



# Harvest Monitoring in Ukraine 2022

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***[www.vista-geo.de](http://www.vista-geo.de)***

December , 2022

Request Ids:  
252020  
252060



# Harvest Detection with Sentinel-1

## Background of the activity



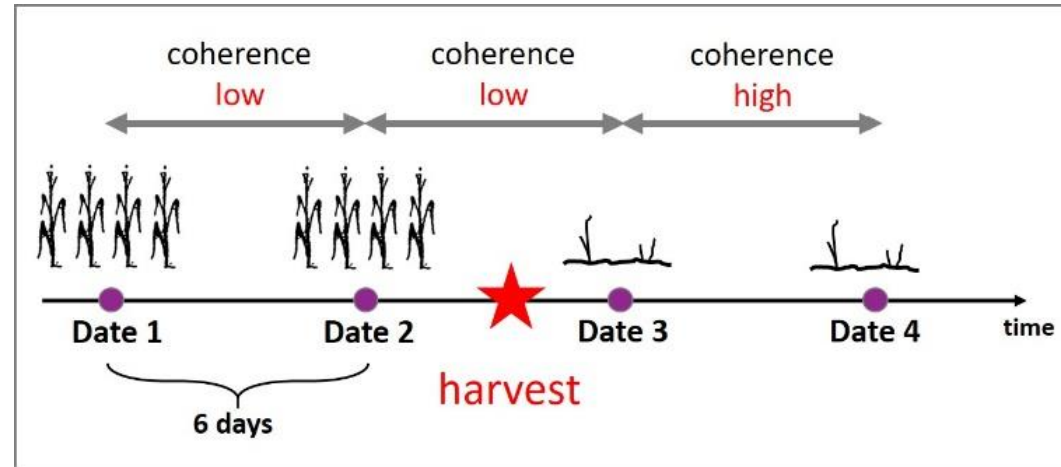
- Within this project we supported a.o. the Ukrainian Government with information on harvest progress using Sentinel-1 coherence and backscatter information.
- The main activity was performed under an FS-TEP CCN2 contract.  
*ESA Contract Number: 4000120074/17/I-EF*
- With this NoR specific Sentinel-1 activity we determined if and whether the actual harvest took place.
- The requirements for storage and processing on the TEP had been covered by the sponsoring IDs 252020 and 252060

# Harvest Detection with Sentinel-1

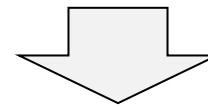
## Theory and Challenge

Periodical observation of SAR backscatter (using two polarisations) and the coherence between the observations allows to track changes in the structure and surface of agricultural areas.

Occurrence of coherence “jump” from low to high after the expected vegetation season indicates bare soils  
➤ Harvest



Sentinel-1 radar data processing  
VV coherence & sigma nought ratio VH/VV



Derivation of harvest date  
Algorithm / Software

### Challenge for the UKRAINE 2022

- Coherence is using **same orbit observations**
- **Sentinel-1B failure** (Dec. 21) reduces the coherence options to 12 day periods
  - Method tested to be suitable
  - **But: Not all harvest activities can be tracked with same reliability as with 6day data**

# Harvest Detection with Sentinel-1

## 12day vs 6day Coherences

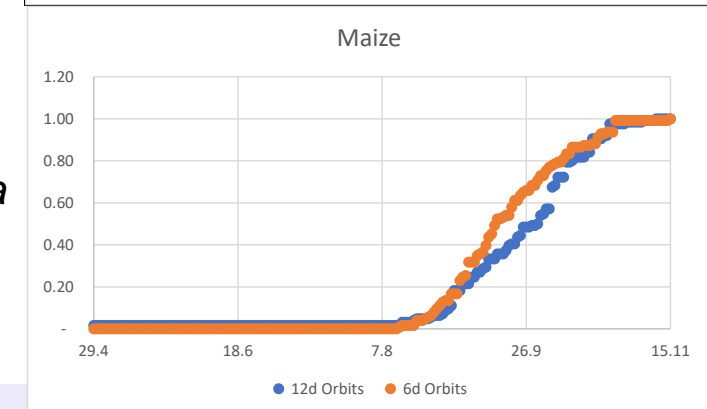
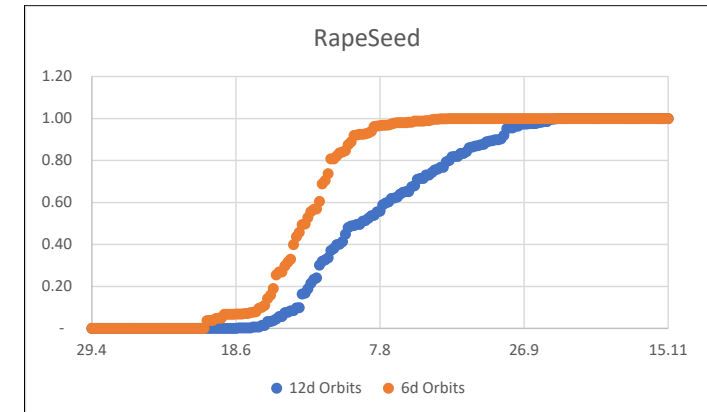
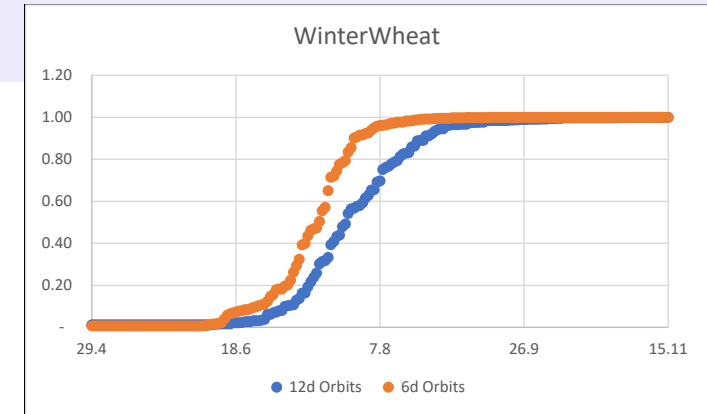
Failure of Sentinel-1B only allows 12 day orbit analyses of coherence.

### 6 day vs. 12 day orbit accuracy tested in Germany

- Harvest detection still possible
- Slower progress in detected harvest events
- Accordingly detected harvest period lasted longer
- Delayed observation depending on crop type and structure

Due to 12 day based algorithm:  
Harvest results have 2-3 weeks delay

*Cumulative harvest progress with time as detected with S1a (blue) compared to tandem constellation (orange) (1 = 100% harvested)*

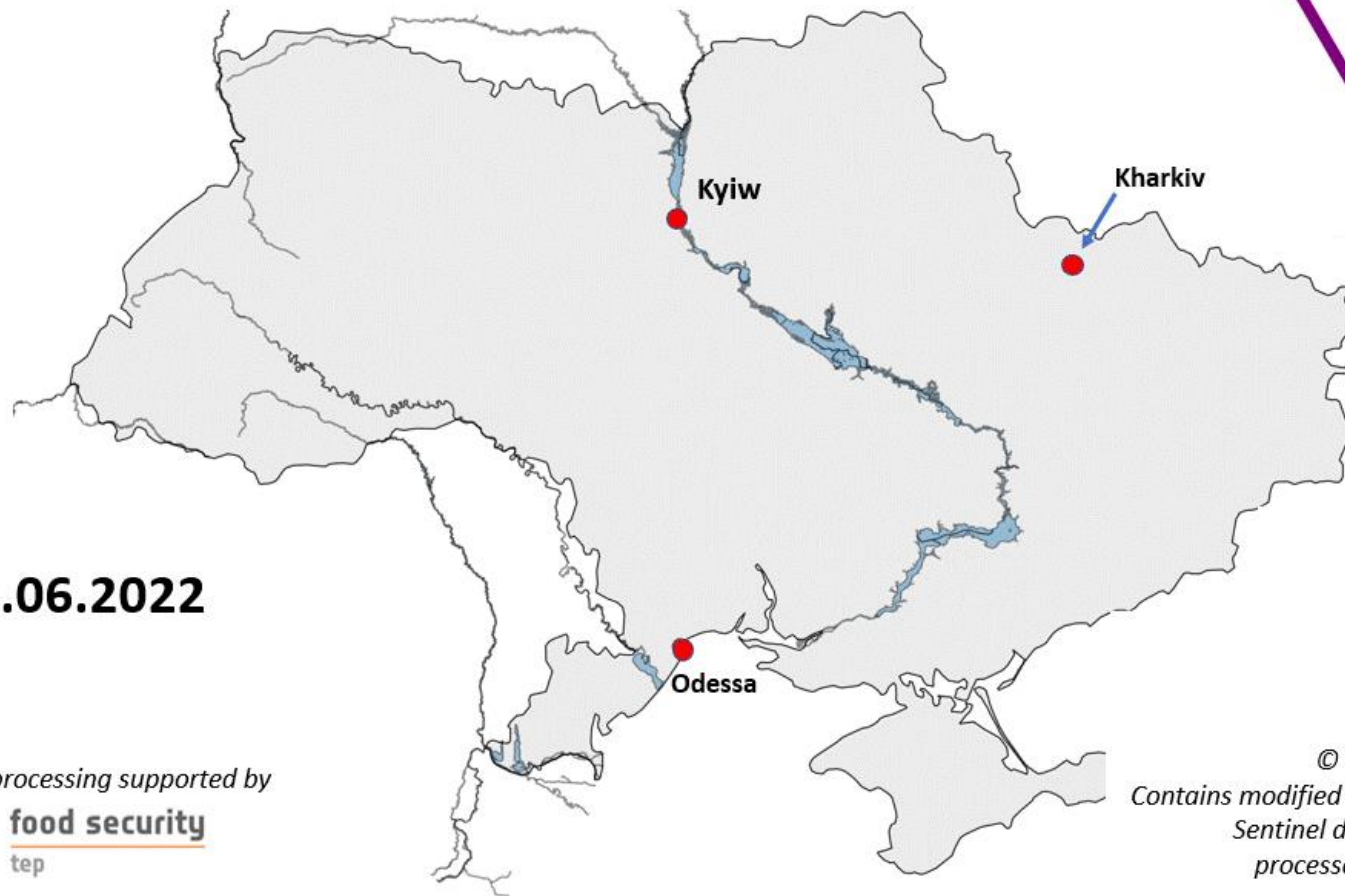




# Harvest Detection with Sentinel-1 Winter Wheat Harvest Progress



## Harvest Progress Winter Wheat – Ukraine 2022



Showing capabilities of S1 harvest detection as illustration (no absolute numbers)

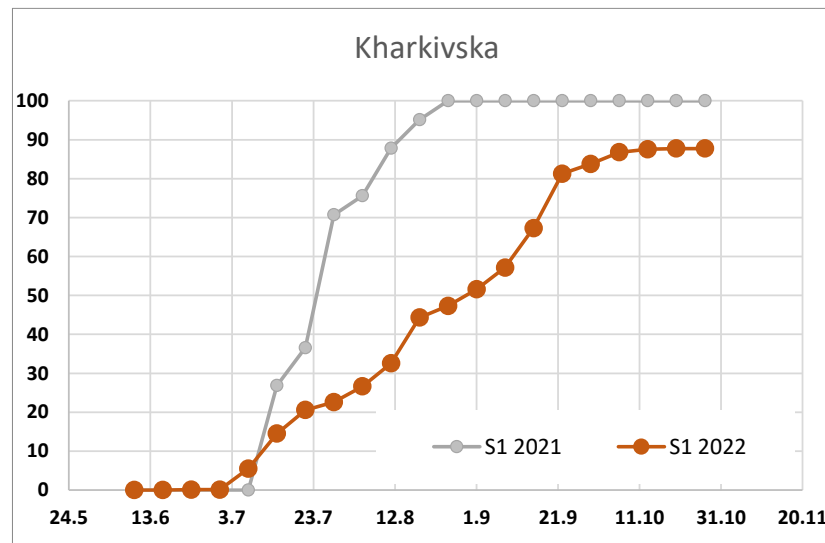
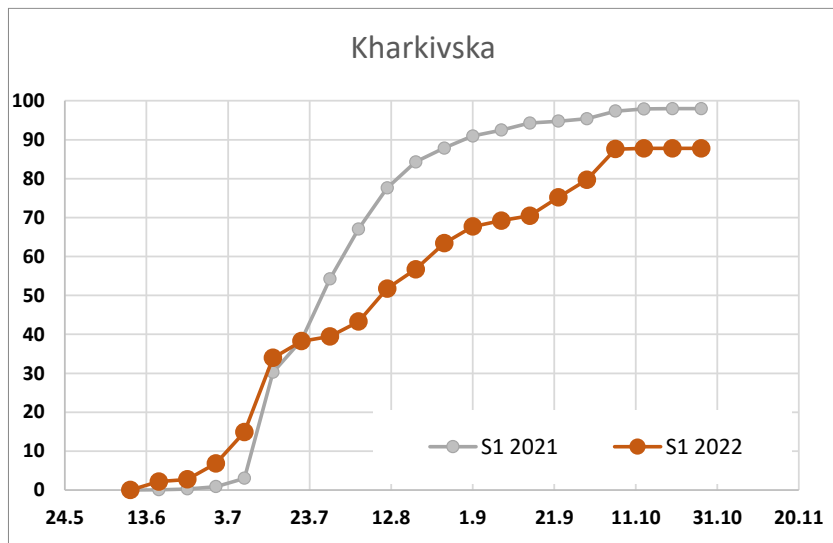
Each dot shows that a field is harvested.

Data processing supported by

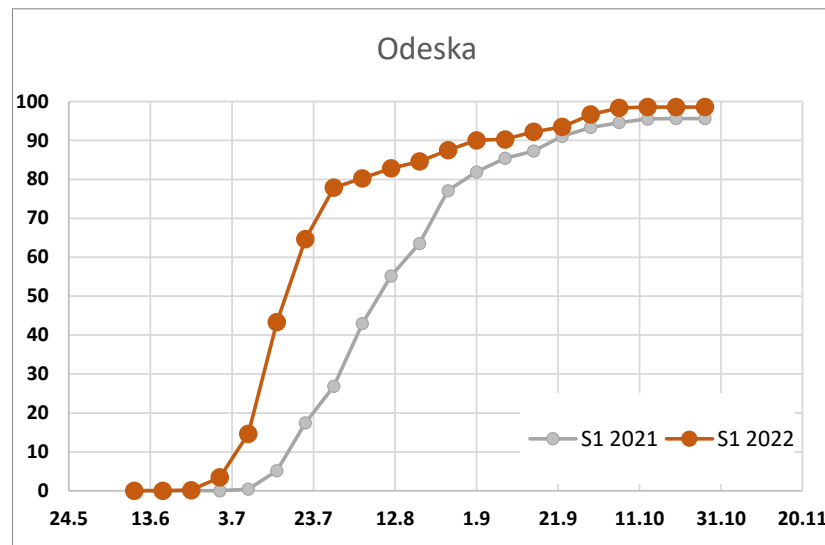
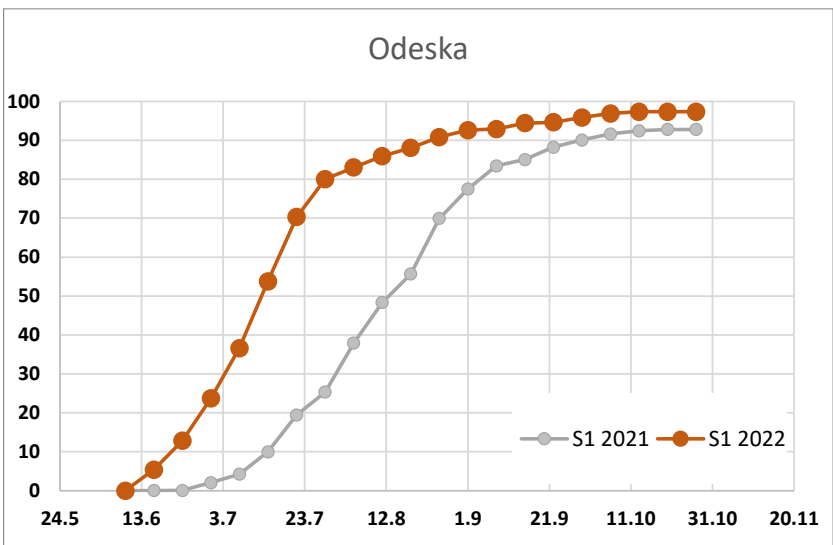


# Harvest Progress detection on oblast level Ukraine 2022: Differences in Harvest Progress

**Winter Wheat**



**Rapeseed**





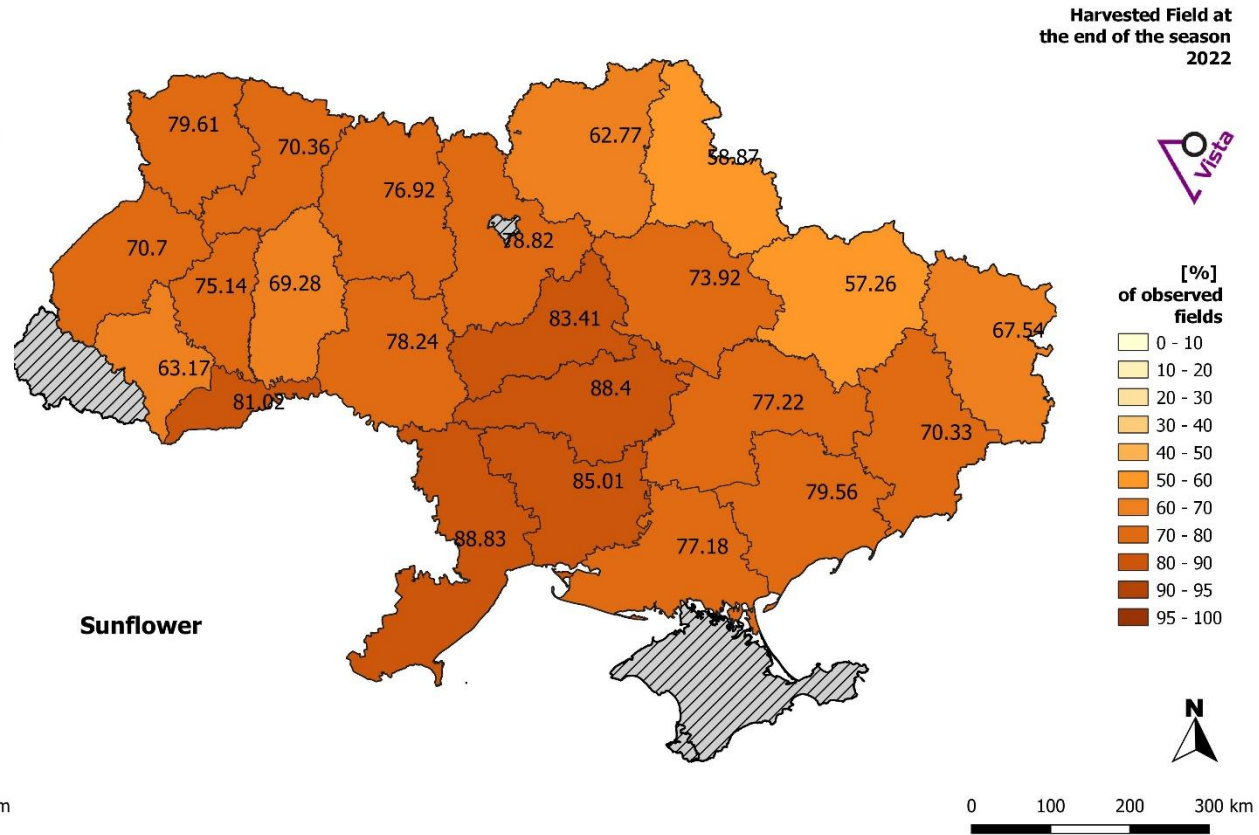
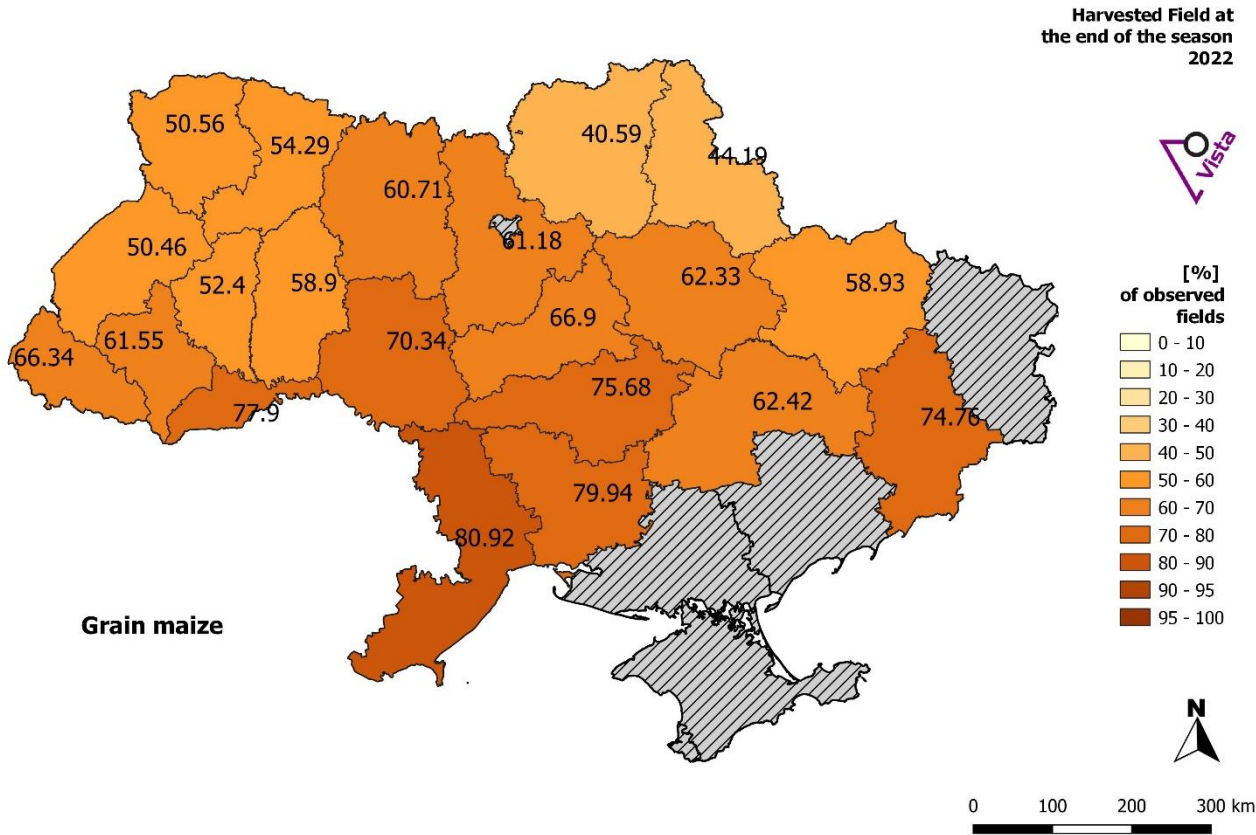






# Harvest Progress 2022

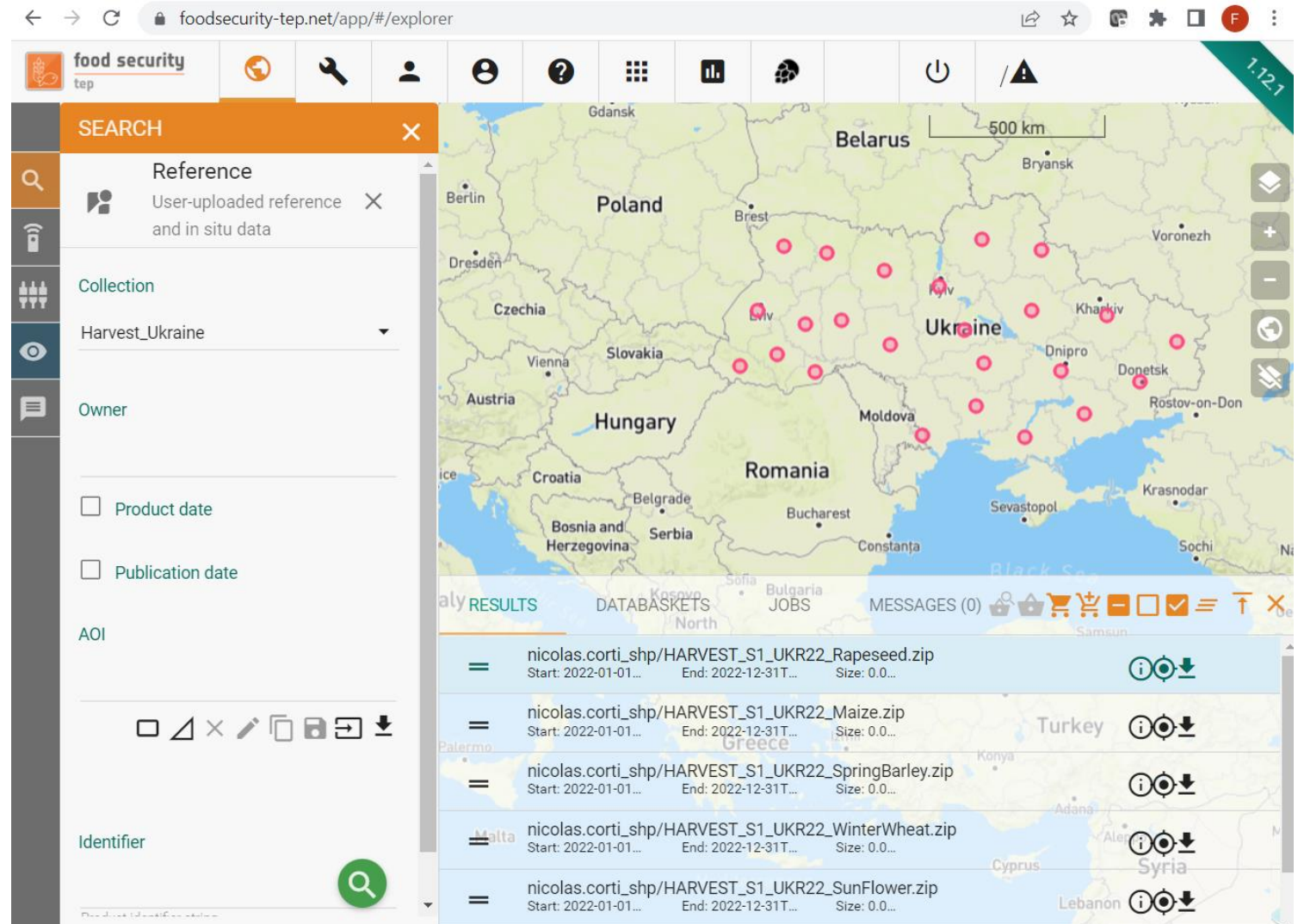
## Maize and Sunflower (Status: Mid Nov 2022)



Project supported by ESA Network of Resources Initiative

## Results available on the Food Security TEP as Reference Data:

- Weekly results of S1 detected Harvest of all five crops types
- Accessible for all registered users
  - *EXPLORER*
  - *Reference Data*
  - *Collection Harvest Ukraine*



The screenshot displays the 'food security tep' web application interface. The browser address bar shows 'foodsecurity-tep.net/app/#/explorer'. The interface includes a search bar, a sidebar with navigation options (SEARCH, Reference, Collection, Owner, AOI), and a main map area showing Europe with red markers in Ukraine. Below the map, there is a table of harvest data:

File Name	Start	End	Size	Actions
nicolas.corti_shp/HARVEST_S1_UKR22_Rapeseed.zip	2022-01-01...	2022-12-31T...	0.0...	Info, Download
nicolas.corti_shp/HARVEST_S1_UKR22_Maize.zip	2022-01-01...	2022-12-31T...	0.0...	Info, Download
nicolas.corti_shp/HARVEST_S1_UKR22_SpringBarley.zip	2022-01-01...	2022-12-31T...	0.0...	Info, Download
nicolas.corti_shp/HARVEST_S1_UKR22_WinterWheat.zip	2022-01-01...	2022-12-31T...	0.0...	Info, Download
nicolas.corti_shp/HARVEST_S1_UKR22_SunFlower.zip	2022-01-01...	2022-12-31T...	0.0...	Info, Download