Background, Status and Strategy of the Food security Platform development

food security
tep

Bringing together Food Security and Big Data

food security
tep

Access to nutritious food is crucial to end hunger and malnutrition

Efficient use of satellite data and spatial information can

- sustainably increase agricultural and aquacultural productivity
- help farmers adapt to global change
- improve early warning initiatives

SUSTAINABLE DEVELOPMENT GOALS

ESA TEPs**

"Bringing the users to the data"

A collaborative virtual work environment with

- access to EO data and tools
- processors and ICT resources
- one coherent interface

** tep thematic exploitation platform

food security tep

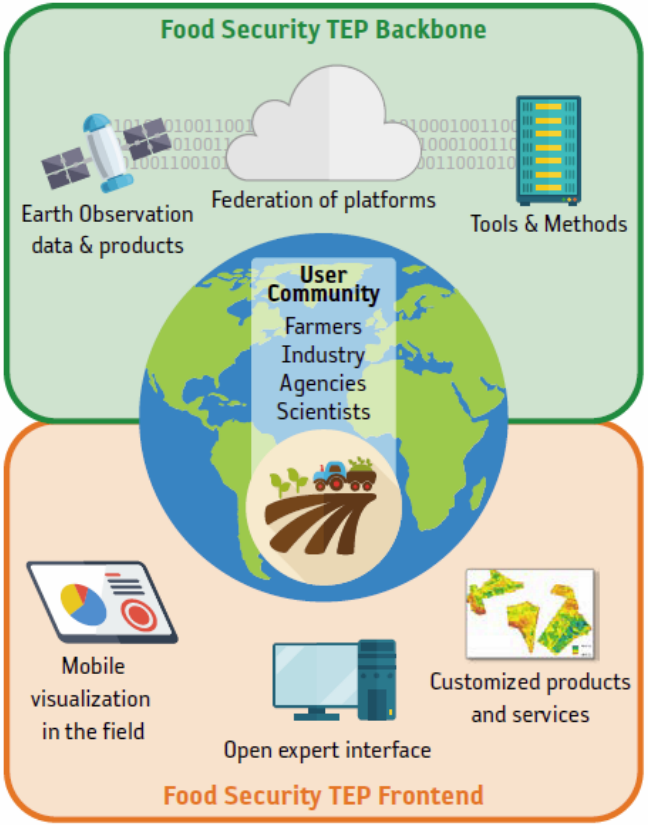
Start of the project: April 2017

- strong focus on users
- agile development
- learning from other TEPs
  - other ESA TEPs started beginning 2015 -

https://foodsecurity-tep.eo.esa.int/

urban tep | geohazards tep | forestry tep | coastal tep | hydrology tep | polar tep

What is the Food Security TEP



food security tep

tep thematic exploitation platform

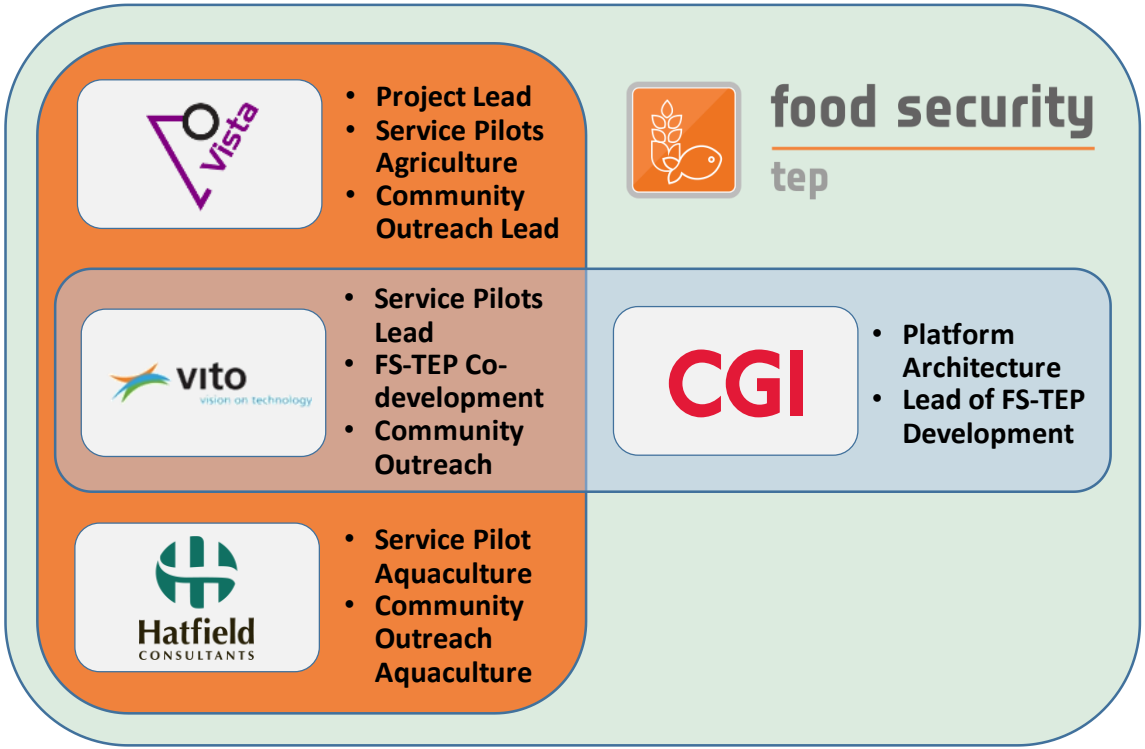
esa

"Supporting Sustainable Food Production from Space"

The innovative platform aims at simplifying the extraction of information from Earth Observation data for the advancement of data-intensive services in the food security sector mainly in Europe and Africa.

Cooperation of the project team

food security tep

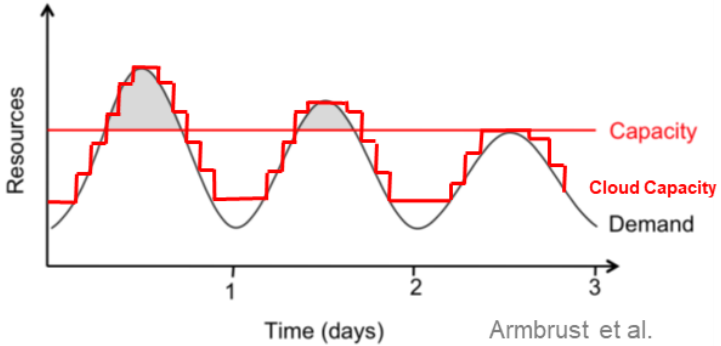


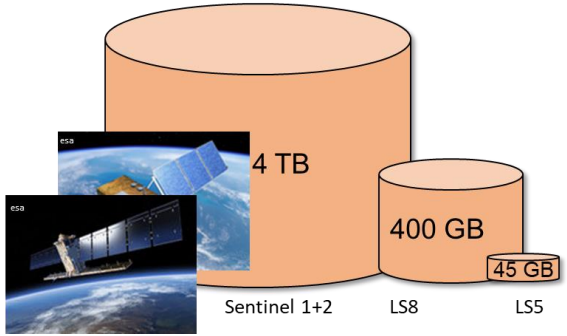
Scalable cloud resources

food security tep

Food Security platform is deployed on EO Cloud - Earth Observation Innovative Platform Testbed Poland which offers:

- Local access to Sentinel-1, Sentinel-2, Sentinel-3, Landsat-8 and MERIS
- Scalable computing resources allowing efficient management of massive processing campaign (as in the first Pilot)



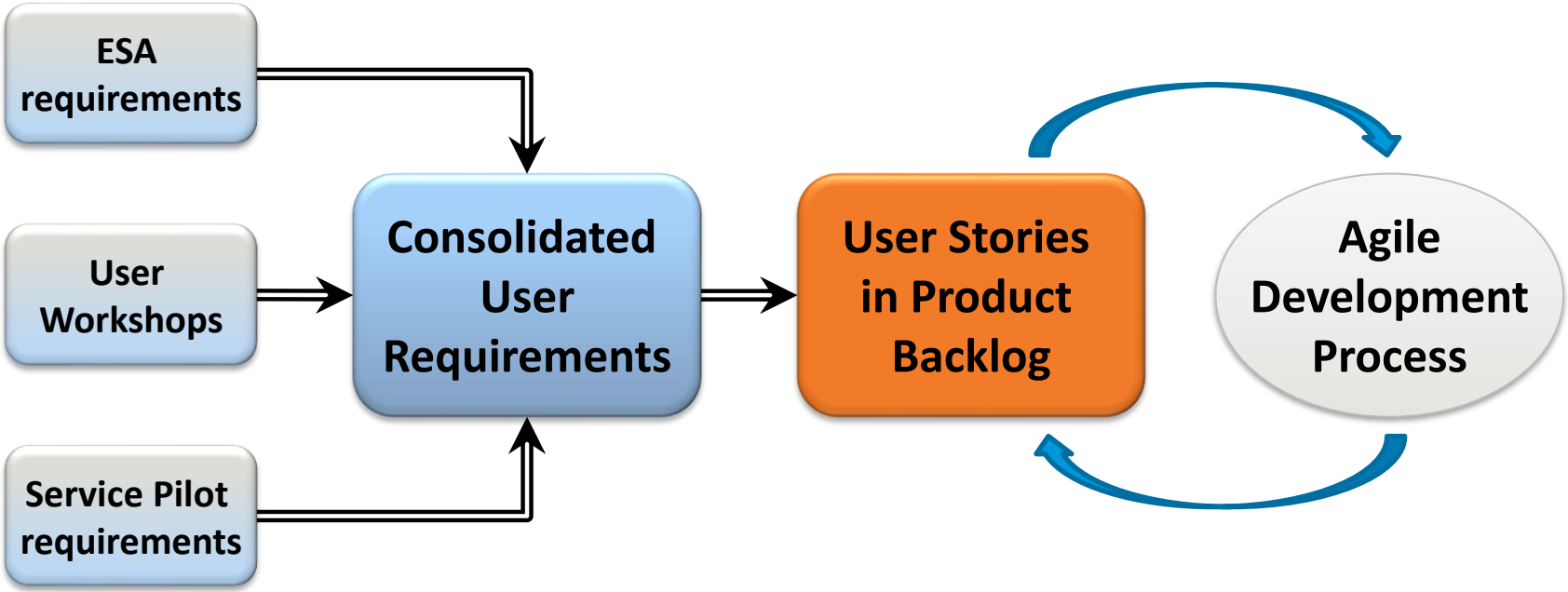


- When DIAS will be operational Food Security TEP will be migrated on it.

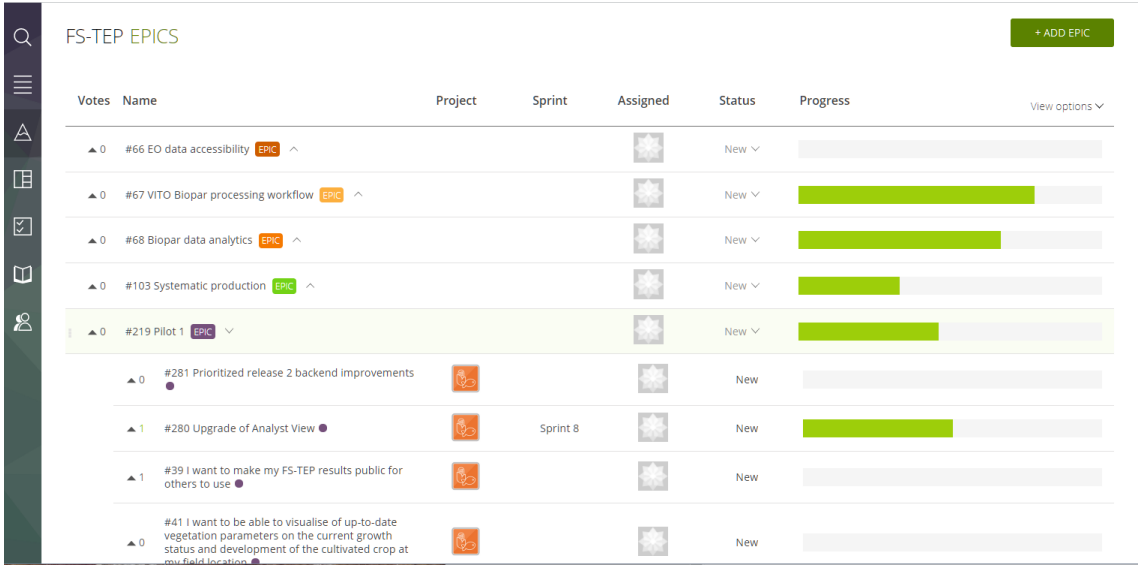
Federation of platforms

From user requirements to user stories

food security tep



Effect of Agile Software Development



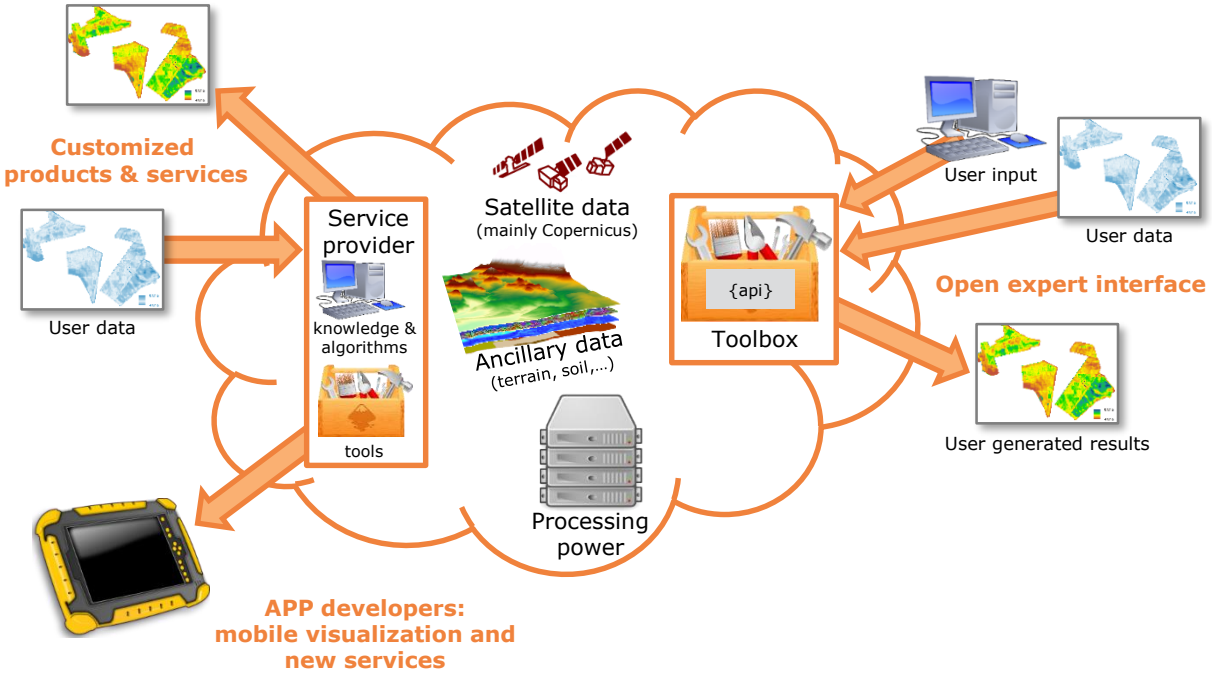
** Agile Development describes a cyclic approach (sprints) under which requirements and solutions evolve through the collaborative effort of developers and customers/users.*

Agile Software Development

- SoW requirements are the basis of the user stories backlog
- User requirements collected at the workshops generate new stories and help ranking existing ones
- Additional platform requirements for the Service Pilots are added during sprint meetings

Which functionalities are supported?

food security tep



Food Security TEP Expert Interface: Available Data and Tools

food security tep

(1) **Satellite data:** Sentinel-1/-2/-3, Landsat 8, some Envisat MERIS data plus pre-processed atmospherically corrected Sentinel-2 data as well as biophysical parameters (LAI, chlorophyll, fAPAR, fCover) for some areas (DE, BE, NL, selected parts of Zambia)

(2) **Copernicus Global Land Service**

(3) **Ancillary data:** Terrain and Soil Maps, Water Bodies data, some Meteo Data

(4) **Tool boxes:** SNAP Toolbox, Sen2Agri Toolbox, GDAL, Orfeo

(5) **Basic functions:** Area and Time of Interest, basic GIS tools

Expert users can use tools to compare and visualize data and their own knowledge and algorithms to process available data with the available tools.

Customized Products & Services

Food Security TEP Customized Services allow the **purchase of EO-based services** without investing into dedicated personnel for EO data analysis.

Service Providers specialised in extracting information from satellite data use

- their IPR protected tools
- the Food Security TEP infrastructure
- available data on the Food Security TEP
- additional data provided by users (e.g. field boundaries)

to derive **high quality information** about crop status and deliver the customized results to the user.

Business Model

food security tep

- During ESA funded phase (autumn 2019), platform use will be free of charge within the limits of prepaid ICT resources:
- After ESA funding phase a business model needs to be derived, but EO-data and open tool provision will stay for free.
- Obviously processing power and storage capacity needs to be charged.
- Additionally EO service providers shall be enabled to use the platform for their own business.

	Computing Resources	Preprocessed EO information products	Customized services
"Pay-per-use"			
Flatrate / Subscription			
Revenue share			

Food Security TEP Service Pilots

food security tep

Food Security TEP Customized is **demonstrated** in three **service pilots.**

Pilot 1 'Agriculture' (**VISTA** – VITO)

Central Europe & Southern Africa

BayWa

belgapom

Pilot 2 'Agriculture' (**VITO** – VISTA)

Africa

ive

(Hatfield)

Africa

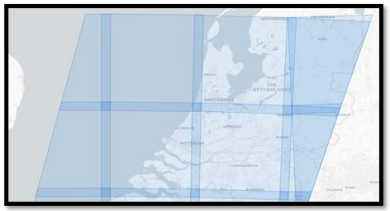
Food and Agriculture Organization of the United Nations

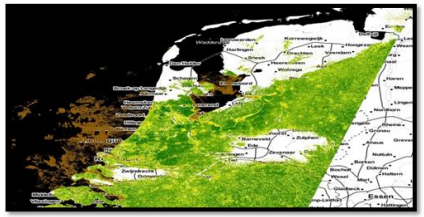
To be discussed during this week's workshops

VITO Service Pilot: Sustainable Intensification

VITO processing chain to derive 4 vegetation indices from Sentinel-2:

- NDVI
- fAPAR
- fCover
- LAI





at 10 m spatial resolution

running on Food Security TEP (public) cloud on 40 CPU-cores in parallel

Processed so far: BE + NL 2016-2017

Products transferred from Food Security Platform to VITO hosted Proba-V MEP (federation of platforms) → Powerful data analytics engine

VITO results – Service Pilot 1a

food security tep

Pilot integration on Food Security TEP:

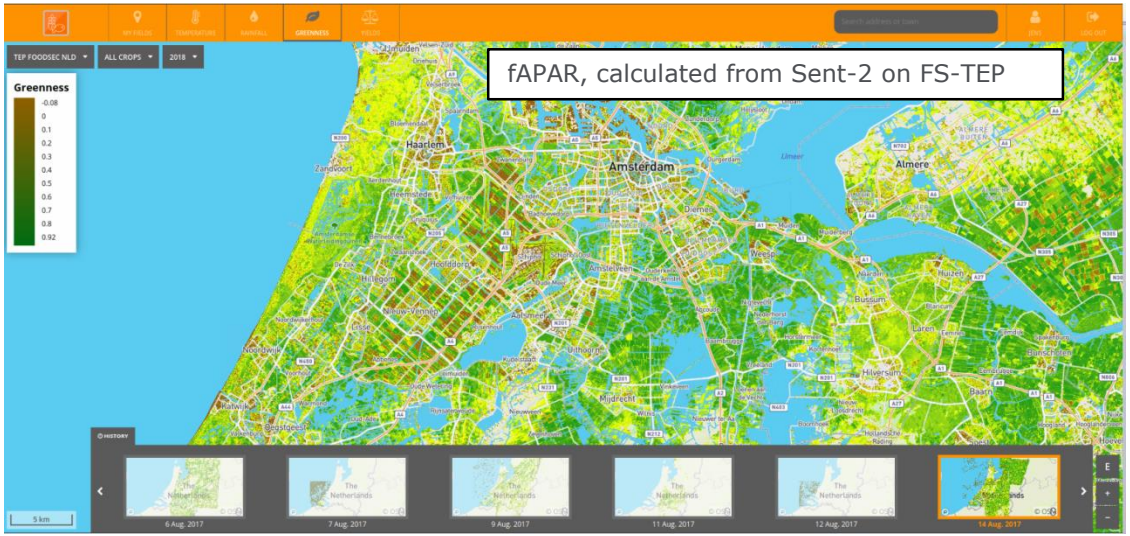
Service with **Web UI for end-users** on Food Security platform itself

VITO acting as service provider, for Belgapom as champion user

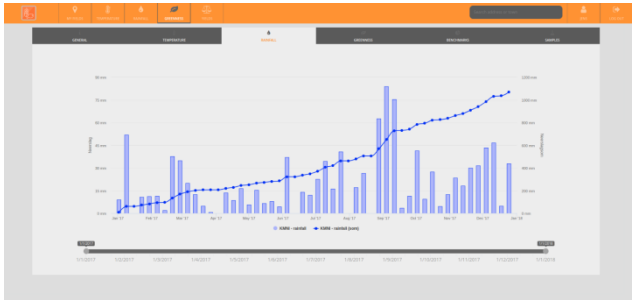
providing access to

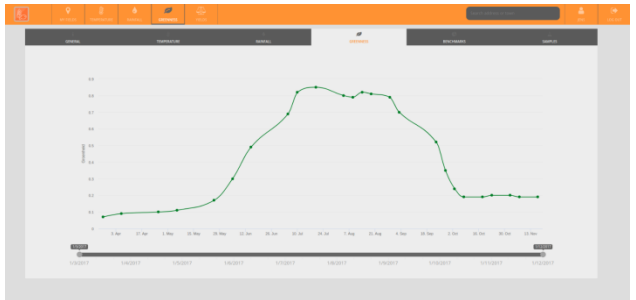
- EO derived information crop growth & development, processed on Food Security platform
- Information on weather conditions (rainfall, temp), made available on Food Security platform
- Model based yield estimates, developed on Food Security platform

food security tep



Rainfall, from KNMI





Temperature – Rainfall – fAPAR: time profile for a specific potato field

Vista Service Pilot: Sustainable Intensification

food security tep

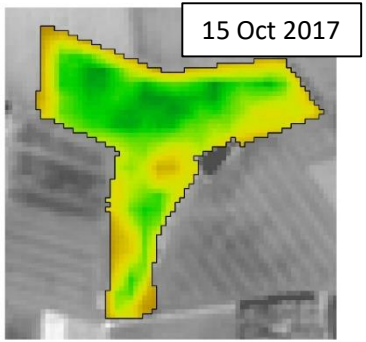
- VISTA processing chain to derive atmospheric corrected Sentinel-2 data and LAI and chlorophyll products over Germany in 10m.

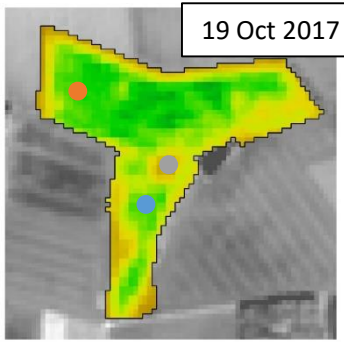
- Fertilization is a central task for each farmer. It determines yield formation, implies costs and can have negative environmental impact (groundwater pollution) when applied inadequately.

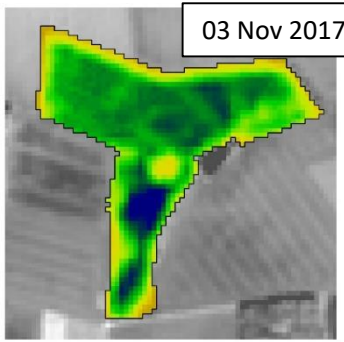
- For demonstration of sustainable intensification at this time of the year, oil rapeseed is the best candidate, since the biomass development over the winter season is input to nitrogen application advice.
  Oil rapeseed is a very important crop in Germany, covering 1.4 Million ha.

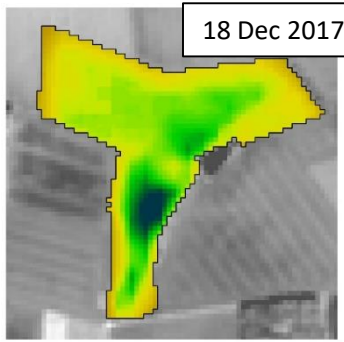
Pilot 1b: Oil Rapeseed – Using satellite data for calculating site-specific N-Uptake

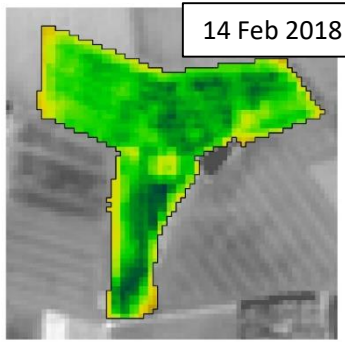
food security tep









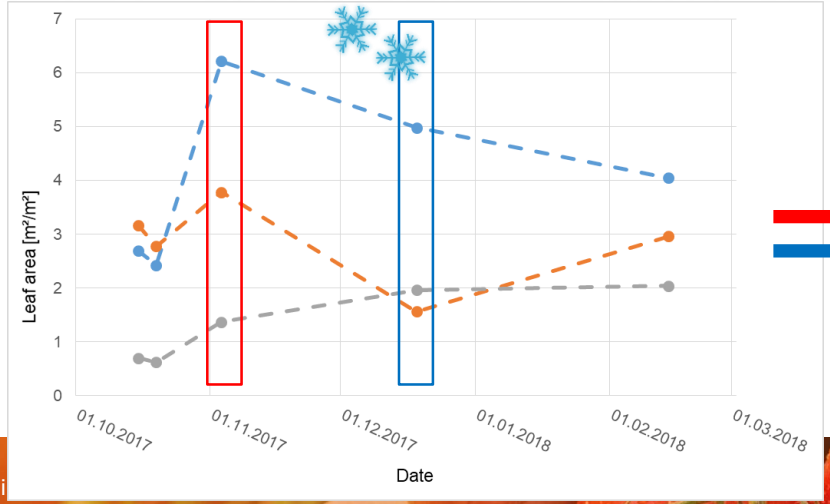


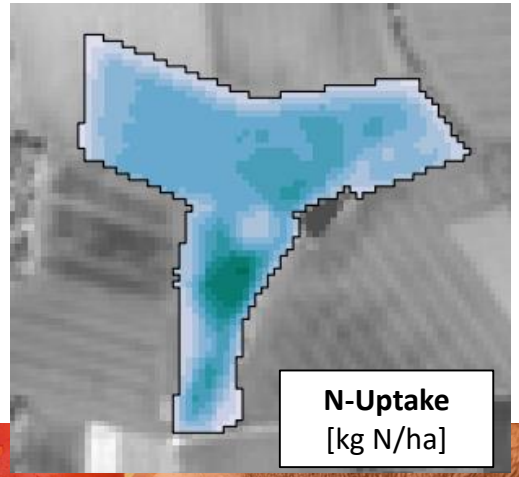
Leaf Area Oil Rapessed

Field boundary

Leaf Area [m²/m²]

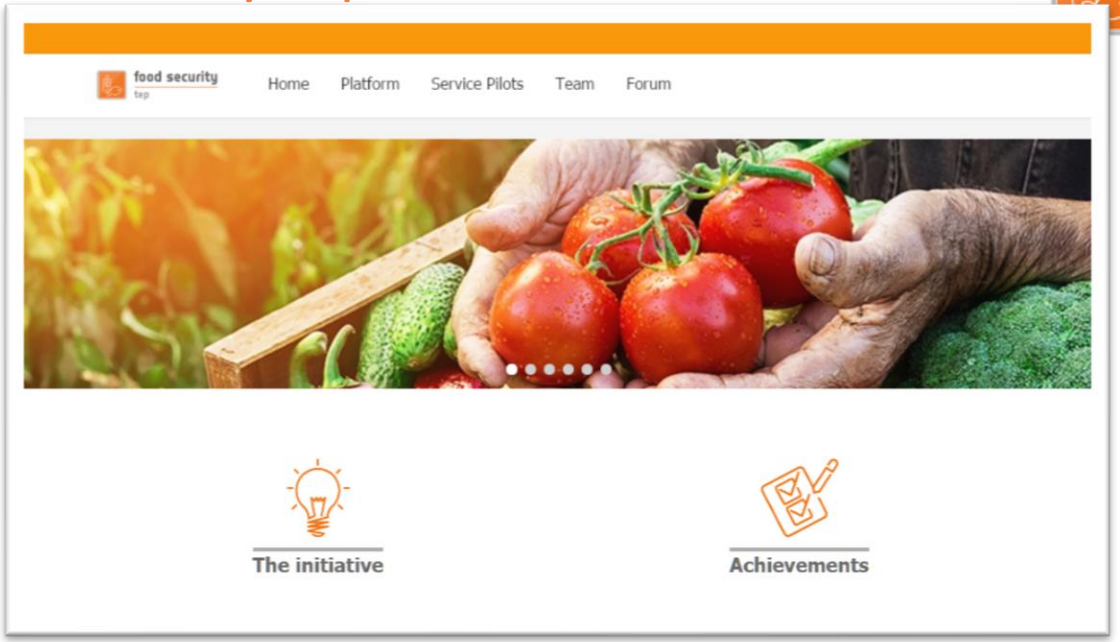
- 0
- 0.6
- 1.2
- 1.8
- 2.4
- 3.0
- 3.6
- 4.2
- 4.8
- 5.4
- 6.0





Please visit: foodsecurity-tep.eo.esa.int

food security
tep



Agile platform development

User consultations	Start of pre-operations Service Pilot Europe agriculture Definition of Service Pilot Africa	User consultations	Service Pilot Europe agriculture Service Pilot aquaculture Further Service Pilots	Gradual transfer to long-term deployment
Start 2017		**2018**	**2019**	