CROP MAPPING OF NINGXIA HUI AUTONOMOUS REGION USING THE SENTINEL-2 FOR AGRICULTURE SYSTEM

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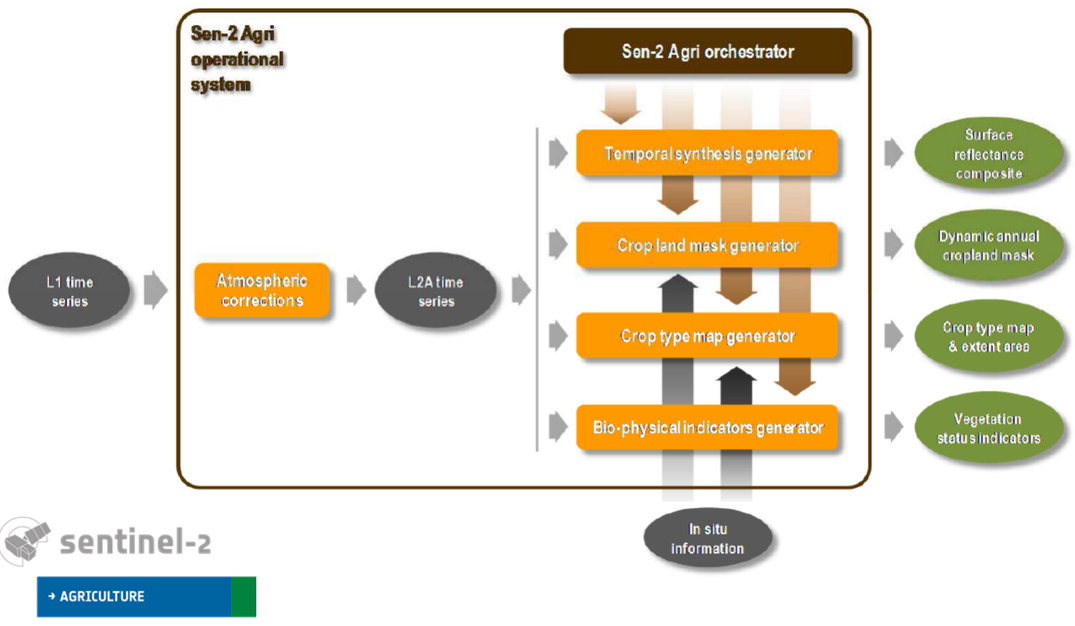
Sentinel-2 for agriculture (Sen-2 Agri) system

An open source system demonstrated at full scale in Near Real-Time or off-line

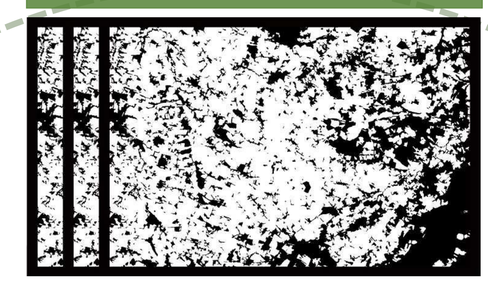
- Automated system to run in NRT, locally or on cloud computing
- System also running off-line for reprocessing
- Designed to be as generic as possible but partly tunable through the user interface (even more adjustable for developers in open source)
- Fully documented, maintained and supported by the Sen-2 Agri team

→ Sen-2 Agri operational system



→ 4 relevant Earth Observation products

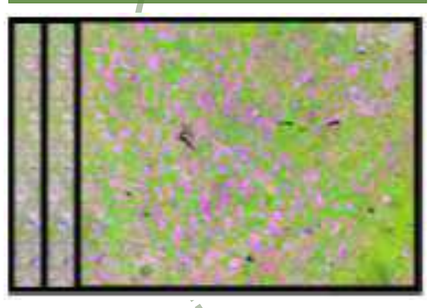
DYNAMIC CROPLAND MASK



Binary map identifying annually cultivated land at 10m updated every month

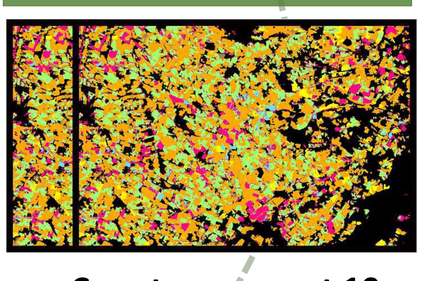
Monthly cloud free surface reflectance composite at 10-20m

CLOUD FREE SURFACE REFLECTANCE COMPOSITE



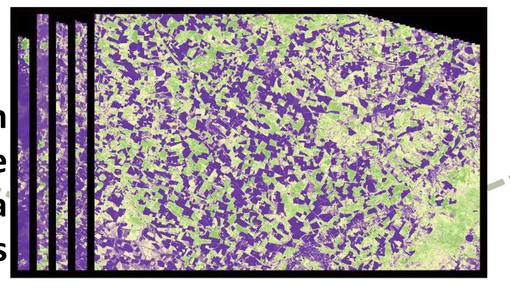
Open source toolbox
Capacity building and training

CROP TYPE MAP



Crop type map at 10m (provided twice along the season) for the main regional crop types

VEGETATION STATUS



NDVI and LAI maps at 20m describing the vegetative development of crops on a 5 to 10 day basis

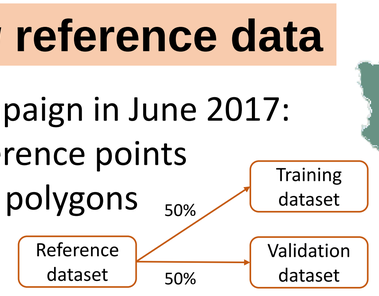
Crop mapping of Ningxia Hui irrigated area (65 000 km²)

Objectives

- Evaluate the performances of Sen-2 Agri system for crop mapping an irrigated agricultural area
  - **Cropland mask** and **crop type map** obtained with *in situ* reference data
  - Crop mapping along the season
  - **Cropland mask** without *in situ* data: possible improvements
  - **Compare** the algorithm with and without *in situ* data

→ *In situ* reference data

- Field campaign in June 2017: 1100 reference points
- Points → polygons

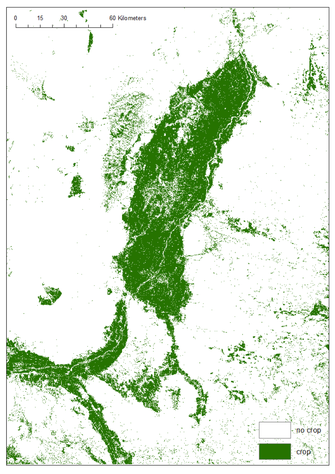


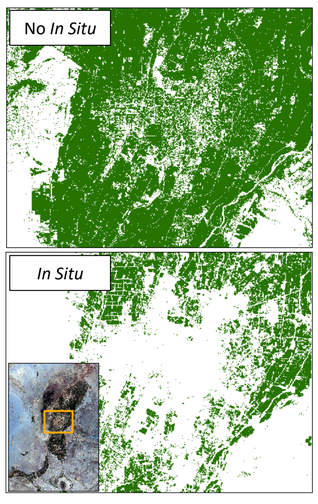
Sentinel-2 cloud free composite (16/07/2017)

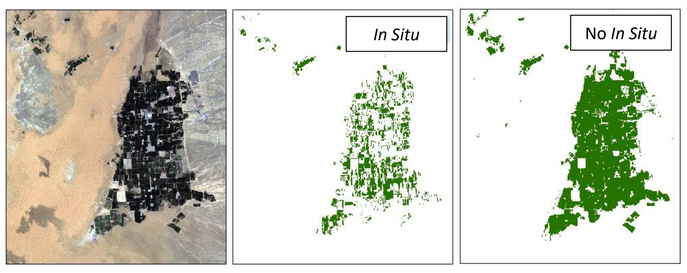
→ Cropland mask with vs. without *in situ* data

With *in situ* data

Without *in situ* data

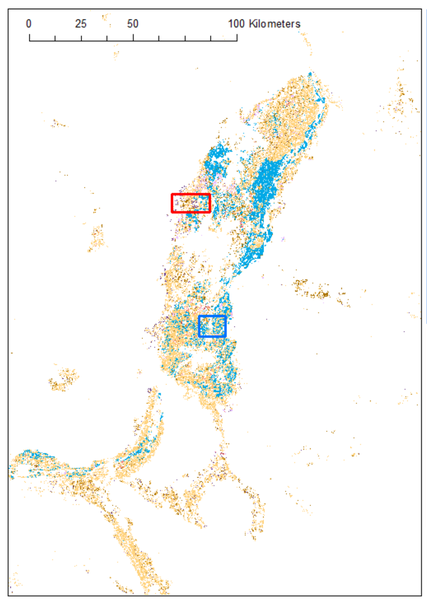


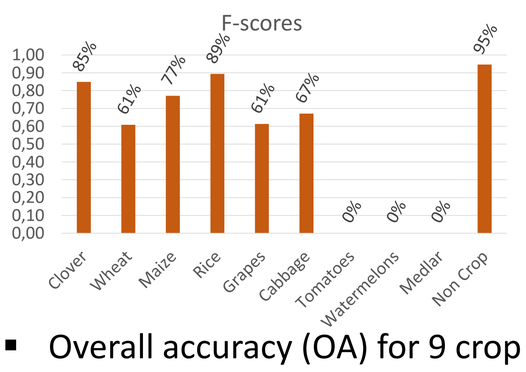




In Situ	No crop	crop
F-scores	0,92	0,94
OA	0,93	
No *In Situ*	**No crop**	**crop**
F-scores	0,56	0,70
OA	0,64	

→ Accurate crop mapping of the region's main crop types

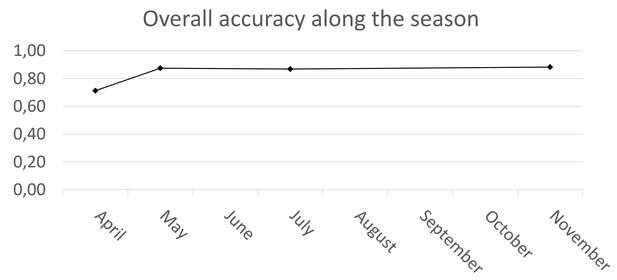


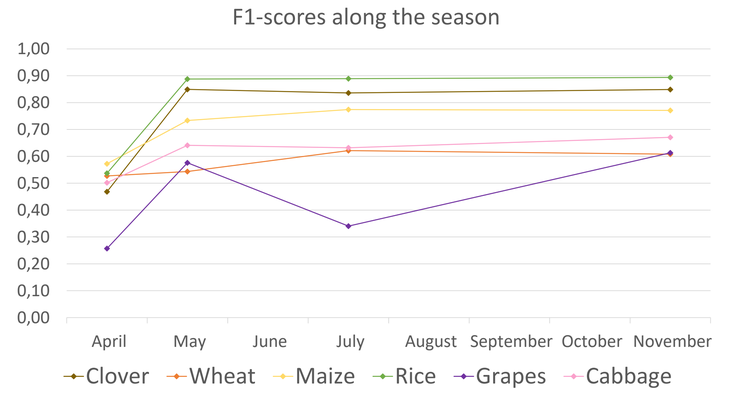


- Overall accuracy (OA) for 9 crop classes and "no crop": **88%**
- **Main crops** are well classified (maize, rice, wheat)
- **Marginal crops** overlooked (tomatoes, watermelon and medlar)

→ An accurate crop type map from the end of May on

How early in the growing season can we generate an accurate crop type map?





→ Conclusions and prospects

- Sentinel-2 for agriculture delivers **high quality crop type maps** for the main crops of a region.
- The system could potentially generate accurate **cropland masks without *in situ* data.**
- Following a new field campaign in July 2018, new tests will be carried out on the system.

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