ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

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Climate Change and Index Based Livestock Insurance in Borana, Ethiopia

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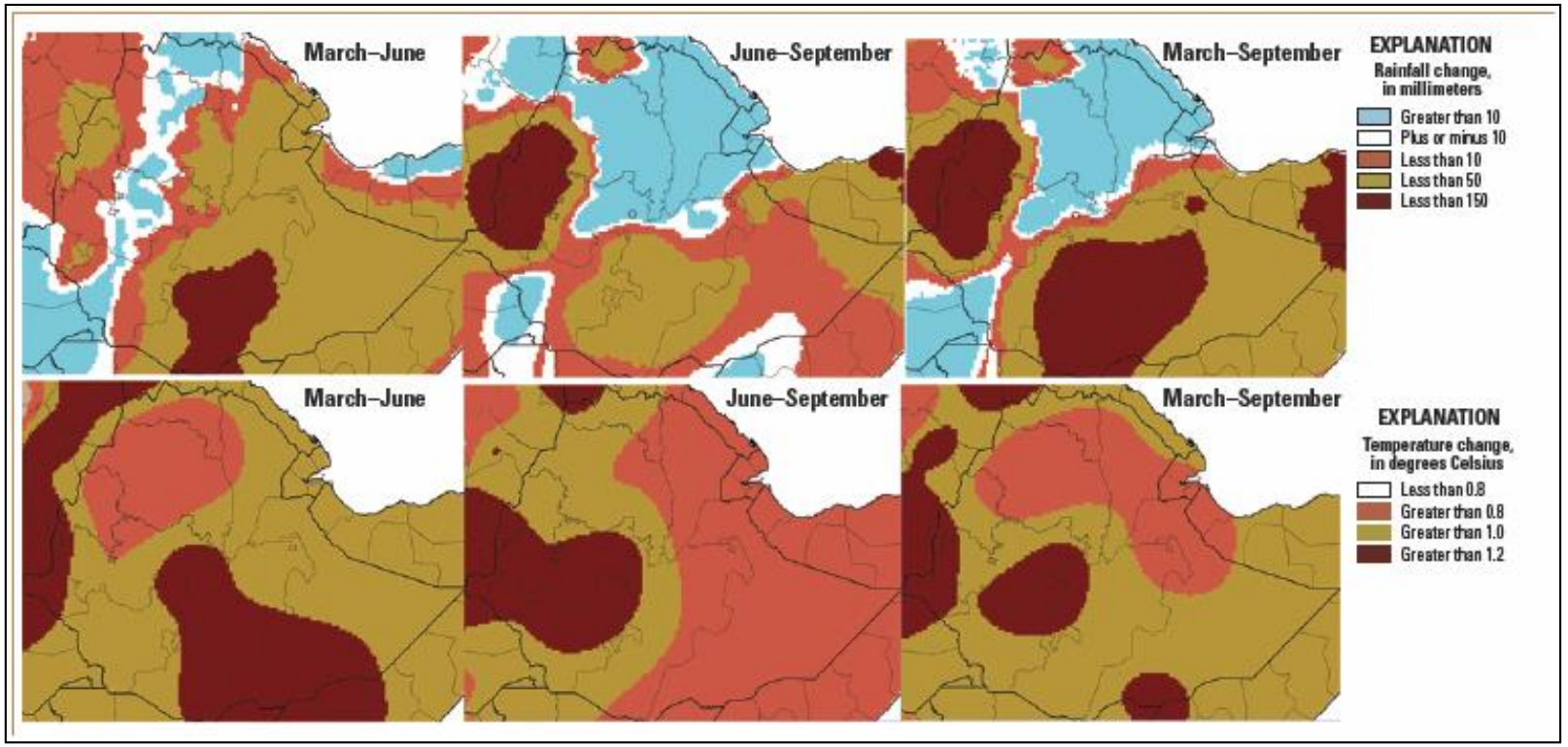
I4 Technical Committee Meeting
University of California Davis
September 13, 2013

Climate Change in Ethiopia

- Precipitation during both rainy seasons has fallen by 15-20% in southern Ethiopia between mid-1970s and late 2000s.
- Increased occurrence of below normal rainy season.
- Warming temperatures across the south.



Observed changes between 1960-2009 projected through 2039. March-June correspond to the Belg or "Long Rain" season. **Source:** Funk et al. 2012

Climate Change: Borana Perspectives and Responses

- Traditional pastoral coping strategies:
  - redistribution of cattle (*busa gonafa)*
  - herd splitting & mobility,
  - wide network of water sources, and
  - livestock that need watering less often.

- Boran pastoralists observe that droughts are becoming more frequent.

Excavation leading down to an ela (well) in the Borana region.

Informal insurance through inter-household transfers is poorly suited for covering large covariate shocks, such as drought.

Index Based Livestock Insurance (IBLI)

Index insurance is specifically aimed at mitigating risk due to covariate drought shocks.

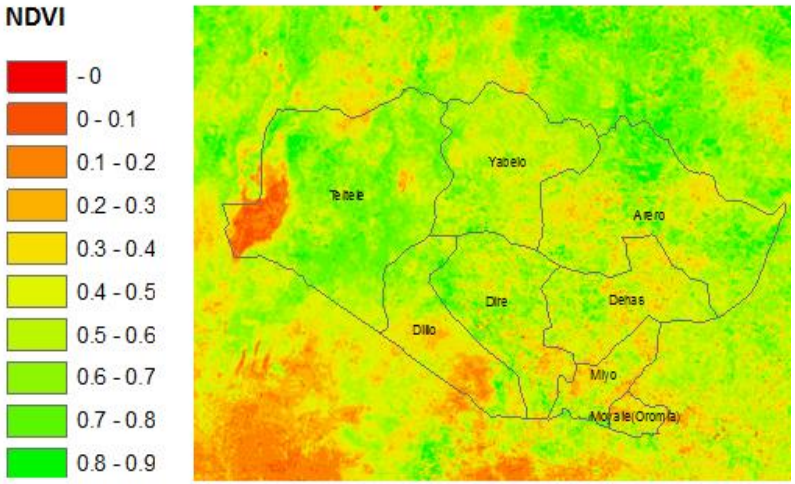
- Supports existing social insurance for idiosyncratic shocks.
- Supports pastoralist livelihoods rather than providing alternatives.

But, climate change also impacts the IBLI index

IBLI Borana Contract

- Based on season's cumulative standardized normalized differenced vegetation index (NDVI).

- Standardizing requires knowledge of the distribution of NDVI.



$$ZNDVI_{ift} = \frac{NDVI_{ift} - E_{if}(NDVI_{if})}{\sigma_{if}(NDVI_{if})}$$

$$i = pixel, f = period, t = year$$

Figure Left. MODIS NDVI in 8 Woredas of Borana Zone, Ethiopia: March, 2010. **Source:** NDVI-based livestock insurance for Borana zone contract summary.

Climate change may effect the seasonal distribution of NDVI or its relationship to palatable forage.

Climate Change and Improving IBLI Design

1. Climate change could impact the NDVI distribution.
   - Incorporate findings from climate change models on changing distributions into the index pricing

2. Changes to forage that are not captured by NDVI
   - Identify palatable forage and filter satellite data to focus index just on biomass available for livestock.

Climate Change & Improving IBLI Design I (work led by Natalie Mahowald)

A statistical approach:

- The geographic scale of current climate/ biomass predictions is too coarse to be of value in index construction or pricing. Attempt to increase the spatiotemporal resolution of ('downscale') climate forecasts to inform improved IBLI design.

Findings:

- Noise increases dramatically, signal largely unchanged. No real promise in downscaling.

Climate Change & Improving IBLI Design II (work led by Natalie Mahowald)

A structural approach:

- Take ensemble (i.e., multivariable) predictions from earth system models from the Climate Model Intercomparison Project (CMIP5).
- Includes interactions between temperature, precipitation, CO^2 and biomass. In principle, can forecast NDVI distributions directly.

Very preliminary findings:

1. Predicts more moisture and increased in vegetation production.
2. BUT, the model over predicts impact of CO^2 fertilization
3. Uncertainty increases at smaller scales.

Climate Change & Forage Palatability
(work led by Chuan Liao and Pat Clark)

Changes to plant species

- Bush encroachment
- Increased cropping

Mid-2011 drought near Yabello, Ethiopia

Classification and ground truthing of vegetation types to link with satellite data to filter out non-palatable forage from the signal.

Key Points

IBLI supports existing coping strategies.

Climate change will likely impact NDVI and the relationship that it has to forage.

To address climate change the IBLI project is:

1. Attempting to downscale climate change models so that the index accounts for climate trends.
2. Move beyond a vegetation measure to a measurement that reflects availability of palatable forage.