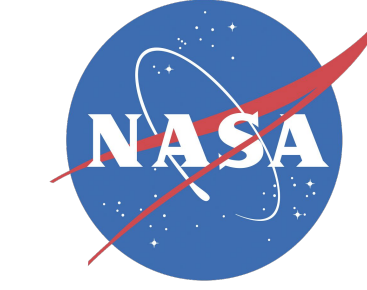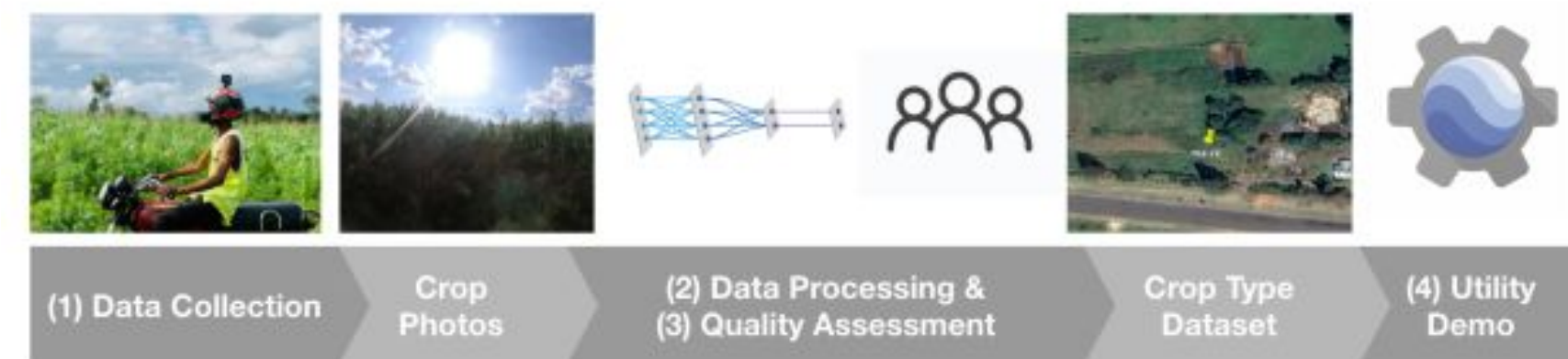# EO-Enabled Regional and National Agricultural (EO-NAM) Monitoring in West Africa

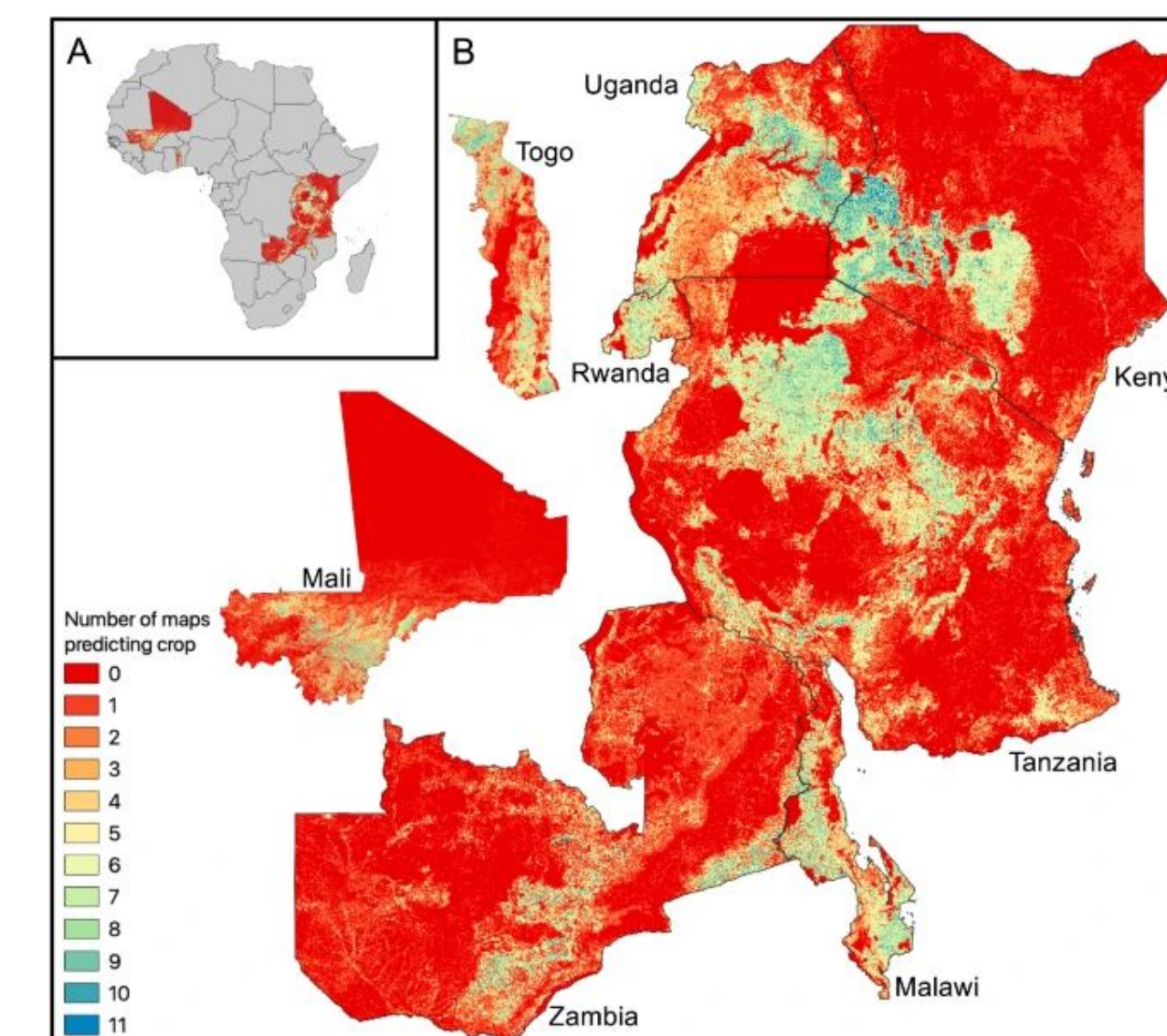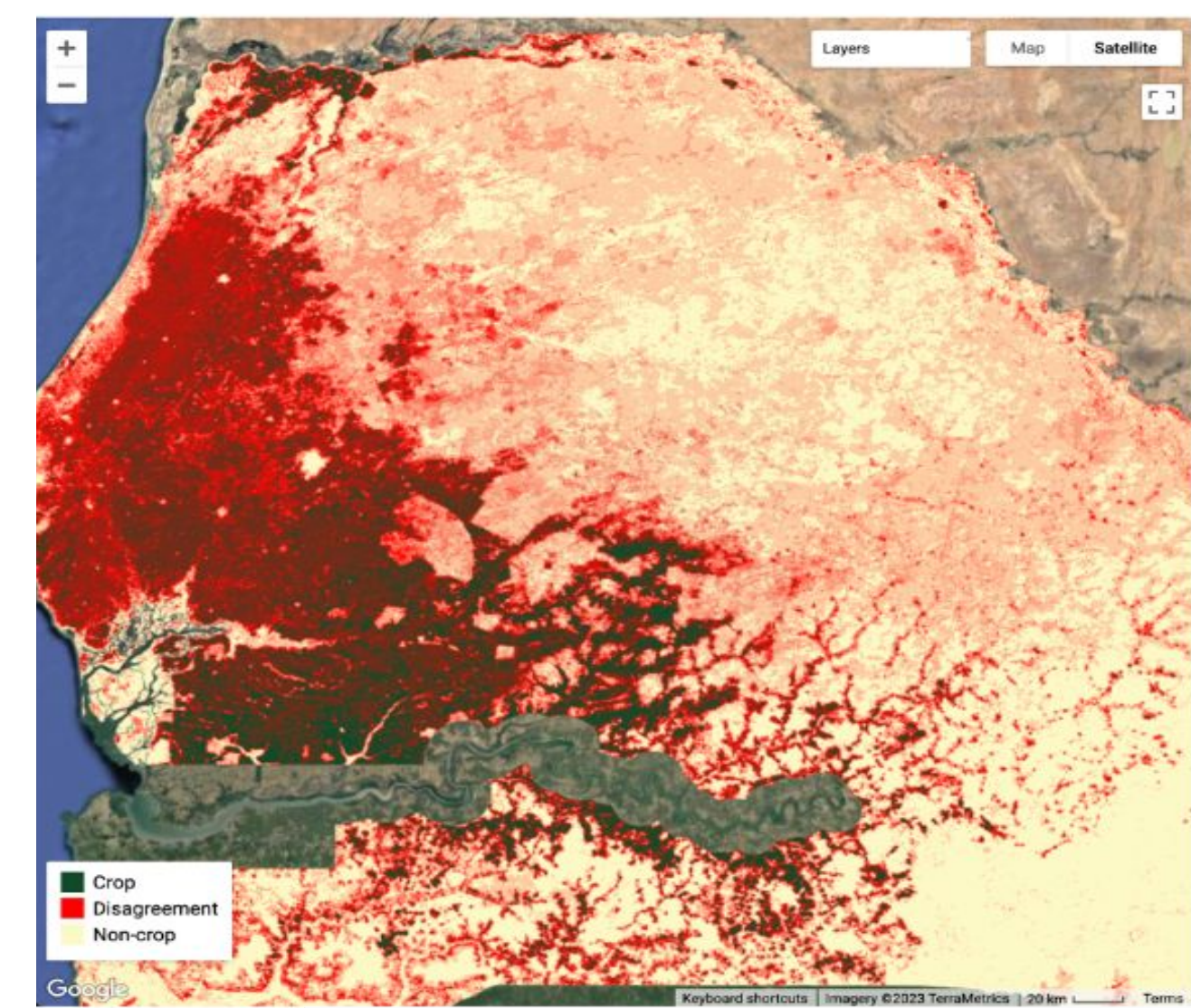USAID FROM THE AMERICAN PEOPLE · NASA · SERVIR WEST AFRICA

EO-NAM enhances West African agricultural monitoring using Earth observation data. We co-develop semi-automated methods for creating crucial EO-derived agricultural datasets through collaboration and training, building local capacity. Our approach replicates and build on successful SERVIR initiatives and lessons from East and Southern Africa.

Satellite Time-Series Data · Satellite imagery · Analysis & Deep Learning

Products
- Crop Land/Type
- Yield
- Crop Condition

Conditions
- Temperature
- Rainfall
- Forecast
- Soil P,C Genotype

Field Agent · Farmers · Analysis & Deep Learning II

Geo-DAS
- Crop Conditions
- Yield Forecast
- Soil Conditions
- Disease Status

Policy · Information & Tech Access · Policy & External Teams (Existing Pipeline)

Project Goals Support CSE to:
- Develop cropland crop-type maps in support of food security assessments
- Developed Machine Learning based crop yield modeling and forecasting system
- Innovate and strengthen field data collection methods in West Africa

Earth Observation Based National Agricultural Monitoring

01 Collection & Processing
Role: Data Providers, Analysts & Engineers
Input: Raw satellite data, Raw in-situ observations
Tasks: Acquisition, quality assurance, standardization, storage, documentation
Output: Analysis Ready satellite data, Analysis Ready in-situ observations

02 Analysis
Role: EO & Domain Experts, Data Engineers
Input: Analysis Ready satellite data, Analysis Ready in-situ observations.
Tasks: Data interpretation and analysis, ML model training, map creation, forecast generation
Output: Agricultural maps, reports and forecasts

03 Insights
Role: Statisticians, EO & Domain Experts
Input: Agricultural maps, reports and forecasts
Tasks: Accuracy assessments, area estimates, analysis of trends and patterns
Output: Actionable recommendations, data-driven narratives, scientific publications

04 Decision Making
Role: Policy makers, implementing institutions, public sector
Input: Actionable recommendations, data driven narratives
Tasks: Crop management, policy planning and development
Output: Data-driven decisions

Data to Decision Loop

(1) Data Collection · Crop Photos · (2) Data Processing & (3) Quality Assessment · Crop Type Dataset · (4) Utility Demo

Problem: How can we sustainably increase agricultural yields and build resilient food systems in the face of climate change, resource scarcity, conflict and growing global demand?

Number of maps predicting crop: 0 1 2 3 4 5 6 7 8 9 10 11

Uganda, Togo, Rwanda, Kenya, Mali, Tanzania, Zambia, Malawi

Crop · Disagreement · Non-crop

Our Approach: Enhancing Agricultural Monitoring through Innovation.
We support and develop new, replicable open-access methods for EO-derived products, while building end-user capacity to utilize these tools for more effective agricultural planning and resource management.

Pathway to Impacts:

Short-term Outputs
1. Enhanced monitoring systems implemented
2. Refined and expanded underlying datasets
3. Strengthened capacity of supporting organizations
4. Decision-makers empowered with actionable insights

Medium-term Outcomes
1. CSE can produce critical baseline data
2. CSE effectively supports DAPSA (Direction de l'Analyse, de la Prévision et des Statistiques Agricoles) in crop monitoring
3. DAPSA decisions informed by Earth Observation (EO) data

Long-term Impacts
1. CSE proficient in applying scalable EO and machine learning methodologies
2. Improved agricultural planning and resource allocation
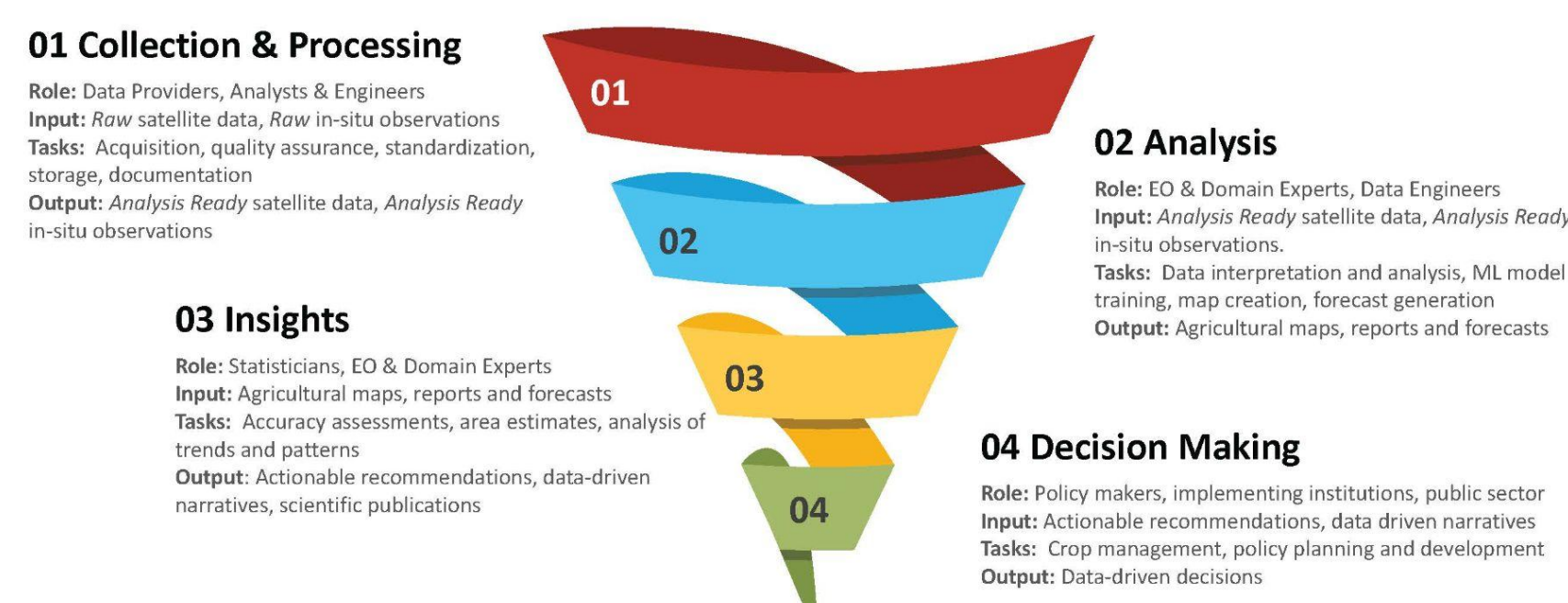3. Enhanced food security and agricultural sustainability

Success Indicators
1. Number of CSE staff trained and actively using new methodologies
2. Accuracy and timeliness of crop yield predictions
3. Frequency of EO data integration in DAPSA reports and decision-making processes
4. Measurable improvements in agricultural productivity and sustainability metrics

Next Steps (2024-2026)
1. Support deployment of Helmets Data Collection System
2. Enhance DAPSA Support for Crop Monitoring
3. Develop Machine Learning-based Yield Model for Senegal
4. Capacity Building and Knowledge Transfer
5. Stakeholder Engagement and Impact Assessment

UNIVERSITY OF MARYLAND · ASU Arizona State University · CSE Centre de Suivi Ecologique · ICRISAT INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPIC · HARVEST EARTH DATA FOR INFORMED AGRICULTURAL DECISIONS · GEOGLAM Global Agricultural Monitoring