



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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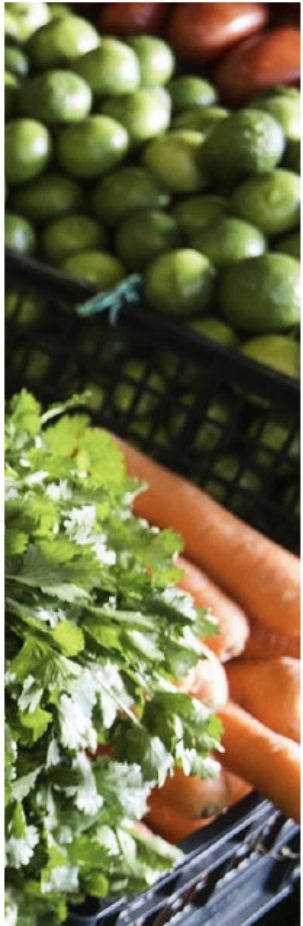
Presentation Outline

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

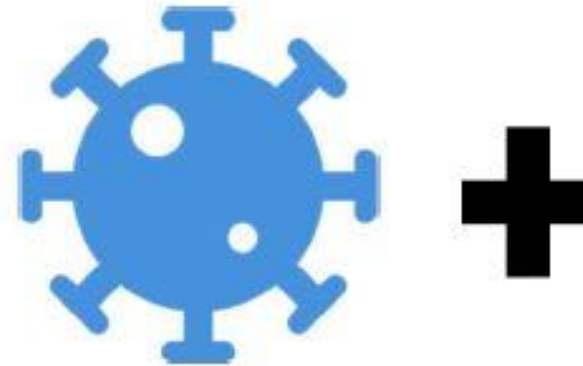
COVID-19 poses a serious threat to food security

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

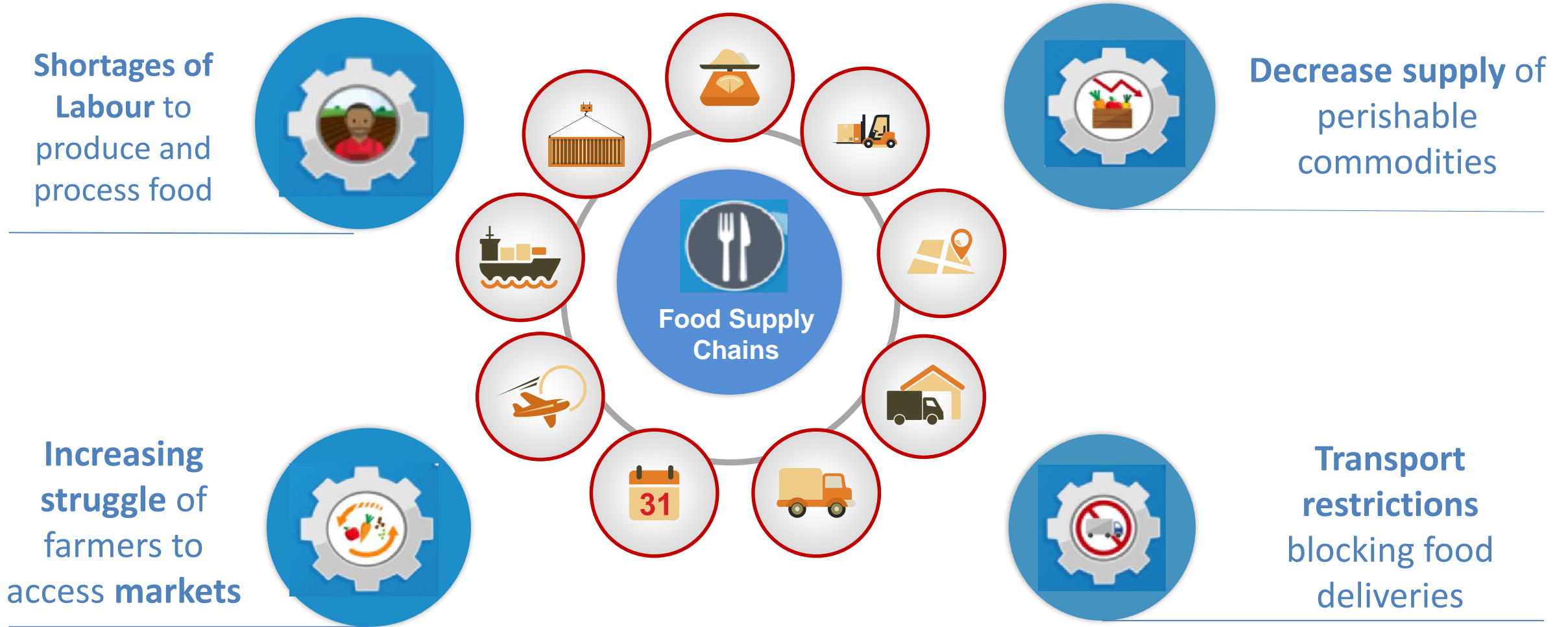
SC/14308

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





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

FAO Data Lab

ABOUT PRODUCTS COLLABORATIONS METHODS & AREAS OF WORK CONTACT

News digest - 19-19-09-2020

Some highlights: Despite the "Clean Plate" campaign launched by China's president to fight food waste and safeguard the country's food supplies, China is still severely affected by the floods in the Yangtze River basin (which is the biggest rice producing area in the country), that curtailed food production in the country and determined heavy food price fluctuations.

The Data Lab for Statistical Innovation

Official statistical systems are facing difficulties posed by reduced budgets, cultural changes and new competitors on the market, which create data gaps as a consequence. Such gaps are widened by emergency contexts, when having access to timely information is very important. The FAO is adapting to this crisis of the traditional data collection systems by modernizing the statistical business process through the activities of the **Data Lab for Statistical Innovation**. Read more...

DataLab products

- Social unrest analysis tool**: A platform that visualizes social mood trends for each country, identified through the analyses of the tweets published by newspapers' accounts from 128 countries.
- Daily & monthly news digests**: Selected daily news and monthly media coverage summaries on food chain disruptions and countries responses to the COVID-19 impact on food chains.
- Covid-19 impact analysis**: The Covid-19 impact analysis tool gathers, organizes and analyzes daily information on the impact of the COVID-19 pandemic on food and agriculture, value chains, food prices, food security and undertaken measures.
- News search**: A searchable platform for news related to food value chains issues. News can be filtered by language, commodity, country and topic (Covid-19, social unrest, food losses and wastes, government response...).
- Daily food prices**: The Data Lab harvests food prices data daily from Numbeo.com and from the FAO's Food Price Monitoring and Analysis website. Visualizations show price changes per country and per commodity.
- Use of statistics in policy**: An analytical tool that evaluates the use of agricultural statistics in policy documents stored in FACLEX, based on the Paris 21 indicator.

Primary objective

Support our members' data needs by:

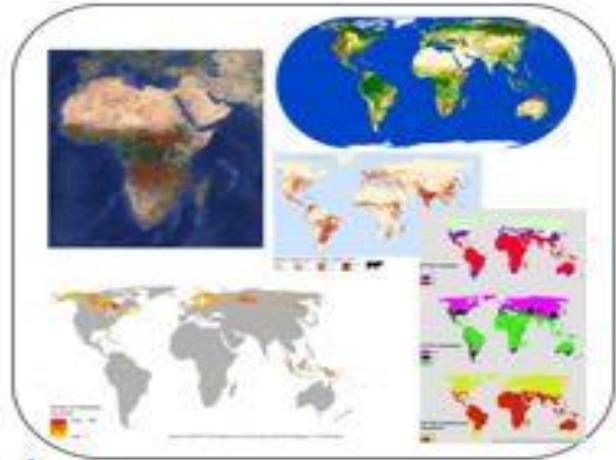
1. Filling data gaps
2. Improving timeliness and granularity of data collection
3. Providing automated analysis
4. Providing early warning signals

Main strategies

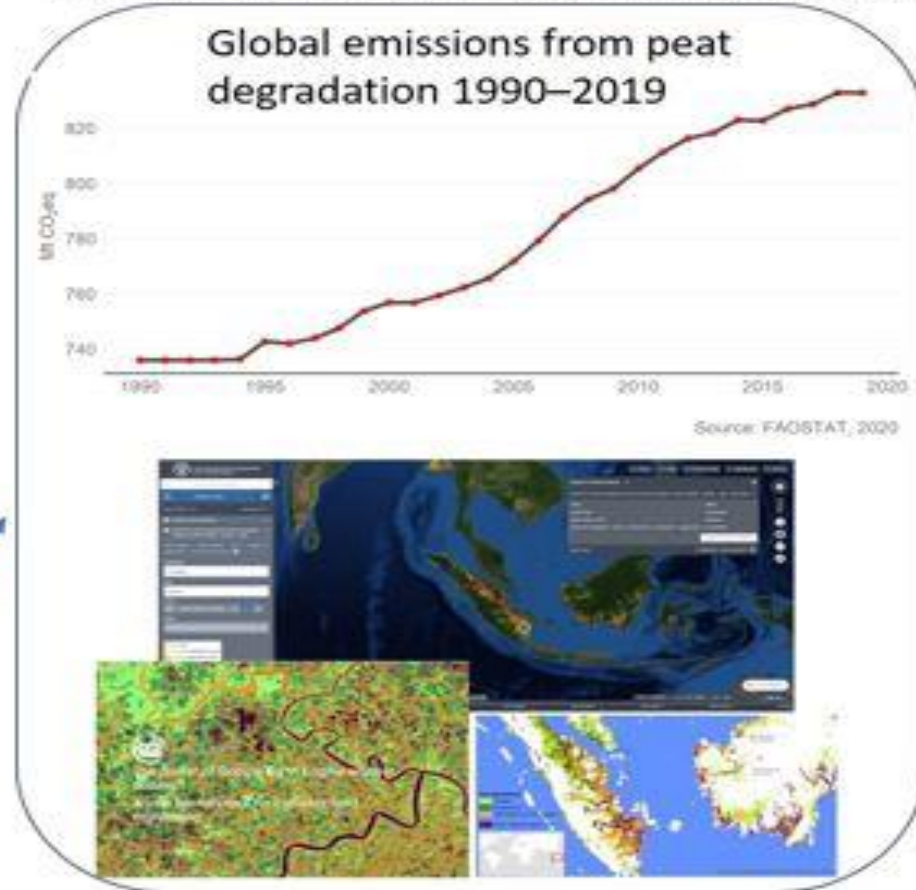
1. Web scraping
2. Text mining
3. Artificial intelligence
4. Geo-spatial data and RS

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

*From global Earth Observations
and thematic maps*



*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*

*Through innovative cloud
modelling and computation*



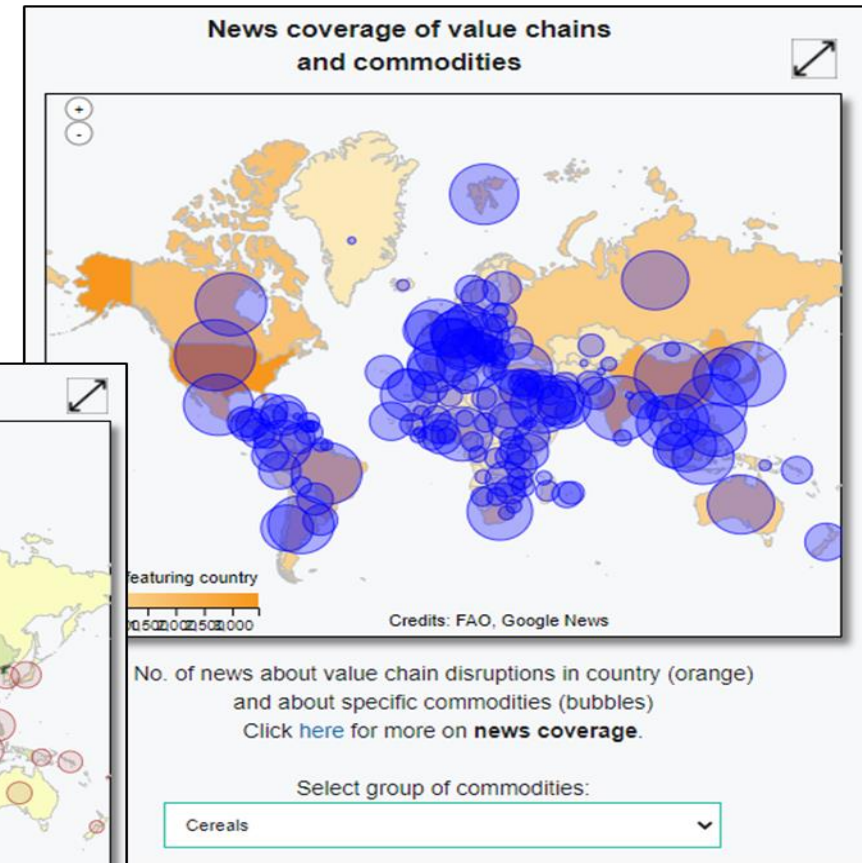
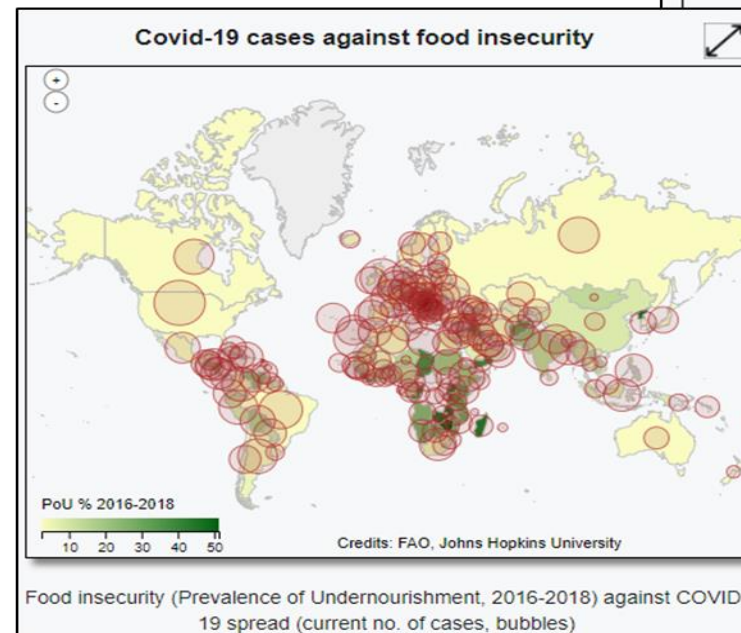
Automated search and text mining to study the effects of COVID-19 on food chains

- 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





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



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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).

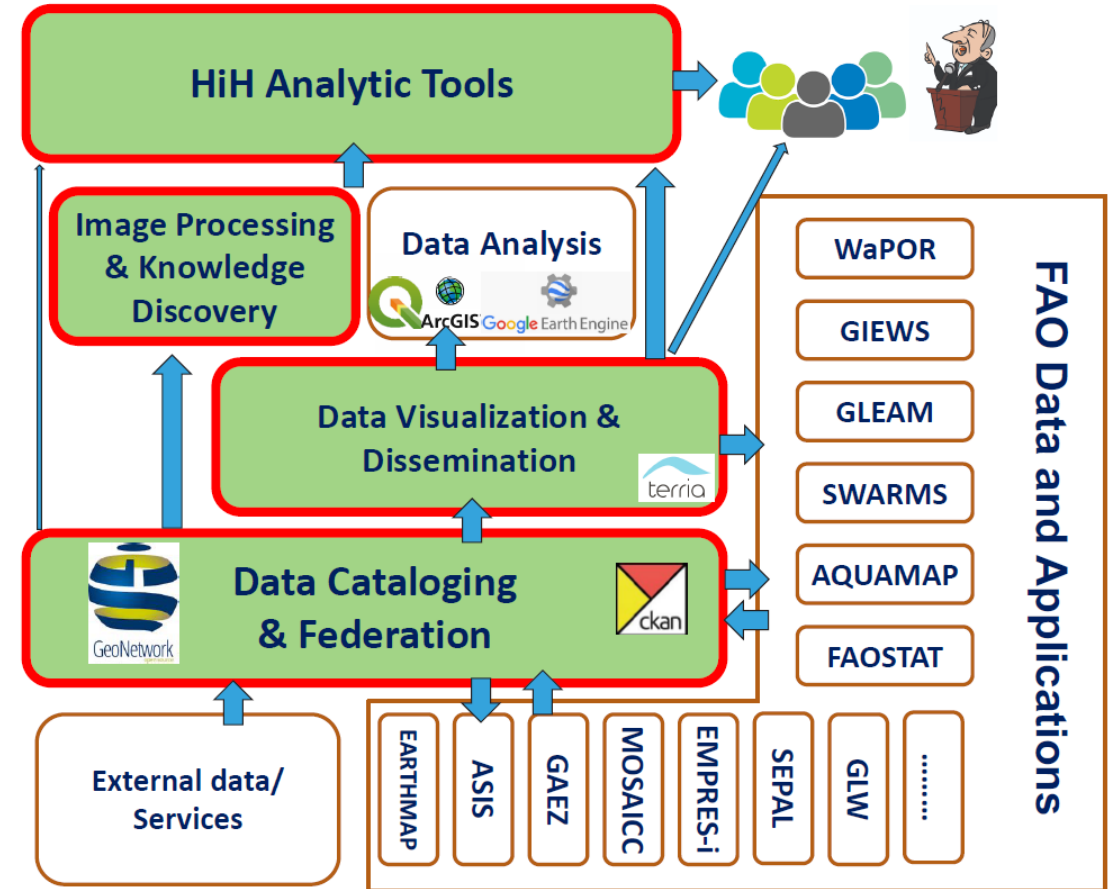
The FAO Hand-in-Hand Geospatial Platform, a component of the initiative, unites data from across the FAO with key data from our member states, partners and public/private data providers and covers topics from Animal Health to Trade and Markets.

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





Hand-in-Hand Geospatial Platform

FAO's geospatial infrastructure for HiH data service



Cloud-based

IaaS and PaaS
No software installation locally



Standard-driven

Geospatial data inter-operation



Multi-disciplinary data federation and integration

All sub-disciplines in ag, from animal health to trade and markets



Strict data policy

Data privacy and ownership



Huge geospatial data asset and growing

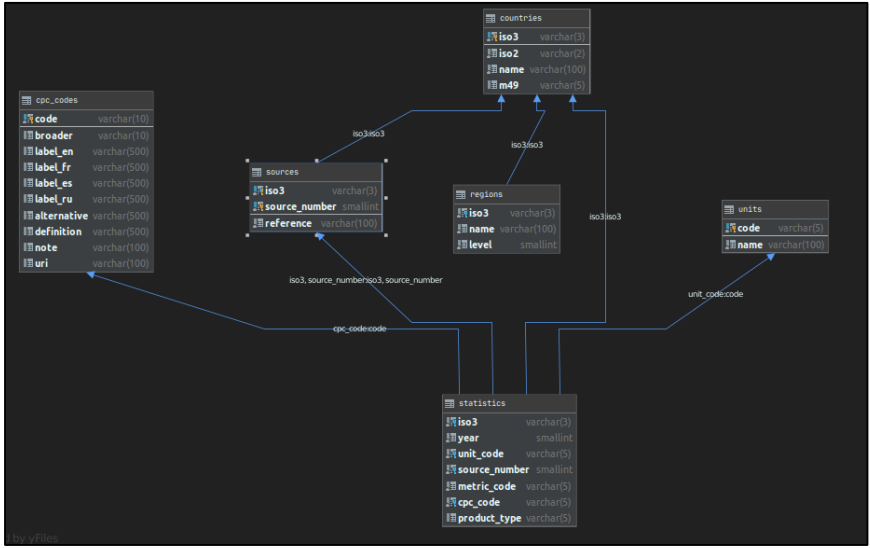
4000+ metadata and 1300+ data series
1,000,000+ geodata layers and thousands of statistics series



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

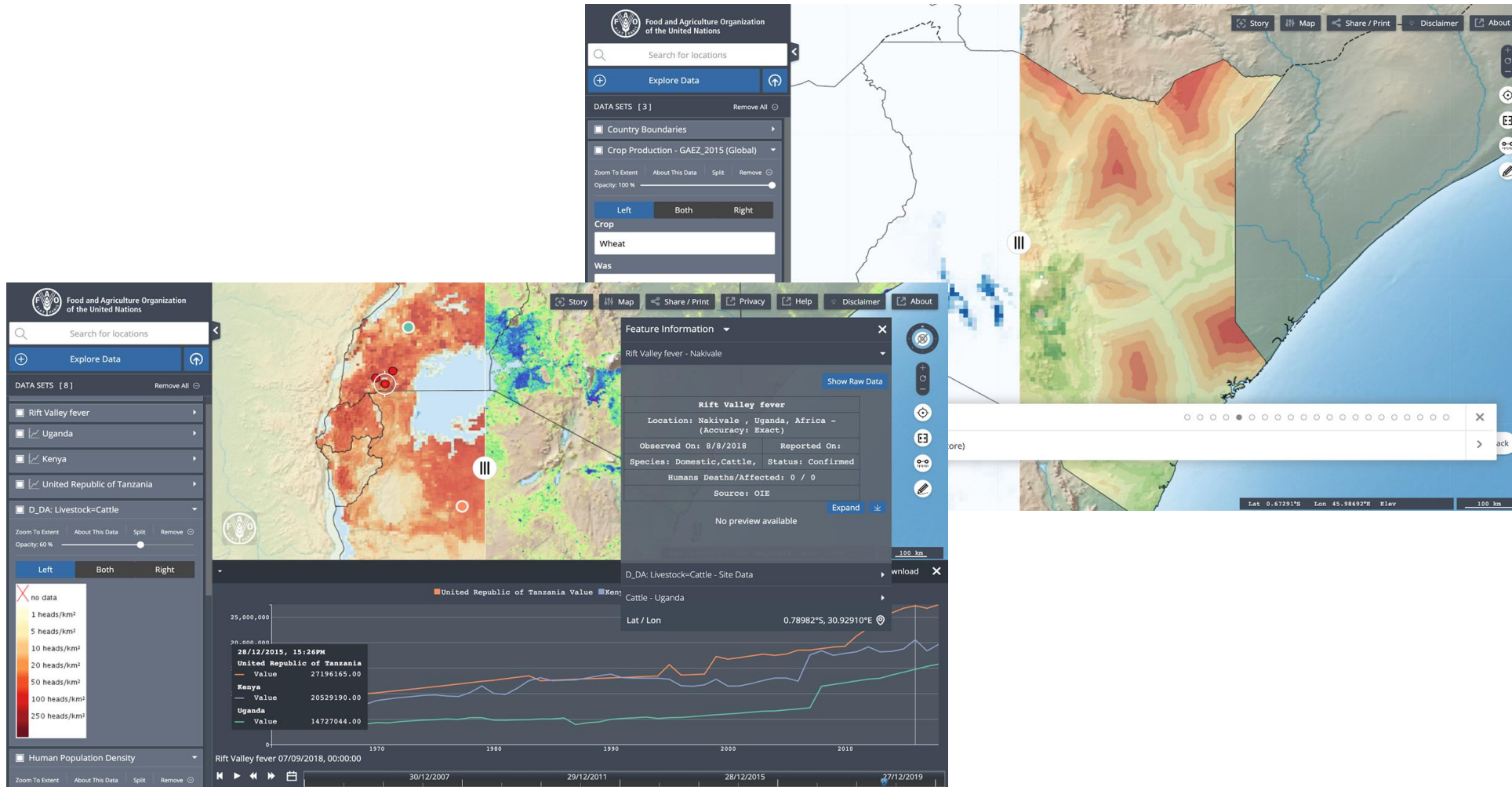


2. Data stored in database updated every day, and validated against official sources

3. Data fed into HiH-GIS Platform



Compare and Contrast





Catalogue with metadata

The screenshot displays the FAO Geospatial Catalogue interface. At the top, there is a navigation bar with categories: Food Security, Crops, Livestock, Trade, Land, Water, Climate, Fishery, Forestry, and Socioeconomic and Demographic. Below this is a search bar with the text "Search the catalogue".

The main content area is divided into two panels. The left panel shows the details for a dataset titled "Actual EvapoTranspiration and Interception (Busia, Kenya - Dekadal - 30m)". It includes a description: "The actual EvapoTranspiration and Interception (ETIa) is the sum of the soil evaporation (E), canopy transpiration (T), and evaporation from rainfall intercepted by leaves (I). The value of each pixel represents the average daily ETIa in a given dekad. The data is provided in near real time from January 2009 to present." Below the description are options for "On going", "Download and links", and "About this resource".

The right panel shows a map titled "Countries requiring external assistance for food". The map displays various countries in different colors (yellow, brown, red) representing different levels of food insecurity. A legend below the map explains the categories: "Countries requiring external assistance for food" are expected to lack resources to deal with reported critical problems of food insecurity. It lists three categories:

- Countries facing an **exceptional shortfall in aggregate food production/supplies** as a result of crop failure, natural disasters, interruption of imports, disruption of distribution, excessive post-harvest losses, or other supply bottlenecks.
- Countries with **widespread lack of access**, where a majority of the population is considered to be unable to procure food from local markets, due to very low incomes, exceptionally high food prices, or the inability to circulate within the country.
- Countries with **severe localized food insecurity** due to the influx of refugees, a concentration of internally displaced persons, or areas with combinations of crop failure and deep poverty.

At the bottom of the interface, there are buttons for "Explore" and "Interactive Map".



View Data in 3D

Food and Agriculture Organization of the United Nations

Search: kilimanjaro

Explore Data

DATA SETS [4] Remove All

- Countries
- Hillshades
- Global Soil Organic Carbon Map V1.5 (GSOC)
- Land Cover Classification

Feature Information

Global Soil Organic Carbon Map V1.5 (GSOC) - Site Data

SOC_Stock: 60.981441497802734

Download this Table

Lat / Lon: 3.07128°S, 37.35597°E

of the United Nations

Search for locations

Explore Data

DATA SETS [9] Remove All

- Countries
- Kenya
- Large Airports
- Coffee, green (Producer Price (USD/tonne))
- Kenya Ports Accessibility Map (2020)
- Kenya Top Location Score (Aggregated Production)
- African terrestrial and undersea fibre optic infrastructure initiatives
- Hillshades

Zoom To Extent About This Data Split Remove Opacity: 100%

18.73
496.55
974.36
1452.18
1930

Feature Information

Coffee, green (Producer Price (USD/tonne)) - Kenya

Area	Kenya
Year	2014
Value	4456.9
Unit	USD
Flag Description	Official data

Value

6,694

Expand

Download this Table

Kenya Ports Accessibility Map (2020) - Site Data

Kenya Top Location Score (Aggregated Production) - Site Data

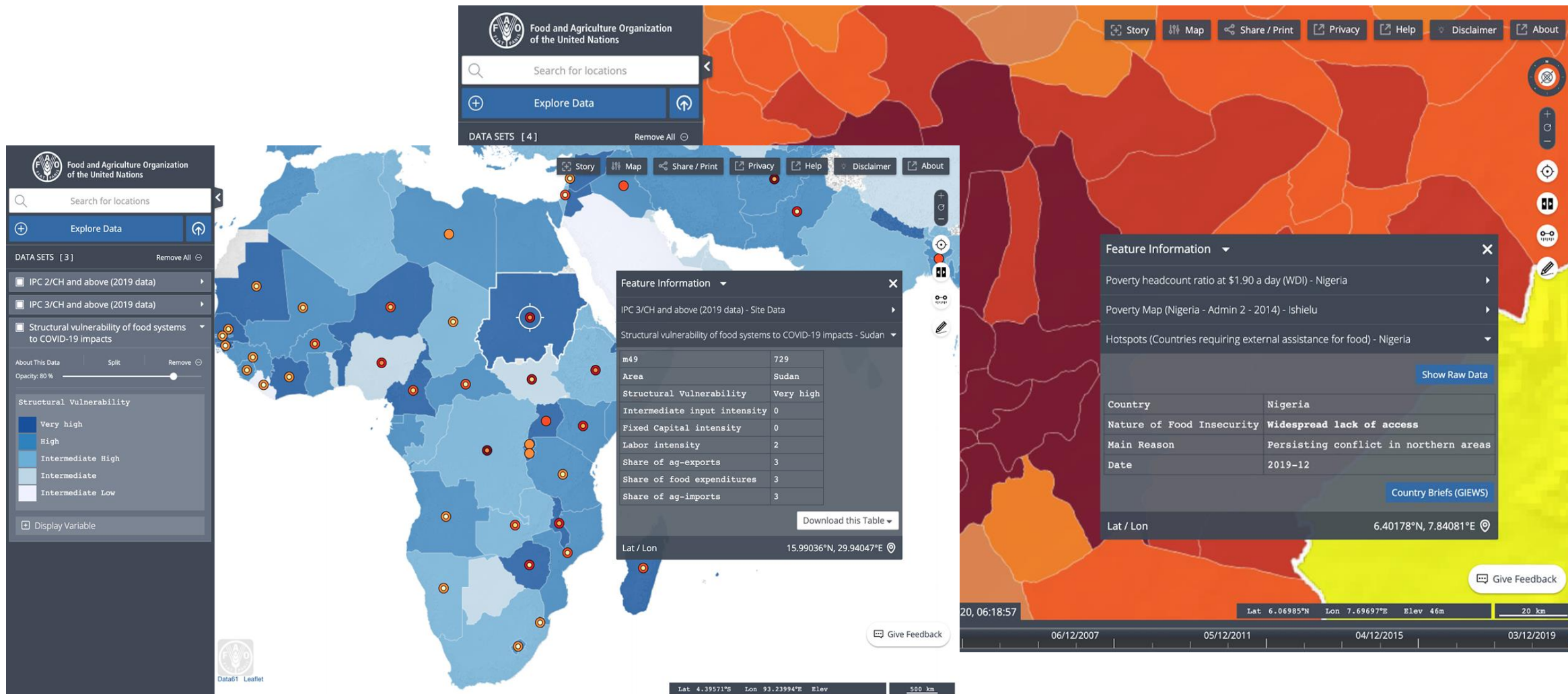
Lat / Lon: 2.44221°S, 39.57336°E

Coffee, green (Producer Price (USD/tonne)) 03/01/2014, 15:34:07

09/12/1994 08/12/1999 06/12/2004 05/12/2009 04/12/2014 03/12/20



View Sub-National Data and Location Data





View Data Related to Projects

The screenshot displays a web application interface for viewing project data. It features a search bar at the top, a list of data sets on the left, and a main map area. Two feature information panels are overlaid on the map, providing details for specific projects.

Data Sets List:

- Country Boundaries
- IATI Active Projects
- Stable lights

Feature Information Panel 1 (Top Right):

Feature Information

IATI Active Projects - Scaling up access to modern electricity services on a regional scale in rural Sub-Saharan Africa by means of a fee for service business model

[Show Raw Data](#)

The overall objective of the action is to scale up access to modern electricity services on a regional scale in Sub-Saharan Africa, in the predominantly rural poor communities of the targeted countries in order to improve their living conditions, alleviate energy-related poverty and stimulate socio-economic development.

Sector: Energy generation, renewable sources - multiple technologies (100%)

Status: Implementation	Commitment (USD): 0	Spend (USD): 5,927,750
Start: 2014-12-01	End: 2020-12-01	Duration (days): 2192

[Details XI-IATI-EC_DEVCO](#)

Lat / Lon: 0.66600°N, 30.26950°E

Feature Information Panel 2 (Bottom Right):

Feature Information

[Show Raw Data](#)

Améliorer l'accès des populations haitiennes aux infrastructures de base à travers des services de transport routier performants et pérennes.

Sector: Road transport (100%)

Status: Implementation	Commitment (USD): 229,381,000	Spend (USD): 0
Start: 2013-04-23	End: 2022-11-29	Duration (days): 3507

[Details XI-IATI-EC_DEVCO](#)

IATI Active Projects - PLAN DE VIABILITE ET STRATEGIE DE COMMUNICATION POUR LE

Water Accounting

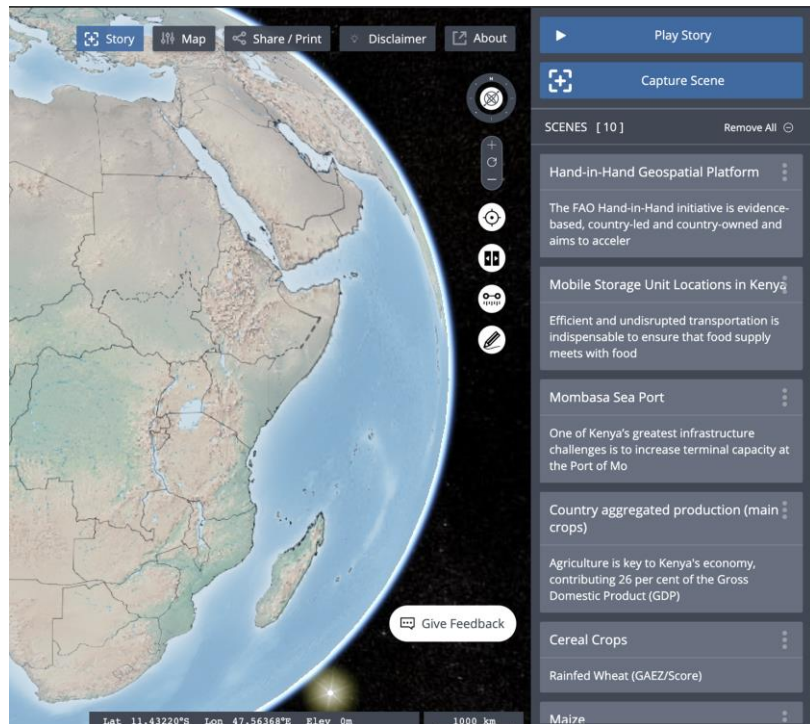


80% of limited freshwater used in agriculture



Mobile Storage Location Analysis

Share Stories



FAO DIGITAL SERVICES PORTFOLIO

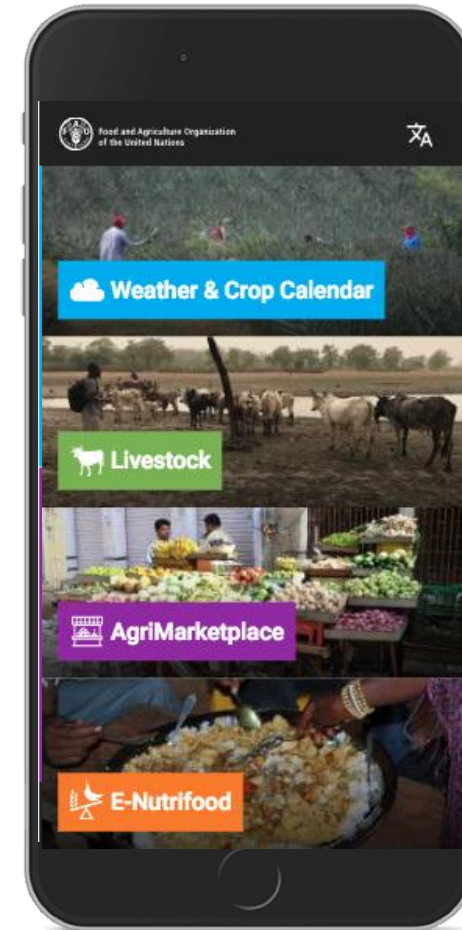
An overview



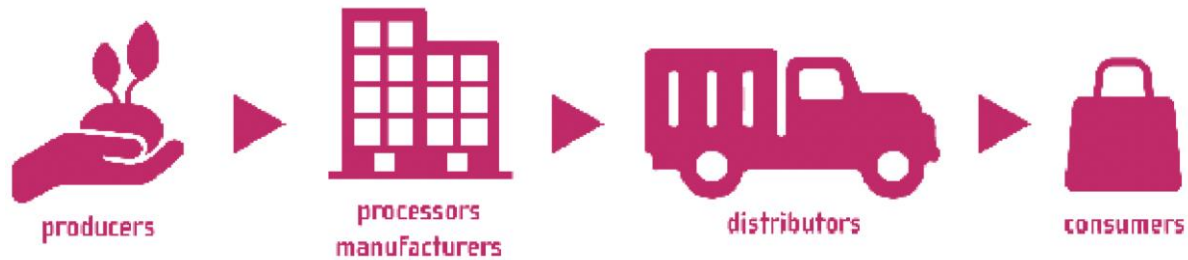


FAO Digital Services Portfolio

- 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)

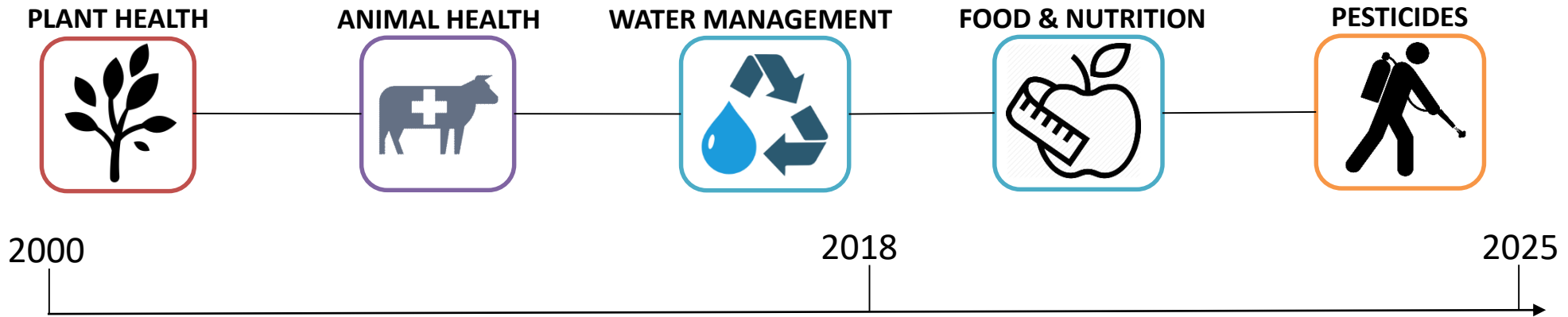


3. Digital Intelligence Platform: Improving value-chain decision making



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?

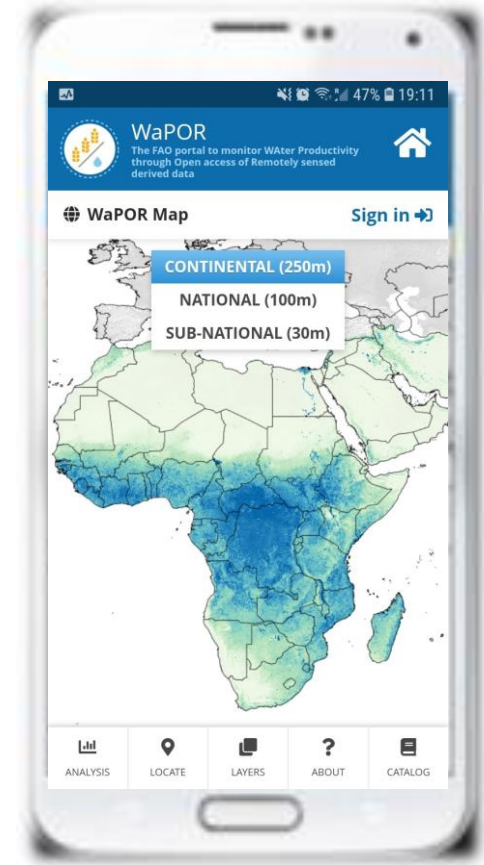


4. WaPOR : Building a Water Secure Future





$$WP = \frac{(\text{Crop} \uparrow)}{(\text{Water} \downarrow)}$$



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 increase 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

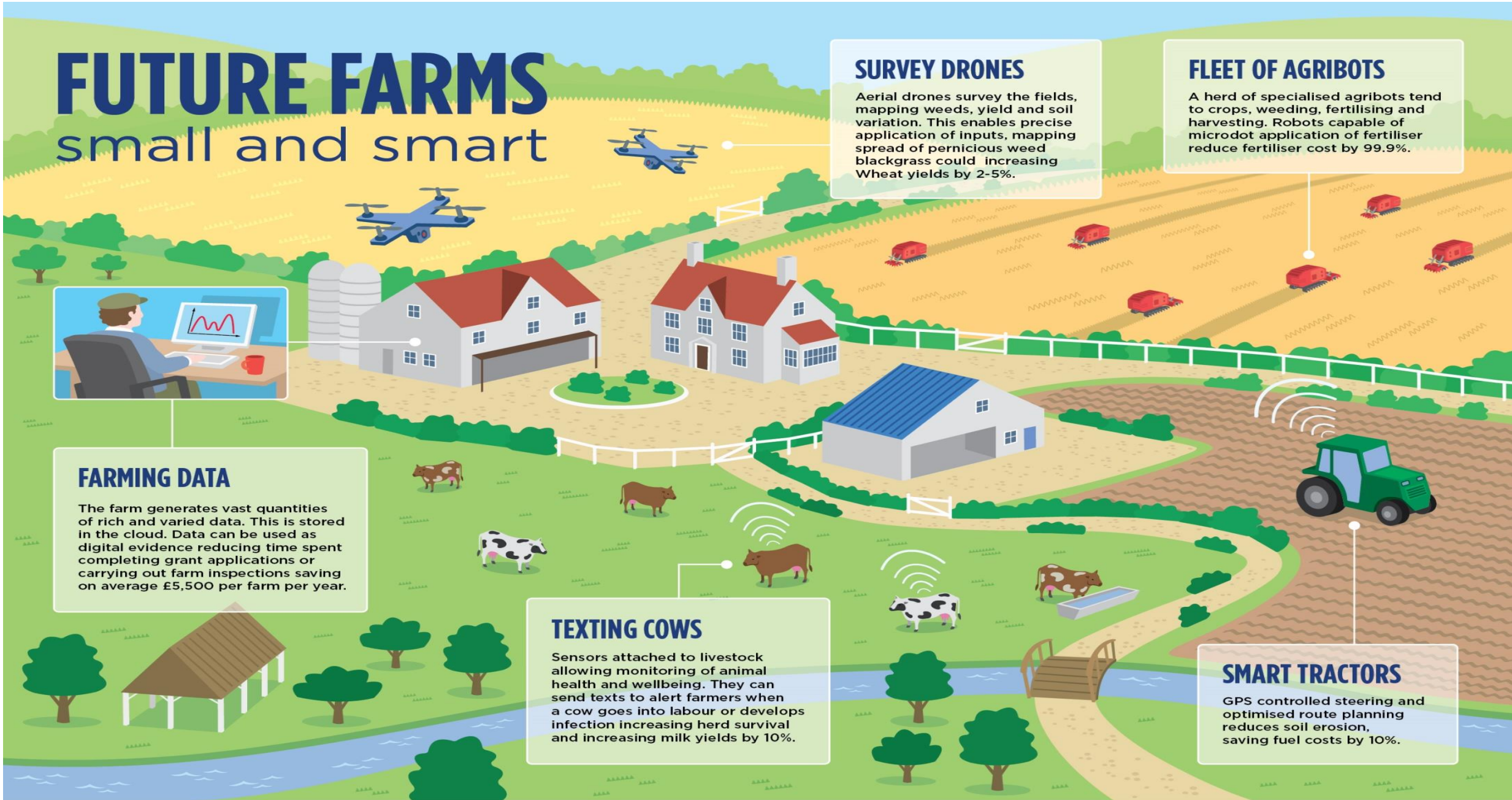
The farm generates vast quantities of rich and varied data. This is stored in the cloud. Data can be used as digital evidence reducing time spent completing grant applications or carrying out farm inspections saving on average £5,500 per farm per year.

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



Artificial Intelligence best-practices in agriculture can help bridge the digital divide while tackling food insecurity

FAO, IBM and Microsoft focus on concrete and sustainable v principles endorsed by Pope Francis



Harnessing Artificial Intelligence's transformative power to make food systems more efficient, sustainable and inclusive

FAO Director-General signs up to ethical resolution on AI endorsed by Pope Francis

