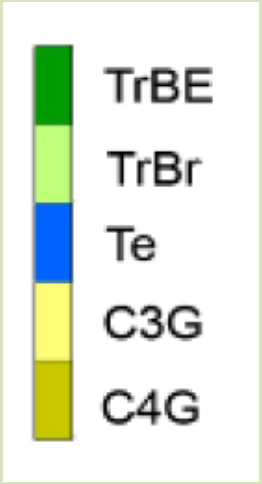
Unpublished IRLI analysis

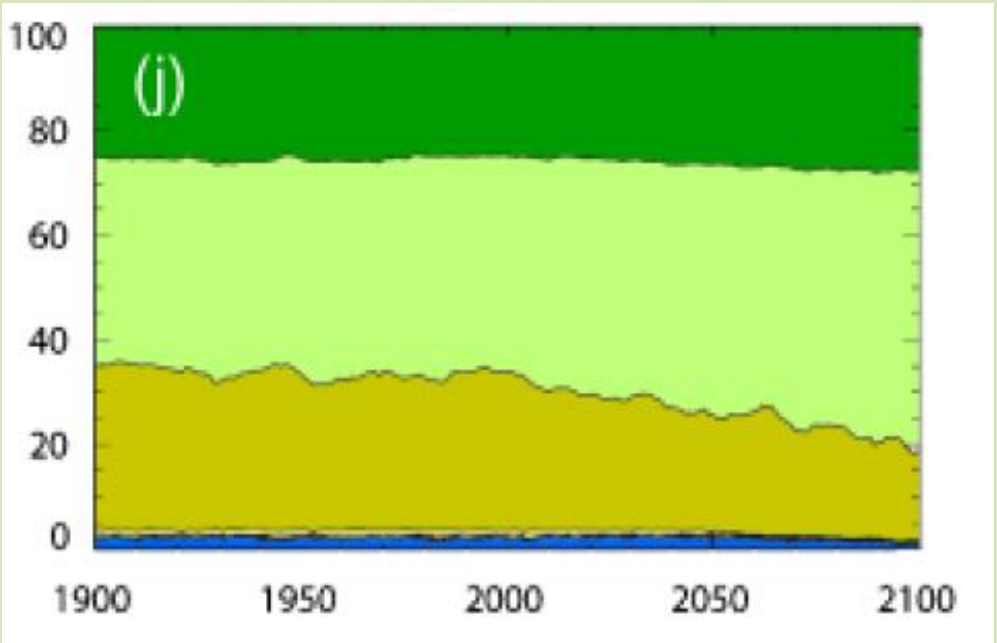
East Africa: Simulated plant funtional types:

(top) 20th century

(bottom) 20th and 21st centuries (one climate model)

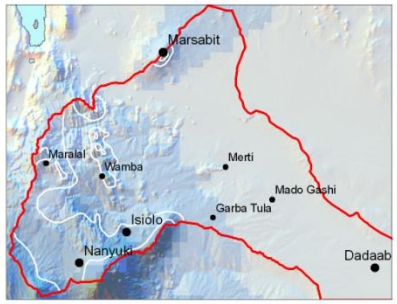




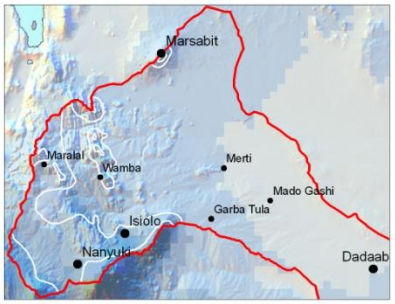


Doherty et al 2009

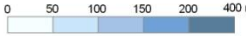
Climate change: rainfall and temperature



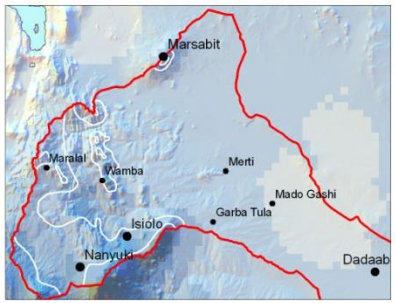
2000



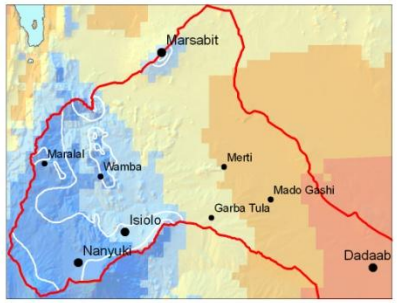
2030*



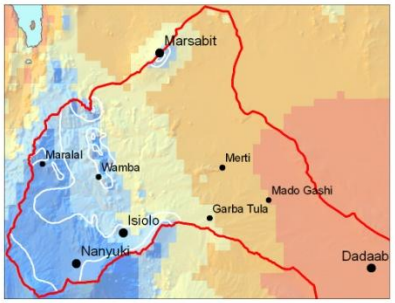
Rainfall



2050*

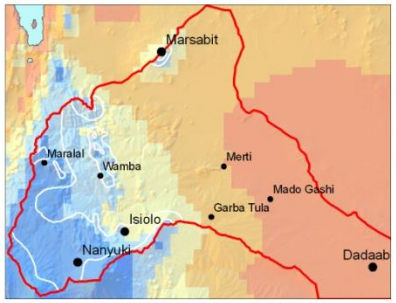


2000

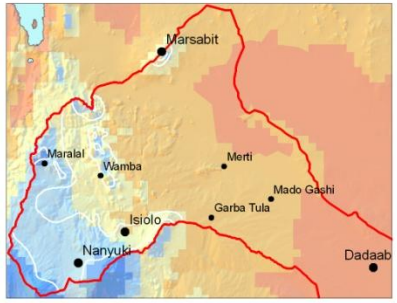


2030*

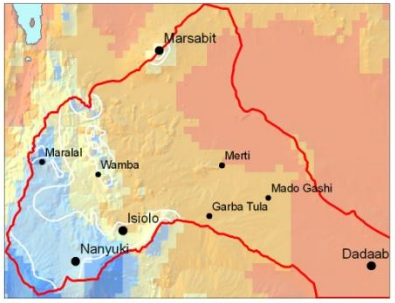
Minimum temperature



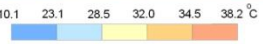
2050*



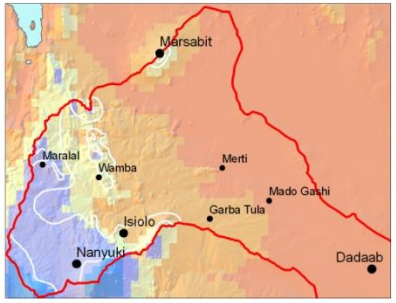
2000



2030*



Maximum temperature



2050*

* Predicted

Scale 1:5,500,000

Sources:

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- Towns (SoK topographic maps scale 1:50,000)
- Waterbodies (FAO 2000)
- Agro-climatic zones (KSS, Sombroek et al. 1982)
- Rainfall and temperature changes (Jones et al http:// futuredim.info)
- Hillshading was generated from ASTER DEM, 30m. ground resolution
- MODIS (Moderate Resolution Imaging Spectroradiometer) satellite data NASA, 2009 Ground resolution: 1 kilometer

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Adaptation research priorities

- Context of rapidly changing production systems and livelihood strategies
- Will CC mean more or less livestock production in marginal areas (CC to Livestock keepers)?
    - What do the exposure thresholds mean for dryland areas?
- Constraints on social/ econ/ institutional issues of adaptive capacity
    - Safety nets
    - Markets
    - Land tenure
- SCENARIOS as a planning tool


Thank you…
Photo: P. Little 2011