

StatEO

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Copernicus4GEOGLAM Service to support Food Security – A standardised approach for crop type area estimation and mapping

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Crop Mapping Service

- Georeferenced in-situ data of crop type;
- Crop area estimates + CV (from in-situ data, and regression);
- Cropland map;
- Crop type map;
- Accuracy assessment of the maps.



Validation Service

- Georeferenced in-situ data of land-cover/commodities of interest;
- VHR interpreted sample areas;
- Accuracy assessment of the map.

Past and current activity

Countries involved in Copernicus4GEOGLAM Phase1 (2021-2024):

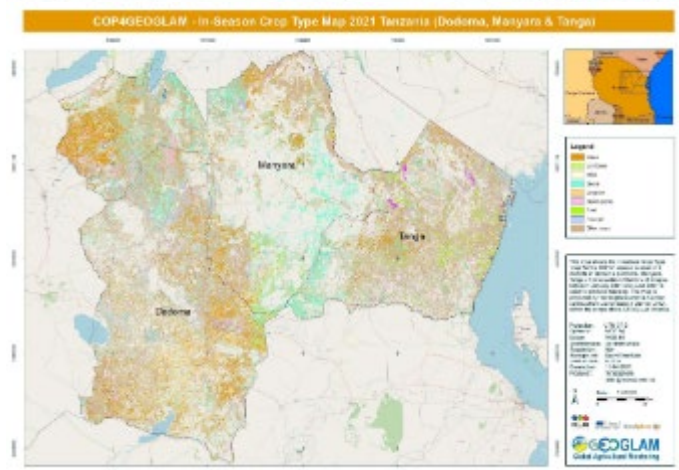
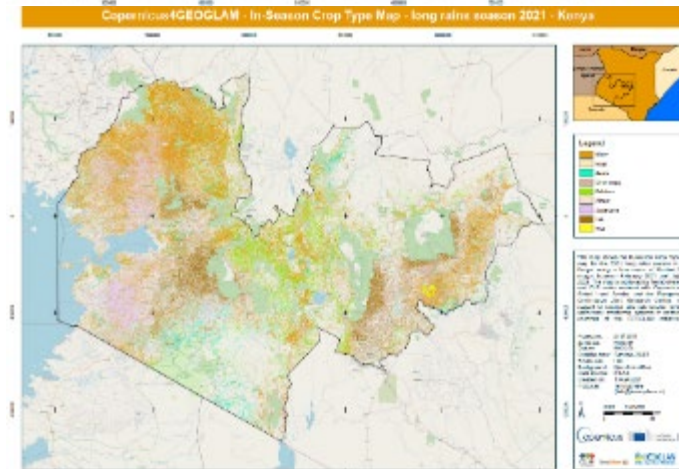
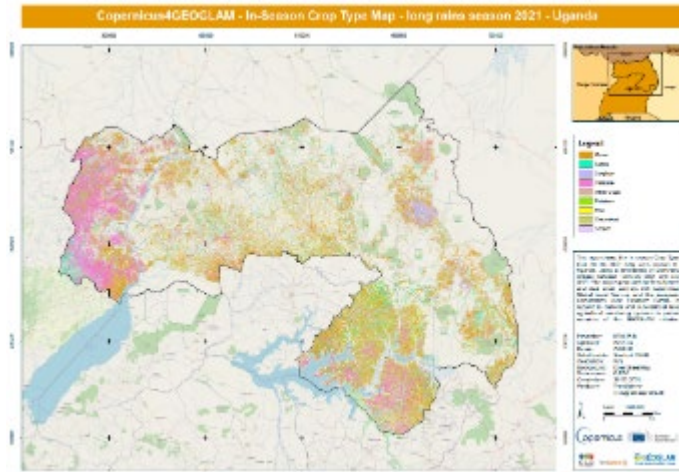


- Kenya and Tanzania (2020-2021/2022-2023, **Crop Mapping**)
- Uganda (2020-2021, **Crop Mapping**)
- Ivory Coast (2022-2023, **Validation Service**)
- Yemen (2024, **Crop mapping**)

Current activity in Copernicus4GEOGLAM Phase2 (2024-2027):



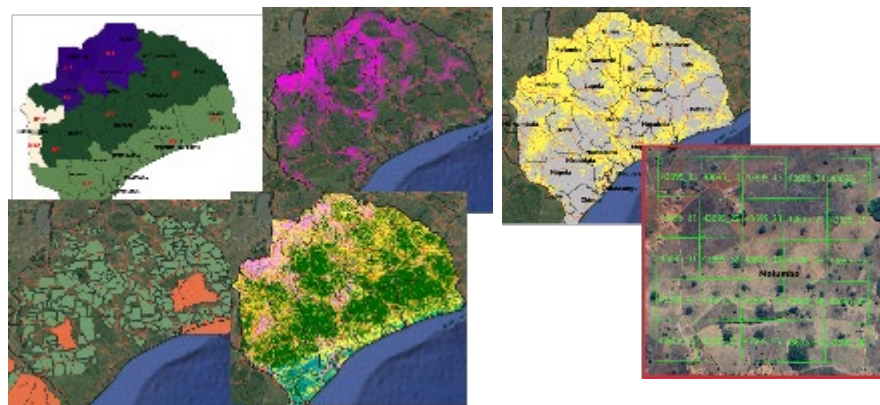
- Mozambique - Zambezia province (2025, **Crop Mapping**)
- Moldova (2025, **Crop Mapping**)
- Zambia (2026-27, **Crop Mapping in prep.**)
- Cameroon (2024-25, **Validation Service** from Phase1)
- Honduras (2025-26, **Validation Service**)



Crop Type Mapping Workflow

Feasibility Study

Example: MOZAMBIQUE



Identification of the Area Of Interest (AOI) & Crop Classes

Stratification & **Sampling design**

Field Campaign

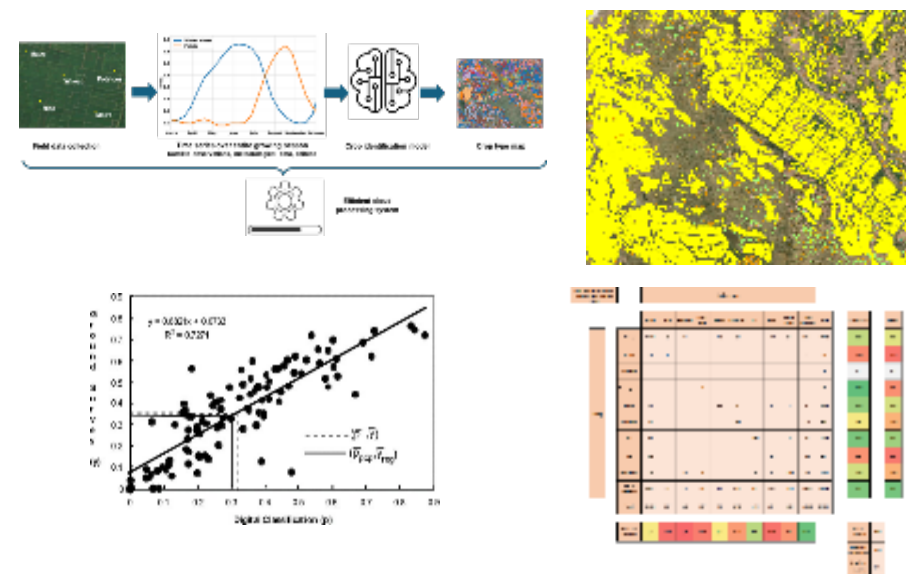


Field Data Collection



Direct expansion:
area estimates

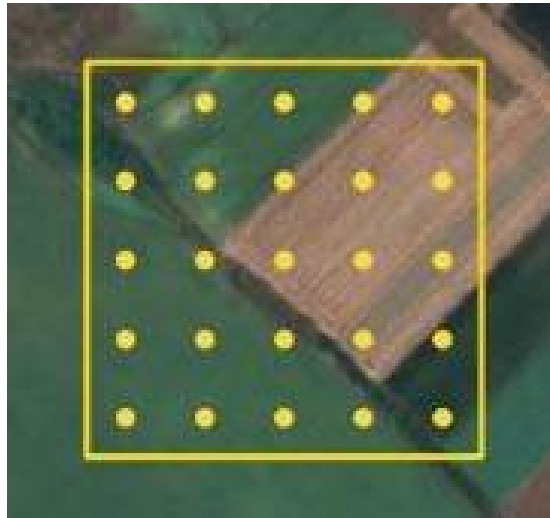
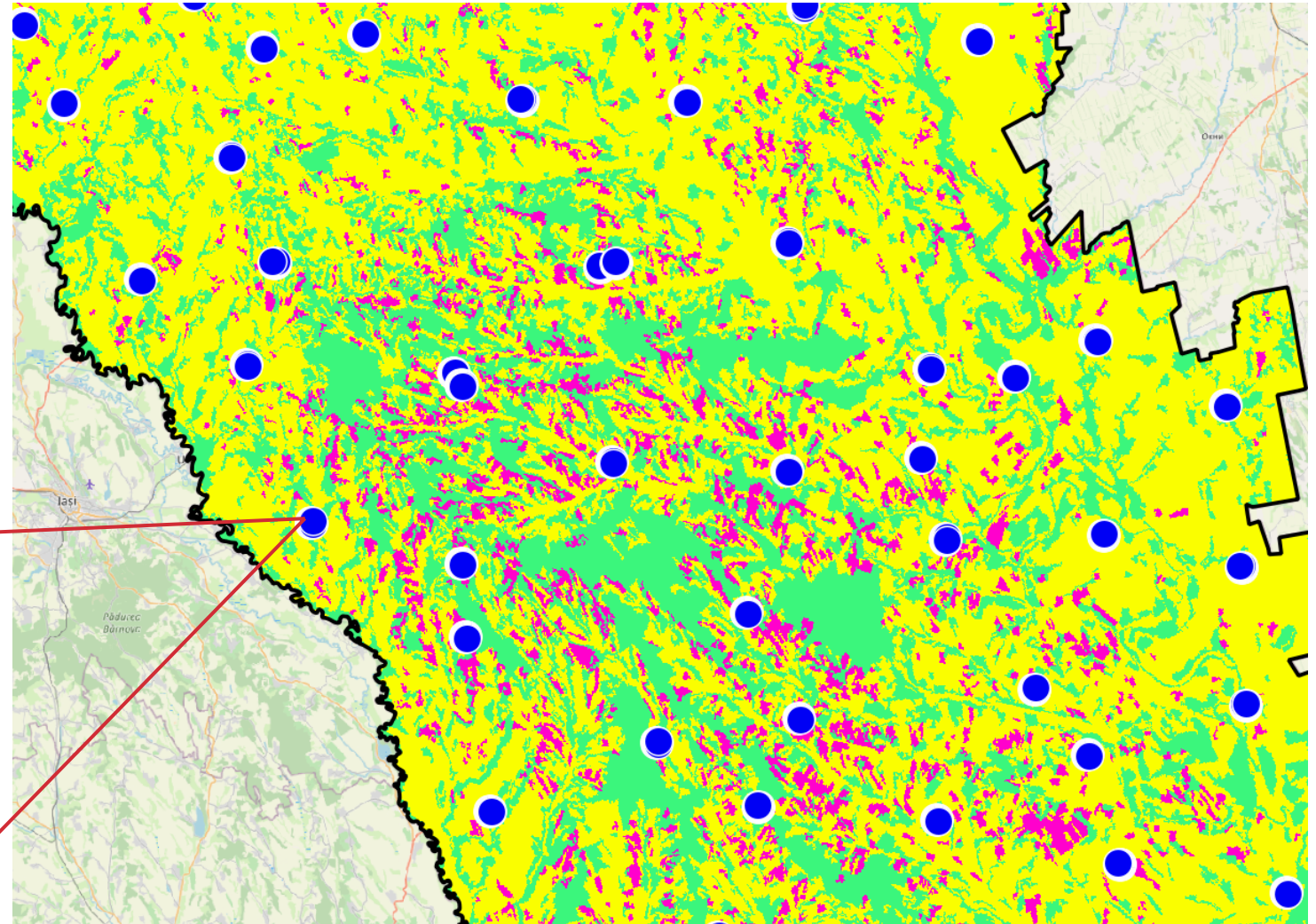
EO processing & Classification



EO data processing (S-1, S2) +
Final **Area Estimates**

Accuracy Assessment of **Crop Maps**

- Stratification aimed to reduce timing and cost
- Probability sampling - Two-stage clustered sample
 - 1st stage: Primary Sample Units (PSU) – selected grid cells
 - 2nd stage: Secondary Sample Units (SSU) – 25 points per PSU



Technical setup:

- Digital data collection via Kobo Toolbox and ODK
- Raster tiles for offline navigation (VHR & S2)
- GNSS and photo-enabled smartphones/tablets

Field Visit

- Training of enumerators
- During growing season before harvest
- Back-up sample units available

Quality control

- Near-Real time quality control via dashboards
- Messaging groups



Geoglam Moldavia

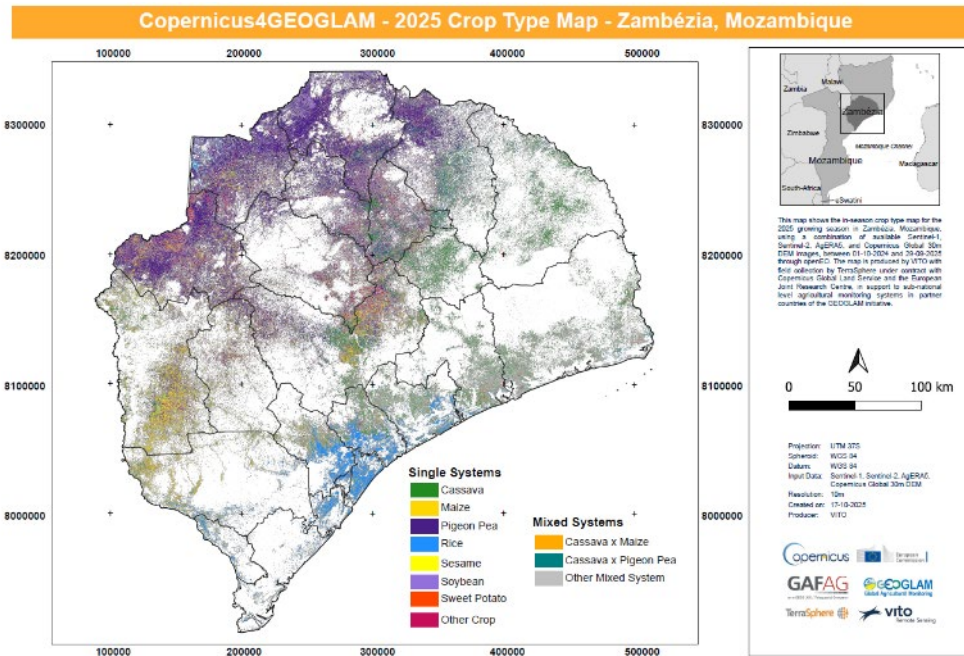
- Dashboard
- Results Fieldwork
- Surveyor Locations
- Progress by Date
- Devices
- Error reports
- Landuse reports

Progress Reports

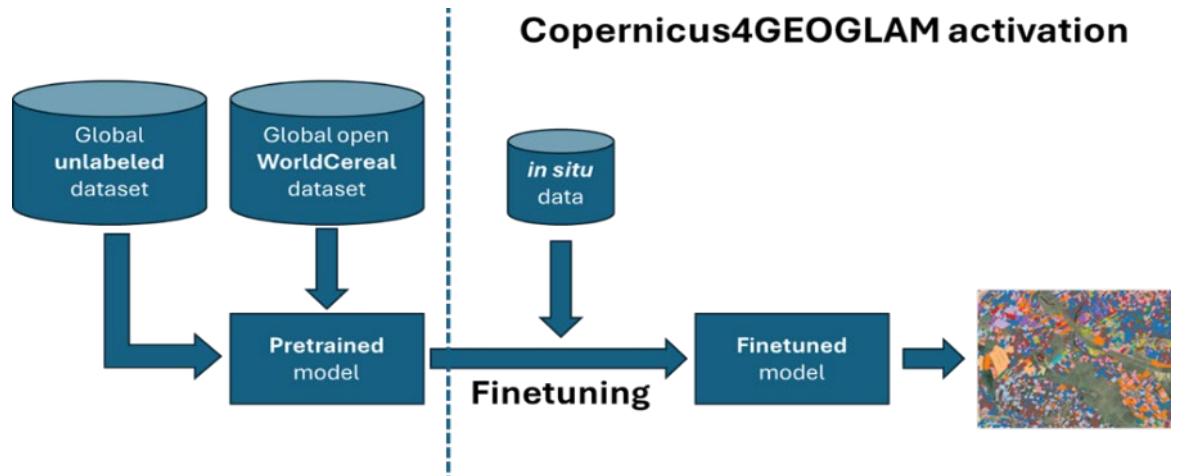
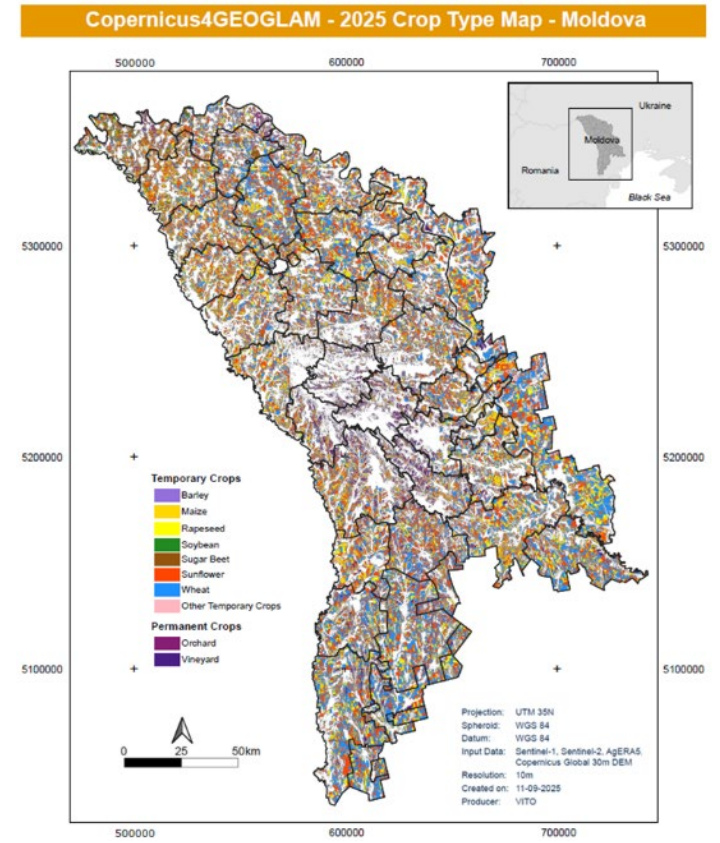
Totals distinct today | **Upload Frequency** | Total Sample Id by day

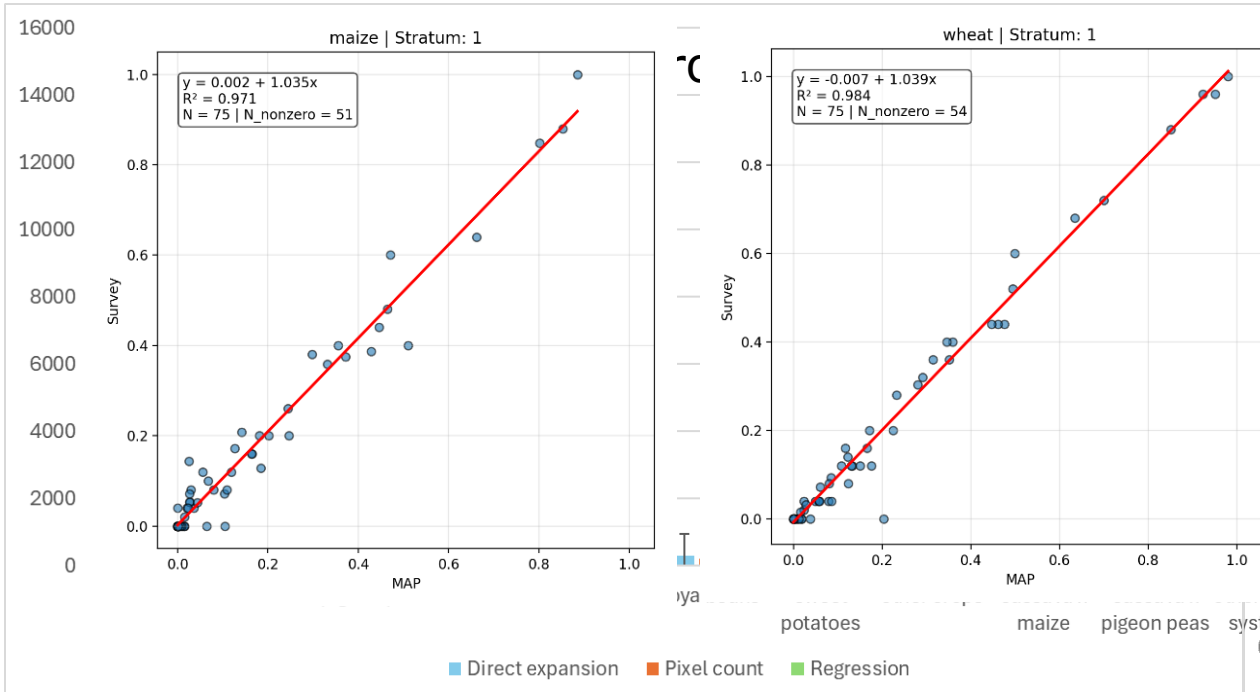
Sample id: Device username: **FILTER** **CLEAR**

INSERT DATE	TODAY	SAMPLE ID	USER	COUNT
2025-06-14	2025-06-13	999	Bogdan	3
2025-06-12	2025-06-09	5	Bogdan	1
2025-06-12	2025-06-09	6	Bogdan	1
2025-06-12	2025-06-09	7	Bogdan	1

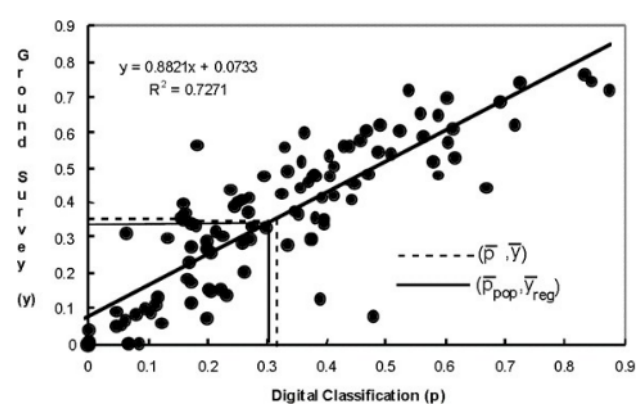


- Prepare collected field data and pair with satellite observations
- Presto model finetuning on agreed classes (*exclude mixed cropping*)
- Pixel Embeddings
- Train CatBoost classifier
- Run inference for full regions



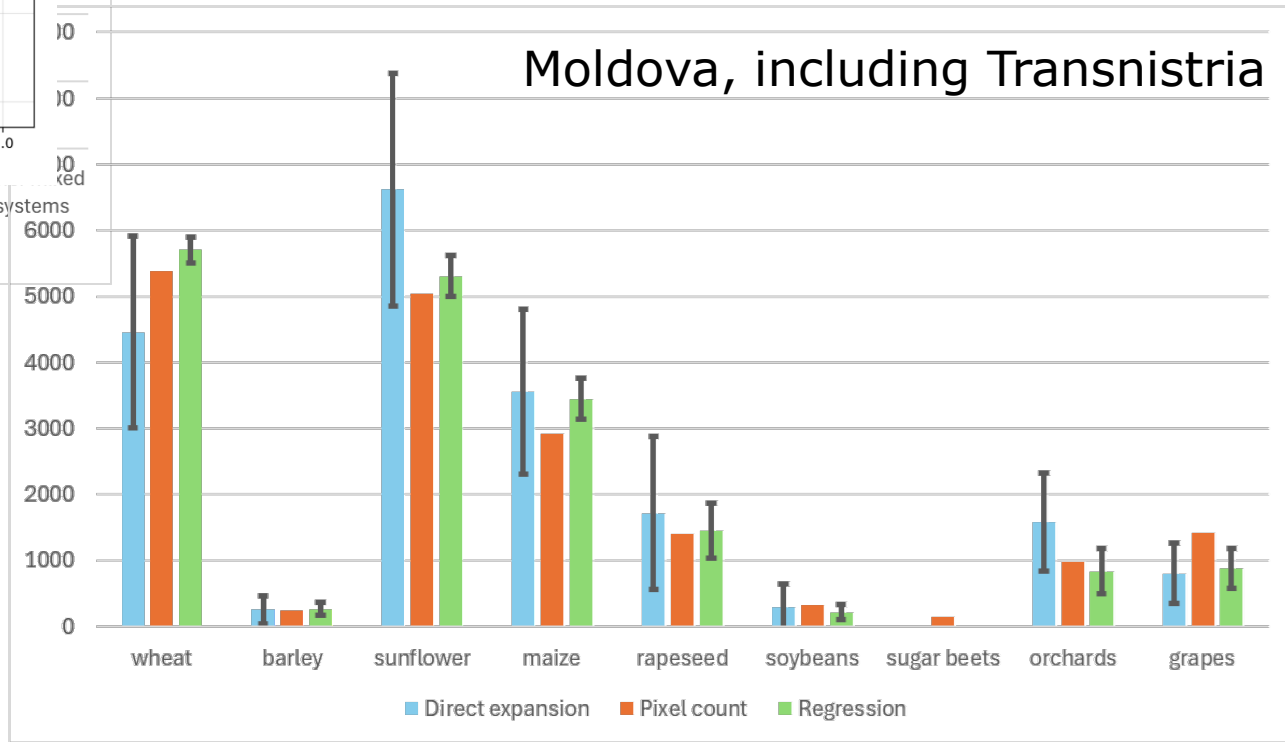


- Direct expansion area estimates available based on field data alone
- Improved estimates using regression analysis (y_{reg})
- Level of improvement assessed with relative efficiency (μ_{reg})
- Factor by which the field sample needs to be increased to reach the same precision (1.6 to 15.5 in Moz, 3 to > 100 in Moldova)



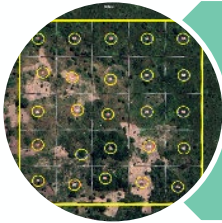
$$y_{reg} = \bar{y} + b * (\bar{p}_{pop} - \bar{p})$$

$$n_{reg} = \frac{1}{1 - r_{py}^2}$$



Milestones and future plans

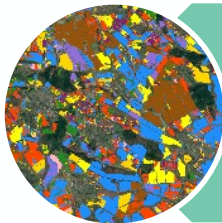
Service	country	Milestone \ Status	Next steps
Crop mapping	Mozambique (Zambezia province)	Completed – final results presented to the country in December 2025.	New implementation in progress to produce a revised crop type map in collaboration with ITC.
Crop mapping	Moldova	Completed – final results presented to the country in January 2026.	LPIS support by JRC.
Validation Service – cocoa map	Cameroon	Interim report.	FAO working on a revised version of the map following JRC recommendations.
Validation Service – coffee map	Honduras	Field campaign completed.	Validation soon completed.
Crop mapping	Zambia	Request of service from country received by JRC. Definition of country needs and datasets.	Feasibility Study to be launched in April.
Validation Service – LC classification	Cote d'Ivoire	Under discussion with national institutions.	Request of service by the country.



Similar Sampling design applied in Mozambique and Moldova (as well as in Kenya, Tanzania and Uganda)



Field campaign implementation was more difficult in Mozambique than in Moldova



Nevertheless the approach in Mozambique still provided useful outcome which are now further improved by combining data with another field campaign



Intercropping pattern in African landscapes requires a different approach to crop type mapping