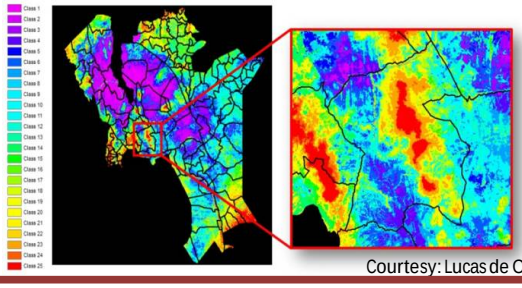
TOWARD NEW PRODUCT GENERATION

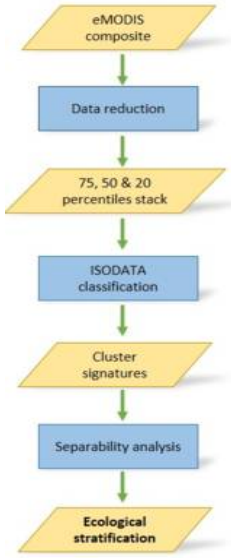
INDEX IMPROVEMENT - SPATIAL AGGREGATION & RANGELAND MAPPING

- ✓ **Are administrative units sufficiently representative of grazing areas?**
- ✓ **How can we relate NDVI-based forage assessment with animal nutrition?**

Spatial analysis of rangeland types and grazing areas to improve unit definition.



Courtesy: Lucas de Oto



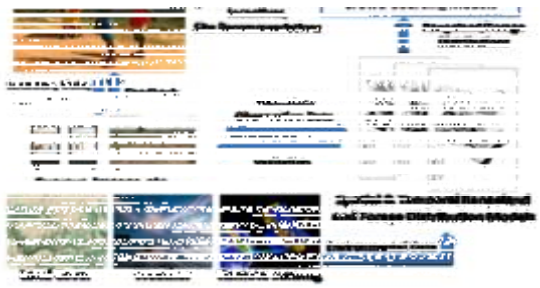
TOWARD NEW PRODUCT GENERATION

GROUND TRUTHING – CROWDSOURCING RANGELAND CONDITION

- ✓ **Can we develop innovative approaches to collect relevant information for index validation?**

- Crowdsource local and near real-time observations of vegetation type and conditions using smartphone app.
- Develop a rangeland model that integrates local observations with existing remotely sensed data.
- Conduct value of information analysis of the rangeland model to direct further local data collection.

Herders Submit Vegetation Images and Surveys with Smartphones

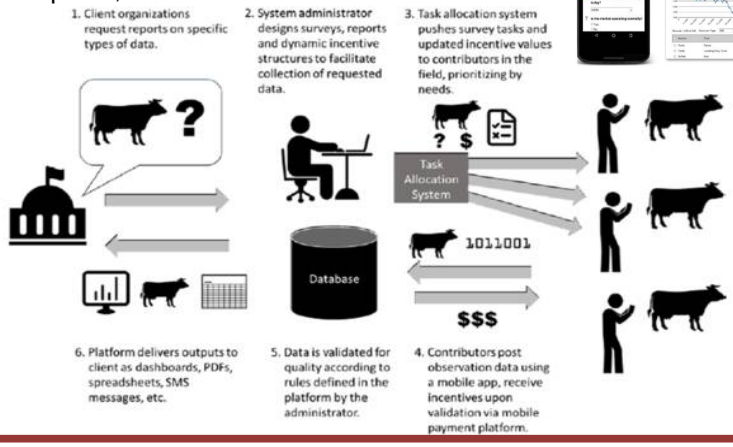


Jensen et al., 2015

TOWARD NEW PRODUCT GENERATION

GROUND TRUTHING – ILRI CROWDSOURCING PLATFORM

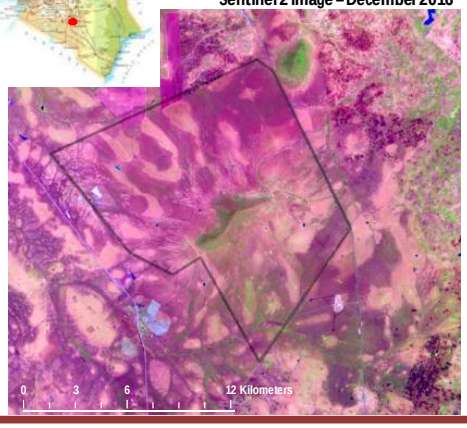
- Rangeland/livestock condition
- Animal diseases/feed and forage info
- Market prices, etc.



TOWARD NEW PRODUCT GENERATION

GROUND TRUTHING – LONG-TERM SITES

Sentinel 2 image – December 2016



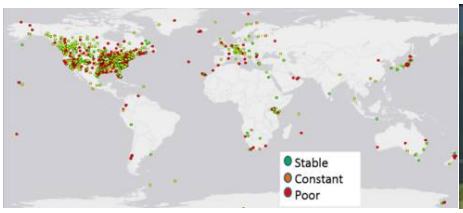
- ✓ Semi-arid rangeland area (550mm)
- ✓ Large experimental farm (33000 Acres)
- ✓ Research Infrastructure in place
- ✓ Ongoing experiments (i.e. GHG) and historical information available
- ✓ Grazing controlled (2500 cattle, 1200 sheep, 250 goats)
- ✓ Livestock & Wildlife

TOWARD NEW PRODUCT GENERATION

GROUND TRUTHING – LONG-TERM SITES

Digital repeat photography (webcam) with fixed camera can provide time series of ground truth information with very high temporal resolution to support satellite product validation at relatively low cost.

Digital repeat photography could provide information on:
- ❑ Rangeland greenness, phenology, production.
- ❑ Livestock condition.



AMOS Network http://amos.cse.wustl.edu/

CONCLUSIONS

HOW IBLI CAN BENEFIT FROM RAPP & SENTINELS?

- ❑ New products development. ***Closing the gap between greenness indicators, vegetation productivity and animal nutrition***.
- ❑ Better rangeland mapping at global and regional scales (S1-S2: vertical structure, PV/NPV, phenology)
  - → ***Need of products targeted to local pastoral systems!***
  - → ***Meet operational requirements!***
- ❑ Long-term data continuity and consistency (S3)
- ❑ Web-tools customized to support index-insurance programs
- ❑ Low-cost , standardized protocols for long-term field data collection
- ❑ Supporting capacity development of local institutions

THANK YOU

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Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

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TOWARD NEW PRODUCT GENERATION

ISSUES & QUESTIONS IN AN UP-SCALING PERSPECTIVE

- ❑ **Is vegetation greenness as proxy of green biomass sufficient to understand if livestock can meet its nutritional requirements?**
  → Remote sensing on forage quantity **& quality**/Mapping on non-palatable species/Multi-source indicators.
- ❑ **Can we find more efficient methods for index spatial and temporal aggregation to improve the relationships with household level impacts, while keeping the approach sufficiently general and understandable?**
- ❑ **How to guarantee long-term RS data continuity with changing Earth Observation platforms and sensors?**
- ❑ **Can new technologies help supporting the collection of ground truth/validation data?**
- ❑ **How to guarantee the transparency of index-based insurance schemes?**

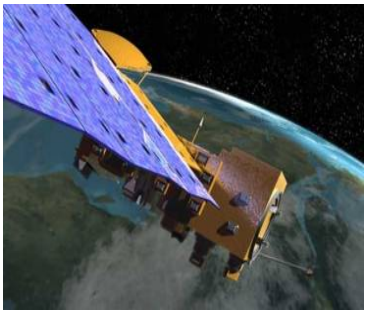
→ Multiple-stakeholder web platform to access relevant contract details and updates

REMOTE SENSING IN IBLI - THE DATA

Operational drought index at national/continental scale to assess drought-related forage scarcity/livestock mortality.

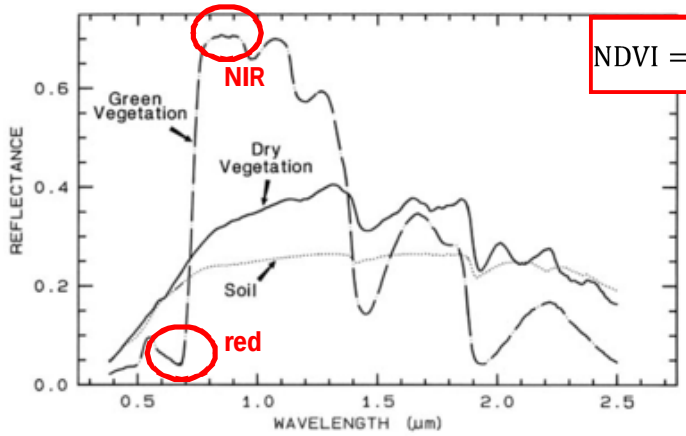
DATA REQUIREMENTS

- ➢ Robust (especially during extreme seasons)
- ➢ High temporal resolution (seasonal dynamics)
- ➢ Long-term time series (forward and backward)
- ➢ Data freely available/ low cost
- ➢ Expected data continuity
- ➢ Closely related to forage availability/livestock condition



disc.sci.gsfc.nasa.gov

REMOTE SENSING IN IBLI - THE DATA



$$NDVI = \frac{NIR - red}{NIR + red}$$

Indicator of the presence of photosynthetically-active green vegetation

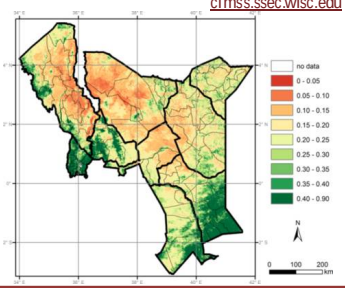
REMOTE SENSING IN IBLI - THE DATA

OPTIONS FOR RS-BASED DROUGHT INDICATORS

Rainfall

- Station-data limited
- Many satellite-derived RFEs, but accuracy for area?
- Detect drought conditions, but how this would affect forage availability and livestock health (e.g. rangeland can be more or less resilient)?

cimss.ssec.wisc.edu



Vegetation indices

- NDVI (but also others like EVI, fAPAR)
- a real measurement, available from many satellites
- Related to drought effect on forage

Alternatives indicators

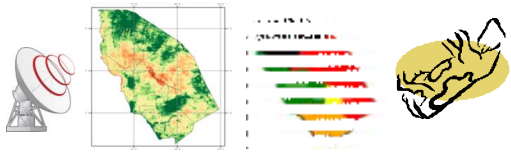
- Soil moisture
- Evapotranspiration (from LST)
- Temporary water bodies

CONTRACT DESIGN – THE INDEX

First Contract: ASSET REPLACEMENT (2010-2013 Marsabit)

- **Response Function:** livestock mortality data modelled from NDVI
- IBLI Contract is for **Asset Replacement**: Pays out when forage scarcity is predicted to cause livestock **deaths** in an area.

RS NDVI → Response Function → Mortality



Chantarat, Mude, Barrett and Carter (2013, *JRI)*

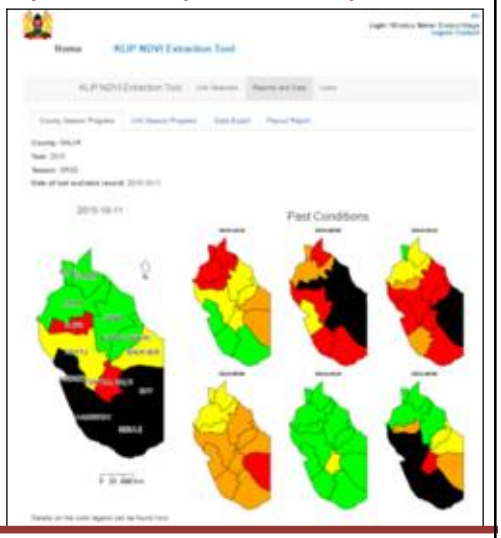
Product performance
- Quality of prediction is highest for more catastrophic drought events
- 85-88% accuracy for average herd losses of at least 20%.
- Even with this subsequent study calls contract precision into question "basis risk"

- ❑ Limited mortality data availability for scaling-up, issues with data accuracy.
- ❑ Why replacing rather than protecting livestock?

IMPLEMENTATION – DIGITAL SERVICES

TOOLS FOR CAPACITY DEVELOPMENT, EXTENSION, MARKETING, SALES

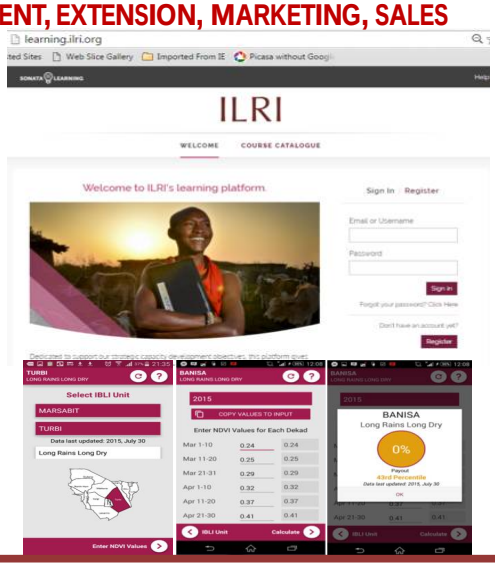
- Level 1: Knowledge and tools for government and insurance industry policy makers
- Level 2:
- Level 3:



IMPLEMENTATION – DIGITAL SERVICES

TOOLS FOR CAPACITY DEVELOPMENT, EXTENSION, MARKETING, SALES

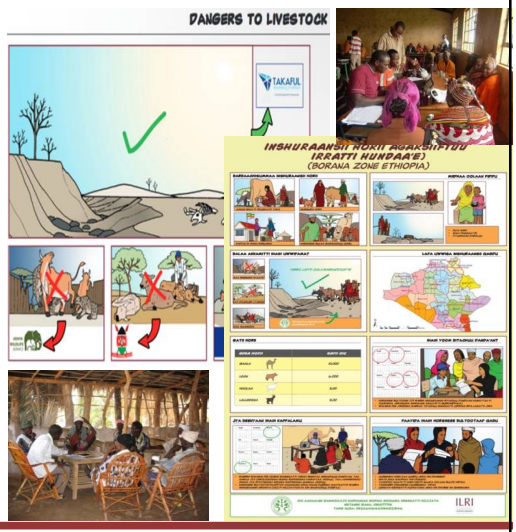
- Level 1: Knowledge and tools for government and insurance industry policy makers
- Level 2: Knowledge, skills and job aids for IBLI/KLIP sales agents and promoters
- Level 3:



IMPLEMENTATION – DIGITAL SERVICES

TOOLS FOR CAPACITY DEVELOPMENT, EXTENSION, MARKETING, SALES

- Level 1: Knowledge and tools for government and insurance industry policy makers
- Level 2: Knowledge, skills and job aids for IBLI/KLIP sales agents and promoters
- Level 3: Awareness raising for potential clients



KEY RESEARCH AREA - CONCLUSIONS

Rangeland ecology and basis risk reduction

- ✓ **Improved methods for forage availability assessment from remote sensing.**
  → Remote sensing on forage quantity **& quality**/Mapping on non-palatable species/Multi-source indicators.
- ✓ **More efficient approaches for insurance units definition and temporal aggregation.**
- ✓ **Ground truth/validation long term dataset. Leveraging new technologies (smart app, crowdsourcing, digital camera networks, etc.)**

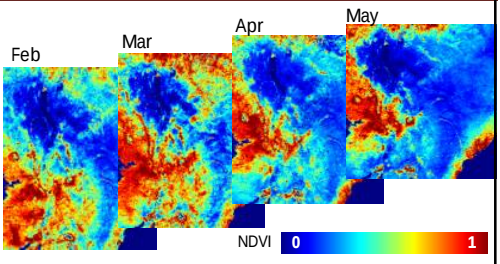
Scaling-up and sustainability

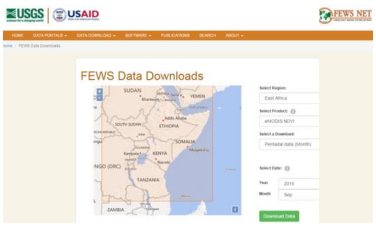
- ✓ **Automatic tools for information delivery, contract design, capacity building, dissemination, sales, etc.**
- ✓ **Digital services infrastructure. Beyond insurance: market (commodities, forage, milk…) information system, health and veterinary, feed and forage, etc.**

REMOTE SENSING IN IBLI - THE DATA

eMODIS PRODUCT

- ❑ Filtered MODIS NDVI times series.
- ❑ Available from 2000 at decadal temporal resolution. 'Real time'.
- ❑ 250 m geometric resolution.
- ❑ Freely distributed.





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