JAMEEL OBSERVATORY
FOR FOOD SECURITY EARLY ACTION

Earth observation options for dryland monitoring

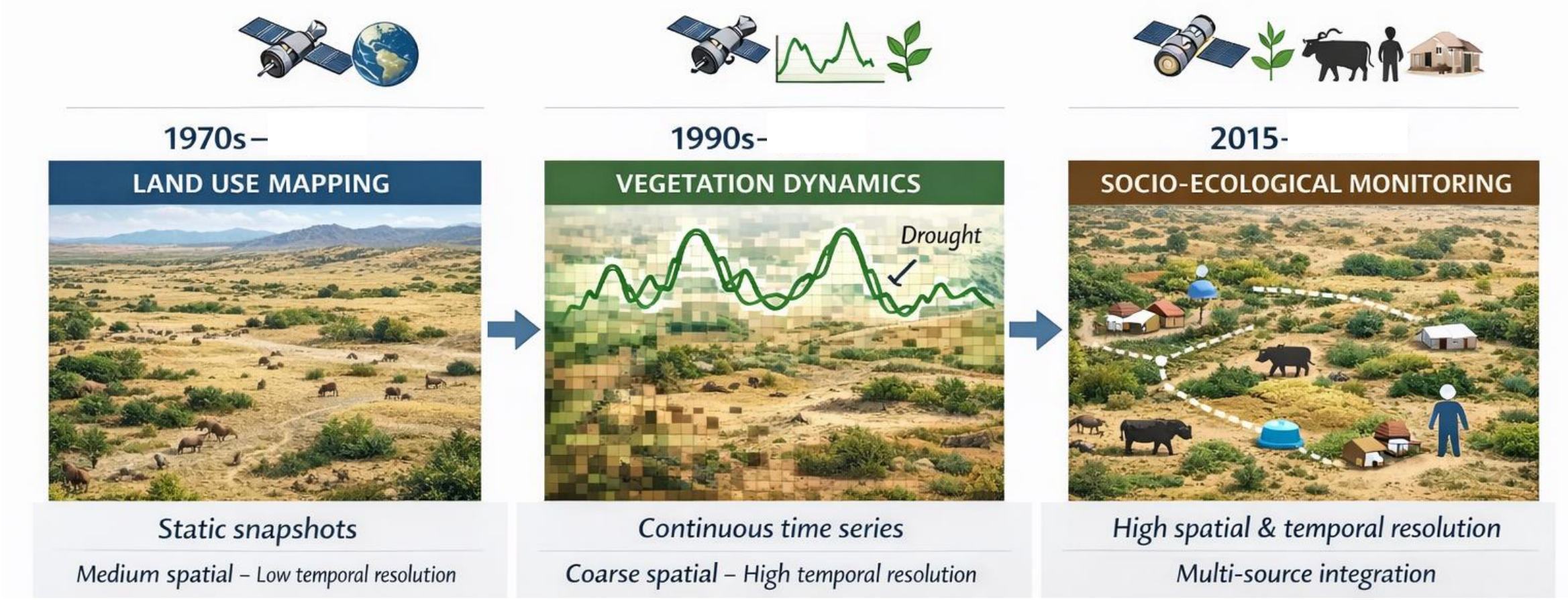
Francesco Fava

ASTER Lab. Agroecosystems Sensing for Environmental Resilience

Università degli Studi di Milano

Jameel Observatory stocktaking webinar on enhancing forecasting and earth observation data and applications for drylands of the Horn of Africa, 20 January 2026

Background – operational rangeland monitoring



Sectorial approach
Livestock vs rangelands vs humans

Interdisciplinary methods
Coupled Socio-ecological systems

Rangeland vegetation dynamics

Chracterization of rangeland spatial & temporal heterogeneity

- Fine-scale mapping of rangelands typologies
- Detecting rapid responses to stress and non-linear relationships with rainfall
- Assessing primary production and carbon stock

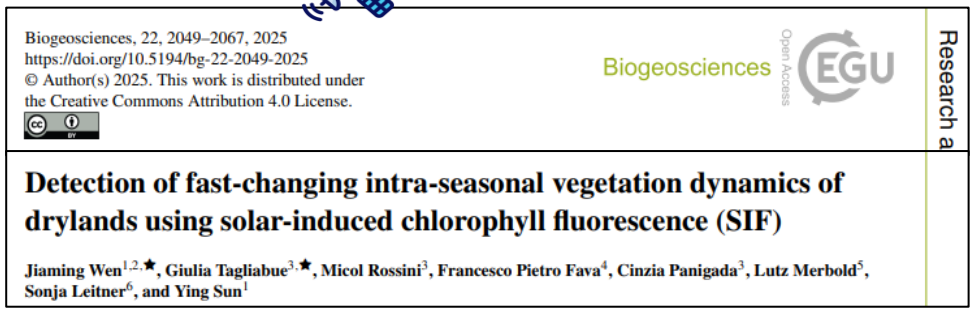
Decision support and land management

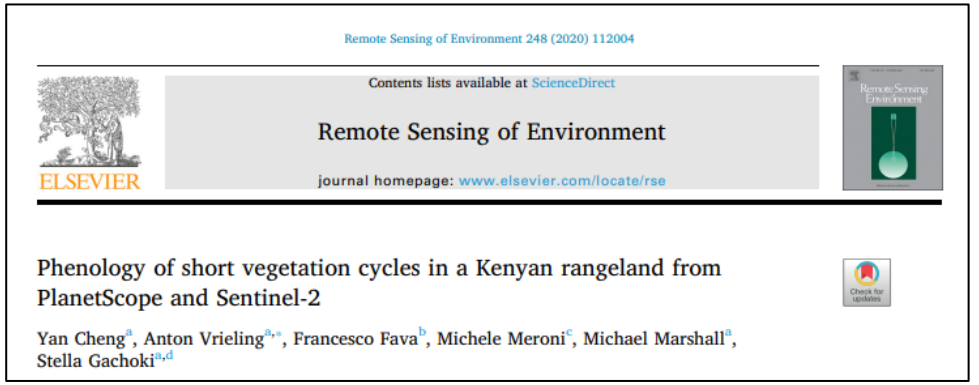
→ Mapping rangeland quantity and nutritional status (hypespectral remote sensing) + virtual fencing

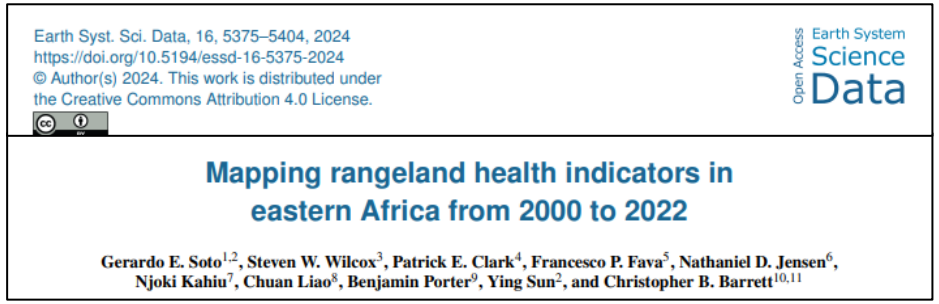
→High resolution monitoring, early warning & impact assessment (rainfall estimates + soil moisture + vegetation production)

→ Cascading and compound risks/impact analysis

→Monitoring management practice and rangeland restoration







Rangeland vegetation dynamics

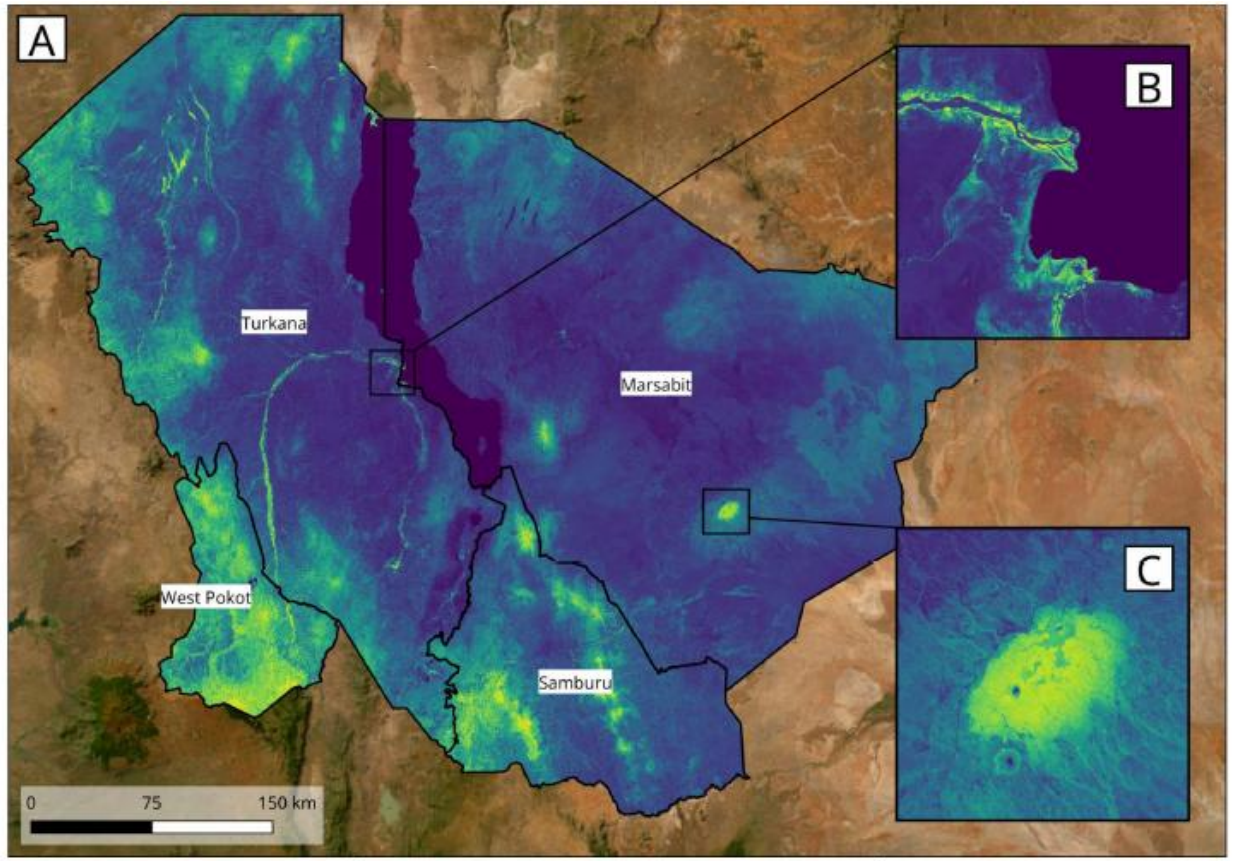
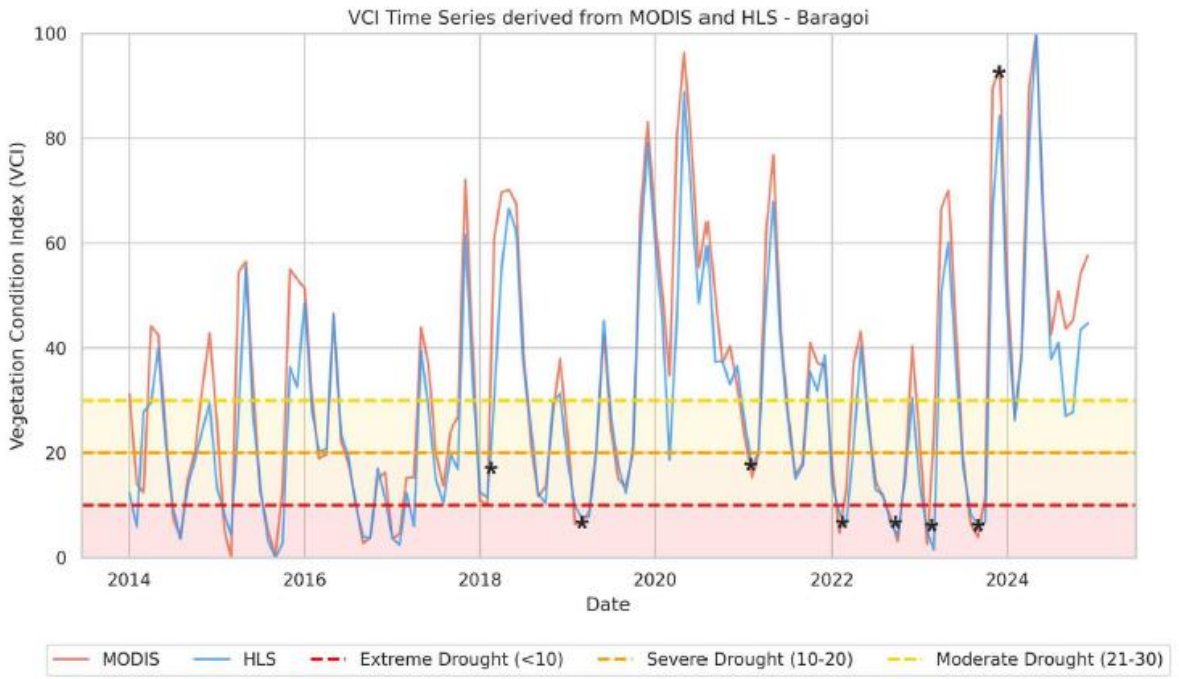


Figure 7: *Example of monthly composite (September 2017) derived from Harmonized Landsat Sentinel (HLS) dataset. (A) Overview of Turkana, Marsabit, Samburu and West Pokot sub-counties; (B) Zoom on Turkel river's mouth; (C) Zoom on Marsabit and Marsabit National Park.*



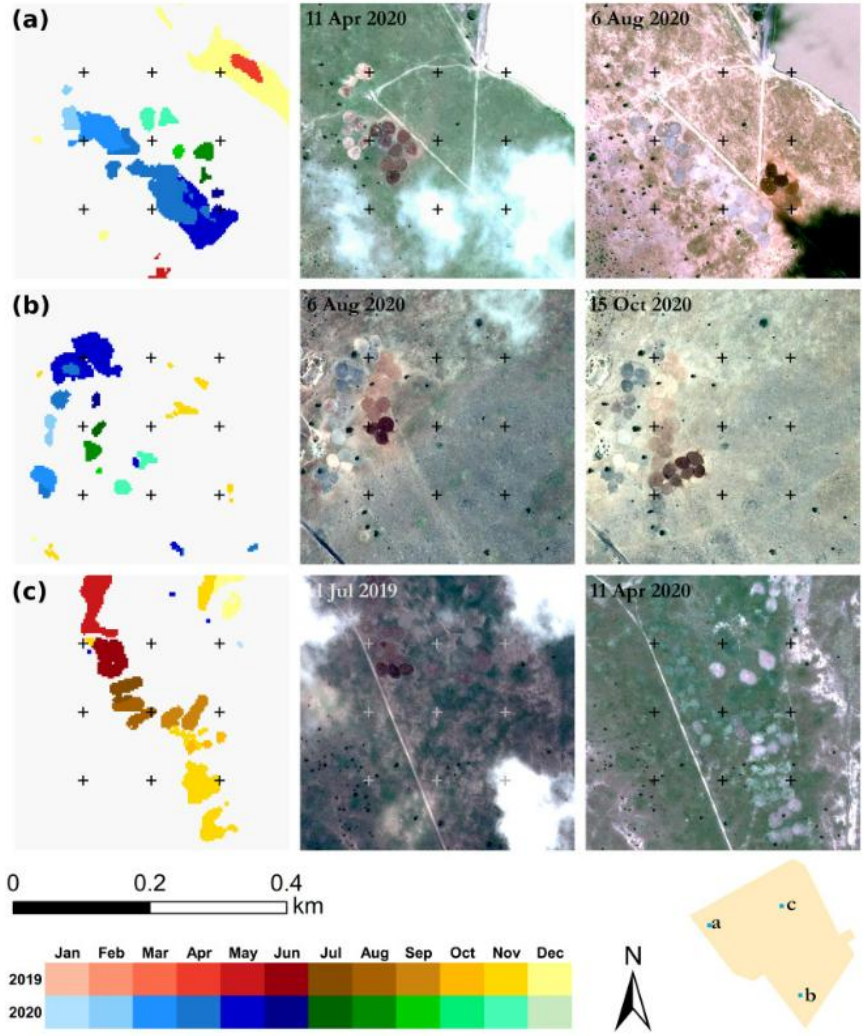
HLS: Harmonized Landsat-Sentinel

Livestock & wildlife

- ❑ Mapping livestock distribution and density (optical and thermal RS)
- ❑ Characterizing GHG emission risk (e.g, manure)
- ❑ Detecting CH^4 emission hotspots







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Biogeosciences Open Access EGU Research

Inferring methane emissions from African livestock by fusing drone, tower, and satellite data

Alouette van Hove[1], Kristoffer Aalstad[1], Vibeke Lind[2], Claudia Arndt[3], Vincent Odongo[3], Rodolfo Ceriani[4,5], Francesco Fava[5], John Hulth[1], and Norbert Pirk[1]

Remote Sensing of Environment 279 (2022) 113110

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Remote Sensing of Environment

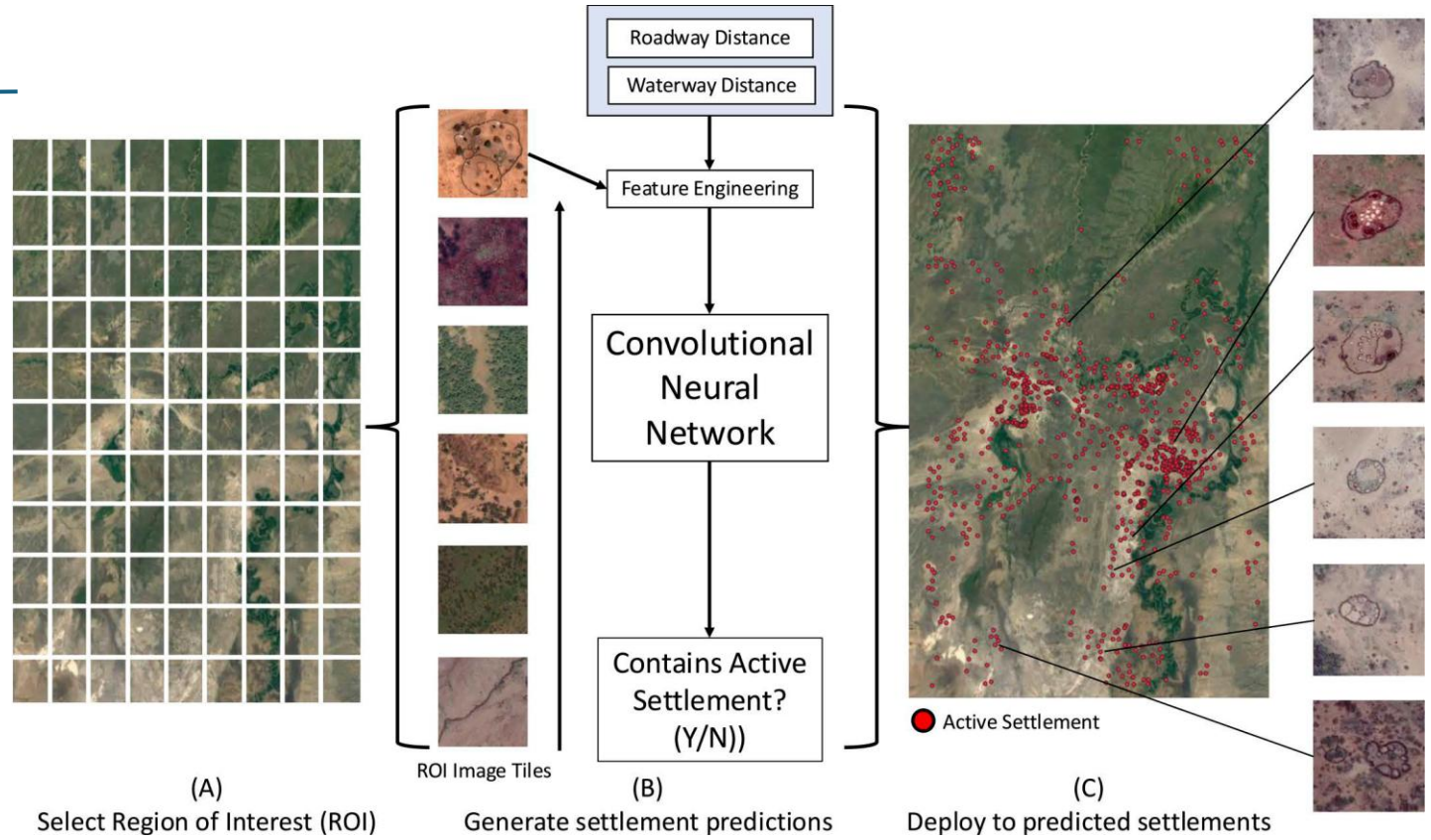
journal homepage: www.elsevier.com/locate/rse

Identification of temporary livestock enclosures in Kenya from multi-temporal PlanetScope imagery

Anton Vrieling[a,*], Francesco Fava[b,c], Sonja Leitner[b], Lutz Merbold[b,d], Yan Cheng[e], Teopista Nakalema[f], Thomas Groen[a], Klaus Butterbach-Bahl[b,g]

Human settlements

- ❑ Mapping human settlements and infrastuctures
- ❑ Monitoring of population density and dynamics
- ❑ Surveillance of risk interphases (human, livestock, wildlife)



PNAS RESEARCH ARTICLE | ECOLOGY OPEN ACCESS

Epidemiological connectivity between humans and animals across an urban landscape

James M. Hassell[a,b,c,1], Dishon M. Muloi[d,e,f], Kimberly L. VanderWaal[g], Melissa J. Ward[d,h,i], Judy Bettridge[c,e], Nduhiu Gitahi[j], Tom Ouko[k], Titus Imboma[l], James Akoko[e], Maurice Karani[e], Patrick Muinde[e], Yukiko Nakamura[m], Lorren Alumasa[e], Erin Furmaga[n], Titus Kaitho[o], Fredrick Amanya[e], Allan Ogendo[e], Francesco Fava[e,p], Bryan A. Wee[c], Hang Phan[n], John Kiiru[k], Erastus Kang'ethe[l], Sam Kariuki[k], Timothy Robinson[q], Michael Begon[c], Mark E. J. Woolhouse[d,f,2], and Eric M. Fèvre[c,e,1,2]

PLOS GLOBAL PUBLIC HEALTH

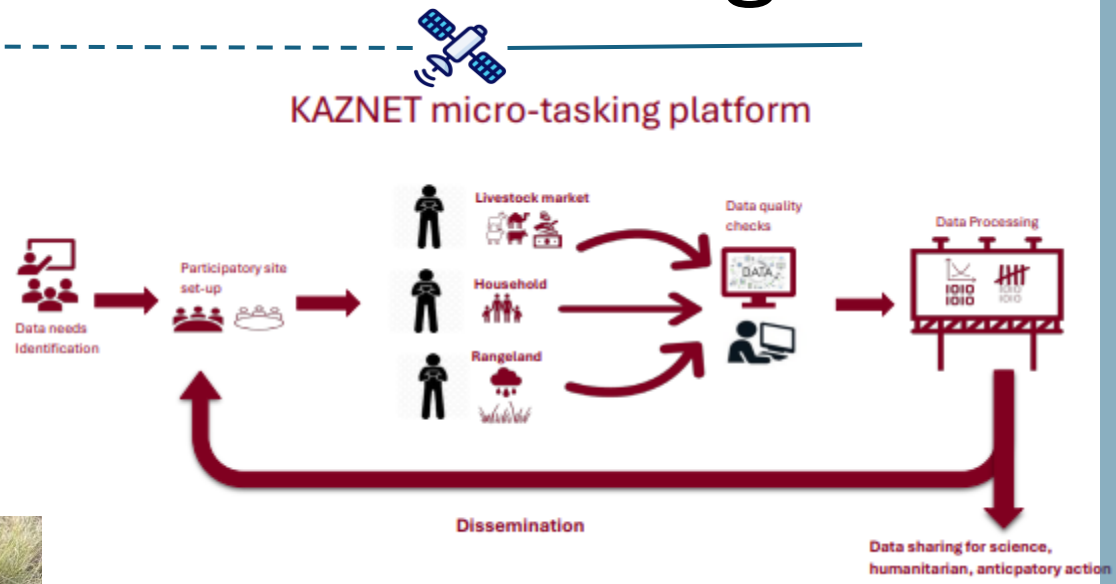
RESEARCH ARTICLE

Leveraging deep learning models to increase the representation of nomadic pastoralists in health campaigns and demographic surveillance

Benjamin Liu[1,2], Stace Maples[3], Jessie Kong[3], Francesco Fava[4], Nathaniel Jenson[5], Philemon Chelanga[6], Sergio Charles[1], James Hassell[7], Lance W. Robinson[8], Luke Glowacki[9], Michele Barry[10], Hannah B. Wild[11]*

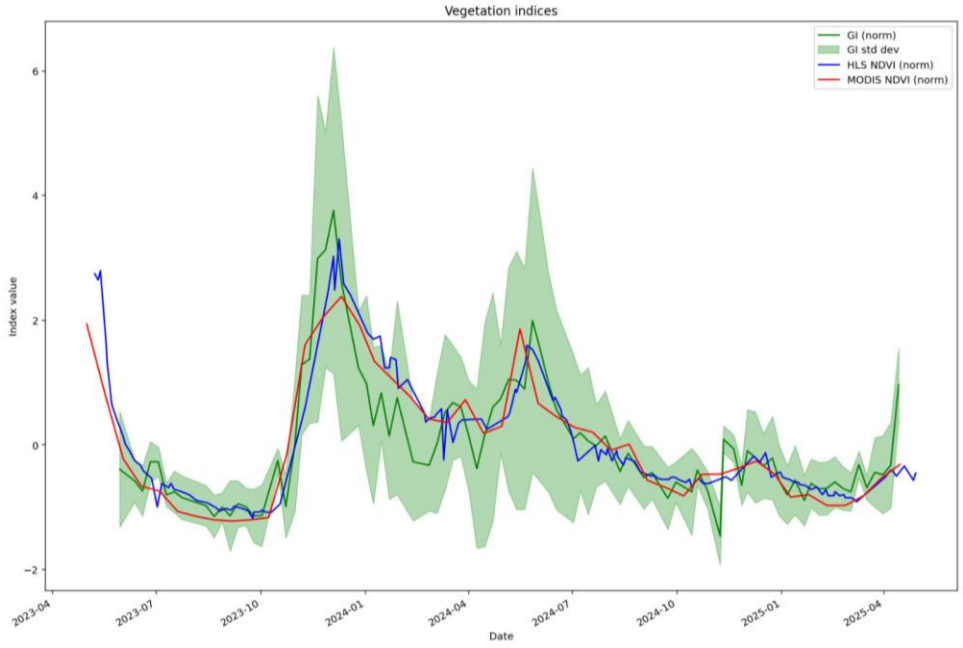
High-frequency multi-level ground monitoring

- ❑ Evaluation/comparison of EO-based models
- ❑ Integration of socio-economic dimension and local knowledge
- ❑ Dissemination and use of the information



Green forage from ground (kaznet) and satellite observations

Nadir mean normalized values for Korr buur







https://cgspace.cgiar.org/server/api/core/bitstreams/30c971ce-ff1c-4f69-a0e0-304ddb9d52d3/content



Source: Watson Lepariyo/ILRI

Implications

Policy, practitioners, farmers

- ❑ Real options for developing decision support systems and inform policies tailored to the local context
- ❑ Integration with modelling to assess impacts of alternative management and climate scenarios → carbon farming/ecosystem services (drylands multifunctionality)
- ❑ Improvement of climate risk management through better understanding and modelling of impact chains and cascading/compound risks
- ❑ Toward adaptive management integrating local experience with scientific data to improve resource use efficiency and productivity

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Thanks!

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