



WorldCereal

WorldCereal: Global crop mapping system

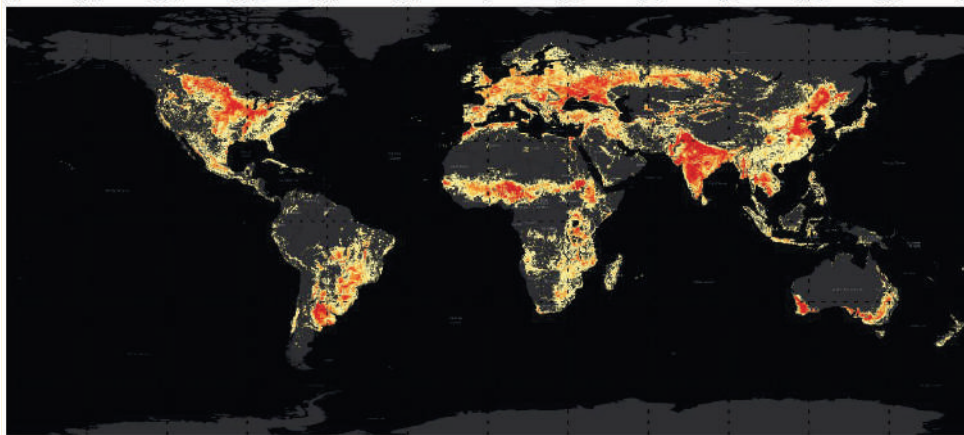


Kristof Van Tricht

ESA UNCLASSIFIED – For ESA Official Use Only

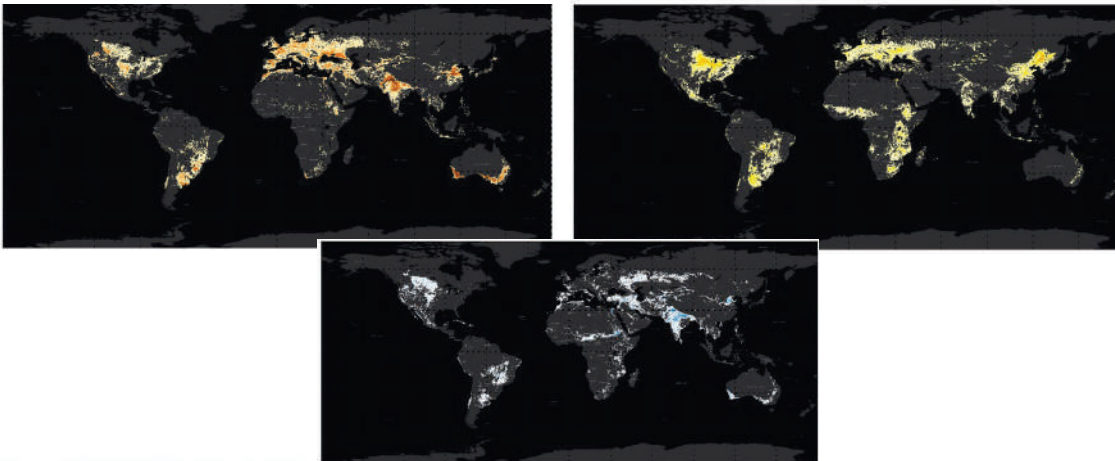


→ THE EUROPEAN SPACE AGENCY



Phase I (2020 – 2023)

Scientific and technical **feasibility study** for **seasonal crop mapping** from the **local to global** scale



Phase II (2024 – 2026)

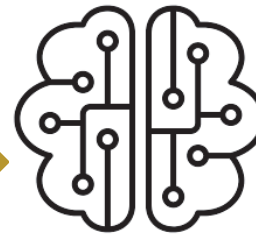
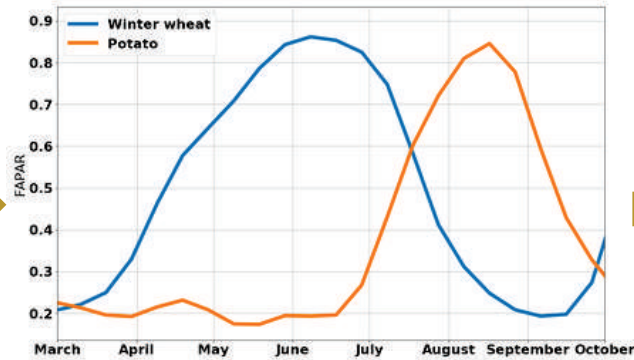
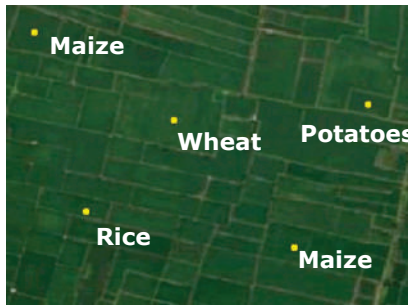
building a crop mapping **community** around a fully **open** and **cloud-based** operational and flexible system



WorldCereal



How to map crops from space



Field data collection

Time series over entire growing season
Satellite observations, meteorological data, altitude

Crop identification model

Crop type map

Remaining one of the largest challenges



An efficient and cloud-agnostic processing system



WorldCereal



→ THE EUROPEAN SPACE AGENCY

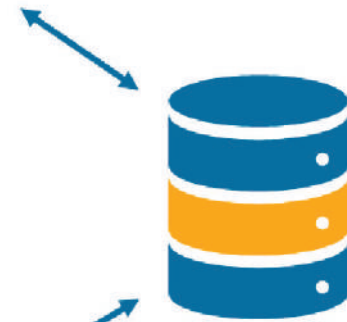
Open reference data repository



Web-based access



API Access



Public and private data set storage



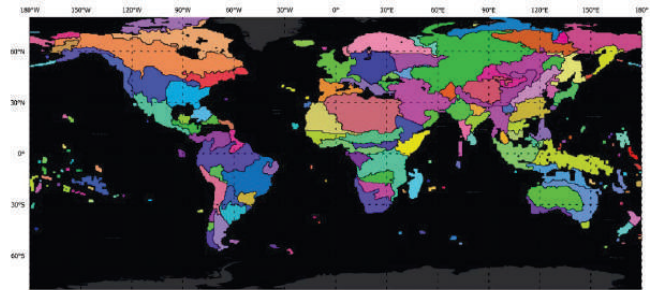
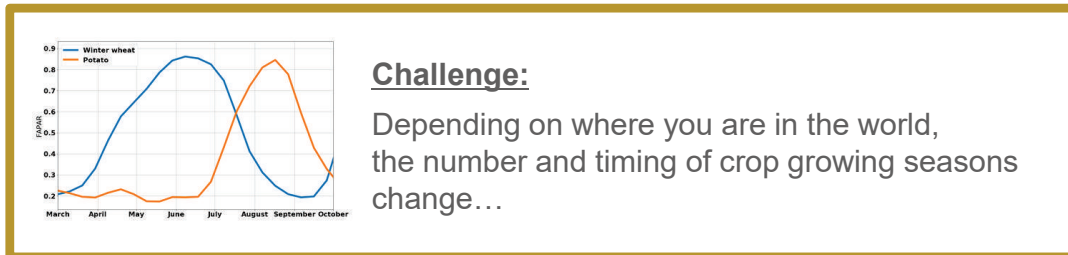
- Explore harmonized data sets
- Download:
 - Harmonized data
 - Metadata
 - Information on harmonization
- Soon: full API access for easy interaction



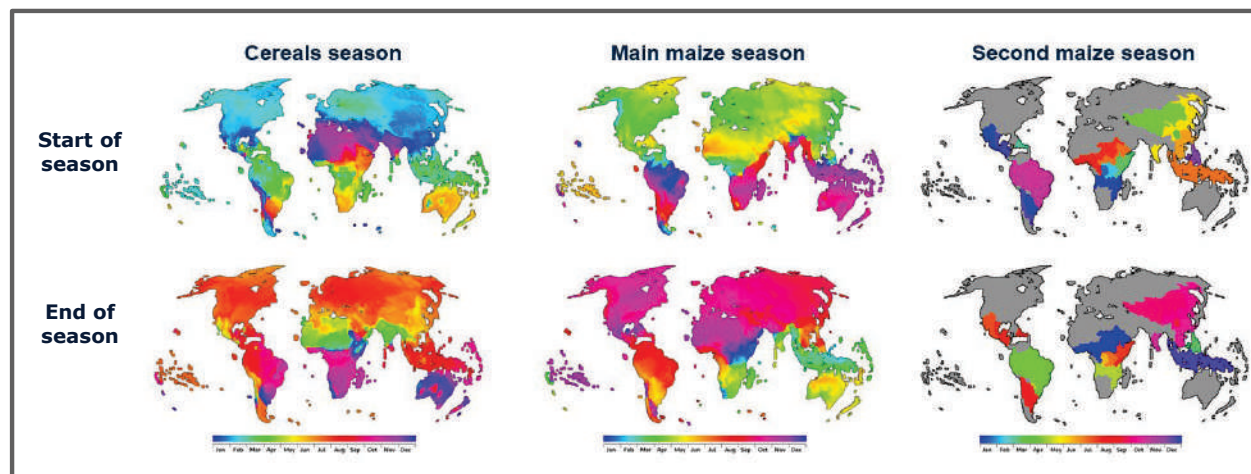
WorldCereal



Project outcomes: crop calendars and zonation



Global crop calendars for maize and wheat



<https://esa-worldcereal.org/en/products/crop-calendars>

Agro-ecological zones

Each characterized by distinctive start and end of up to 3 growing seasons

= basis of global products

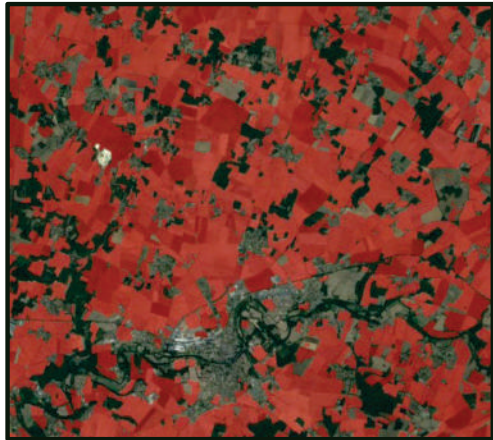


WorldCereal



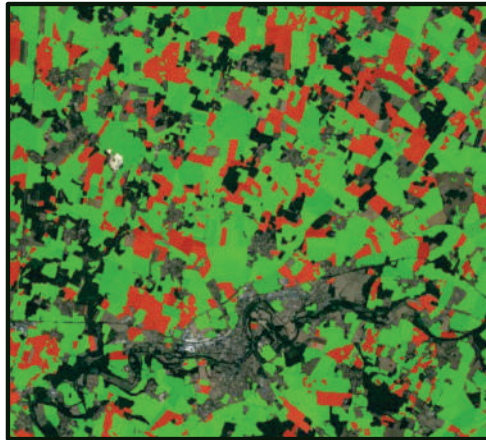
→ THE EUROPEAN SPACE AGENCY

Project outcomes: Global products 2021



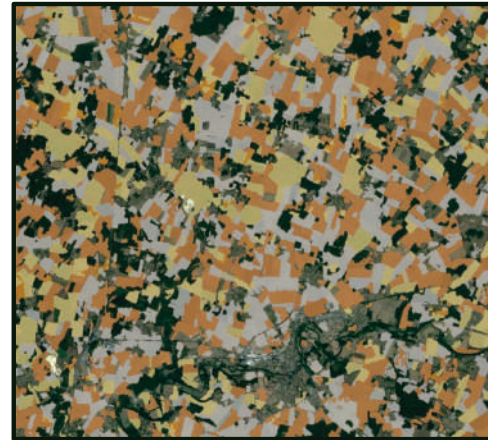
Temporary crop extent

Which part of the land was designated for food crop production?
Generated once per year.



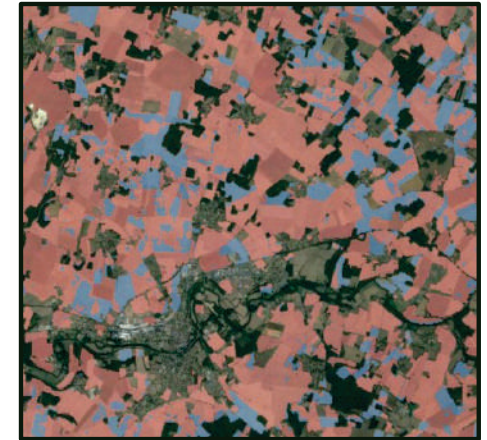
Seasonal active cropland

Which crop area has been actively cultivated in a particular season?
Generated at the end of the season.



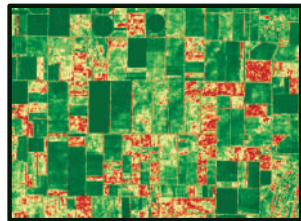
Seasonal crop type

Which crop area contained a particular crop type during a particular season?
Generated at the end of the season for each crop type separately.
Available for [maize, winter cereals and spring cereals](#) *.



Seasonal irrigation

Which crop area has been actively irrigated during a particular season?
Generated at the end of the season.



Confidence maps

Each product is accompanied by a model confidence product, indicating the uncertainty of the product.

* Cereals = wheat, barley and rye



WorldCereal



→ THE EUROPEAN SPACE AGENCY

Access to WorldCereal products?



WorldCereal viewer:

<https://vdm.esa-worldcereal.org>



Download products from:

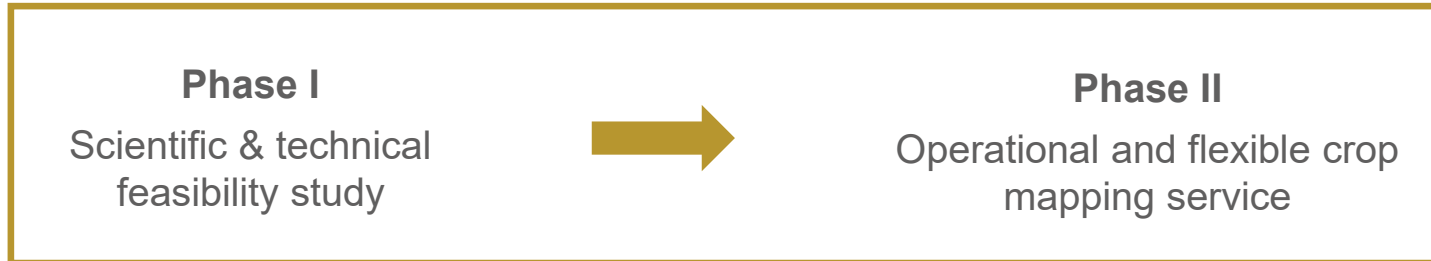


WorldCereal



→ THE EUROPEAN SPACE AGENCY

WorldCereal Phase II (2024-2026)



- ✓ **User-friendly and cloud-based** processing system
(powered by OpenEO and Copernicus Data Space Ecosystem)
- ✓ **New set of global products for 11 crop types** (year TBD)
(maize, winter cereals, spring cereals, sunflower, rapeseed, millet, sorghum, wheat, barley, rye, soybean)
- ✓ **Customizable** crop type model training and application
- ✓ Addition of crop **yield** module to the system
- ✓ Focus on **capacity building** → towards increased adoption of the system

More details: <https://esa-worldcereal.org/en/about/worldcereal-phase-ii>



WorldCereal



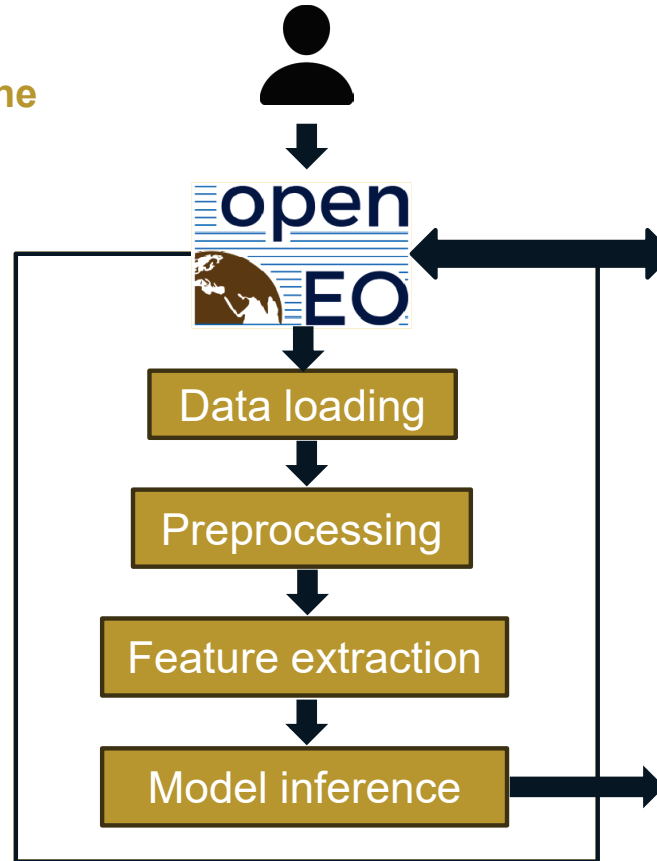
→ THE EUROPEAN SPACE AGENCY

Towards a cloud-based crop mapping system



- **OpenEO as processing backbone**
- **CDSE as default cloud provider**

- High performance
- Scalable processing
- To be onboarded in ESA NoR
- *Standalone system as alternative*



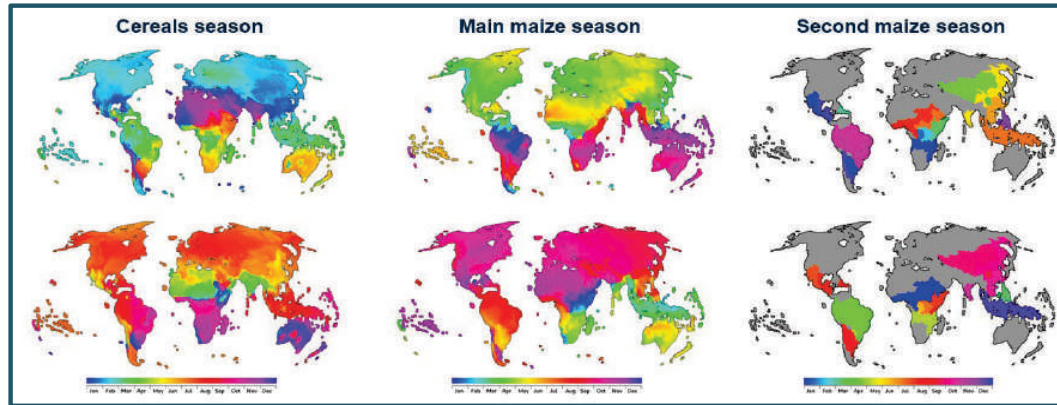
**WorldCereal
product**



WorldCereal



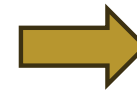
Update global crop calendars and AEZ



Winter cereals

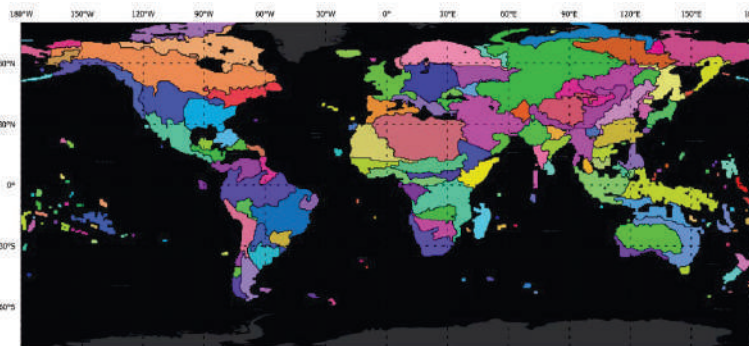
Maize
(Spring cereals)

Maize



Identification of two “dominant”
crop growing seasons

Support any crop type



Redefine AEZ's in line with
administrative boundaries

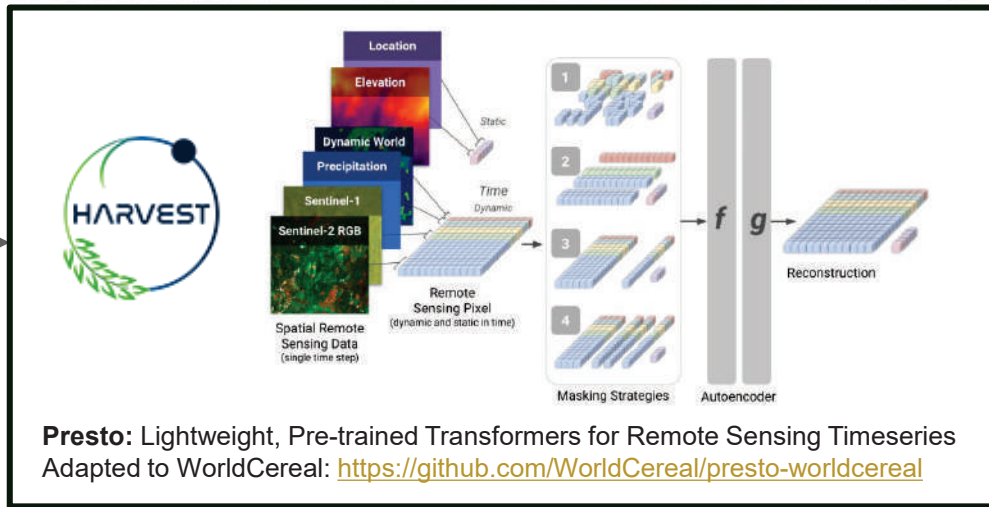
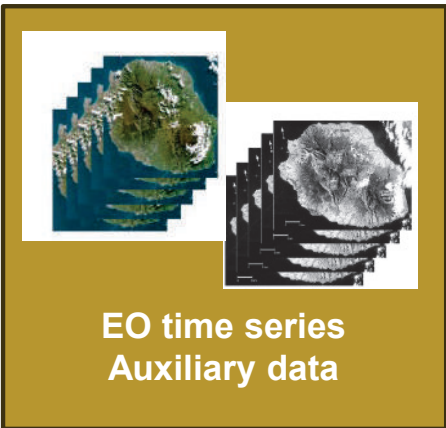
More intuitive product boundaries



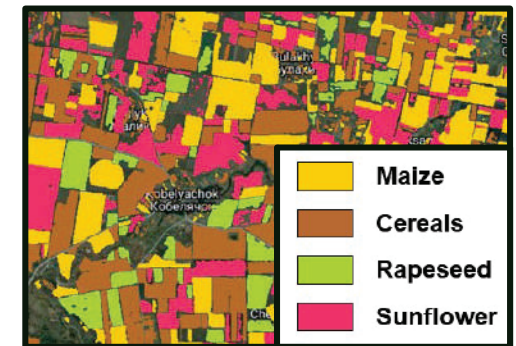
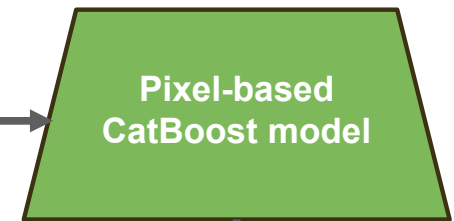
WorldCereal



Updated classification approach



New feature extraction method

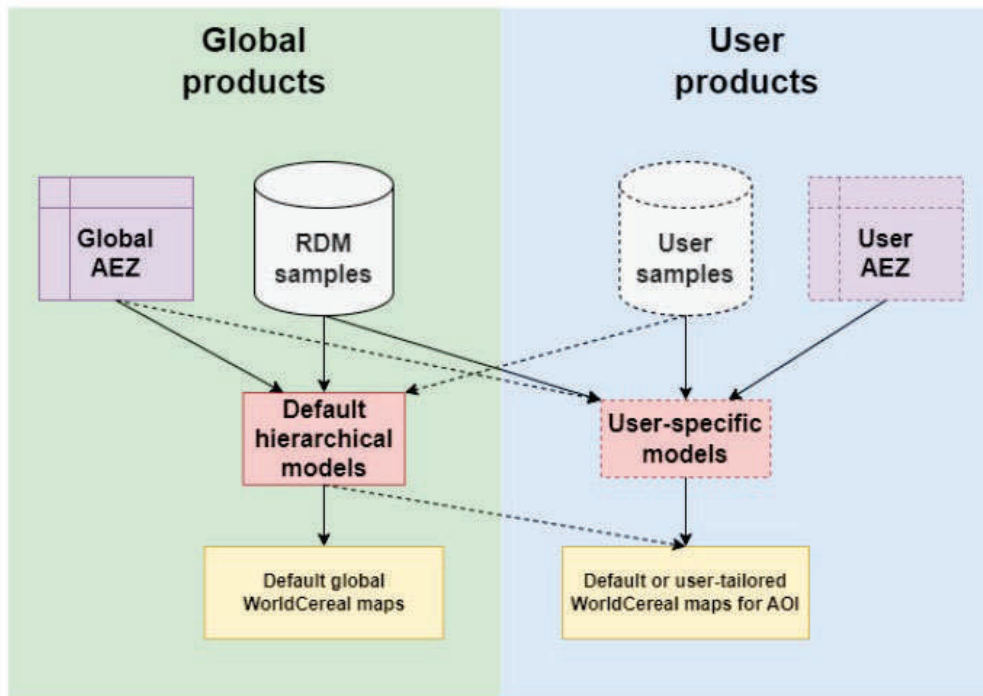


	Argentina	Spain	Latvia	Ethiopia	Nigeria	Tanzania	MEAN
Phase I Baseline	0.05	0.05	0.03	0.20	0.24	0.62	0.20
Presto	0.04	0.04	0.02	0.13	-0.04	0.44	0.11

Performance drop (F1) for left-out country (*lower is better*)



Custom model training & application



Using the new processing system, users will be able to...

- Generate **default WorldCereal products** for custom year and AOI
- Combine public and private reference data to **train custom models** building upon pretrained Presto
- Apply custom models to any year and AOI



Regional use cases



Estimation of crop yield and production: enhancing national/subnational/local production statistics and forecasting.



Dynamic Area Changes: Monitoring and understanding changes in crop areas due to conflicts or policy shifts.



Climate-Smart Agriculture: Supporting recommendations and investments that promote climate-smart agricultural practices.



Damage Assessments: In the face of extreme weather events or conflicts, WorldCereal products can aid in rapid damage assessment, and disaster management.



Winter cereals in Argentina



ARYA crop yield model



WorldCereal

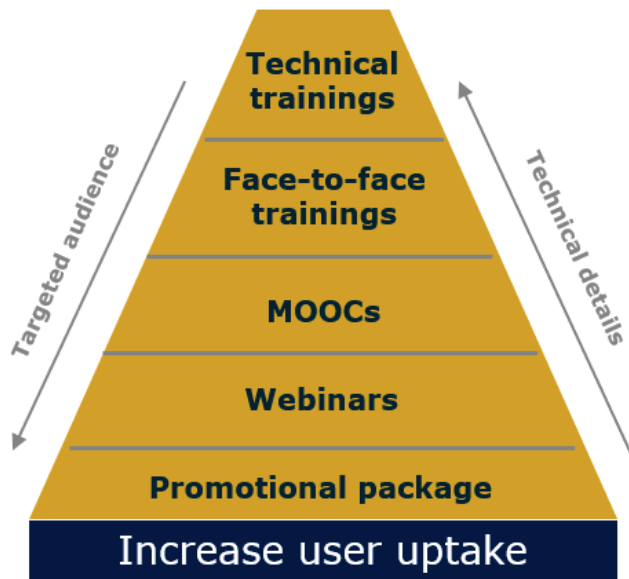


<https://esa-worldcereal.org>



Subscribe to our mailing list:

<https://esa-worldcereal.org/en#subscribe>



Follow us on social media:



https://twitter.com/ESA_WorldCereal



<https://www.linkedin.com/company/esa-worldcereal>



[ESA WorldCereal](#)



WorldCereal



Planning



Dec '23
Kick-off

Jan '25
System v2

May '26
Release global products



Sept '24
System v1

Oct '25
Start global production

Dec '26
Project end

— Demonstrations, outreach & trainings —>



WorldCereal



→ THE EUROPEAN SPACE AGENCY



WorldCereal



THANK YOU



ESA-WORLDCEREAL.ORG



VDM.ESA-WORLDCEREAL.ORG

