Leibniz Centre for
Agricultural Landscape Research
(ZALF)

Data Analysis
& Simulation

User-Centered Agricultural Drought Monitoring: Integrating Multisource Remote Sensing Data for Effective Decision Making

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Background and Aims

Monitoring agricultural systems is essential for ensuring food security and achieving sustainable development goals. This requires understanding how climate extremes and field management practices impact crop yields in a spatially explicit and scalable way. **ADM-KENYA** aims to co-develop solutions for monitoring **crop condition** and **cropping systems** with Earth Observation (EO) data to derive evidence-based **quantitative vegetation condition** estimates with high spatial and temporal resolution.

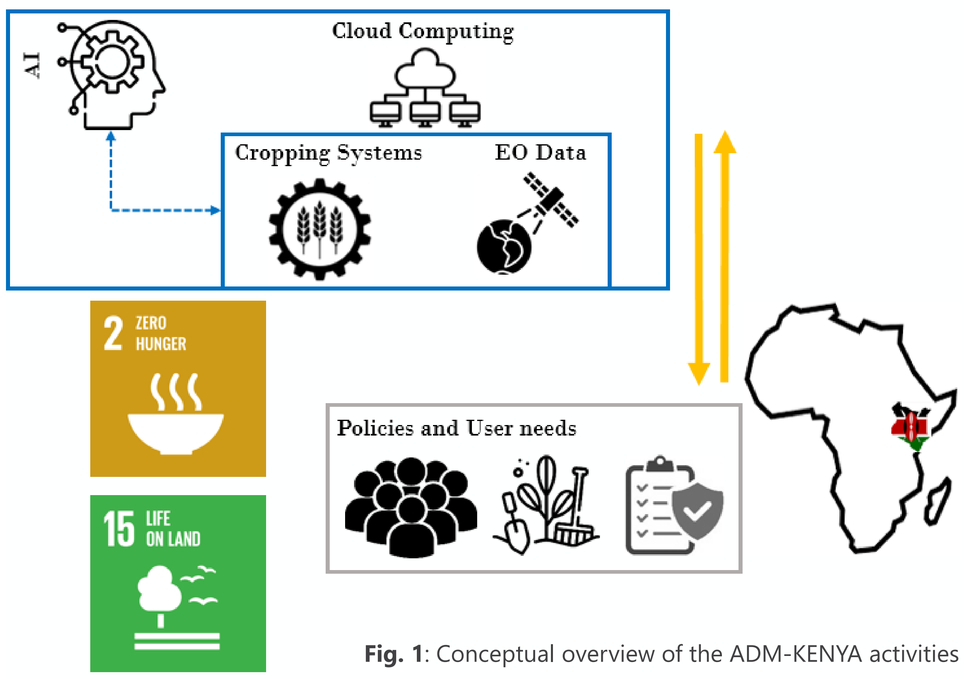

Fig. 1: Conceptual overview of the ADM-KENYA activities

- **Leveraging freely accessible EO data** to monitor changes in abiotic stressors in croplands accurately and frequently by **tracking subtle changes in time series**.
- Developing **cloud-based processing** algorithms that enable the accurate and spatially explicit analysis of drought hazards and impacts using remotely sensed images (**Sentinel-1, -2, &-3**).
- **National scale** analysis in Kenya, observing **multi-season droughts** in recent years.
- Deriving drought-relevant agricultural information, such as high-resolution crop management data, including **irrigation** at a national level and localized information on **cropping practices** in pilot areas.

Dataset and Methods

The approach emphasizes **user engagement** by actively engaging stakeholders to identify needs and incorporate their perspectives into the **data development** and **validation process** to ensure that the data is tailored to **end users needs**.

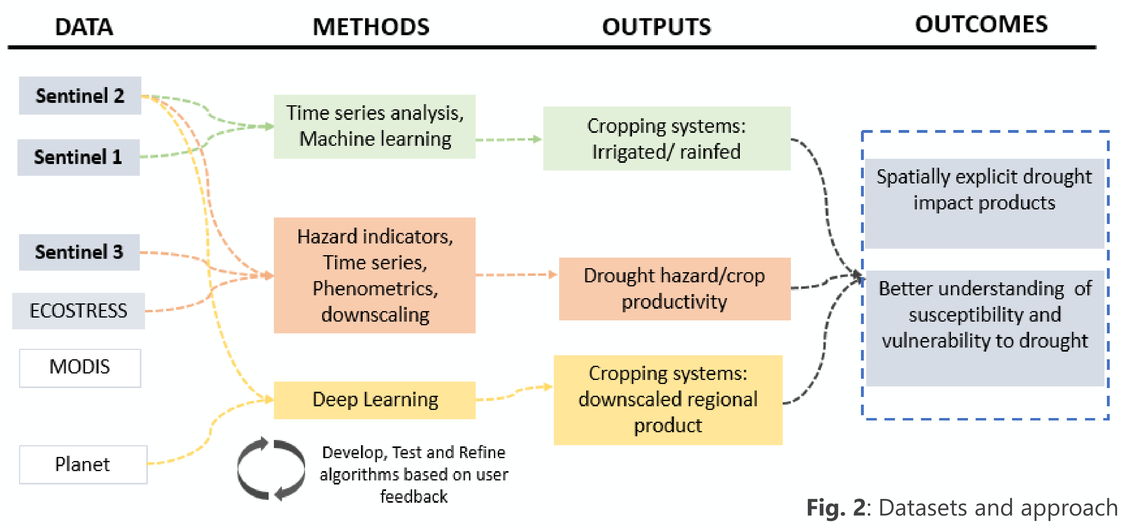

Fig. 2: Datasets and approach

Results and Validation

High resolution national and county scale products, including **crop condition**, **Evapotranspiration (ET)**, and **irrigation** system maps were provided using **Sentinel 2/3 time series**.

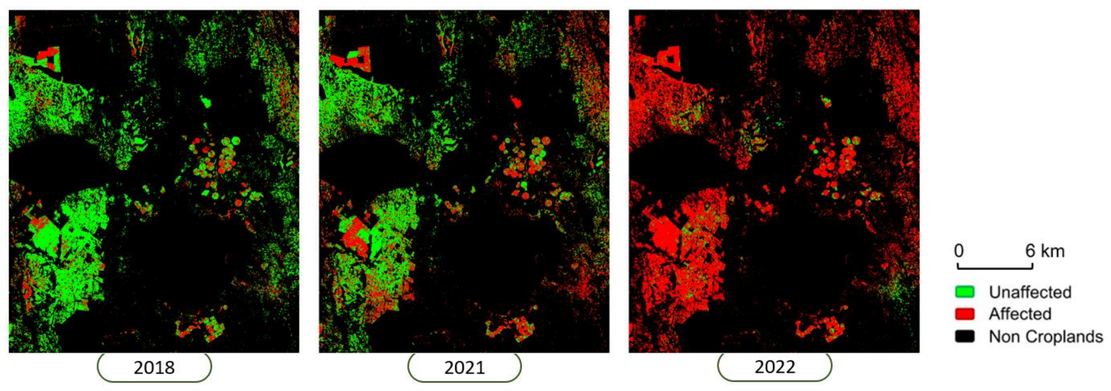

Fig. 3: Short rain crop condition map, illustrating affected regions by drought.

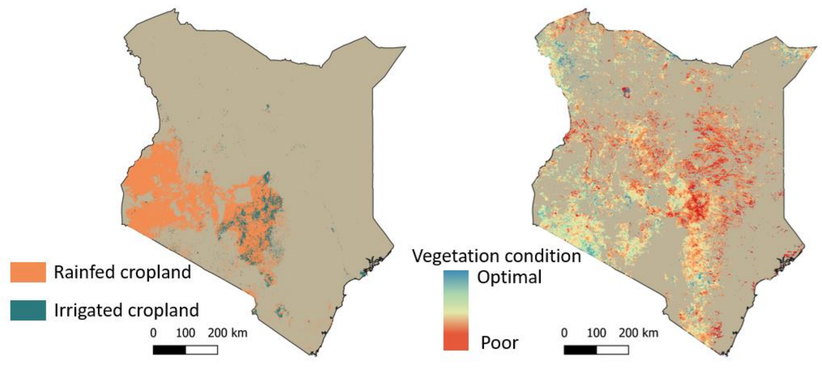

Fig. 4: Irrigated and rainfed cropland map derived from EO time series and moderate resolution vegetation condition

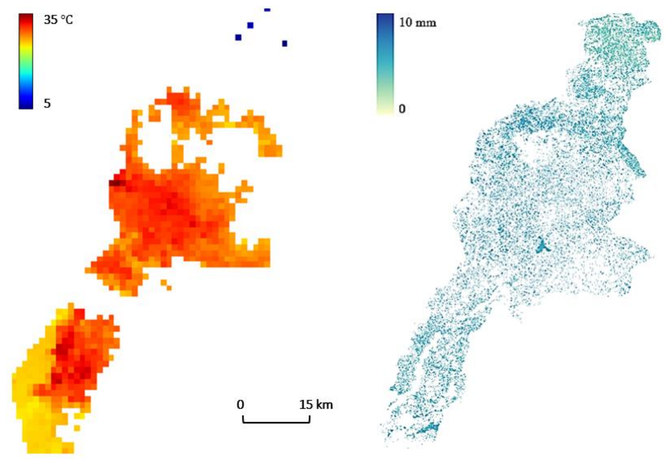

Fig. 5: Coarse resolution (1-km) LST map of Sentinel-3 L2 SLSTR (left) to high resolution (20-m) ET product (right) in Busia county

- **Direct validation**: This involves comparing satellite-derived products with in-situ data (such as field data collected in 2023).
- **Indirect validation**: This encompasses products' intercomparisons and assessments of their temporal and spatial consistency with similar datasets or other appropriate reference data.
- **User-based validation**: This involves consolidating the feedback and evaluations from end users who utilize the satellite-derived data.

Outlook and contribution

The innovative approach to drought monitoring using EO data and agricultural information development enables **more precise monitoring of drought conditions and crop status.**

By providing **relevant** and **up-to-date** information to **stakeholders** and **policymakers**, the approach can aid in developing effective drought management strategies and policies.

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