# Track 3: Climate Impacts on Soil Health, Agricultural Resilience, and Food Security in Sub-Saharan Africa

Key questions, technical information and recommended datasets

In this track, the aim is to bring together soil constraint indicators (pH, organic carbon, texture, erosion risk) and climate stress projections to pinpoint where degraded land and future moisture deficits coincide. With over 65 % of SSA's arable soils already compromised, the tool should integrate current datasets like AfSIS/SoilGrids250m and GloSEM baseline with Atlas NDWS/NDWL and bias-adjusted ISIMIP CMIP6 moisture projections. By layering agricultural exposure from MapSPAM and GLW4, it should reveal risk hotspots and highlight the urgency of targeted land-management interventions to safeguard yields, food security, and rural livelihoods.

Designed for adaptation planners, scientists, and proposal writers, the tool will offer summaries, country or agroecological filters, and time-slice selections (2000–2020 historical; 2021–2100 future) to address current soil conditions, intensification of moisture stress, overlap of soil and climate risks, agricultural exposure, and suitable management practices. Interactive maps, charts, text summaries and downloadable tables should enable users to compare subregions, overlay historical versus future projections, integrate watershed boundaries, and explore solution linkages—such as liming, mulching, compost applications or water-harvesting strategies drawn from WOCAT—to inform robust, data-driven adaptation investments.

[Useful background info](#)

Below, you can find suggestions and recommendations for datasets that might help you answer these questions. The only datasets you need to use are those found in the [Baseline Datasets](#) notebook provided.

1. ## What is the current condition of soils across SSA, in terms of acidity, organic carbon, texture, and erosion?
   - [Soil Grids 250m v2.0 | awesome-gee-community-catalog](#) (includes data for SOC, pH, and other soil related variables)

- FAO Soil database:
  - [Harmonized world soil database v1.2 | FAO SOILS PORTAL](#)
  - [Harmonized World Soil Database (HWSD) version 2.0 - awesome-gee-community-catalog](#)
- Erosion:
  - [Soil Erosion | Resource Watch](#)
  - [GloSEM 1.3: High-resolution global estimates of present and future soil displacement by water erosion](#)
- [Annual dynamic dataset of global cropping intensity from 2001 to 2019](#)

## 2. Where will soil moisture stress intensify under future climate scenarios (aligned with ATLAS SSPs and timeframes)? Do extremes become more extreme? Is there more chance of climate whiplash?

- [AAA Atlas Hazard Data](#):
  - NDWS and Soil moisture/holding capacity
- [ISIMIP Soil Moisture](#)
- [Soil Grids 250m v2.0 | awesome-gee-community-catalog](#)(for Soil water content)
- Adaptation strategies for agricultural green water scarcity under climate change. [Paper (PNAS NEXUS)](#) | [Dataset (Xenodo)](#)
- [GloSEM 1.3: High-resolution global estimates of present and future soil displacement by water erosion](#)

## 3. Which locations face compound risk—i.e., current soil constraints overlapping with current and future climate stress?

- Soil Constraints:
  - Data from question 1 can be used here to identify the regions with poor soil condition.
  - CropSuite limiting factor could also be used to identify regions/crops where soil health is the primary constraint. [CropSuite – Crop suitability assessment for 48 crops under rainfed and irrigated conditions for Africa](#)
- Climate Hazards:
  - [AAA Atlas Hazard Data](#)
  - [AAA Atlas Hazard Exposure](#)


## 4. How much agricultural activity (crop and livestock) is exposed to these risks?

- AAA Atlas
  - Exposure datasets of value of production, livestock numbers, production, etc. Overlay with soil constraint data to approximate how much value is currently exposed to poor soil conditions.
- Livestock:

- - *s3://digital-atlas/domain=exposure/type=livestock/source=glw4/region=ssa/time=2020/processing=atlas-harmonized/variable=vop_nominal-usd-2021/glw4-2020_vop_nominal-usd-2021.tif*
  - Crops:
    - *s3://digital-atlas/domain=exposure/type=crop/source=spam2020v1r2_ssa/region=ssa/processing=atlas-harmonized/variable=vop_nominal-usd21/spam_vop_nominal-usd21_all.tif*

## 5. What sustainable land, soil, and water management practices are most suitable to respond to these risks?

- Global Database on Sustainable Land Management (impact of land management practices)
- AAA Atlas solutions:
  - *s3://digital-atlas/domain=solution/theme=yield-impact/source=atlas_analogues/region=ssa/processing=raw*
- SoiLEX | FAO SOILS PORTAL (policy that countries have implemented)
- Suggestion: include a non-spatial CSV linking restoration options to each soil constraint; e.g. lime application (acidity), cover cropping and mulching (erosion), compost or manure (SOC), and water harvesting or conservation tillage (moisture stress).