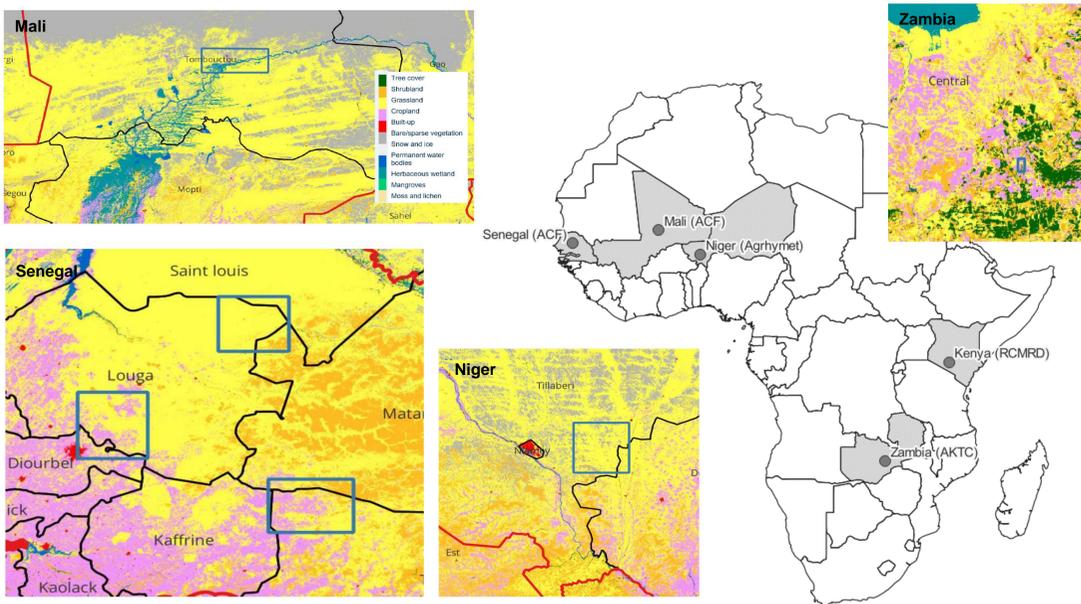


### Scientific Aims

Within "ARIES", experimental EO analysis techniques will be developed and validated, addressing water management and food security in Africa. These techniques, algorithms and prototype solutions will be based on a new generation of operational EO data from thermal (ECOSTRESS) and hyperspectral (PRISMA/EnMAP) satellite sensors. More specifically, we will investigate the synergy between these new data sources and operational Copernicus data services (mainly Sentinel-2 and Sentinel-3) to generate high-resolution indicators on crop growth and water stress. As such, the experiences gained within this project will deliver important information for the design of future Copernicus missions (CHIME, LSTM). The project started in September 2022 and runs for two years.

### Partnership

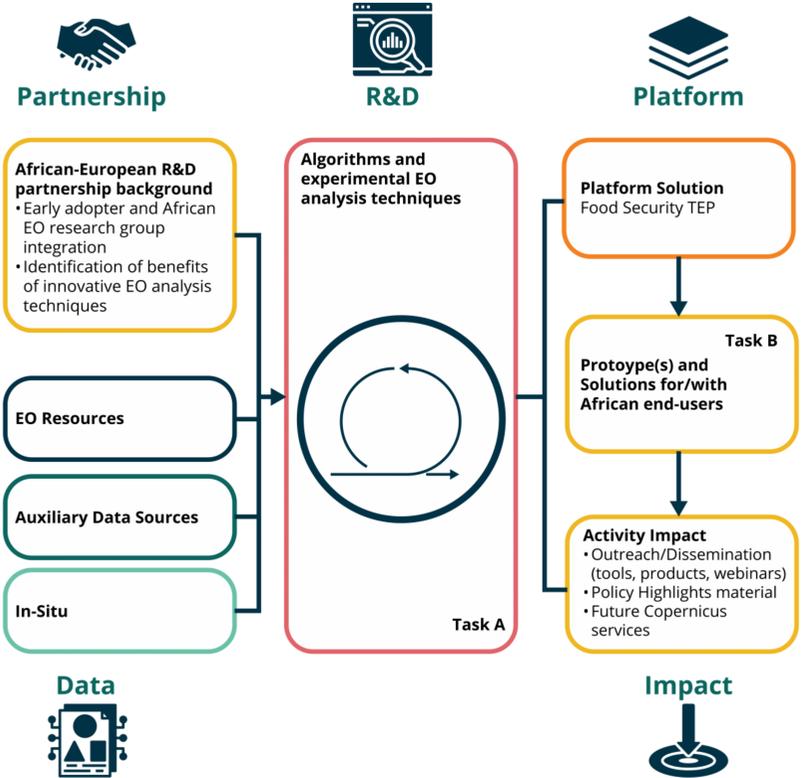
To ensure the products developed within the project serve the needs of future users, we developed an integration strategy with five African Early Adopters. These partner organizations and their designated test sites are covering different regions in Africa as well as different agricultural management systems (irrigated and non-irrigated croplands and pastoral systems). Thereby, the developed algorithms and approaches can be validated, tested and evaluated in different geographical regions with different climatic conditions and agricultural practices.



Product	Description	EO inputs	Spatial resolution
Ecosystem water stress	An indicator signifying the amount of water stress received by the landscape.	ECOSTRESS, Meteo	70m
Crop water stress	High resolution indicator on water stress experienced by crops.	Sentinel-3 LST, Sentinel-2 optical bands, Meteo, DEM	20m
Drought susceptible area	Rapid change index (RCI) based on STR	Sentinel-2 SWIR bands	10m
Plant leaf water content	Modelled using radiative transfer models	PRISMA, ENMAP	30m
Green plant leaf area	Modelled using radiative transfer models	PRISMA, ENMAP	30m
Canopy water content	Combination of leaf water content and leaf area products	PRISMA, ENMAP	30m

### Validation Strategy and Data

In ARIES a broad validation strategy, encompassing direct and indirect validation as well as global sensitivity analysis and tests of product transferability, will be applied. We will be using in-situ data provided by our partners as well as additional datasets, in cases where little or no suitable in-situ data is available.



### Impact

ARIES aims to create more detailed and timely information about drought conditions and crop water stress for African land use stakeholders. Thus, helping them navigate changing climatic conditions with unreliable rainfall patterns, that threaten food security. On an individual field or farm level this could e.g., take the form of more timely irrigation advice. On a larger scale the information that will be generated aims to inform drought policy frameworks in the respective regions.

### User Requirements and Products

The overarching use case highlighted in the interviews with the different users is the impact of drought/water stress on crop and forage productivity. Crucial elements will be the detection of when plants experience water stress and for how long and the effects this has on crop and grassland biomass production. The user requirements are expected to evolve throughout the project.

Currently we foresee 6 products within the scope of the ARIES project: Green leaf area, Leaf water content, Canopy water content, Ecosystem water stress, High resolution crop water stress and Drought susceptible area.

It is foreseen that at the end of the project, the product specifications can be further detailed based on the findings of the ARIES project, with a better understanding of the possibilities and limitations of the thermal and hyperspectral EO data.

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Test site characterization maps were created using ESA World Cover Data © ESA WorldCover project / Contains modified Copernicus Sentinel data (2021) processed by ESA WorldCover consortium

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