



ASAP ADVANCED SUSTAINABLE AGRICULTURAL PRODUCTION

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ASAP – PROJECT OVERVIEW

The Project entitled: **ASAP “Advanced Sustainable Agricultural Production”** is co-financed by European Space Agency under the ARTES IAP Programme and was initiated in September 2015 with a conclusion planned for the end of 2018.

The Project aims at adjustment of existing methods of satellite data application for mutable soil-climatic conditions in Poland and development of new models on the basis of fusion of in-situ, aerial and satellite data based information.

The service developed within the ASAP Project will be dedicated to a wide group of users and customers, related to various sectors of agriculture. Proposed service will offer the range of products supporting management of fields and enabling optimization of yield production in parallel with decrease of fertilization. Field manager will be offered support in selecting the best time for fertilization in respect to crop type which has significant impact on potential of crop production. The satellite data based information is considered to enable the reduction of disadvantageous influence on the environment, reducing expenses and producing a higher yield. The System will offer two major Services to its Users and Customers:

- Free of charge Service
- Payable Service – Premium Zone

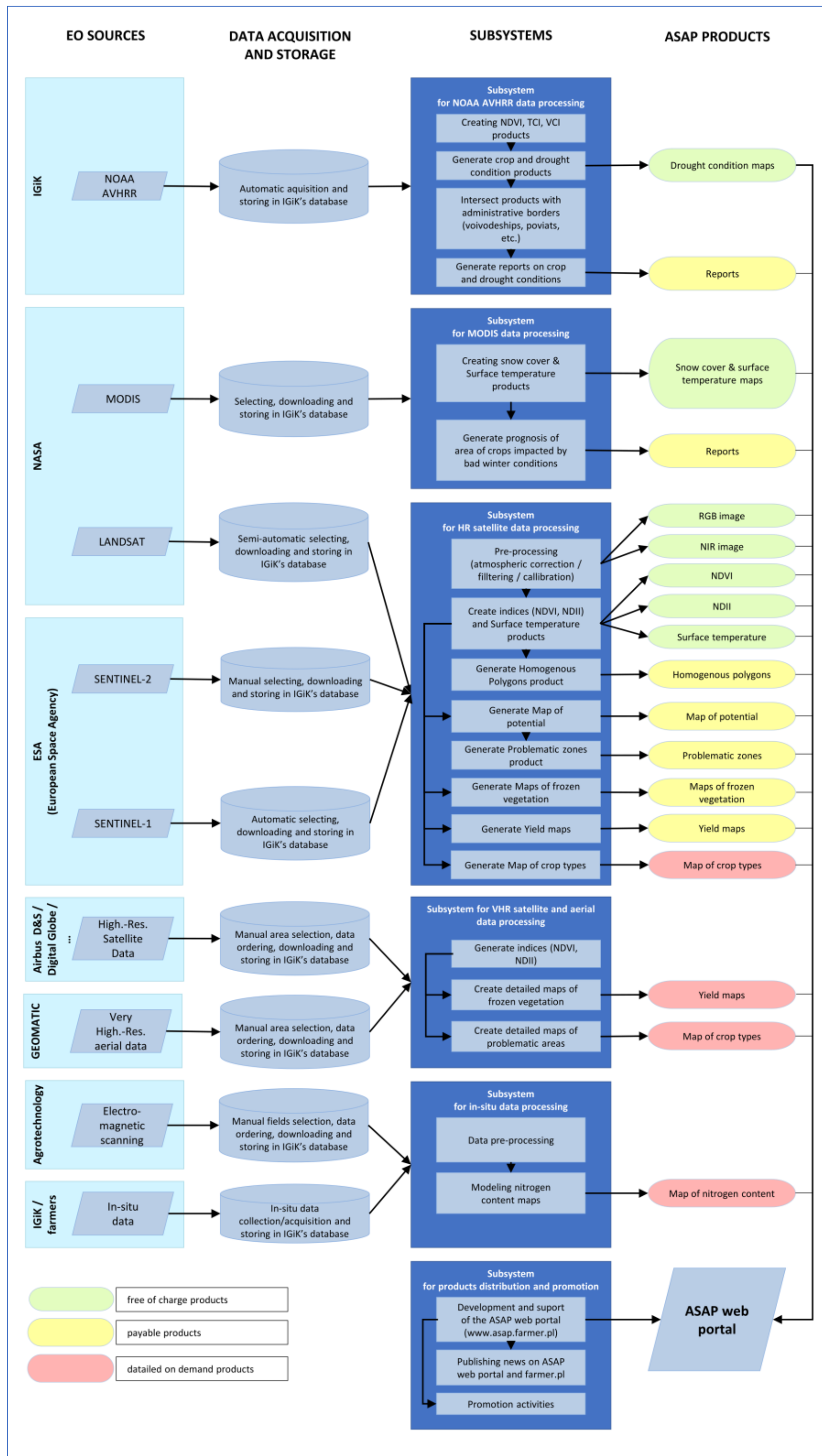
Free of charge Service will be offering several products such as:

- For all Users: Drought Prediction and Monitoring, Surface Temperature and Snow Cover for whole Poland with the special resolution of 1km. The maps are updated every 10 or 8 days.
- For registered Users: Basic products supporting farmers in the field management and reporting processes (area of the plots, recognition of crops and precise area of crops, crop condition, Surface temperature, differentiation of water content, satellite images in RGB and CIR)

Payable Service – Premium Zone will be available for the registered Users. It will offer the following:

- Advanced products:
 - The map of homogenous polygons – updated and delivered to the Users once per year. The homogenous polygons are defined as soil-landscape units where the bare soil surface reflectance is internally homogenous and at the same time different from neighboring units. The result is similar to the soil electromagnetic scanning results.
 - Map of potential - delivered to the Users approximately 3 times per growing season, especially before the harvest.
 - Problematic zones - delivered on a regular basis (app. every 3 weeks, depending on the data availability). Users will be requested to provide location of lower condition/damaged/etc. parts of fields (which they spot during routine monitoring) and to verify spots marked as problematic based on the delivered product.
 - Map of yield – based on satellite image recorded before the harvest. It shows the final yield value. The maps show spatial yield distribution on the field and allows yield mapping without having to harvest with specially equipped combine harvesters.
- Advance knowledge and digital maps on:
 - Documentation of losses in crop production (droughts, floods, bad wintering of crops, etc.)
 - Crops classification - recognition of the crops in the appointed area

ASAP – HIGH LEVEL SYSTEM ARCHITECTURE



ASAP – BASIC PRODUCTS

Crop condition - NDVI



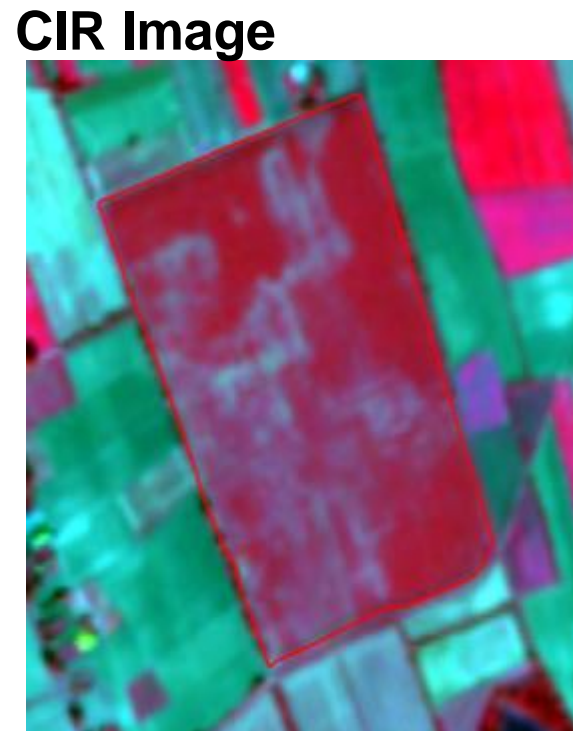
Water content - NDII



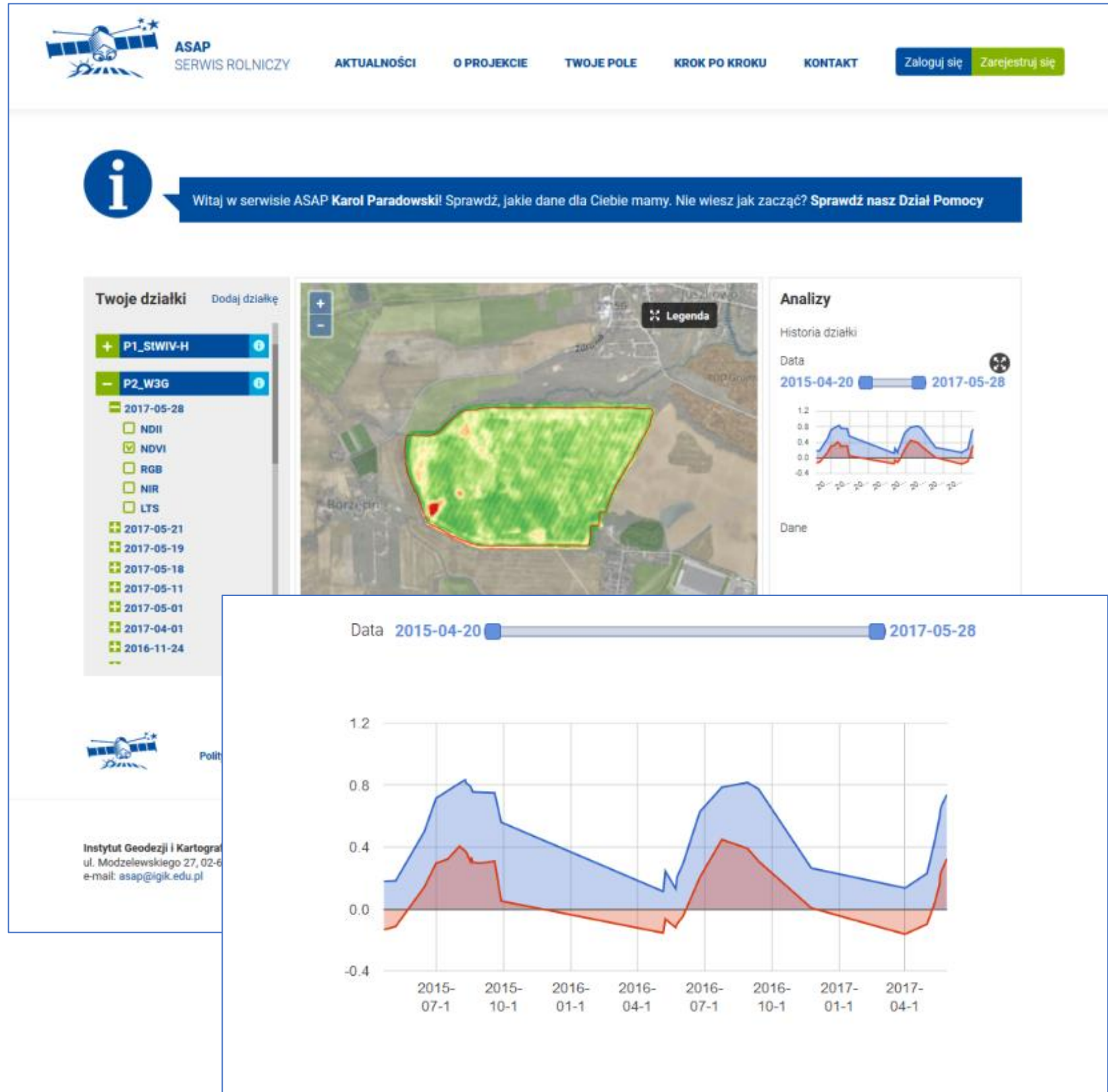
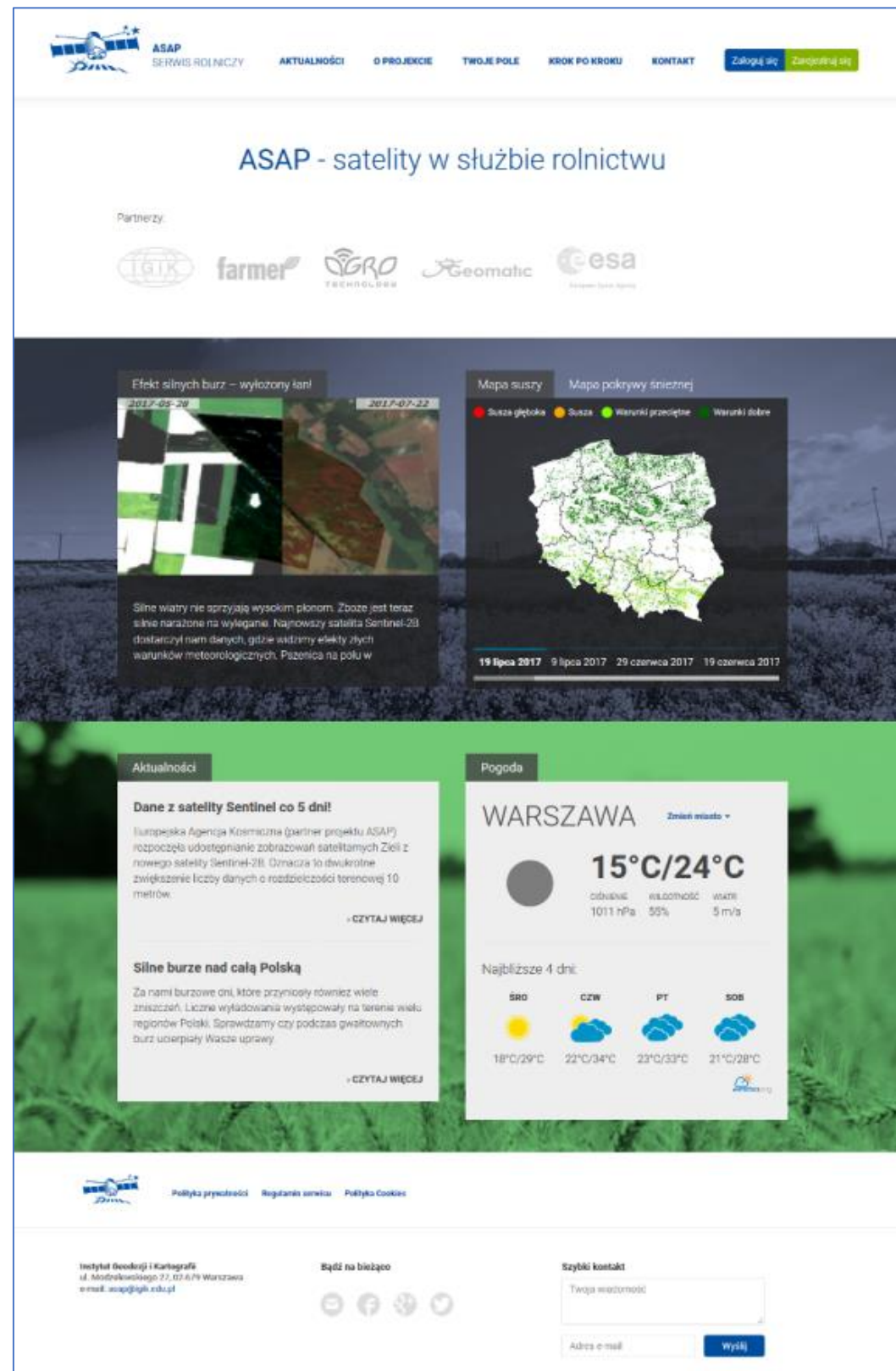
RGB Image



CIR Image



ASAP – WEB PORTAL



ASAP – CONCLUSIONS

So far the ASAP Service automatically generates and delivers basic products, namely: RGB and CIR images as well as NDVI and NDII maps on the basis of cloudless Landsat 8 / Sentinel-2 satellite data. At the moment the number of active Users exceeds 50, with more than 600 plots under continuous monitoring.

The maps of homogenous polygons and problematic areas were delivered to these Users for testing and their feedback on the products' accuracy and applicability is expected.

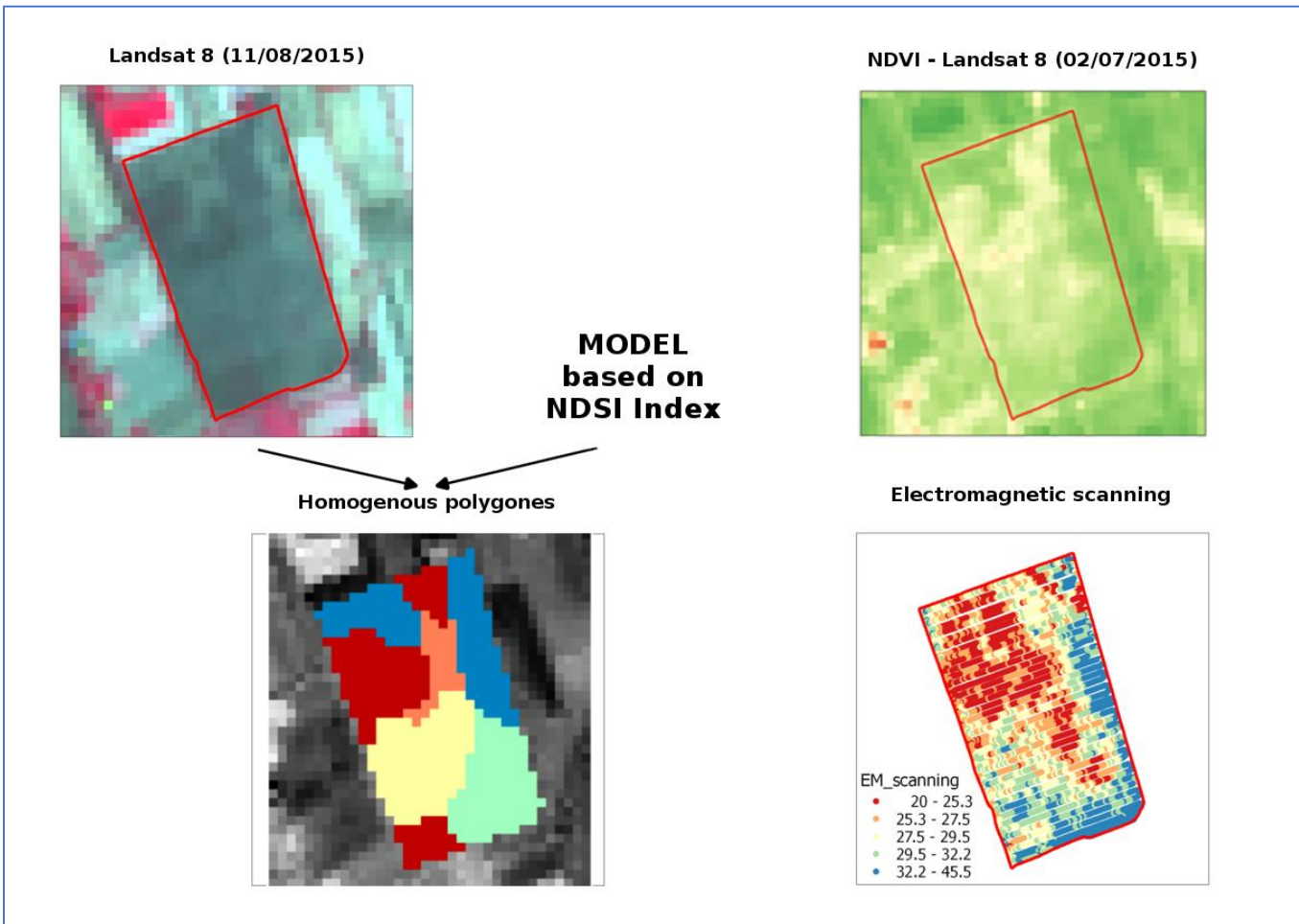
There are plans of further enhancements of the method of homogenous polygons delimitation and assessment of the soil productivity on the basis of correlation with satellite data based indices characterizing the crop production. Moreover the liaisons with the insurance companies will be continued in order to fill the information gap as well as to start delivery of operational services supporting more efficient and accurate evaluation of their clients claims.

The automatic delivery of the following products: basic products, maps of homogenous polygons and soil productivity, map of problematic areas as well as documentation of the losses is planned to be developed and delivered to the Customers in the form of fully operational, commercial Service until September 2018.

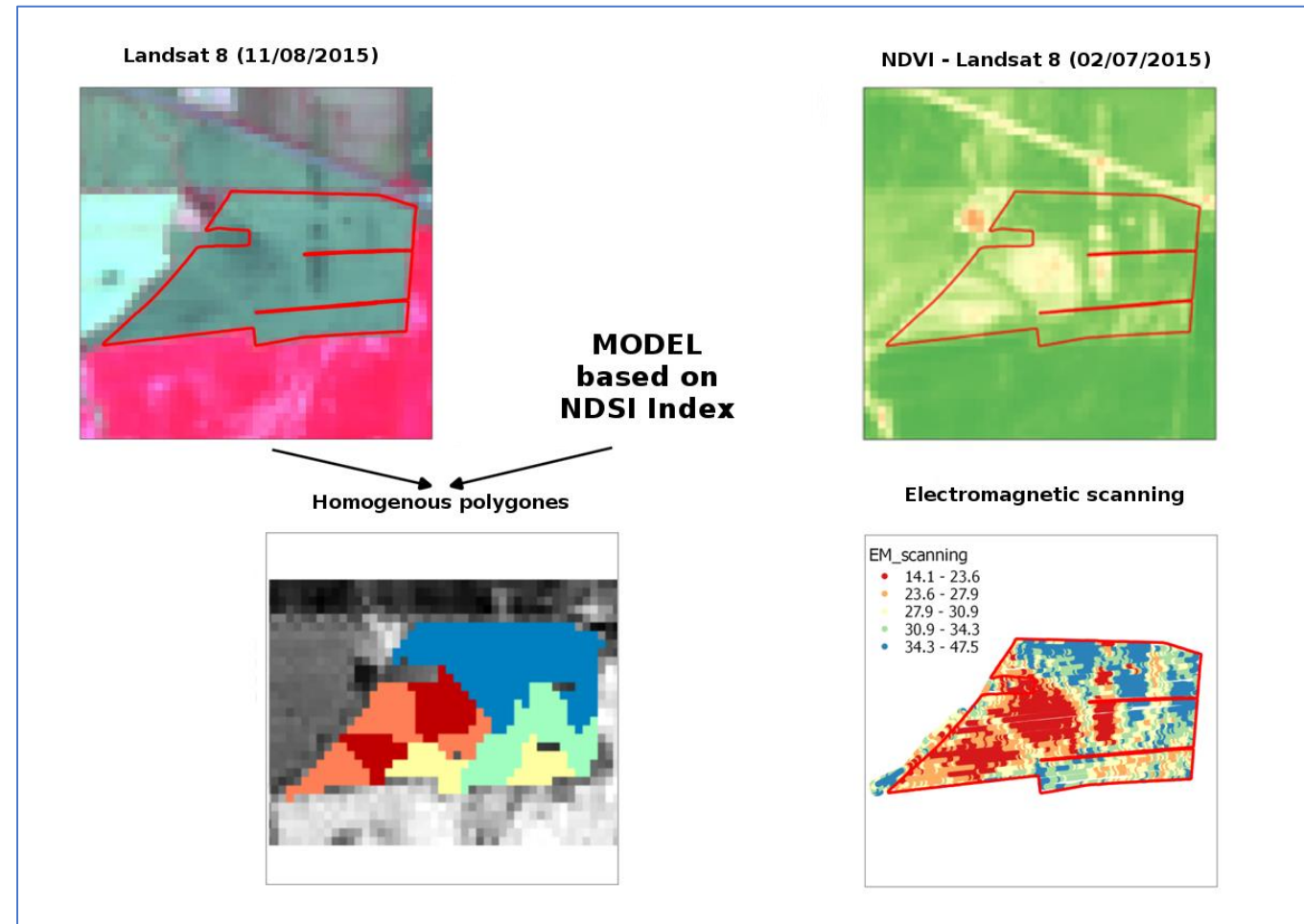
The Project is planned to be concluded in December 2018.

Visit the website:
www.asap.farmer.pl

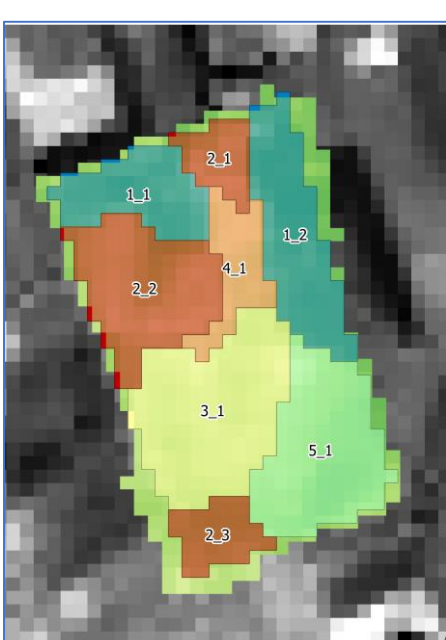
The map of homogenous polygons



ASAP – ADVANCED PRODUCTS

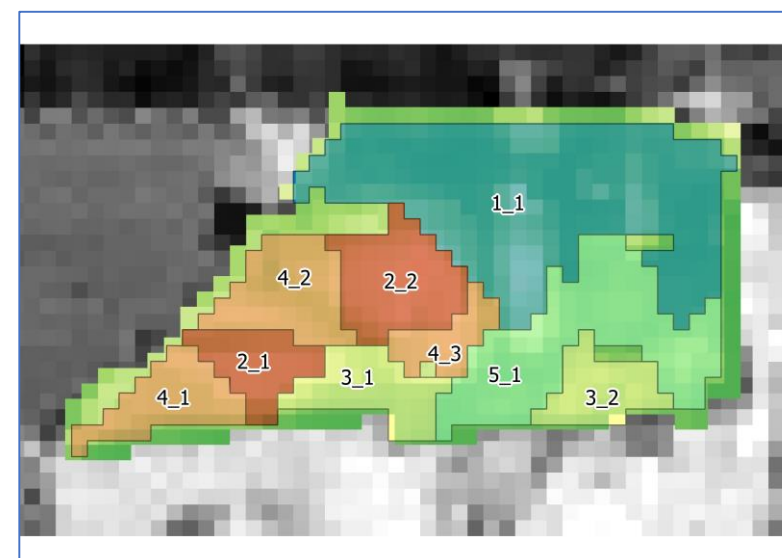


The comparison of homogenous polygons map with the map of NDVI, delivered on the basis of Landsat 8 satellite data, acquired in the end of growing season.

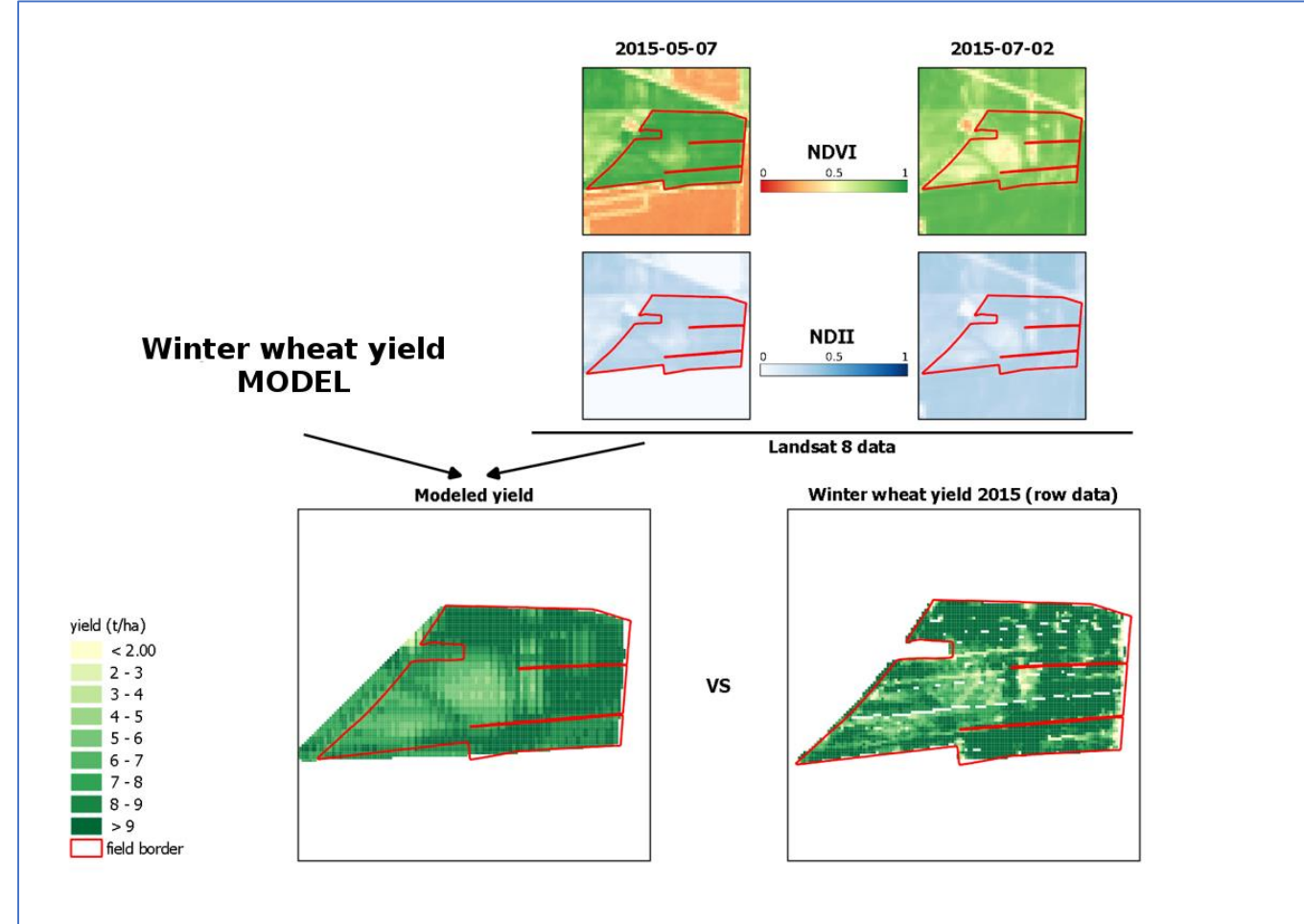
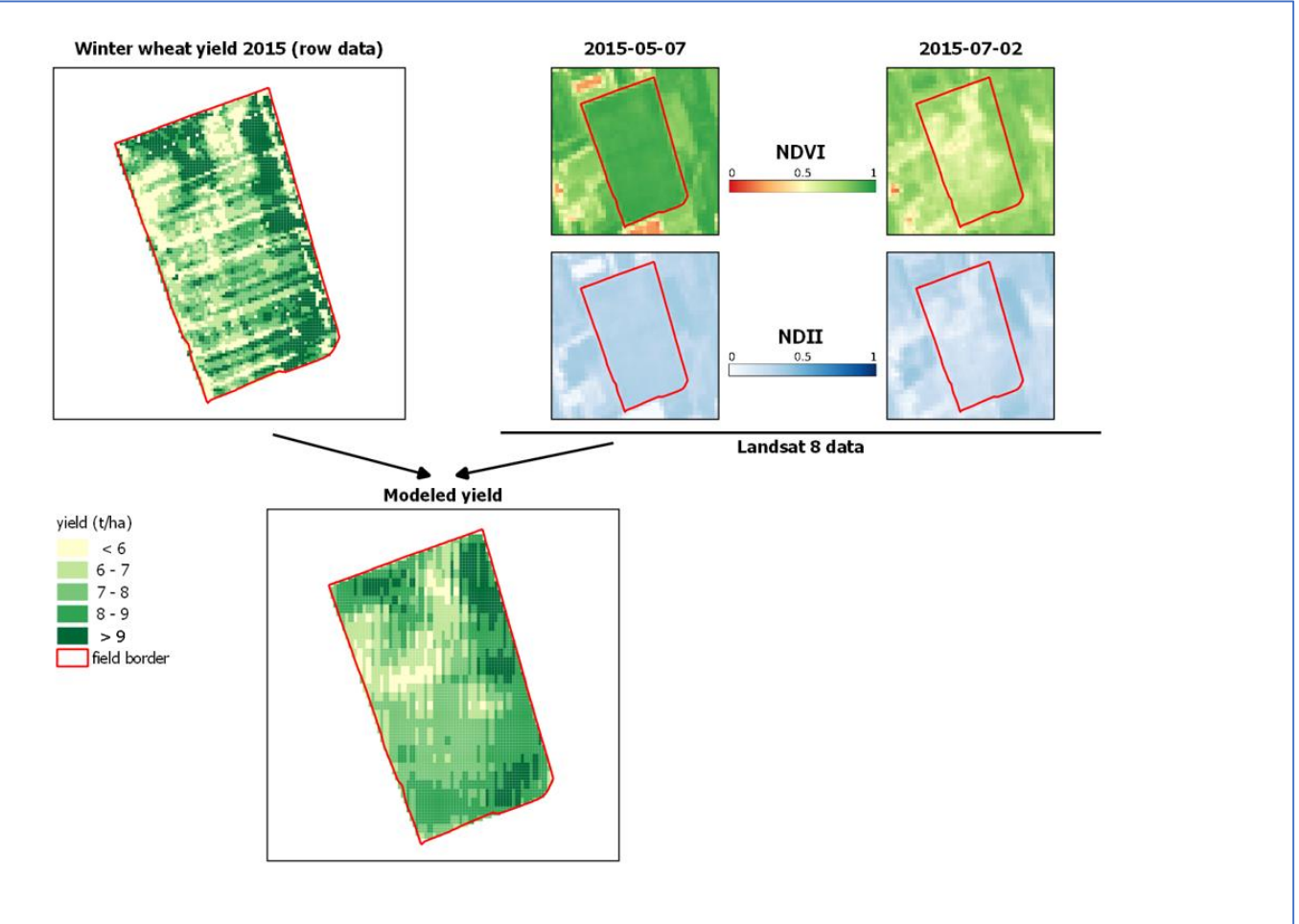


| Polygon | Average NDVI values |
|---------|---------------------|
| 1.1 | 0,79 |
| 1.2 | 0,80 |
| 2.1 | 0,64 |
| 2.2 | 0,64 |
| 2.3 | 0,65 |
| 3.1 | 0,68 |
| 4.1 | 0,63 |
| 5.1 | 0,76 |

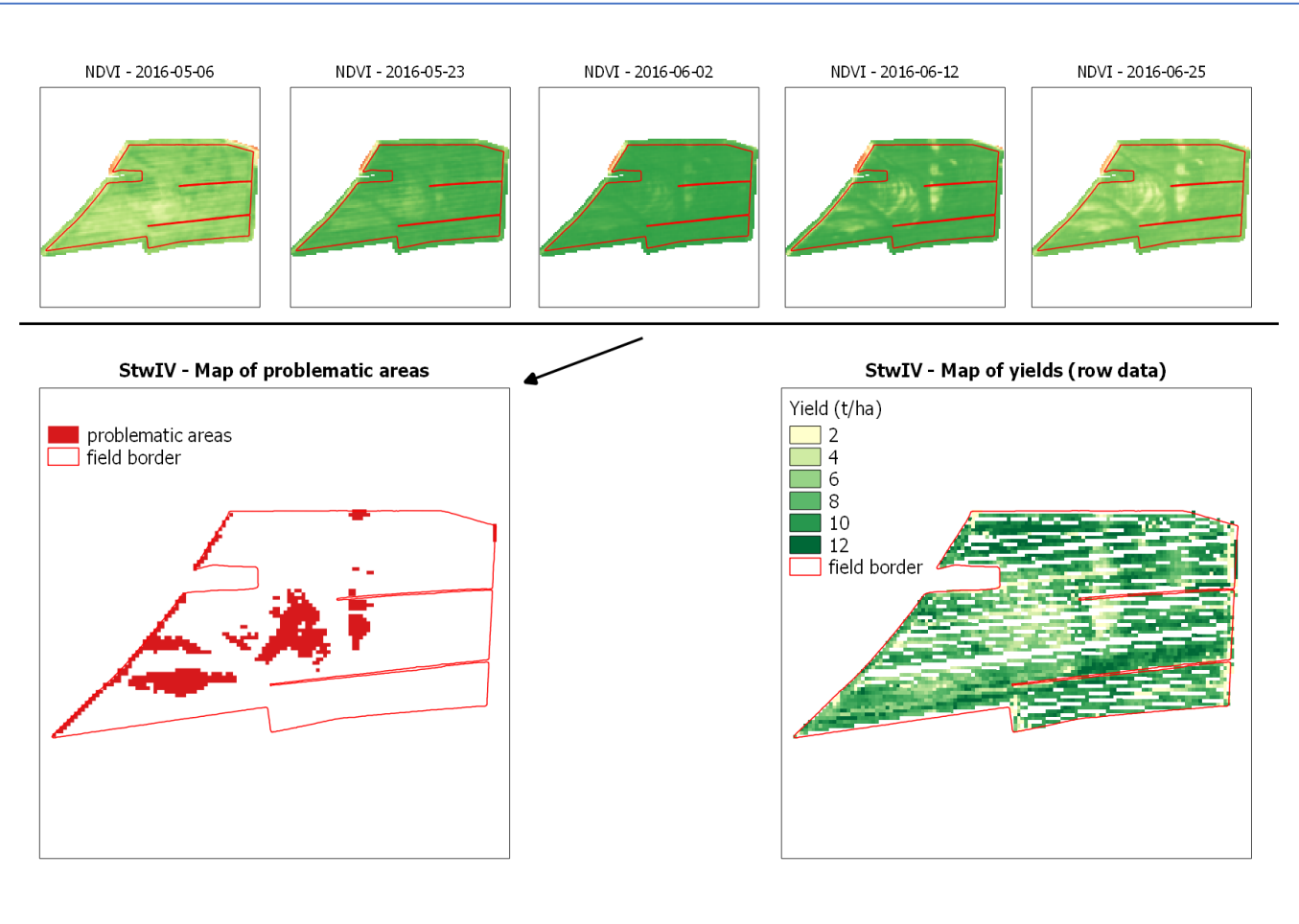
| Polygon | Average NDVI values |
|---------|---------------------|
| 1.1 | 0,80 |
| 2.1 | 0,60 |
| 2.2 | 0,58 |
| 3.1 | 0,81 |
| 3.2 | 0,81 |
| 4.1 | 0,70 |
| 4.2 | 0,70 |
| 4.3 | 0,66 |
| 5.1 | 0,82 |



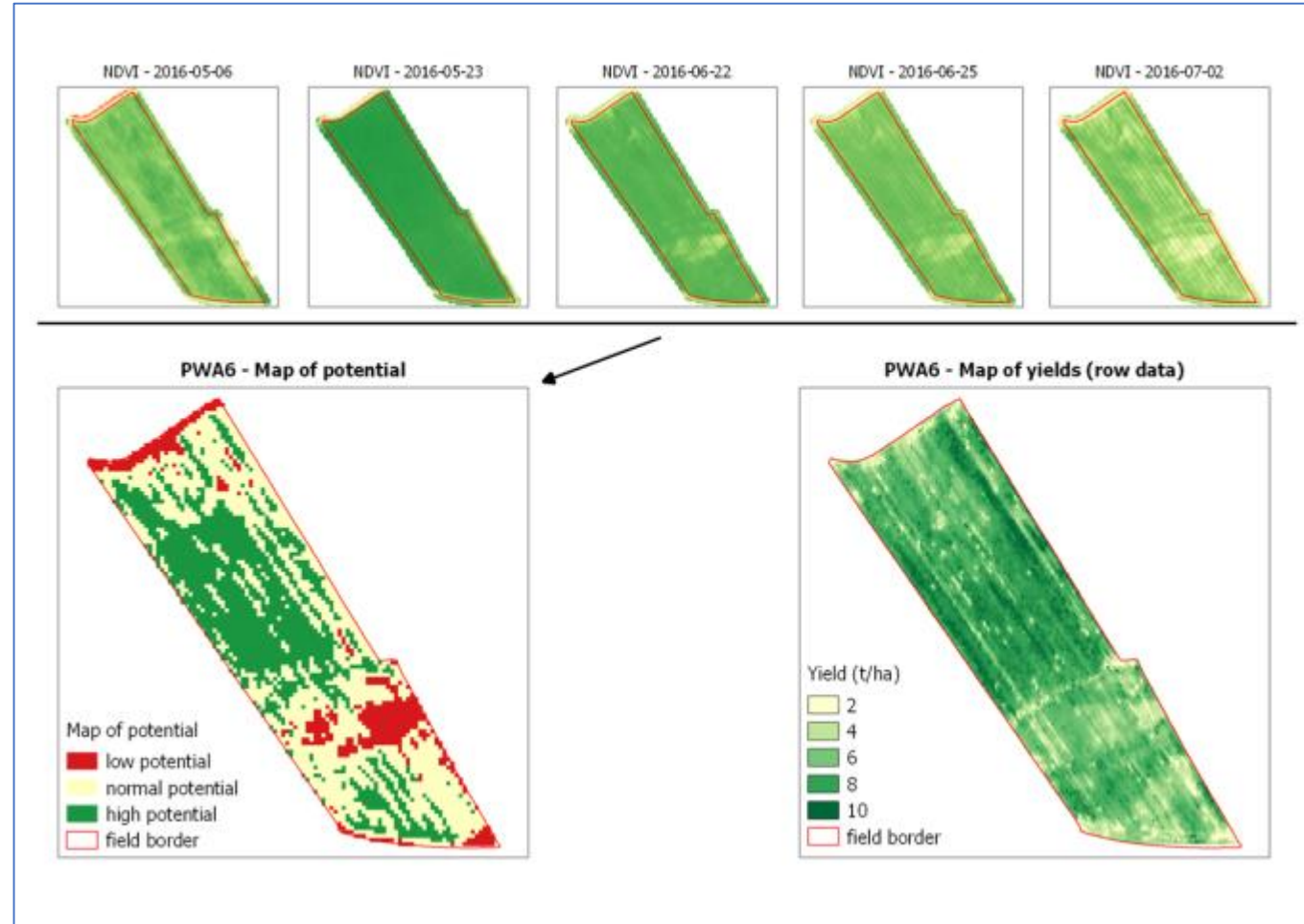
The map of yield



The map of problematic zones

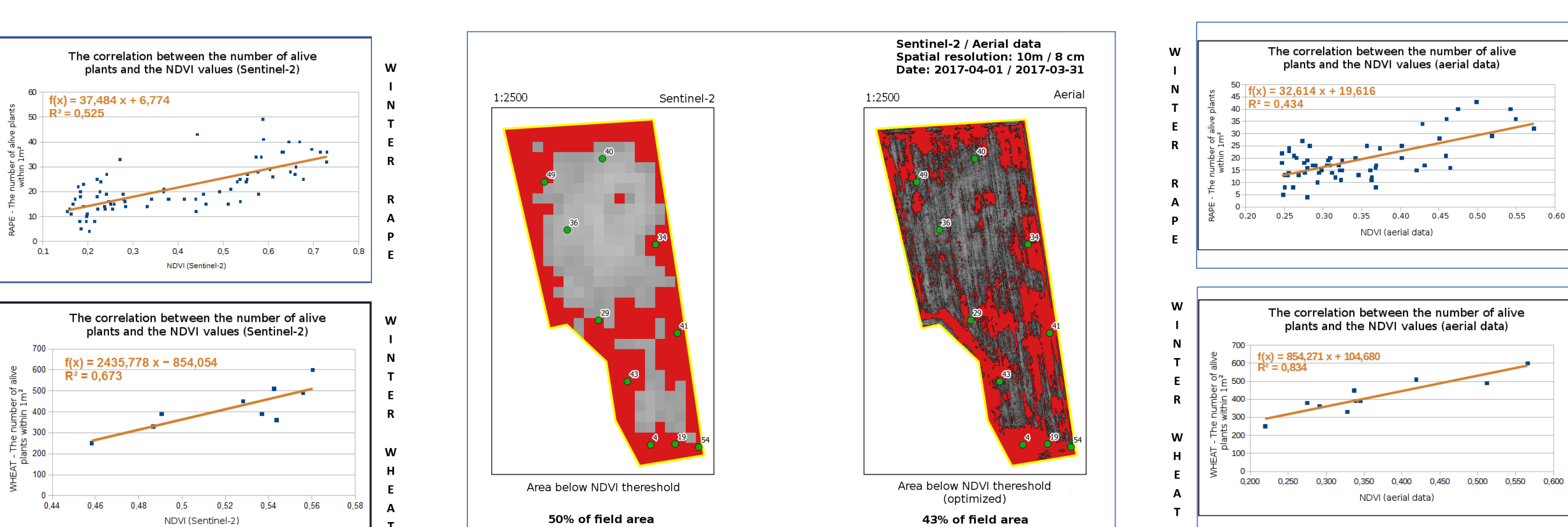


The map of potential



Documentation of losses in crop production– Sentinel-2 vs. Aerial data

The pilot study on the applicability of the Sentinel-2 satellite data (10m spatial resolution) as well as aerial data (8cm) for the estimation of the area of frozen vegetation was performed with two Polish insurance companies in March/April 2017. On the basis of in-situ data on the number of healthy plants in 1m², the models based on aerial and satellite data were delivered. The resulting maps of frozen vegetation were compared.



The difference of the classifications results is presented above. The percentage of fields for which the number of alive crops for 1m² was below 30 (considered to be a loss in the production due to frozen vegetation) is indicated. Based on the correlation of the number of alive plants measured within the 1m² and the NDVI, the threshold values of NDVI, which indicates the number of plants lower than 30 in 1m², were calculated and applied.