Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

**United Nations Expert Group Meeting on Population, Food Security, Nutrition and Sustainable Development**

# Data, Big-data, Innovation and Technology In Food and Agriculture

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# Presentation Outline

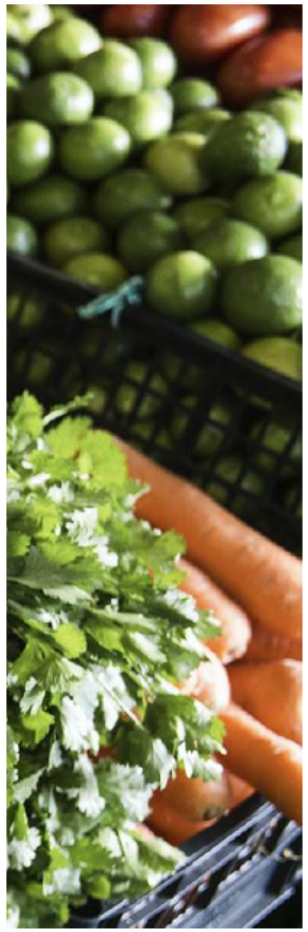
1. Current Situation in the Food and Agriculture

2. The Role of Data in Food and Agriculture

3. FAO examples in applying Data and Big Data in agriculture

4. Emerging and future data uses in Food and Agriculture

# We are not on track towards ending hunger, food insecurity and malnutrition



## World hunger is still increasing

**Up by 10 million people in one year and nearly 60 million in five years**

## Looking beyond hunger

**Over 2 billion people do not have regular access to safe, nutritious and sufficient food**

## The world is not on track to eradicate hunger

**If recent trends continue, the number of hungry people would surpass 840 million by 2030**

## The world is not on track to defeat malnutrition

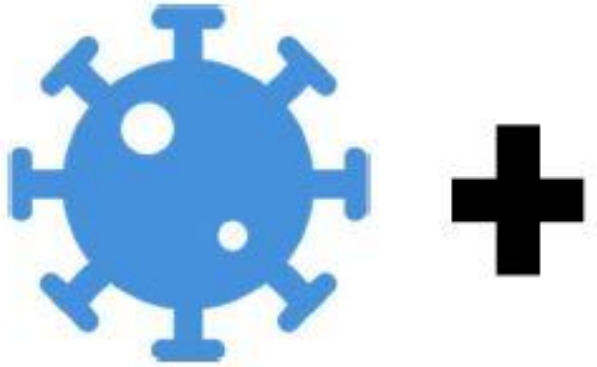
**While there is some progress in child stunting and breastfeeding, child overweight is not improving and adult obesity is rising**

## COVID-19 poses a serious threat to food security

**The pandemic may add as many as 132 million people to the total number of hungry in 2020. It may also reduce nutrient intake and diet quality, thus increasing the risk of malnutrition**

# Current Situation in the Food and Agriculture

Covid-19 has worsened the food insecurity worldwide – developing countries mostly impacted



- Conflict/insecurity
- Weather extremes
- Economic turbulence
- Plant pests/diseases
- Displacement

PRESS RELEASE

SECURITY COUNCIL

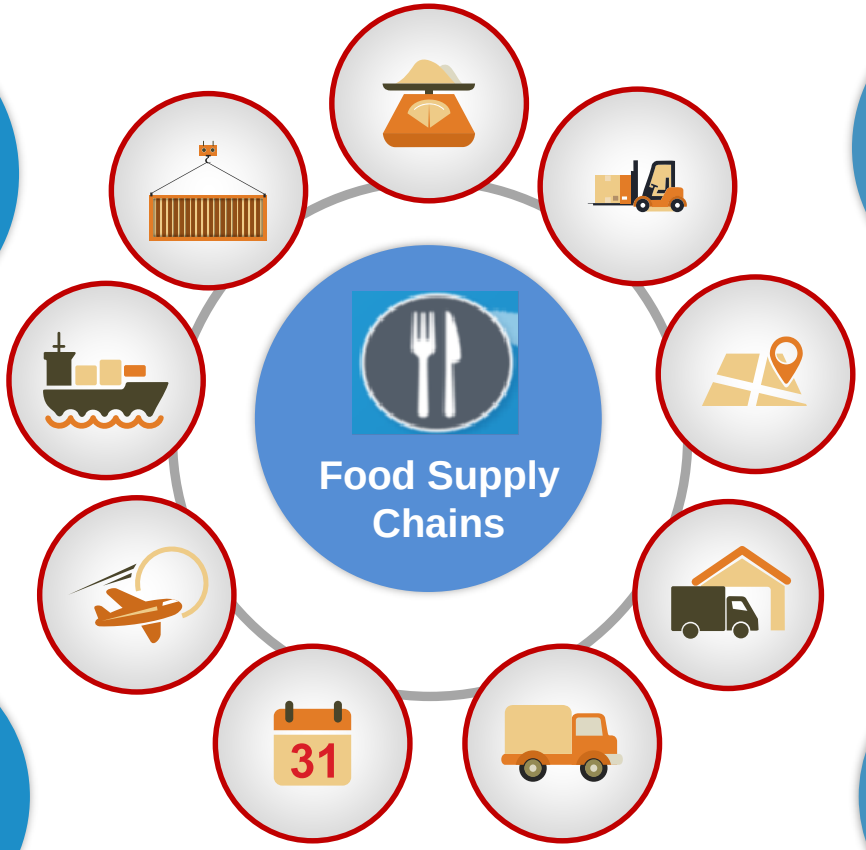
SC/14308

17 SEPTEMBER 2020

**Conflict Zone Populations Face Gravest Threat of Hunger amid COVID-19, Aid Experts Tell Security Council, Warning Food Insecurity Worldwide Expected to Double by Year's End**

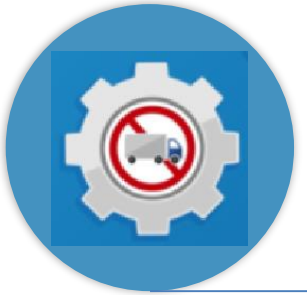
# Impact of COVID-19 to Food Supply Chains

**Shortages of Labour** to produce and process food



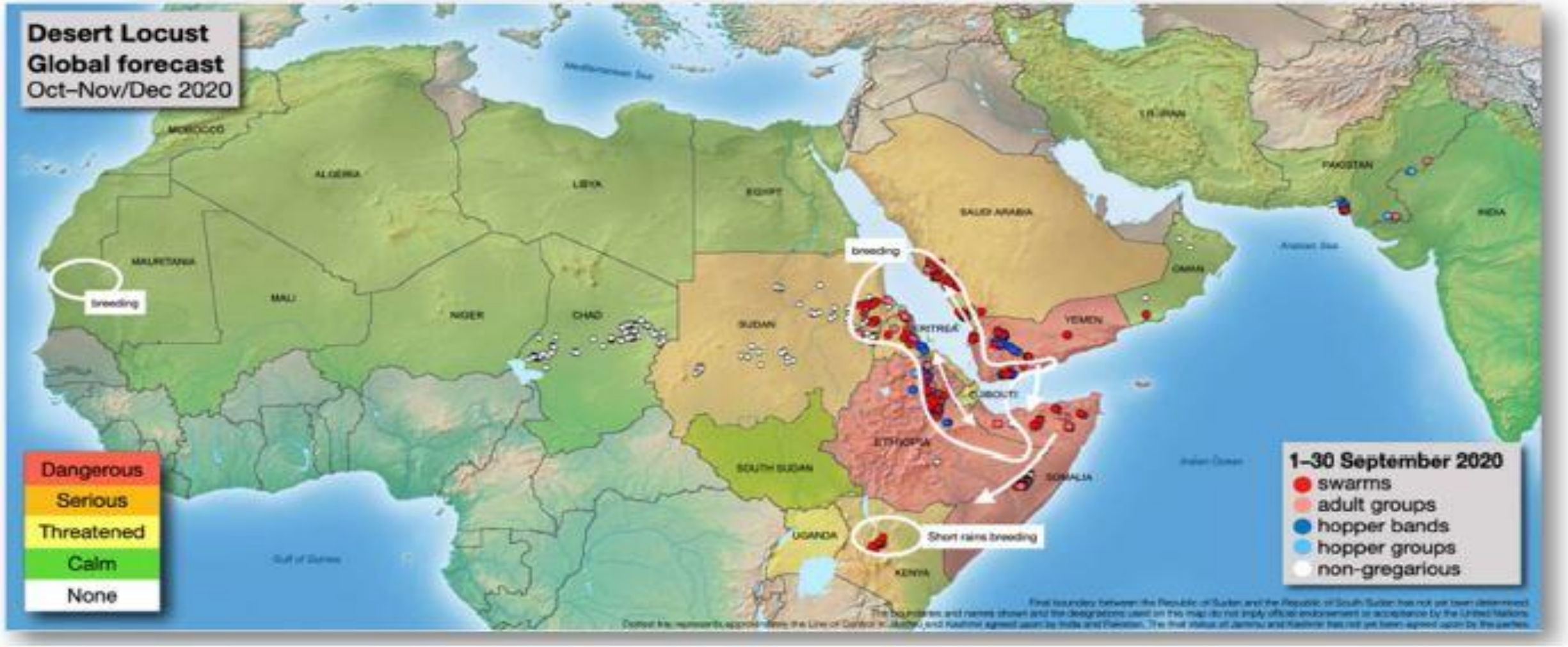

**Decrease supply** of perishable commodities

**Increasing struggle** of farmers to access **markets**



**Transport restrictions** blocking food deliveries

# Desert Locust Crisis



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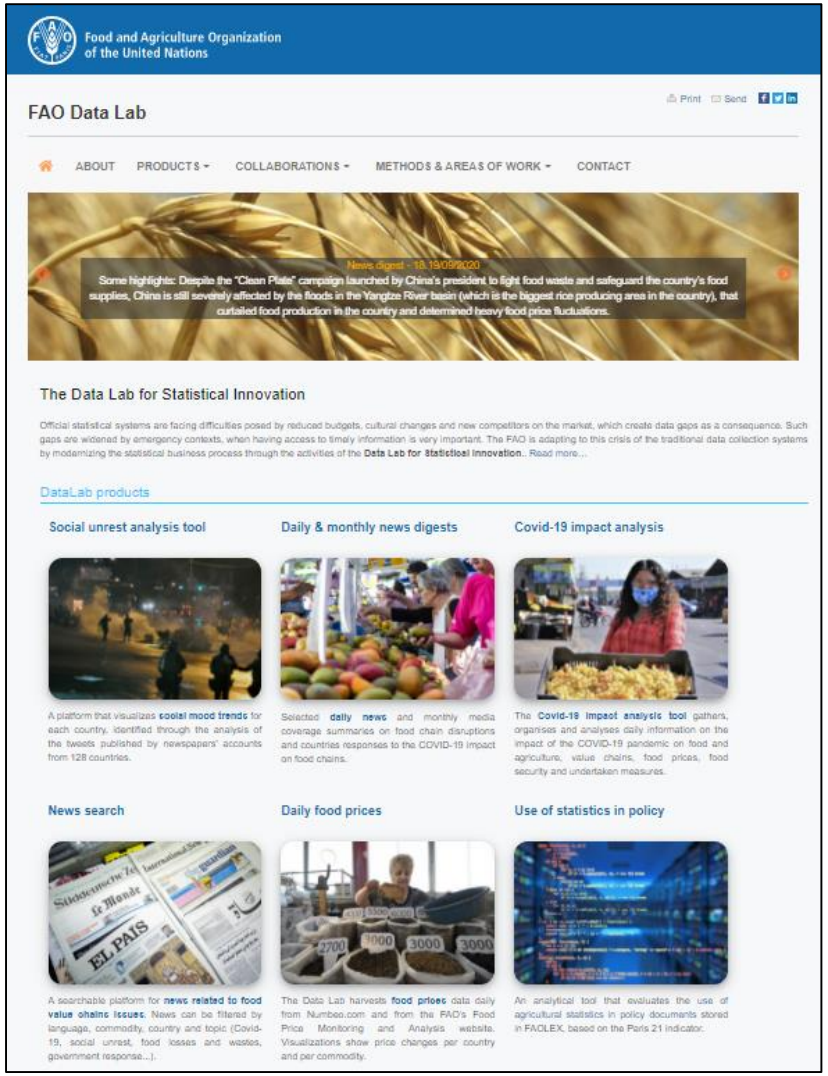
# FAO: Data, Big-data, Innovation and Technology in action

- FAO Big Data Lab
- Geospatial Platform and Hand in Hand Initiative
- FAO Digital Service Portfolio

# FAO Data Lab : objectives and methods




## Primary objective

Support our members' data needs by:

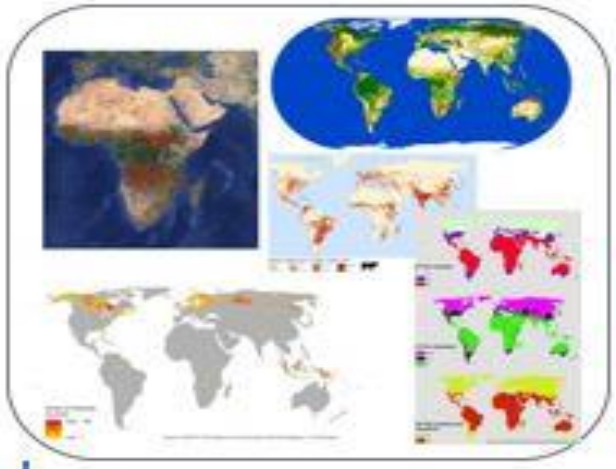
1. Filling data gaps
2. Improving timeliness and granularity of data collection
3. Providing automated analysis
4. Providing early warning signals

## Main strategies

1. Web scraping
2. Text mining
3. Artificial intelligence
4. Geo-spatial data and RS

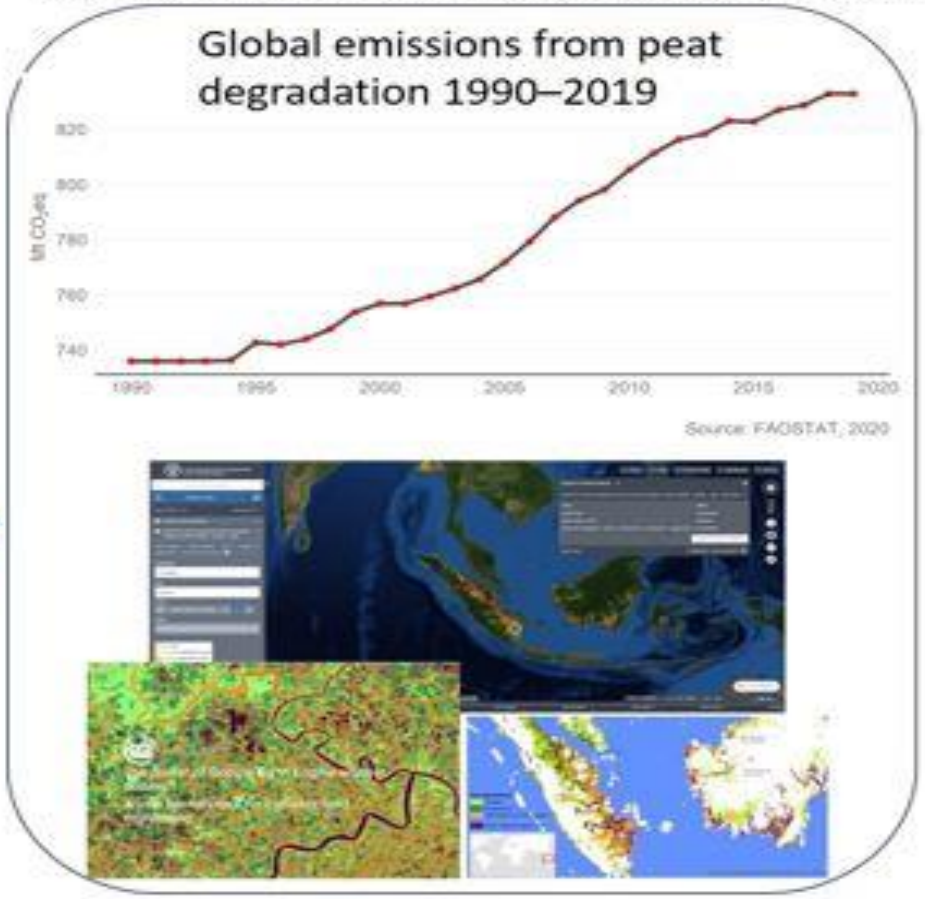
# Use of geo-spatial data for statistics: estimating Peatland degradation

***From global Earth Observations and thematic maps***



***Through innovative cloud modelling and computation***

***Aggregate statistics and geospatial results are derived and disseminated***




## STATISTICS

***Support countries official reporting to the UN Climate Convention and SDGs***

***Inform reporting of national pledges to reduce emissions***

***Global knowledge and reference product***

***Advance analytical work on sustainable food systems***

# Automated search and text mining to study the effects of COVID-19 on food chains

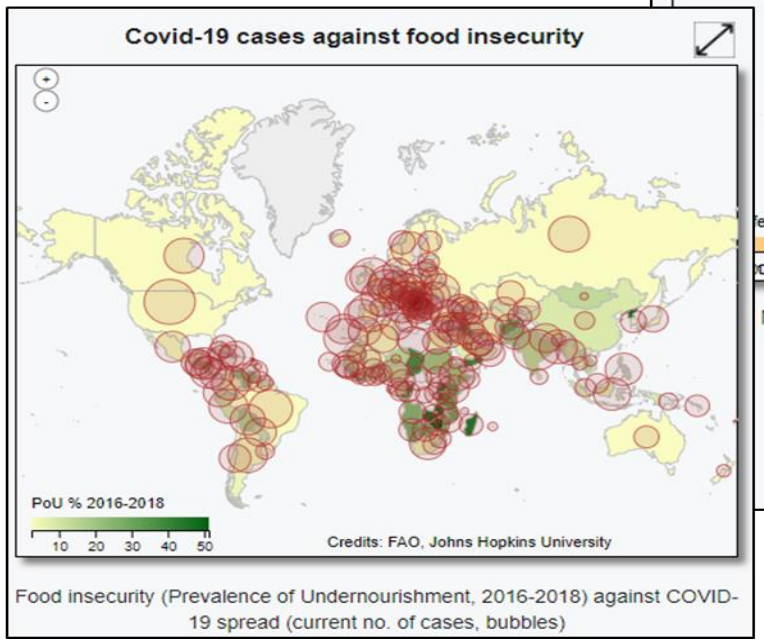
- Data collected through **iterative APIs** and use of **specific keywords**
- Then analyzed through **text mining**


## COVID-19 Impact Analysis

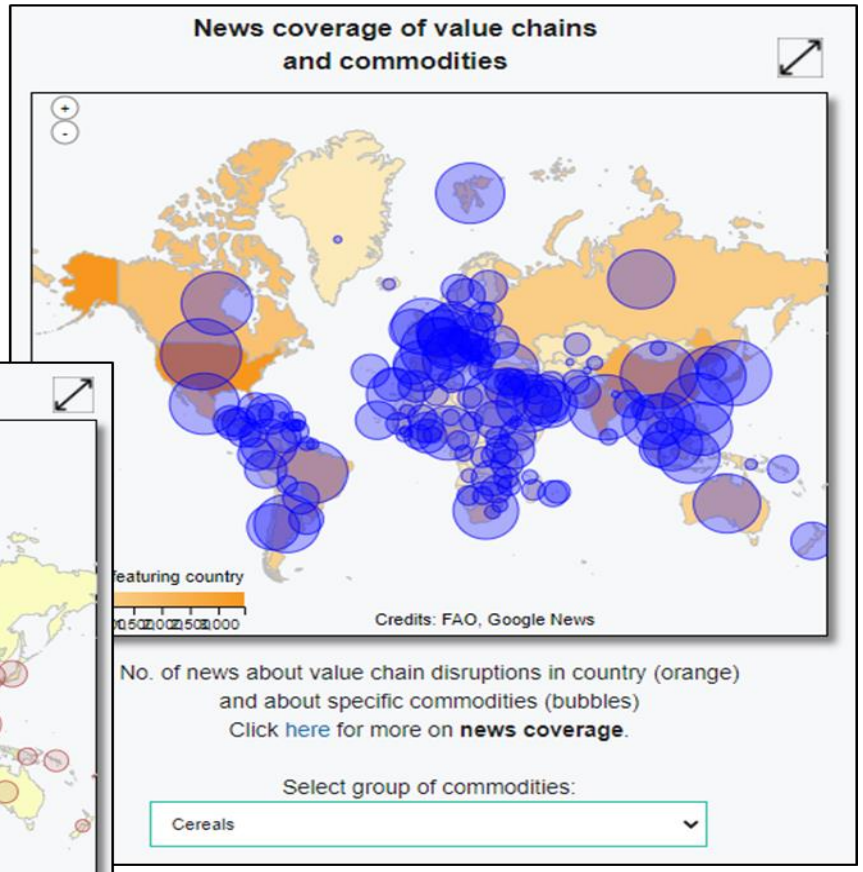
- Analysis of the effects of the coronavirus pandemic on the **state of food insecurity** in the world

- Analysis of the effects of the coronavirus pandemic on **value chains** and **specific commodities**

Both are automatically updated every day




Food insecurity (Prevalence of Undernourishment, 2016-2018) against COVID-19 spread (current no. of cases, bubbles)



# Use of artificial intelligence to build up new datasets: the FLW database


- Publications / Reports **scraped** from the web
- Then **analyzed** through **natural language processing**

To identify specific patterns related to:

- **Geographic location**
- **Commodities**
- **Quantities**

Then data are fed into the FAO's **Food Loss and Waste Database**

# Hand-in-Hand Geospatial Platform

https://data.apps.fao.org

# FAO Hand-in-Hand Geospatial Platform

The FAO Hand-in-Hand initiative is evidence-based, country-led and country-owned and aims to accelerate agricultural transformation and sustainable rural development to eradicate poverty (SDG1) and end hunger and all forms of malnutrition (SDG2).

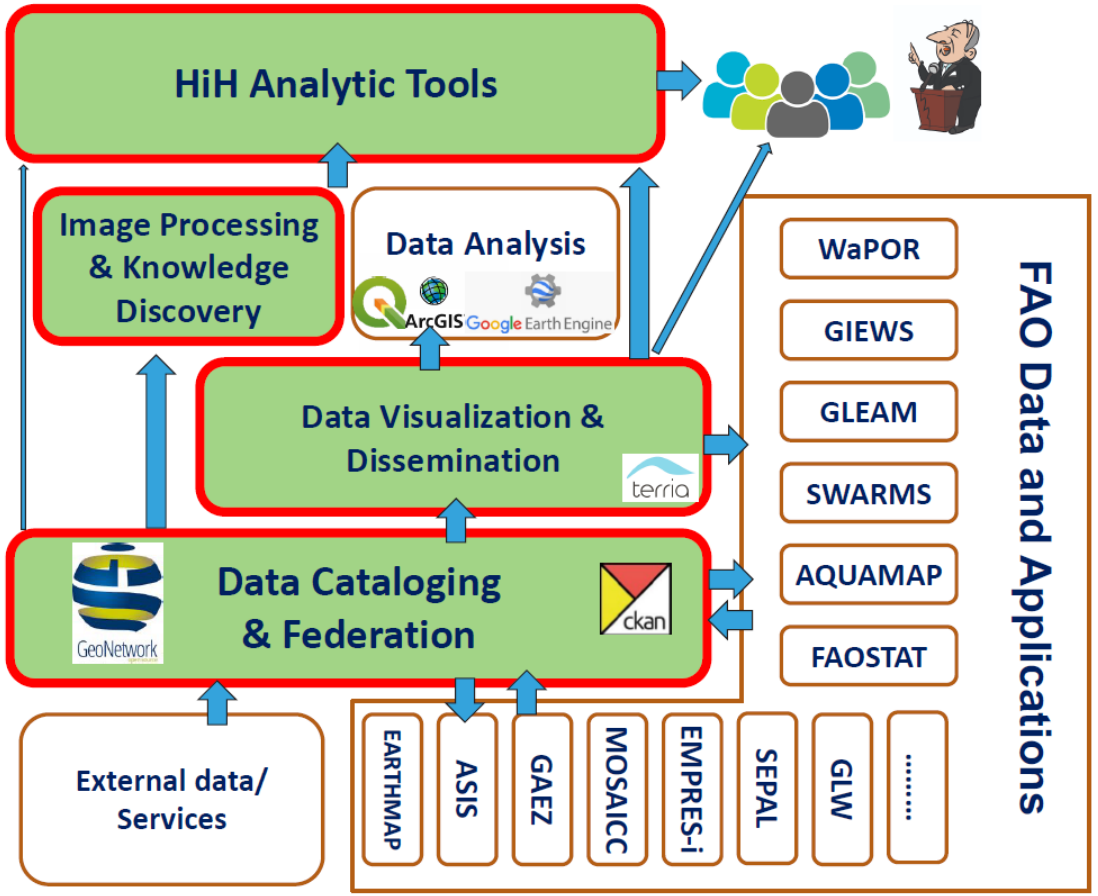
The FAO Hand-in-Hand Geospatial Platform, a component of the initiative, unites data from across the FAO with key data from our member states, partners and public/private data providers and covers topics from Animal Health to Trade and Markets.

The platform has been assembled over a period of months and integrates millions geospatial layers, thousands of statistics series with accompanying metadata records.

# Hand in Hand Demands Data

HiH is an evidence-based initiative, needs massive geospatial data:

- Multi-sectorial data to address wide-spectrum problems with a system approach
- Trustable data with quality control and verification
- Interoperable dataset to make data from different sources/domains work together
- Break silos of geospatial data for better collaboration



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# Hand-in-Hand Geospatial Platform

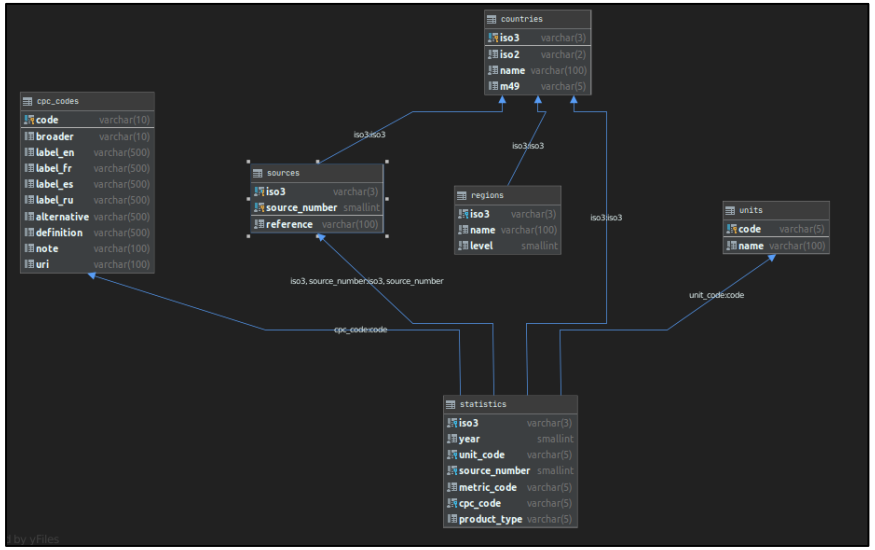
## FAO's geospatial infrastructure for HiH data service

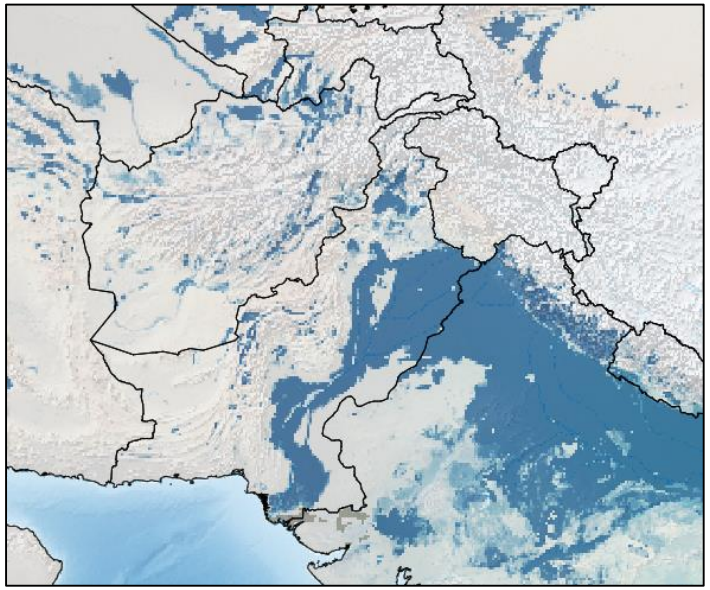
| Cloud-based | Standard-driven | Multi-disciplinary data federation and integration | Strict data policy | Huge geospatial data asset and growing |
|---|---|---|---|---|
| IaaS and PaaS<br>No software installation locally | Geospatial data inter-operation | All sub-disciplines in ag, from animal health to trade and markets | Data privacy and ownership | 4000+ metadata and 1300+ data series<br>1,000,000+ geodata layers and thousands of statistics series |

# Granular data to optimize investments in territories: Hand-in-Hand Initiative

**1.** Sub-national data collected through **web scraping**, **text mining**, **artificial intelligence**

| Year | Type of regional level | Regional level | Regional code | Commodity | Commodity code | Production | Unit of measure |
|---|---|---|---|---|---|---|---|
| 2017-18 | Sub-regional | Punjab | PAK.7_1 | Wheat | 111.0 | 19178,5 | 1000 tonnes |
| 2017-18 | Sub-regional | Sindh | PAK.8_1 | Wheat | 111.0 | 3639,5 | 1000 tonnes |
| 2017-18 | Sub-regional | Khyber Pakhtunkhwa | PAK.5_1 | Wheat | 111.0 | 1322,7 | 1000 tonnes |
| 2017-18 | Sub-regional | Balochistan | PAK.2_1 | Wheat | 111.0 | 935,4 | 1000 tonnes |
| 2017-18 | Regional | Pakistan | PAK | Wheat | 111.0 | 25076,1 | 1000 tonnes |

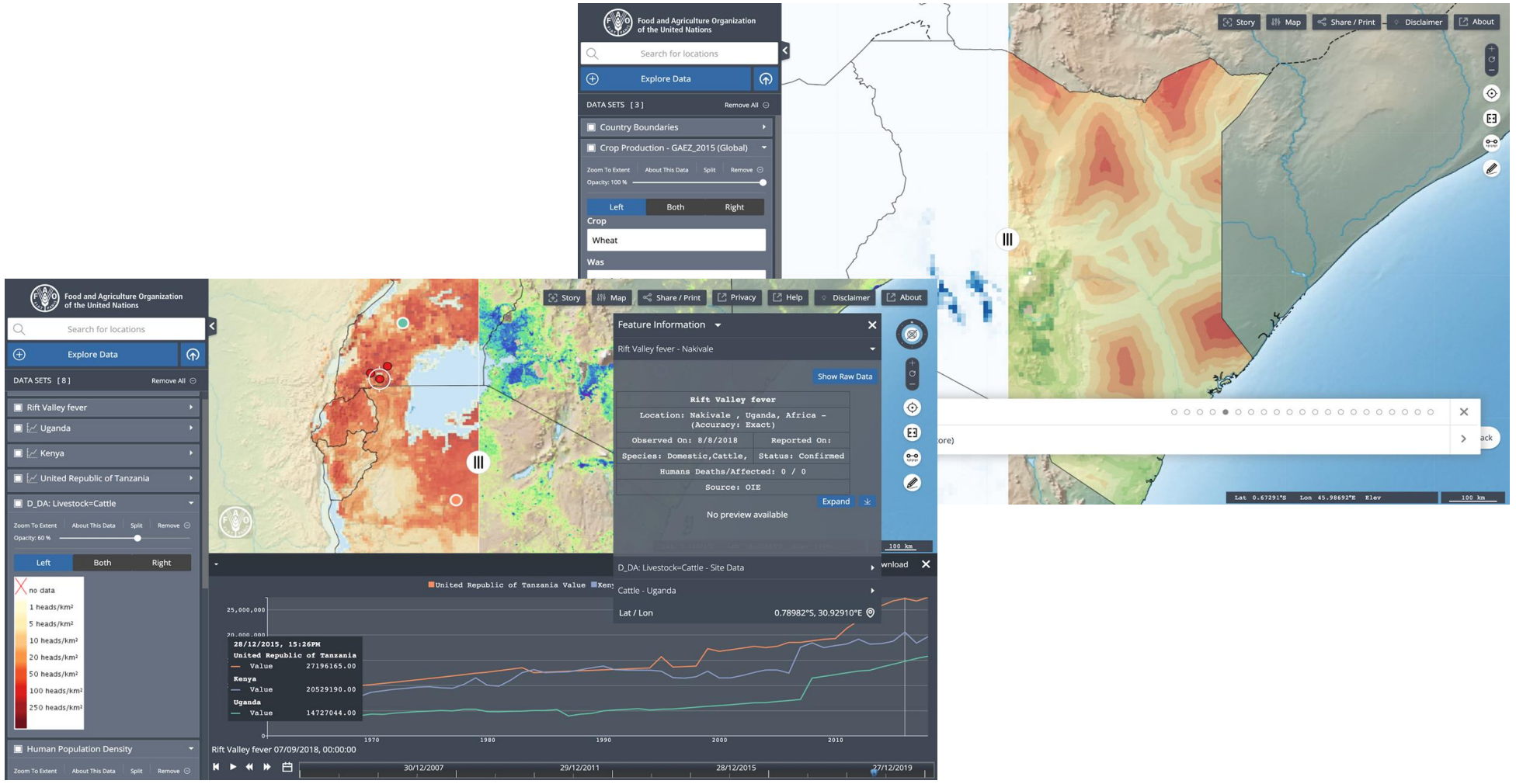


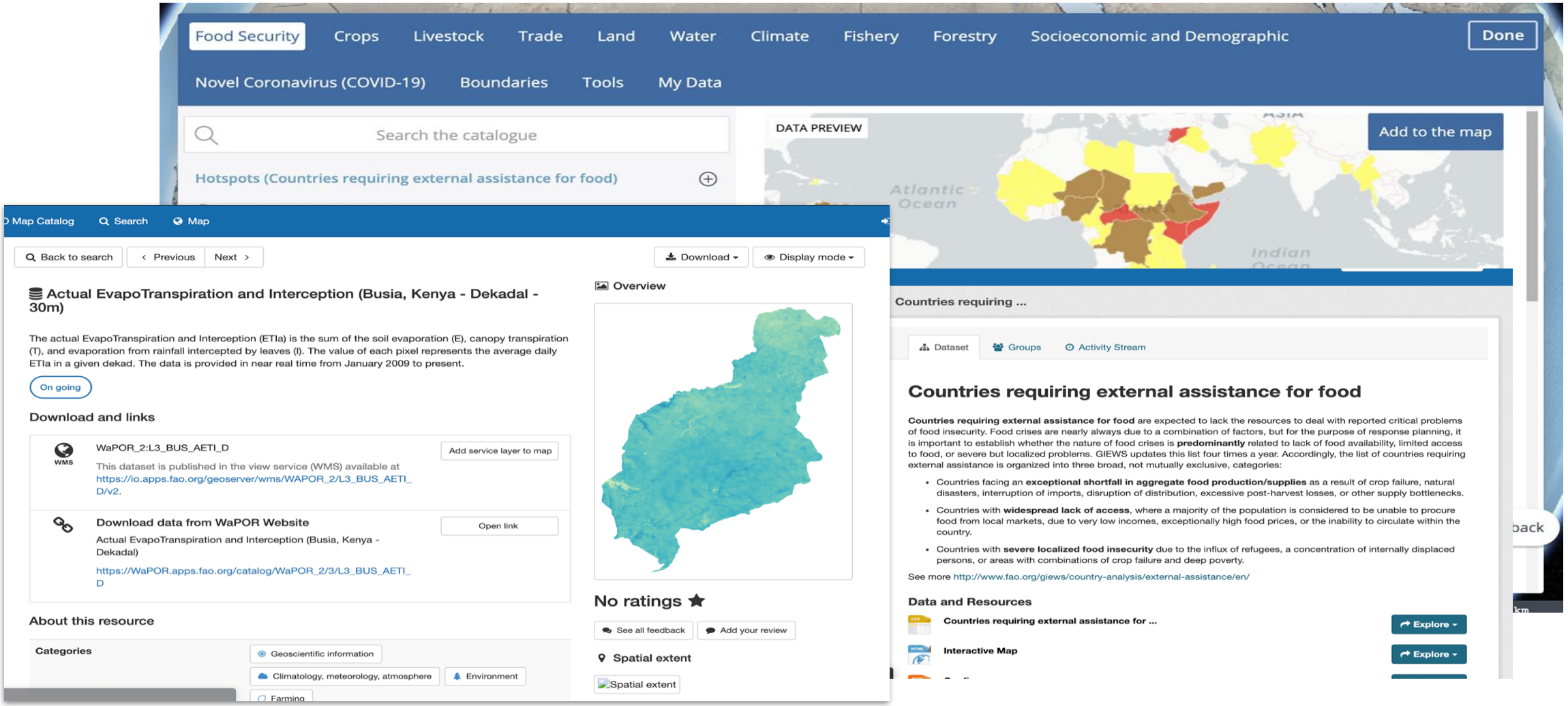
**2.** Data stored in database **updated every day**, and **validated** against official sources

→ **3.** Data fed into **HiH-GIS Platform**

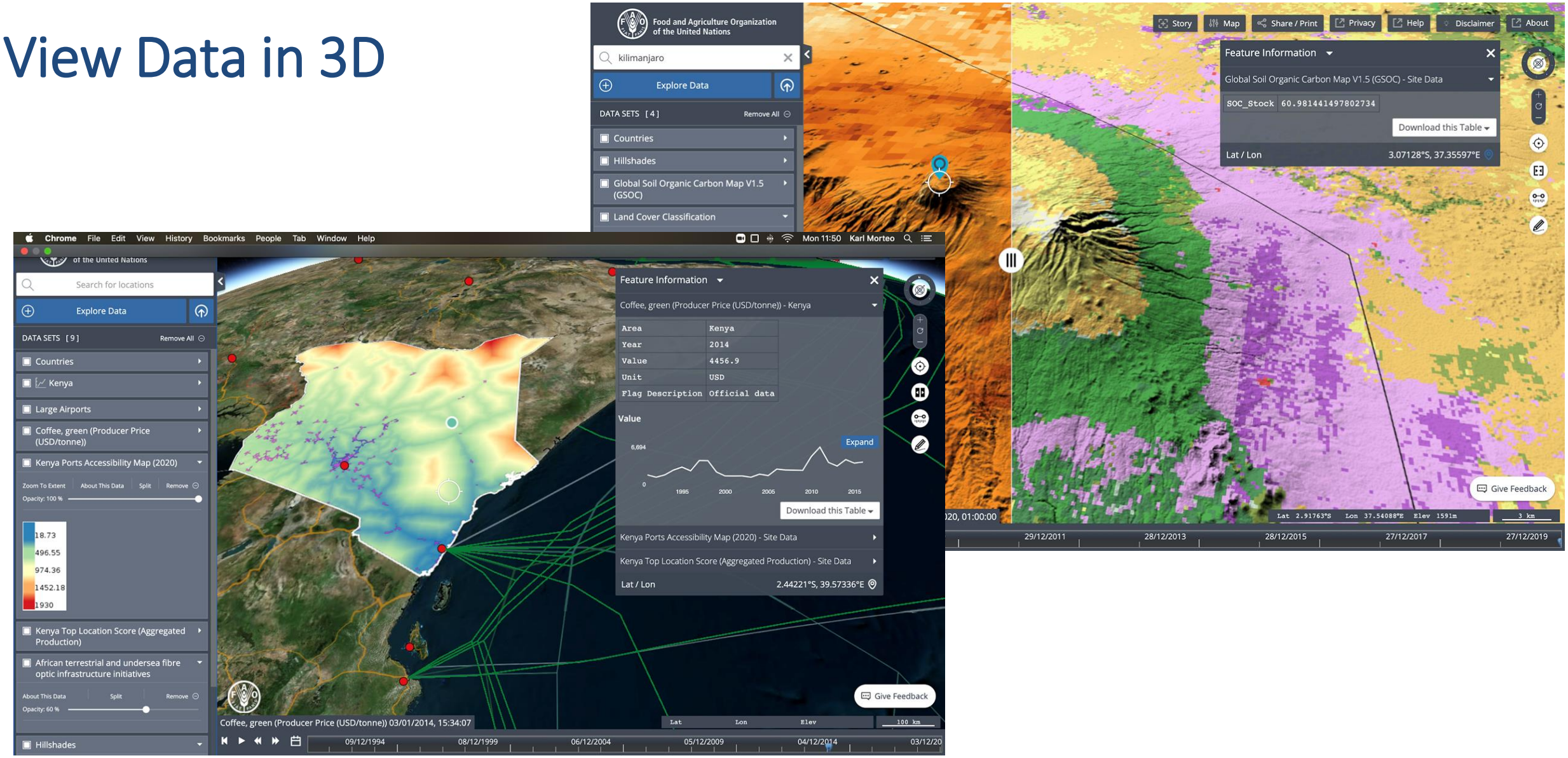
# Compare and Contrast



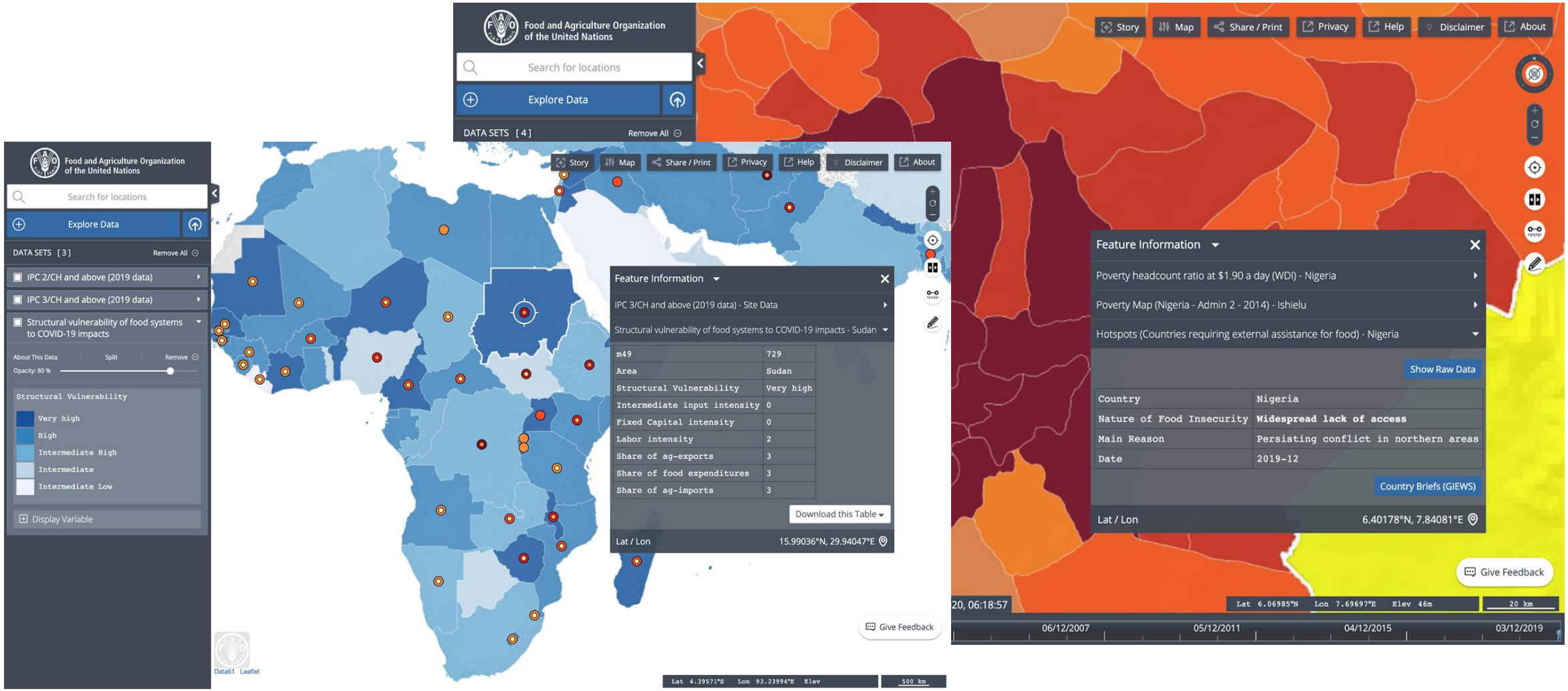
# Catalogue with metadata



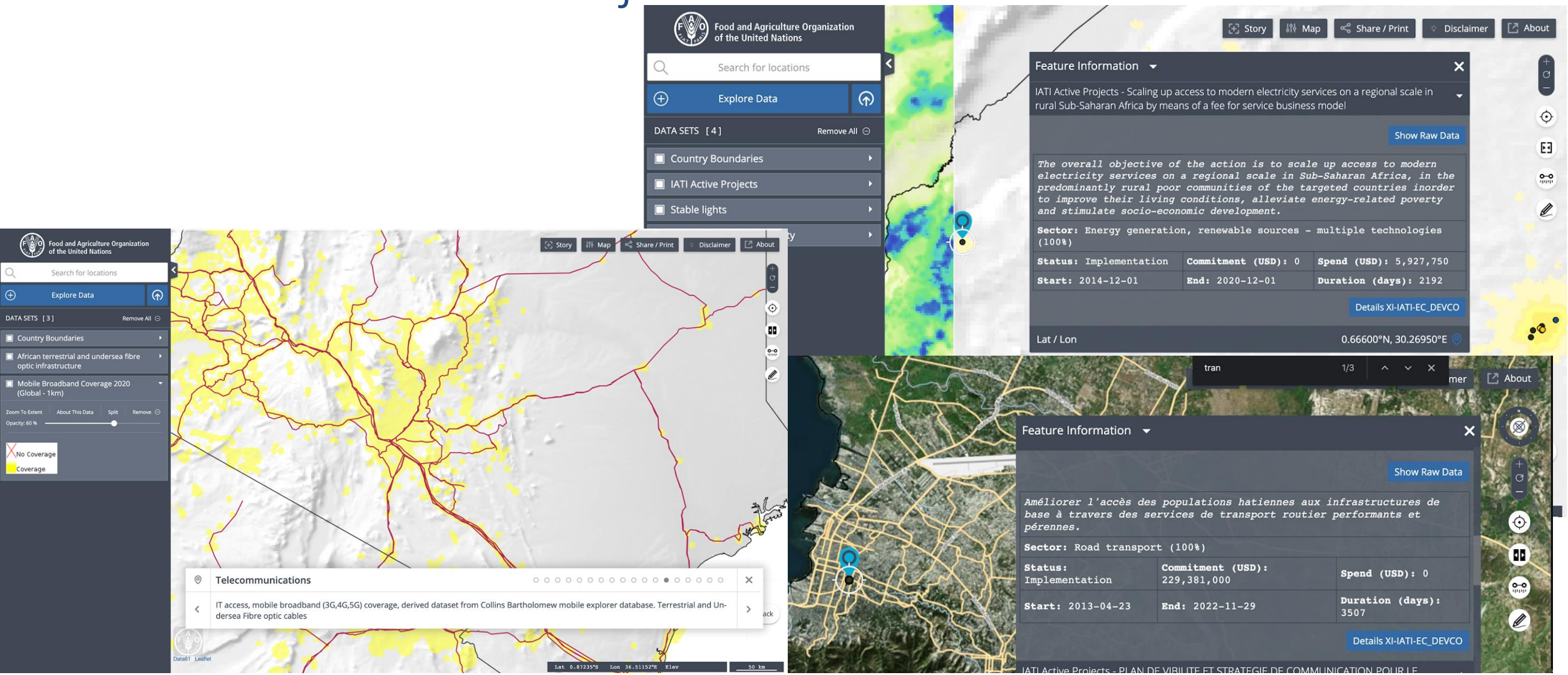
# View Data in 3D



# View Sub-National Data and Location Data



# View Data Related to Projects

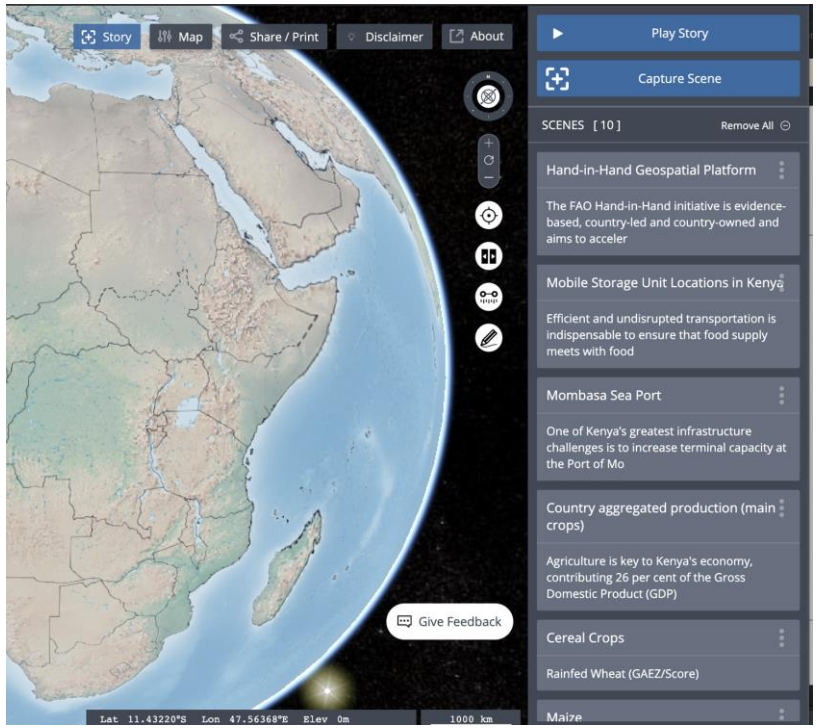


# Water Accounting

80% of limited freshwater used in agriculture

# Mobile Storage Location Analysis

Share Stories

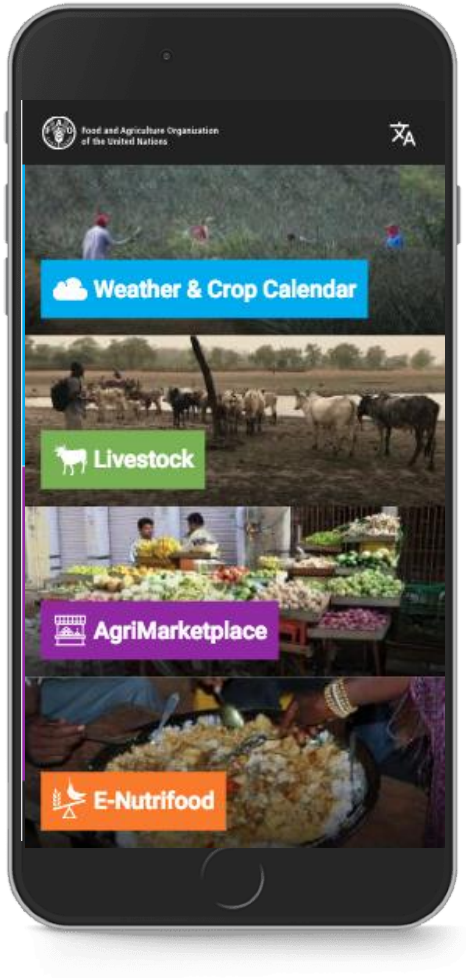



# FAO DIGITAL SERVICES PORTFOLIO

An overview

# FAO Digital Services Portfolio

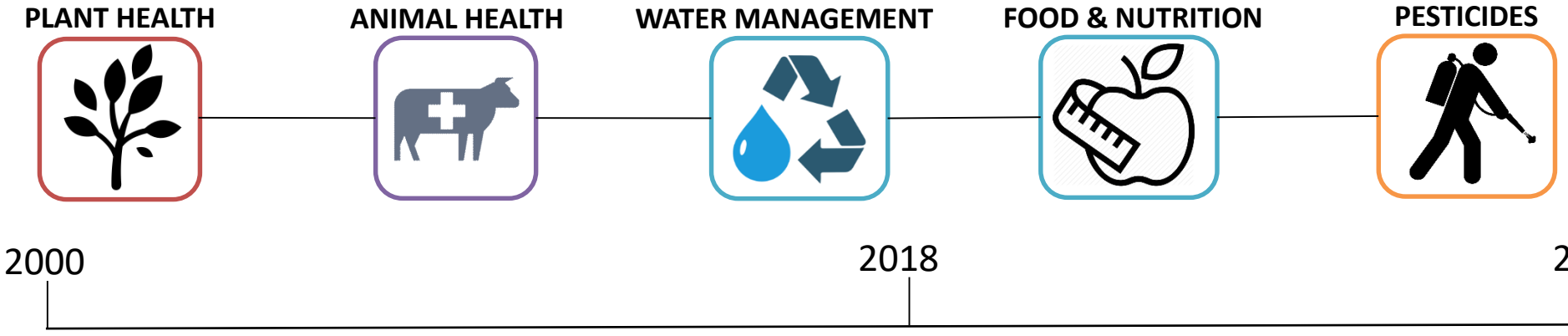
- Offer information & advisory messages to farmers in the field
- Connect directly Governments to Rural Farmers
- A platform working as a SaaS
- Implemented in,
  - Rwanda
  - Senegal
  - Egypt
  - Tanzania (Up coming)



# 3. Digital Intelligence Platform: Improving value-chain decision making


*food and agriculture value chain*

*business capabilities*

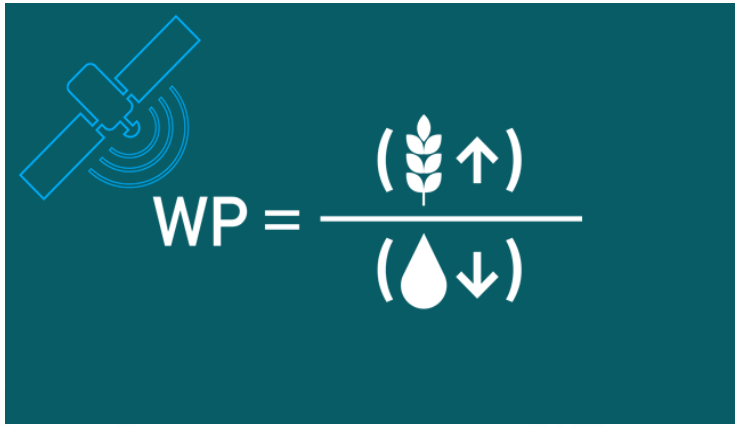


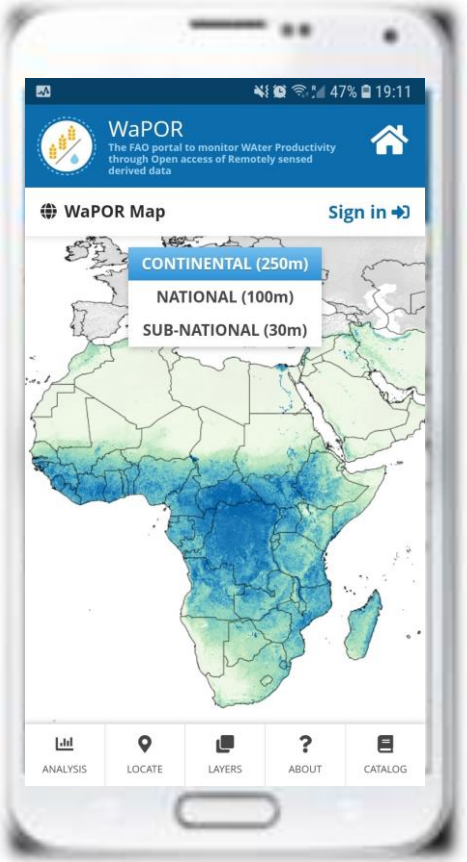

- What is the national problem?
- How is the country doing?

- What is the village problem?
- How is the village doing?

- How will happen to my crops?
- What should I do?

# 4. WaPOR : Building a Water Secure Future



# FUTURE FARMS
## small and smart

### SURVEY DRONES

Aerial drones survey the fields, mapping weeds, yield and soil variation. This enables precise application of inputs, mapping spread of pernicious weed blackgrass could increasing Wheat yields by 2-5%.

### FLEET OF AGRIBOTS

A herd of specialised agribots tend to crops, weeding, fertilising and harvesting. Robots capable of microdot application of fertiliser reduce fertiliser cost by 99.9%.

### FARMING DATA

The farm generates vast quantities of rich and varied data. This is stored in the cloud. Data can be used as digital evidence reducing time spent completing grant applications or carrying out farm inspections saving on average £5,500 per farm per year.

### TEXTING COWS

Sensors attached to livestock allowing monitoring of animal health and wellbeing. They can send texts to alert farmers when a cow goes into labour or develops infection increasing herd survival and increasing milk yields by 10%.

### SMART TRACTORS

GPS controlled steering and optimised route planning reduces soil erosion, saving fuel costs by 10%.

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# Emerging Issues and future data uses in Food and Agriculture

## Artificial Intelligence -Issues

# FAO and Artificial Intelligence – recent developments