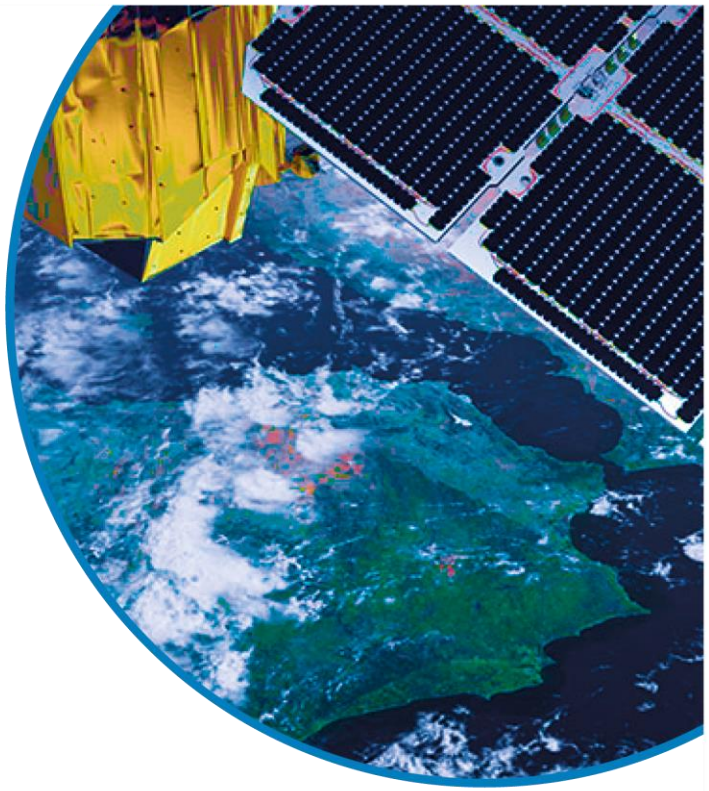


Analýza uživatelských potřeb dat v zemědělství

www.EO4AGRI.eu

Ing. Václav Šafář, Ph.D. – Wirelessinfo & VÚGTK, v.v.i.

ČZU 30.1.2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821940

Atos

EOX

WIRELESSINFO

NPA
NATIONAL PAYING AGENCY

GeoVille

Club of Ossiach

e-geos
AN ASI / TELESPAZIO COMPANY

Plan4all

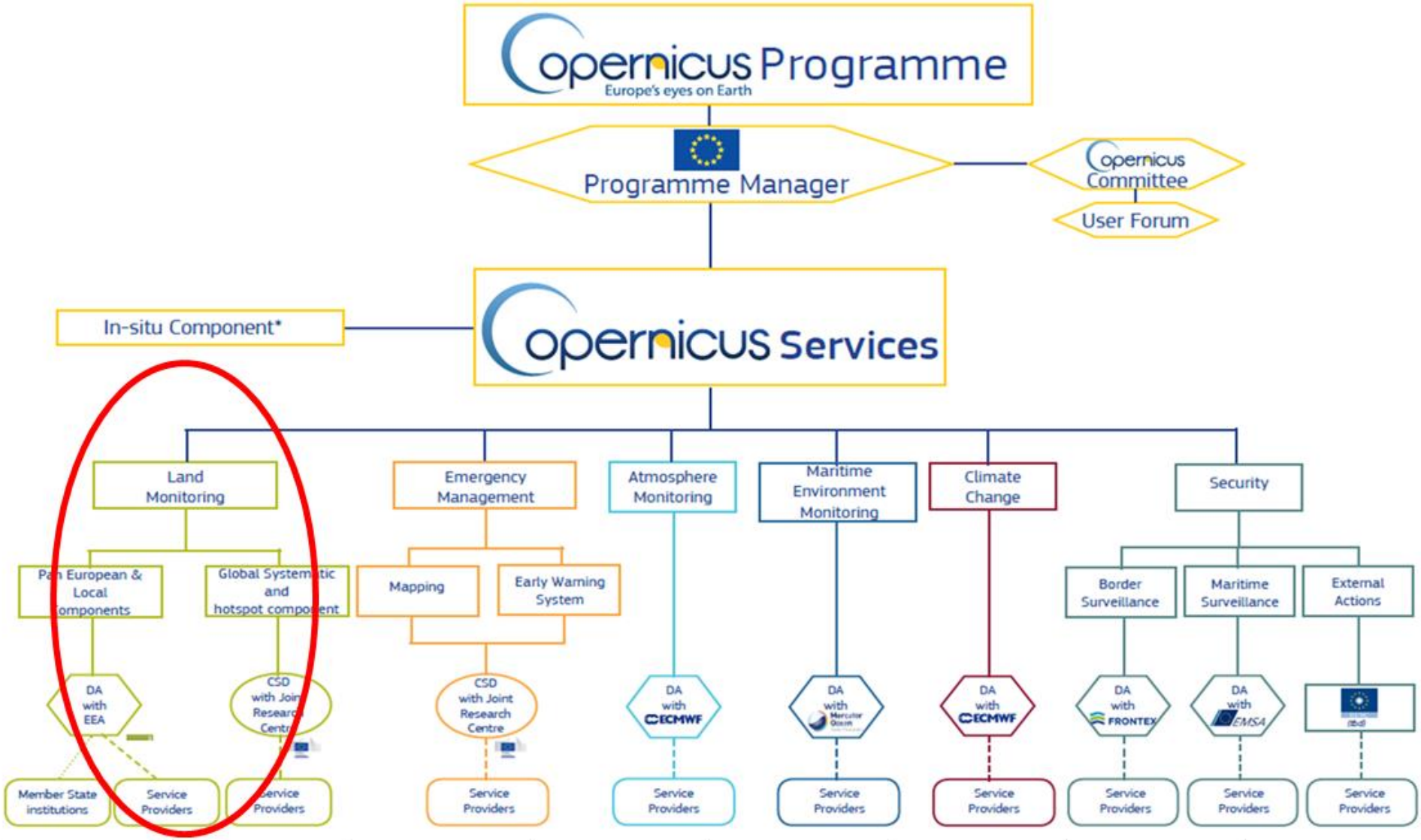
Wallonie
recherche
CRA-W

PROGIS
Software GmbH

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821940

www.EO4AGRI.eu

Družice řady Sentinel



Družice řady Sentinel

Copernicus consisting of three basic components and the red ellipse is main part of interest EO4AGRI EO4AGRI

SENTINEL-1:
4-40m resolution, 3 day revisit at equator

S1A and 1B in orbit

Polar-orbiting, all-weather, day-and-night radar imaging

SENTINEL-2:
10-60m resolution, 5 days revisit time

S2A and 2B in orbit

Polar-orbiting, multispectral optical, high-resolution imaging

SENTINEL-3:
300-1200m resolution, <2 days revisit

S3A and S3B in orbit

Optical and altimeter mission monitoring sea and land parameters

SENTINEL-4:
8km resolution, 60 min revisit time

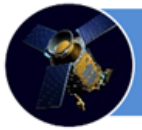
1st Launch 2022

Payload for atmosphere chemistry monitoring on MTG-S

SENTINEL-5p:
7-68km resolution, 1 day revisit

S5P in orbit

Mission to reduce data gaps between Envisat, and Sentinel 5



SENTINEL-5:
7.5-50km resolution, 1 day revisit

1st Launch 2023

Payload for atmosphere chemistry monitoring on MetOp 2nd Gen

SENTINEL-6:
10 day revisit time

1st Launch 2020

Radar altimeter to measure sea-surface height globally

Data sources – satellite Sentinel

Spectral bands for the Sentinel-2 sensors diagram Copernicus described area of interest by red ellipse, which is point of interest EO4AGRI

Sentinel-2 bands	Sentinel-2A		Sentinel-2B		
	Central wavelength (nm)	Bandwidth (nm)	Central wavelength (nm)	Bandwidth (nm)	Spatial resolution (m)
Band 1 – Coastal aerosol	442.7	21	442.2	21	60
Band 2 – Blue	492.4	66	492.1	66	10
Band 3 – Green	559.8	36	559.0	36	10
Band 4 – Red	664.6	31	664.9	31	10
Band 5 – Vegetation red edge	704.1	15	703.8	16	20
Band 6 – Vegetation red edge	740.5	15	739.1	15	20
Band 7 – Vegetation red edge	782.8	20	779.7	20	20
Band 8 – NIR	832.8	106	832.9	106	10
Band 8A – Narrow NIR	864.7	21	864.0	22	20
Band 9 – Water vapour	945.1	20	943.2	21	60
Band 10 – SWIR – Cirrus	1373.5	31	1376.9	30	60

Datové zdroje z leteckého snímkování a LDPZ

Letecké kamery RGBIr současnosti

RGBIr Cameras

Vexcel

Leica

Leica

VisionMap

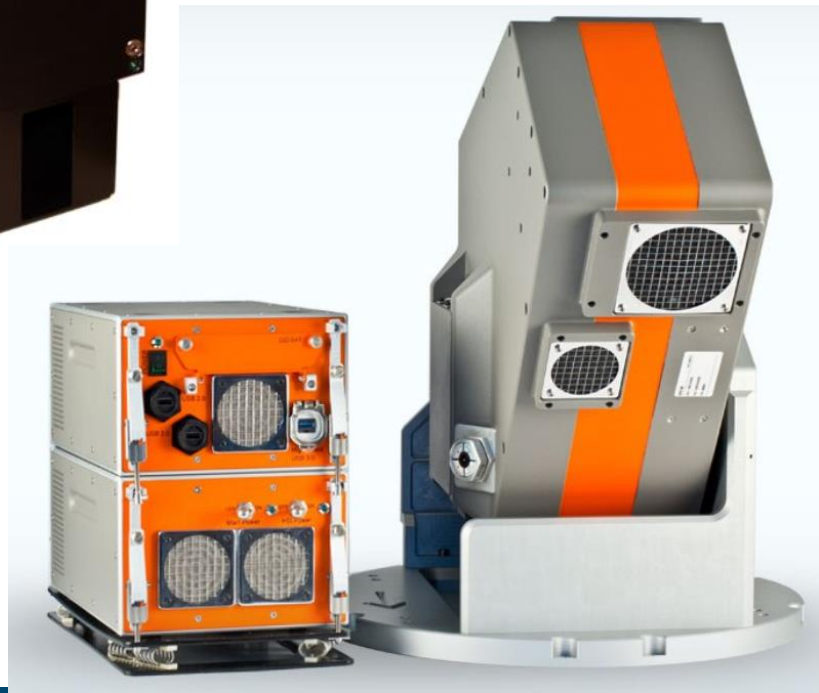
Hyperspektrální kamery

Others cameras

HySpex SWIR 384

ITRES Canada

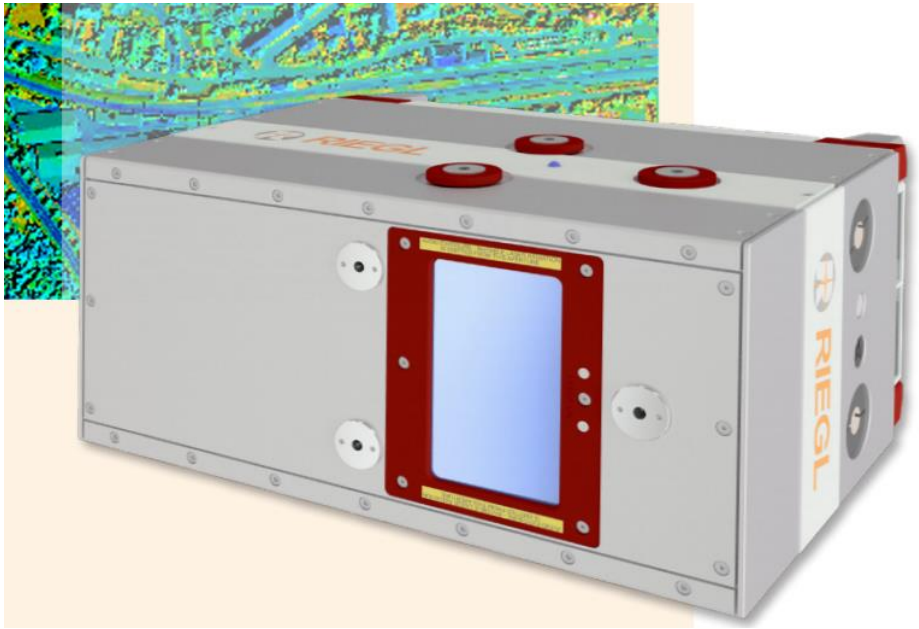
Aisa FENIX 1K



Letecké laserové skenování

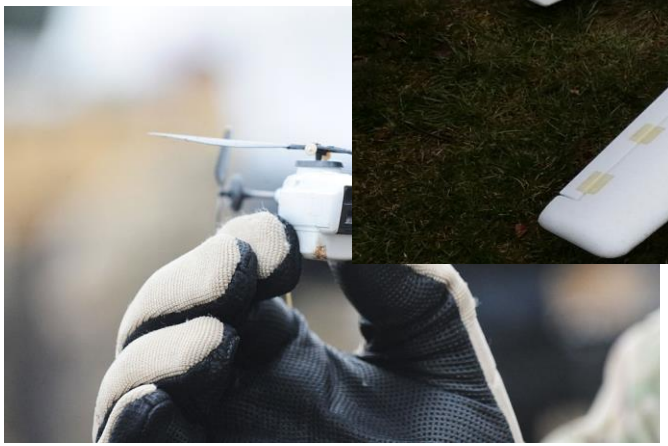
Scanners

RIEGL VQ-780i



Leica TerrainMapper

UAV ve prospěch zemědělství - nosiče



Kamery RGB pro UAV nosiče

RGB Cameras for UAV

FF cameras

MF cameras - PhaseOne

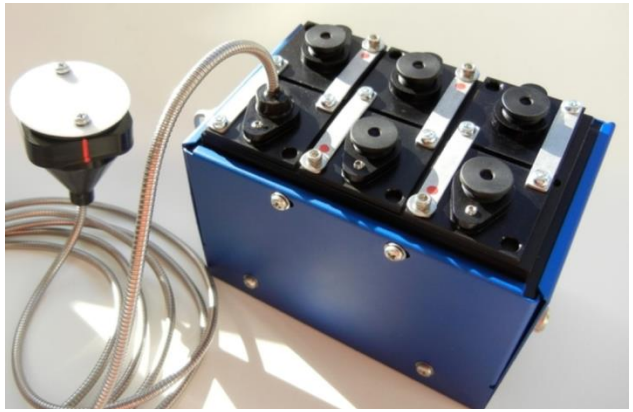
Compact cameras

Multispektrální a hyperspektrální kamery pro UAV

Others cameras for UAV

PARROT SEQUOIA+ multispectral camera

Mini-MCA6 multispectral camera

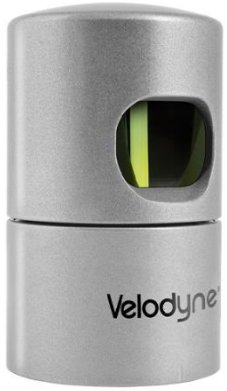


Hyperspectral „camera“ (Fabry-Perot Interferometer)

Laserové skenování s UAV

Scaners for UAV

Velodyne HDL -32E



RIEGL VUX-1UAV

FARO Laser Scanner Focus 3D X130

YellowScan Lidar

Přístroje pro přímá měření v poli

Spektrometrické měření pro etalonáž

FieldSpec® 3

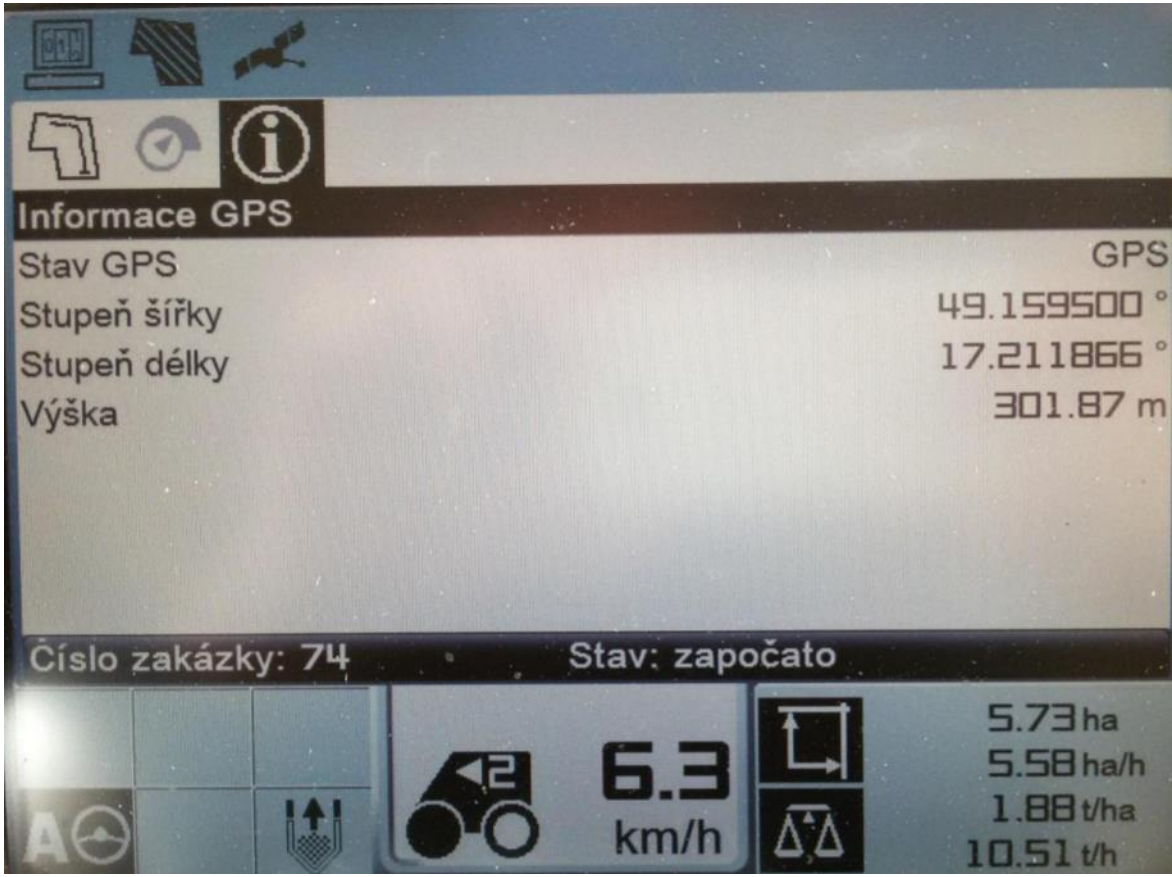
Čidla pro přímé měření

Yara N Sensor WIN

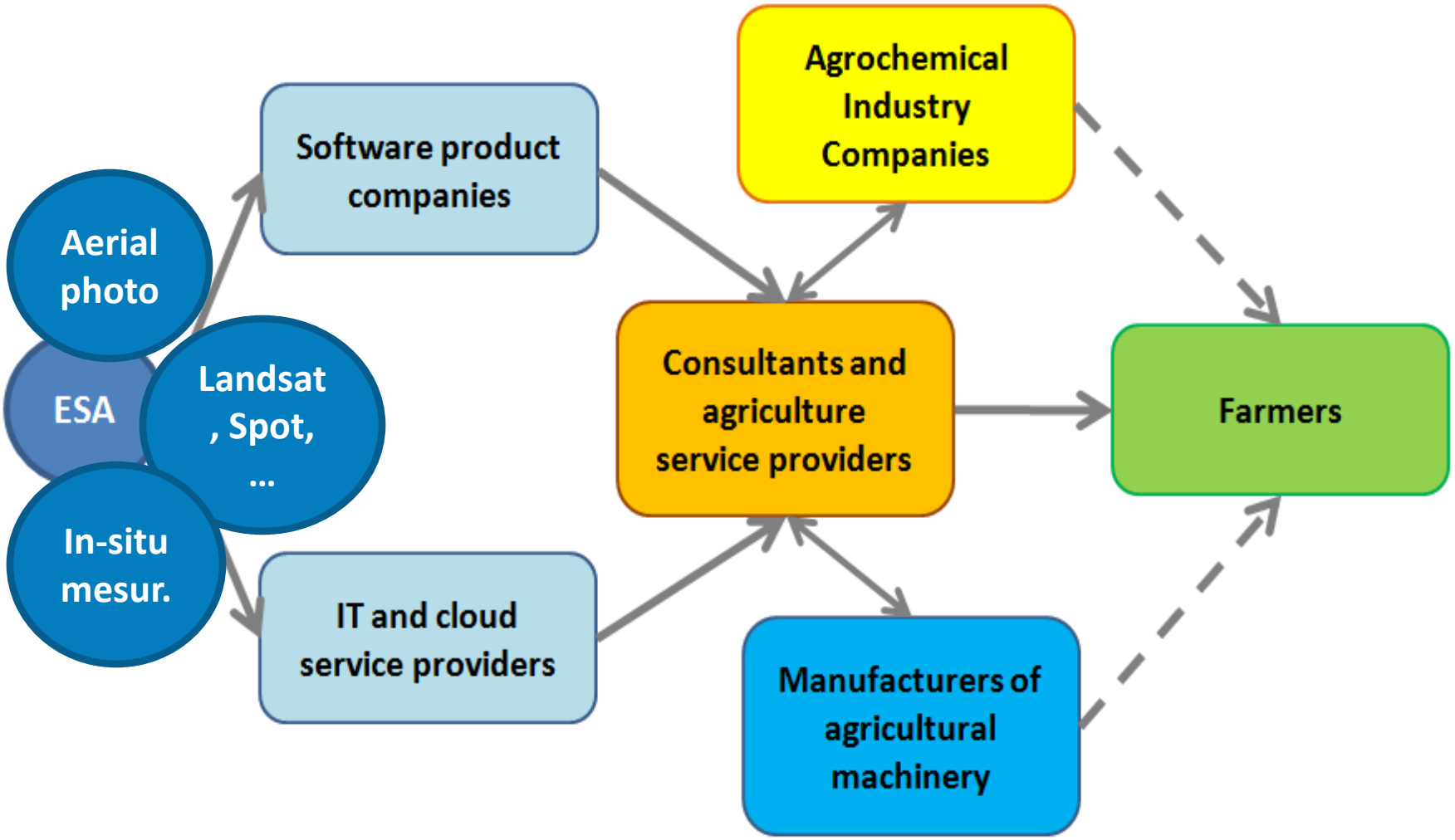
Naše volanty a navigační systémy na mechanizaci

Field IQ standard Trimble

Screen with CEBIS software from CLAAS



Rozdělení zemědělsko-potravinářského sektoru



AgroFood Industry Sector - Dividing UR by group – Farmers

AFarCloud	**ECoLaSS**	**IoF2020**	**RE-CAP**
AGRICAB	ECOPOTENTIAL	ISAC	REDDAF
AgriCLASS	EKLIPSE	MARS-FOOD	REDDINESS
AgriXchange	**EO4SD**development	MEDEO	RISE
Ami4For	**EO4wildlife**	MS.MONINA	SAGA-EO
APOLLO	**EOVAS**	**MULTIPLY**	**SDI4Apps**
AQUACROSS	**EUXDAT**	MyWater	**Sen2Agri**
ASAP	**FATIMA**	**NADiRA6**	SEN3APP
BACI	FIGARO	**NextGEOSS**	**SEN4CAP**
BALKANGEONET	**FOODIE**	**NextSpace**	**SENSAGRI8**
BDVe	ForMoSA	**NIVA**	SenSyF
BRAGMA	**FUTURE Farm**	Open EO	**SNAP**
CANDELA	**GEOGLAM**	PANDA	Soil moisture CCI
CCI Open Data	GEONETCAB	**Perspective- Sentinel7**	SWITCH-ON
CD-LINKS	**Georice**	**PILOT4CAP**	SWOS
ConnectinGEO	GIONET	**Plan4business**	Talking Fields
DataBio	GMES PURE	**PREMIA**	TRANSrisk
DIABOLO	HELM	QA4EVC	TWINBAS
DIANA	IMAGINES	RAMFLOOD	**VOICE**
EAU4FOOD	INFORM	RASOR	VGT4AFRICA

Soupis a hodnocení potřeb podle skupin zainteresovaných na zem.-potr. komplexu

Work package number:	2	Work package title:	User Requirements & GAP analysis
		Lead beneficiary:	Wirelessinfo
Task 2.2	AgroFood Industry	Lead of task:	Wirelessinfo
Description:	The agrifood group will be formed from representatives of farmers, advisors, machinery producers, food industry, agro chemistry and market. EO4AGRI will analyse needs of different groups for EO related services. This includes precision farming services, crop forecast and weather forecast. The needs of different groups will be analysed and the EO4AGRI results and proposals will be validated through dedicated workshops based on methodology coming from Task 2.1		
Deliverable:	End User Requirements Collection and Foresight Methodology		

ISN = is not relevant

						E = for al
						G = Glob
Groups of End Users:	I - IT and cloud service providers	I	I	I	I	C = Cont
	S - Software product companies	S	S	S	S	U = EU
	C - Consultants and agriculture service providers	C	C	C	C	N = Natio
	F - Farmers	F	F	F	F	R = Regio
	A - Agrochemical Industry Companies	A	A	A	A	F = Field
	M - Manufacturers of agricultural machinery	M	M	M	M	P = Parc
Required data, processes and services:		The main user group AgroFood Industry	Secondary user group AgroFood Industry	Tertiary user group AgroFood Industry	Quaternary user group AgroFood	Covera cover sma

AgroFoot Industry | Financial sector | Public sector | Food and Nutrition Security | Users requirement for Africa

Potřeby dat z pohledu jednotlivých skupin uživatelů

Data collecting of the land site variability (land uniformity and heterogeneity)
Data for determining the height of the crop
Data used for forecast of agricultural yields
Data for real crop yield maps
Data for determining of crop rotation
Data for monitoring buffer strips around agricultural fields.
Data for monitoring appearance of disease or damage
Data for estimating the extent of disease or damage (loss)
Data for plan for using insectids
Data for plan for using fungicide
Data for plan for using pesticide
Data for monitoring of hydrological stress
Data for soil water index
Data for water needs for irrigation,
Data of weather forecast

Popis uživatelských požadavků atributy

Každý UP je upřesněn 24 atributů

1. The main user group AgroFood Industry
2. Secondary user group AgroFood Industry
3. Tertiary user group AgroFood Industry
4. Quaternary user group AgroFood Industry
5. Coverage (The most detailed coverage level is indicated, smaller are acceptable)
6. Frequency requirements
7. Usually used technology to collect data, present
8. Usually used type of sensor for data collection
9. Usually the required spatial resolution of input data
10. The future required spatial resolution of input data
11. Present required final data grid
12. Required spatial resolution in the future
13. Degree of availability - present
14. Degree of availability future
15. The degree of automation of data creation today
16. The degree of data generation automation in the future
17. The degree of necessity of data for farmers

…. ….

…. ….

Hodnoty atributů - příklady

Každý z atributů má „X“ hodnot

Pokrytí (vždy je uveden převažující rozsah uživatele dat)	Frekvence požadavků na data	Obvyklý nosič používaný v současnosti	Obvyklý typ senzoru používaný v současnosti
E = for all coverages			R - SAR
G = Global	Y - year	E - equally all methods	A - all methods equally
C = Continental	Q - quarter	O - others (errand in the field, laboratory test, etc.)	O - others (soil moisure sensor, sensor of wheather, soil temperature sensor, yeild senzor etc.)
U = EU	M - monthly	T - terrestrial	S - spectrometer
N = National	W - weekly	U - UAV	G - camera RGB
R = Region	D - daily	G - UGV	M - multispestral sensor
F = Field	H - hourly	A - aerial	H - hyperspectral sensor
P = Parcel	X - at a given moment	S - satellite	T - thermal senzor

Agregace požadavků podle četnosti a skupin uživatelů

Golden group	1a	Data of weather forecast
		Data of weather forecast
		Data of weather forecast
	1b	Data used for forecast of agricultural yields
		Data used for forecast of agricultural yields
		Data used for forecast of agricultural yields
	1c	Data for soil water index
		Data for soil water index
		Data for soil water index
	1d	Data for providing a drought early warning system.
		Data for providing a drought early warning system.
		Data for providing a drought early warning system.
	1e	Data for measuring of bonited soil
		Data for measuring of bonited soil
		Data for measuring of bonited soil
Silver group	2a	Data for detailed analysis of information on a specific plot of land
		Data for detailed analysis of information on a specific plot of land
	2b	Data for monitoring appearance of disease or damage
		Data for monitoring appearance of disease or damage
	2c	Data for real crop yield maps
		Data for real crop yield maps
	2d	Data for water needs for irrigation,
		Data for water needs for irrigation,
	2e	Data for erosion precaution
		Data for erosion precaution
	2f	Data for grassland management
		Data for grassland management
	2g	Data to create maps sprouting crops
		Data to create maps sprouting crops
	2h	Data for determining of crop rotation
		Data for determining of crop rotation
	2i	Data for monitoring buffer strips around agricultural fields.
		Data for monitoring buffer strips around agricultural fields
	2j	Data for production exact information about climatic changes
		Data for production exact information about climatic changes

Data of weather forecast
Data used for forecast of agricultural yields
Data for soil water index
Data for providing a drought early warning system.
Data for production maps of basic fertilizer
Data for production maps of fertilizer in the phenophase 30-34
Data for determining the height of the crop
Data for estimating the extent of disease or damage (loss)
Data for monitoring of hydrological stress
Data for production exact information about climatic changes

Data for identificated parcels for potential land for biomass production
Data for creating flood maps (for Q5,25,50,100years)
Data for maps of providing annual soil erosion risk maps
Data for produce map of occurrence of diseases
Data for produce of actual calamities map (droughts, flood, fires, earthquakes, ...)
Data for production maps of relevance information for biofuel production
Data for determination productivity of grassland and pastures.

Data for support of Common Agricultural Policy new 'greening' rules, crop, ecological sensitive areas
Data for the identification of crops to control subsidies
Data for water protection against nitrates
Data for monitoring of implementation of natural water retention measures
Data for mapping parcels and validation of acreage parcels < 0,5ha
Data for updating of Land Parcel Identification System (LPIS)
Data for monitoring phenology of grassland (number of cuts/grazing events per season)
Data for produce of crop growing calendar for agricultural monitoring

Data for yield modelling for food security
Data for food security information.
Data for cross-border land monitoring, given the interconnectedness environmental problems that cross country borders which are connecte food security
Data for near real-time vegetation biomass measurements for agriculture and food security during the cropping season.
Data for early warning information for food security.

Výsledná doporučení pro budoucí satelitní mise

Minimální požadované parametry pro senzory z pohledu požadavků na data používaná v zemědělství

For future: L-band SAR imagery with resolution 5 m or better, dual pol systems, revisit time 5 days
For future: C-band SAR with resolution 2m or better, dual pol systems, revisit time 4 days
For future: X-band SAR with resolution 1m or better, dual pol systems , revisit time 4 days
For future: RGB camera with resolution 0,86m or better, revisit time 7 days
For future: Multispectral camera with resolution 1,24m or better, revisit time 3 days
For future: Hyperspectral camera with minimal 50 bands from VNIR (or better), with resolution 5m (or better), revisit time 3 day
For future: Hyperspectral camera with minimal 40 bands SWIR (or better), with resolution 10m (or better) , revisit time 3 days

Děkuji za pozornost

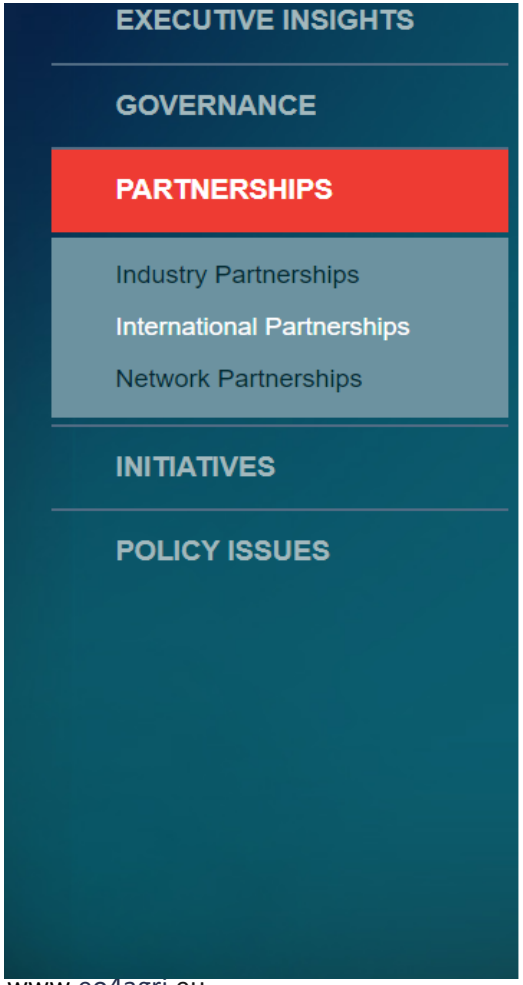
Ing. Václav Šafář, Ph.D.

Vaclav.safar@vugtk.cz

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 821940

www.EO4AGRI.eu

AgroFood Industry Sector - Dividing UR by group – IT and cloud service providers



MoU Partners

Internet2 has formed peer-level relationships with organizations outside the U.S. who have projects similar to Internet2 in scope and objectives. Internet2 currently partners with over 70 such international organizations and networks. Here's a complete list.

americas

CEDIA (Ecuador)
CNTI (Venezuela)
CONARE (Costa Rica)
CUDI (Mexico)
INNOVA-RED (Argentina)
RENATA (Colombia)
REUNA (Chile)
RNP (Brazil)
University of the West Indies, The (Trinidad and Tobago)

canada

CANARIE, Inc. (Canada)

africa

NUC (Nigeria)
SANReN (South Africa)
TENET (South Africa)
TERNET (United Republic of Tanzania)

europe

ARNES (Slovenia)
BELNET (Belgium)
CARNet (Croatia)
CESNET (Czech Republic)
Consortium GARR (Italy)
DFN-Verein (Germany)
FCCN (Portugal)
GIP RENATER (France)
GRNET (Greece)
HEAnet (Ireland)
HUNGARNET (Hungary)
IUCC (Israel)
Jisc (United Kingdom)
PIONIER (Poland)
RedIRIS (Spain)
RESTENA (Luxembourg)
RIPN (Russian Federation)
SANET (Slovakia)
SUNET (Sweden)
Surfnet BV (Netherlands)
SWITCH (Switzerland)

AgroFood Industry Sector - Dividing UR by group – IT and cloud service providers

Proba-V Toolbox
PolSARpro
Download
Community
Useful Links

Sentinel 1 Toolbox

The Sentinel-1 Toolbox (S1TBX) consists of a collection of processing tools, data product readers and writers and a display and analysis application to support the large archive of data from ESA SAR missions including SENTINEL-1, ERS-1 & 2 and ENVISAT, as well as third party SAR data from ALOS PALSAR, TerraSAR-X, COSMO-SkyMed and RADARSAT-2. The various processing tools could be run independently from the command-line and also integrated within the graphical user interface. The Toolbox includes tools for calibration, speckle filtering, coregistration, orthorectification, mosaicking, data conversion, polarimetry and interferometry.

The Sentinel-1 Toolbox is being developed for ESA by Array Systems Computing in partnership with DLR, Brockmann Consult and OceanDataLab.

S1TBX Features

S1TBX Frequently Asked Questions

AgroFood Industry Sector - Dividing UR by group – software product copmanies

GISGeography

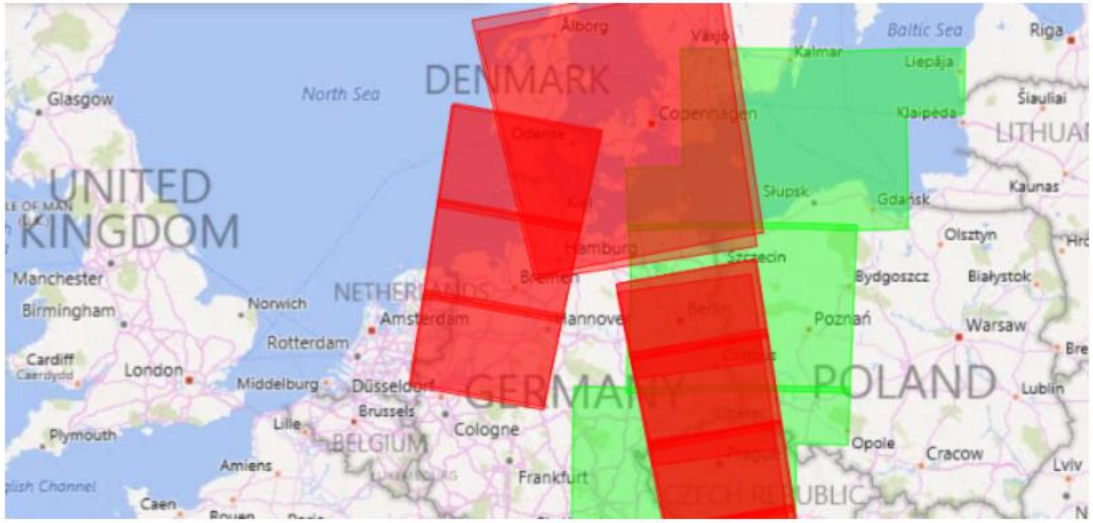
ANALYSIS | CAREER | DATASETS | MAPPING | SATELLITES | SOFTWARE

LATEST > What is Full Motion Video (FMV)? ▸ SOFTWARE

SEARCH ...

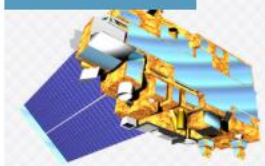
HOME > DATA SOURCES > How to Download Free Sentinel Satellite Data

How to Download Free Sentinel Satellite Data



HELPFUL RESOURCES

REMOTE SENSING

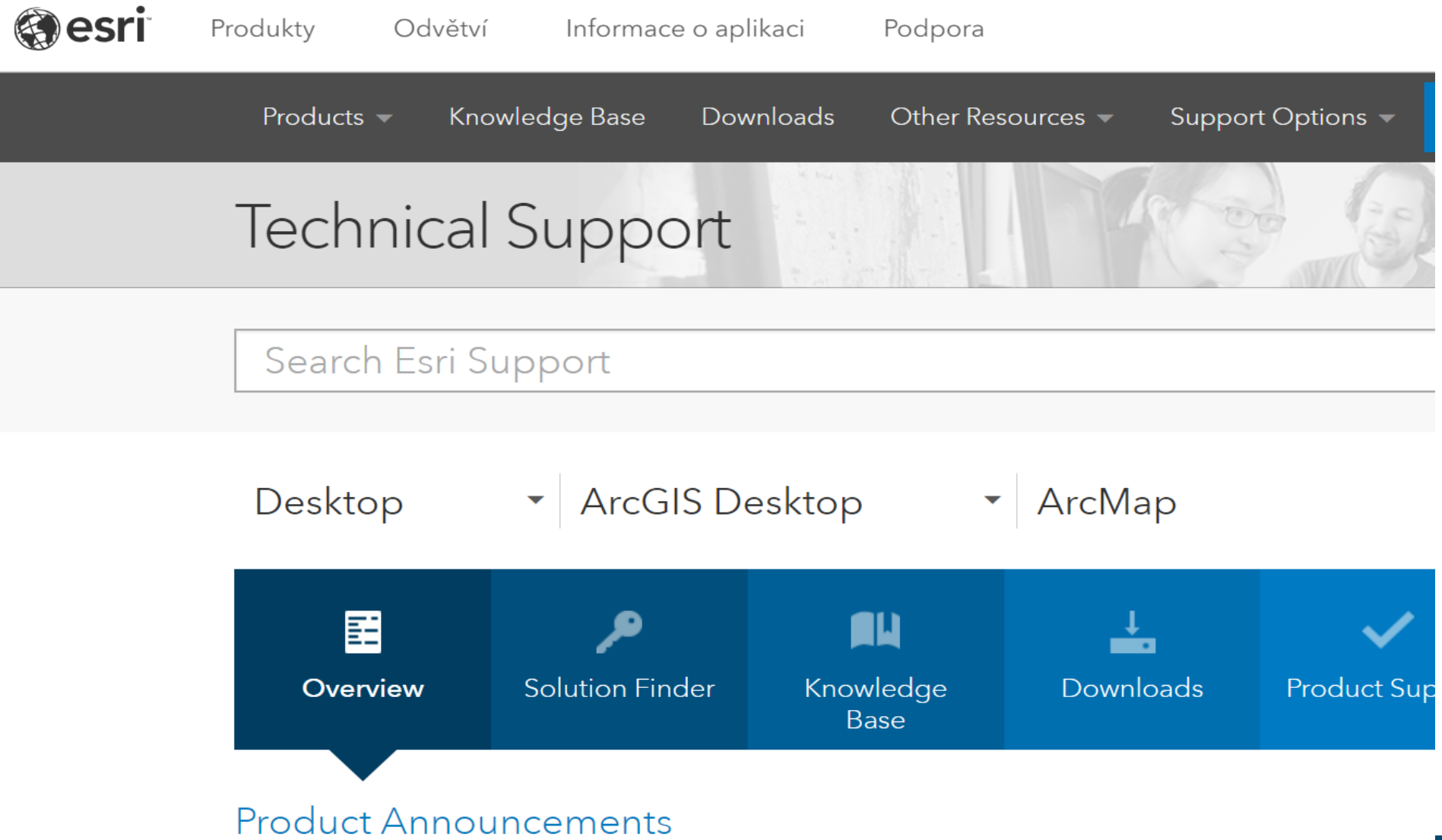


THE BIG SATELLITE LIST

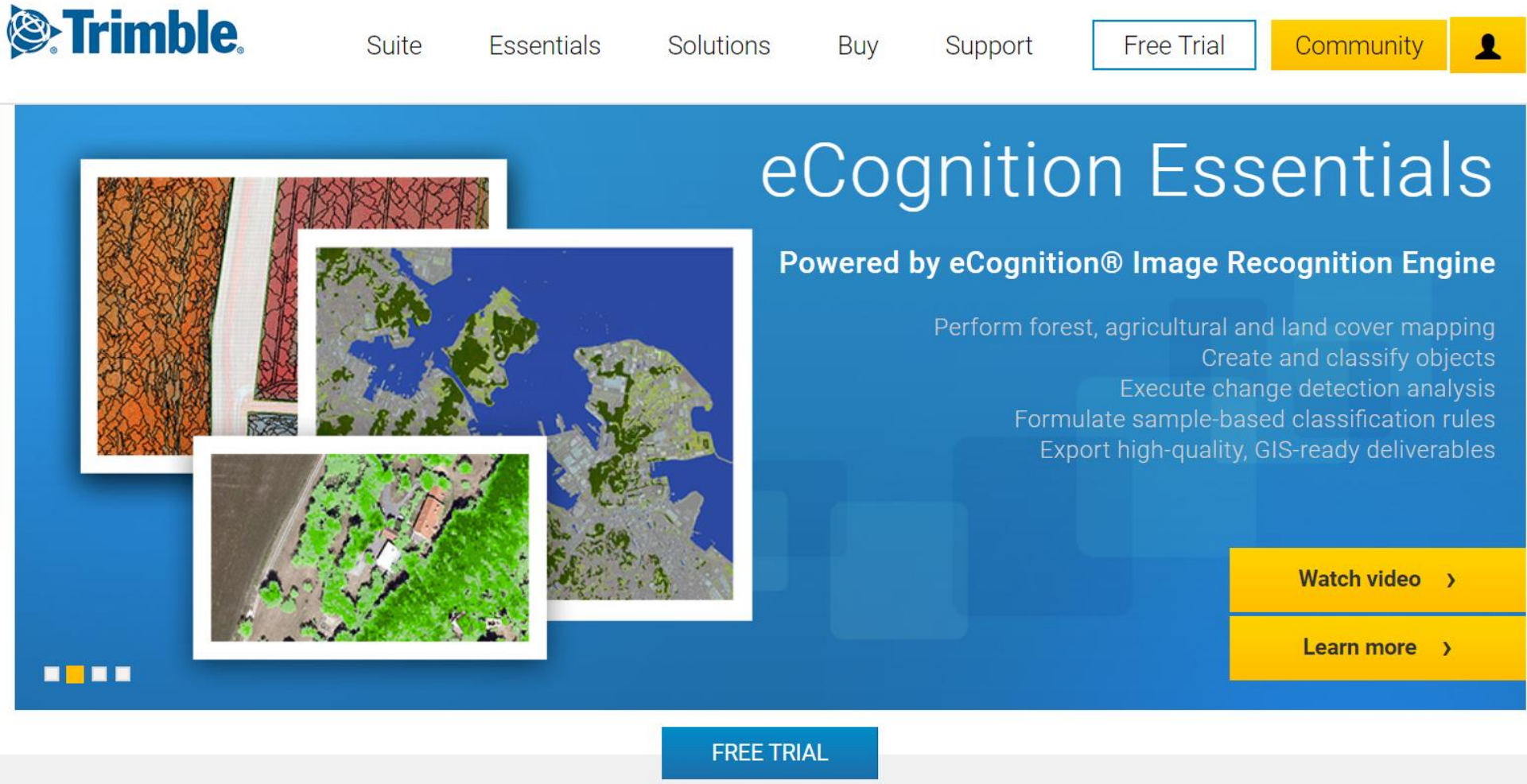
50 Satellites You Need To Know: Earth Satellite List

Today I'm going to show you the largest Earth satellite list ever put together. From oceans to weather, here's our list of the 50 most iconic satellites

AgroFood Industry Sector - Dividing UR by group – software product copmanies



AgroFood Industry Sector - Dividing UR by group – software product copmanies



AgroFood Industry Sector - Dividing UR by group – software product copmanies

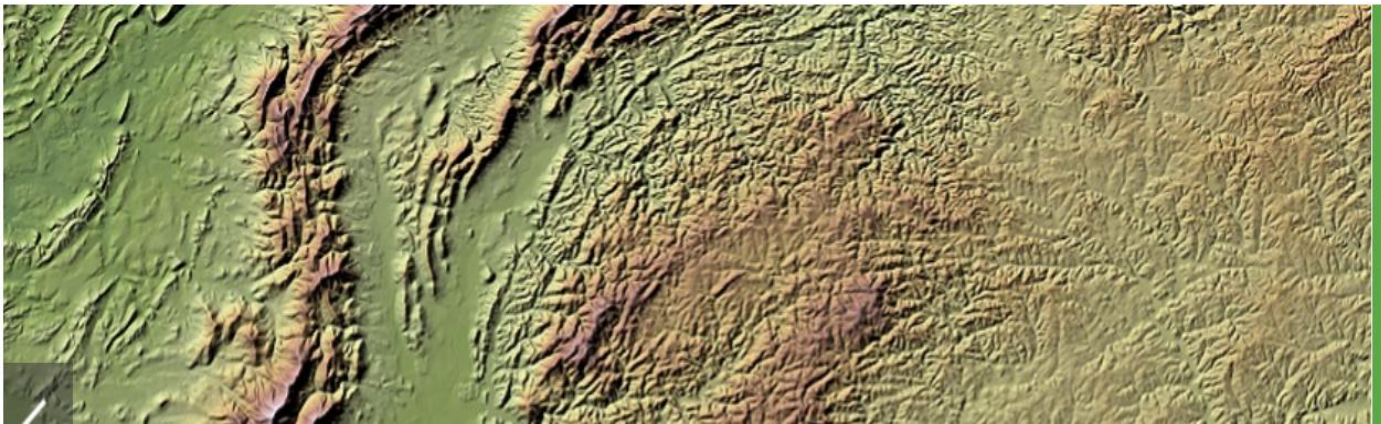
HEXAGON GEOSPATIAL

Products Industries Partners Resources Store About Us

Hexagon Geospatial > Hexagon Geospatial Products > Power Portfolio > ERDAS IMAGINE

ERDAS IMAGINE

ERDAS IMAGINE is offered within the Producer Suite of the Power Portfolio.



The World's Leading Geospatial Data Authoring System

Tools for all your Remote Sensing, Photogrammetry and GIS

AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

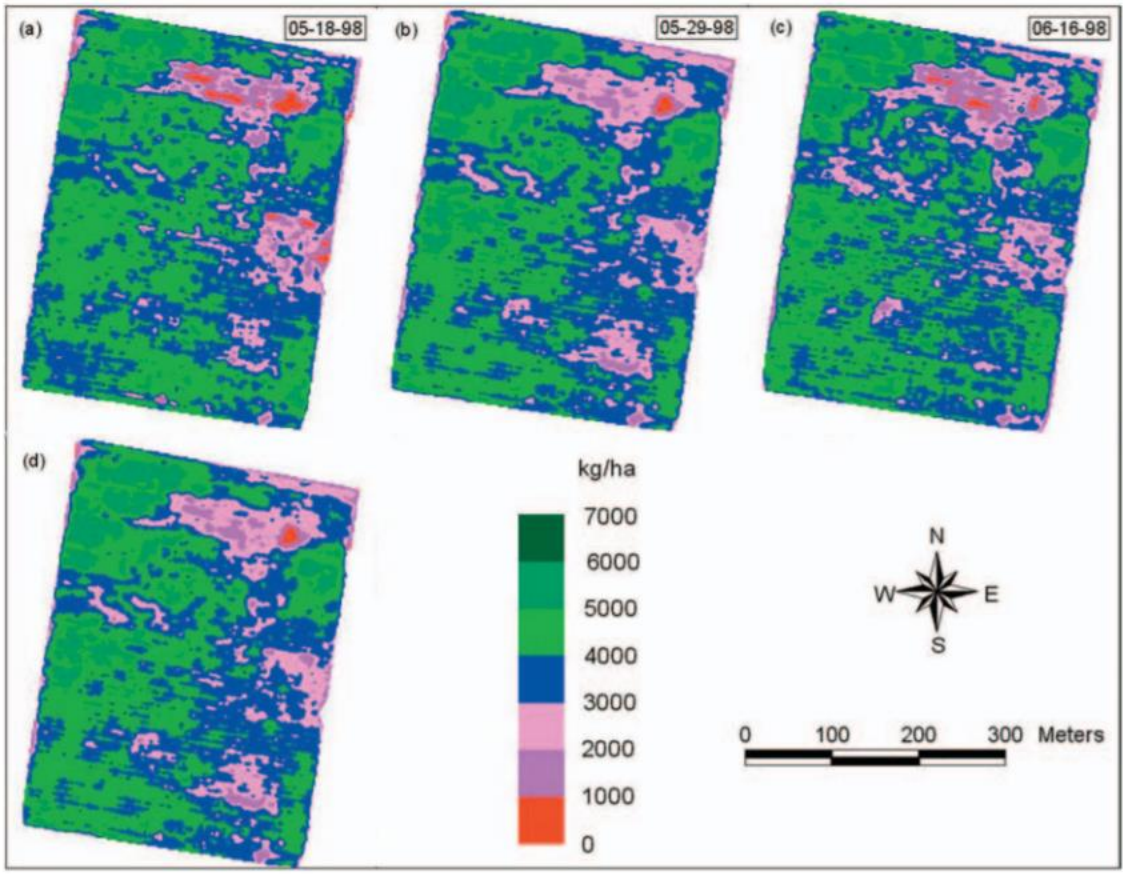


Plate 4. Within-season yield maps generated from digital color-infrared images from a grain sorghum field on three dates during the growing season (a, b, and c) and data obtained with a yield monitor at the end of the season (d) (from Yang *et al.*, 2000).

AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

EARSC
European Association of Remote Sensing Companies

MEMBERSHIP

EARSC has 127 members from most European countries. For our members, the annual membership dues are a cost-effective way to stay informed, promote their company, engage with political and institutional representatives, have networking opportunities with other industry players and help to support the future of geo-information Industry.

Please see the table below for details on the different types and costs of membership.

Company or Organization	Country	Status
20tree	Portugal	Full member
ACRI-ST SAS	France	Full member
AgroApps PCC	Greece	Full member
Air and Space Evidence Ltd	United Kingdom	Full member
Airborne Technologies GmbH	Austria	Full member
Airbus Defence and Space GmbH	Germany	Full member

AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

Global Agricultural Drones Market 2016-2025 by System Segment, Application, Product Type, and by Region

ID: 3858041 | Report | September 2016 | Region: Global | 211 Pages | Grace Market Data

DESCRIPTION | TABLE OF CONTENTS | SAMPLES | COMPANIES MENTIONED | METHODOLOGY

Agriculture is considered as a prime area of potential growth in the drone industry because of the technology's ability to help survey crops and gather real-time information on farmland. Crop-spraying drones are suitable for all kinds of complex terrain, crops and plantations of varying heights. In addition, precise and accurate crop spraying ensures the best coverage and application of fertilizers or pesticides on lands.

Agricultural drones are anticipated to account for a significant and ever-growing portion of the overall agricultural drones industry in the next decade. The author predicts the global agricultural drones or UAVs market to grow phenomenally at 37.1% per annum by unit shipment, and 28.9% yearly on average by annual sales revenue generated from agricultural UAV hardware, drone software and servicing section over the next decade (2016-2025).

> ***"Global Agricultural Drones or UAVs Market to Grow Phenomenally at 37.1% Per Annum by Unit Shipment"***

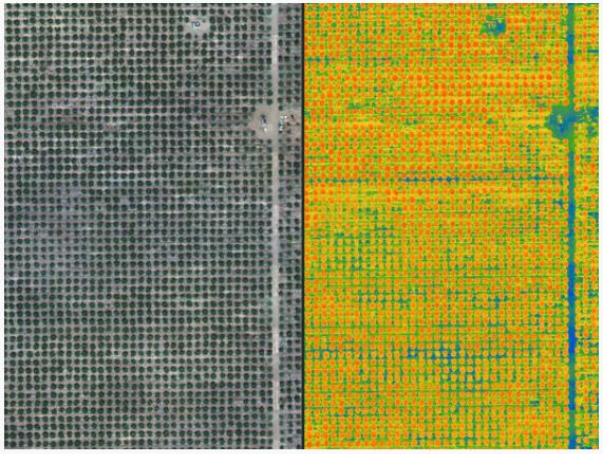
FEATURED COMPANIES

3D Robotics (US)
Agribotix LLC (US)
Boeing (US)
DroneDeploy (U.S.)
HUVRData, LLC (US)

AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

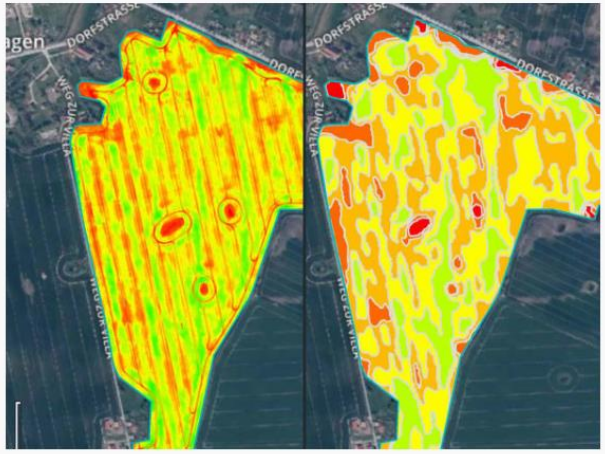
Indexes , DTM, inspect, soil, insurance, crop production

Decisions start in the field



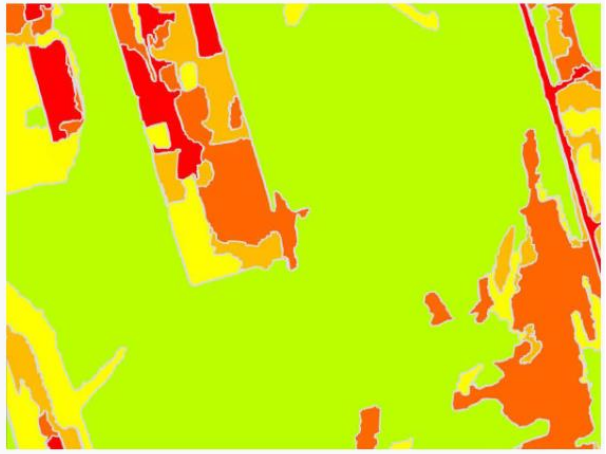
Inspect your fields

Identify issues faster by scouting with timely and high-resolution maps.



Understand your fields

Explore different vegetation index maps to identify the key crop areas that need to be addressed.

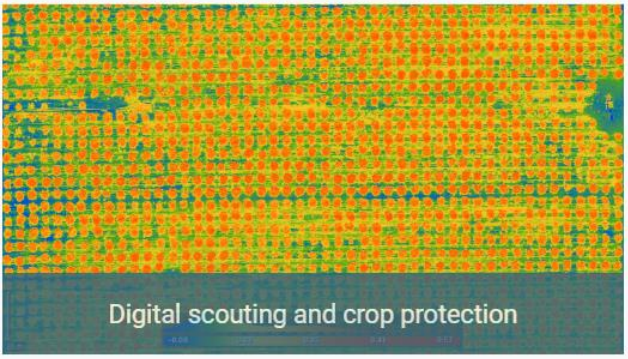


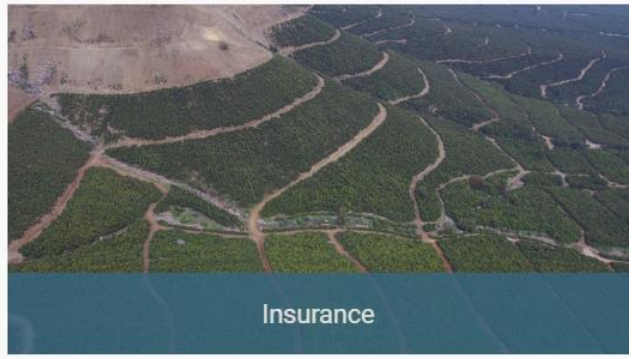
Use your inputs in a targeted way

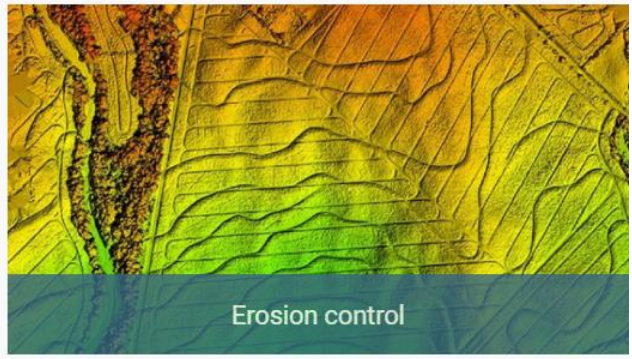
Create comprehensive zonation and prescription maps to know exactly where to use how much.

AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

Indexes , DTM, inspect, soil, insurance, crop production

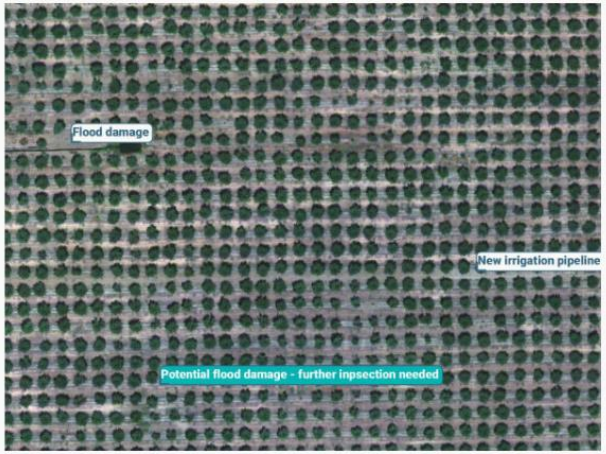






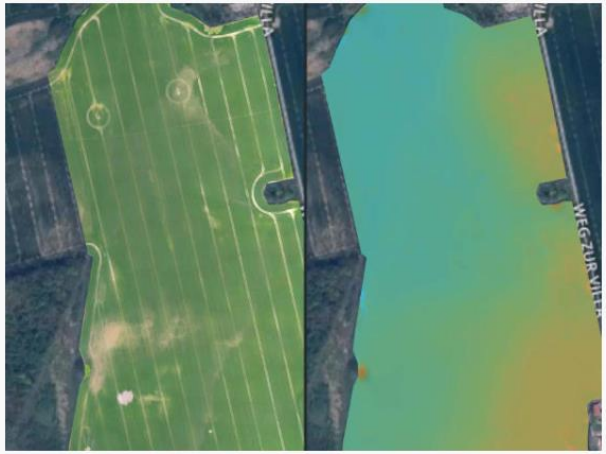
AgroFood Industry Sector - Dividing UR by group – Consultants and agriculture service providers

Indexes , DTM, inspect, soil, insurance, crop production



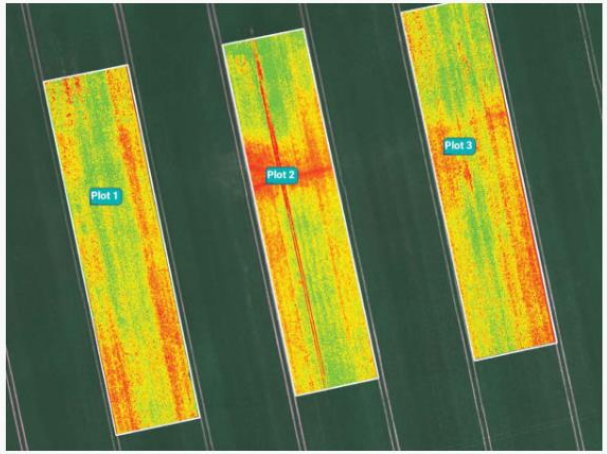
Validate and sustain your insurance claims

Generate maps rapidly to map footprints of your crop damage.



Manage irrigation and minimize soil erosion

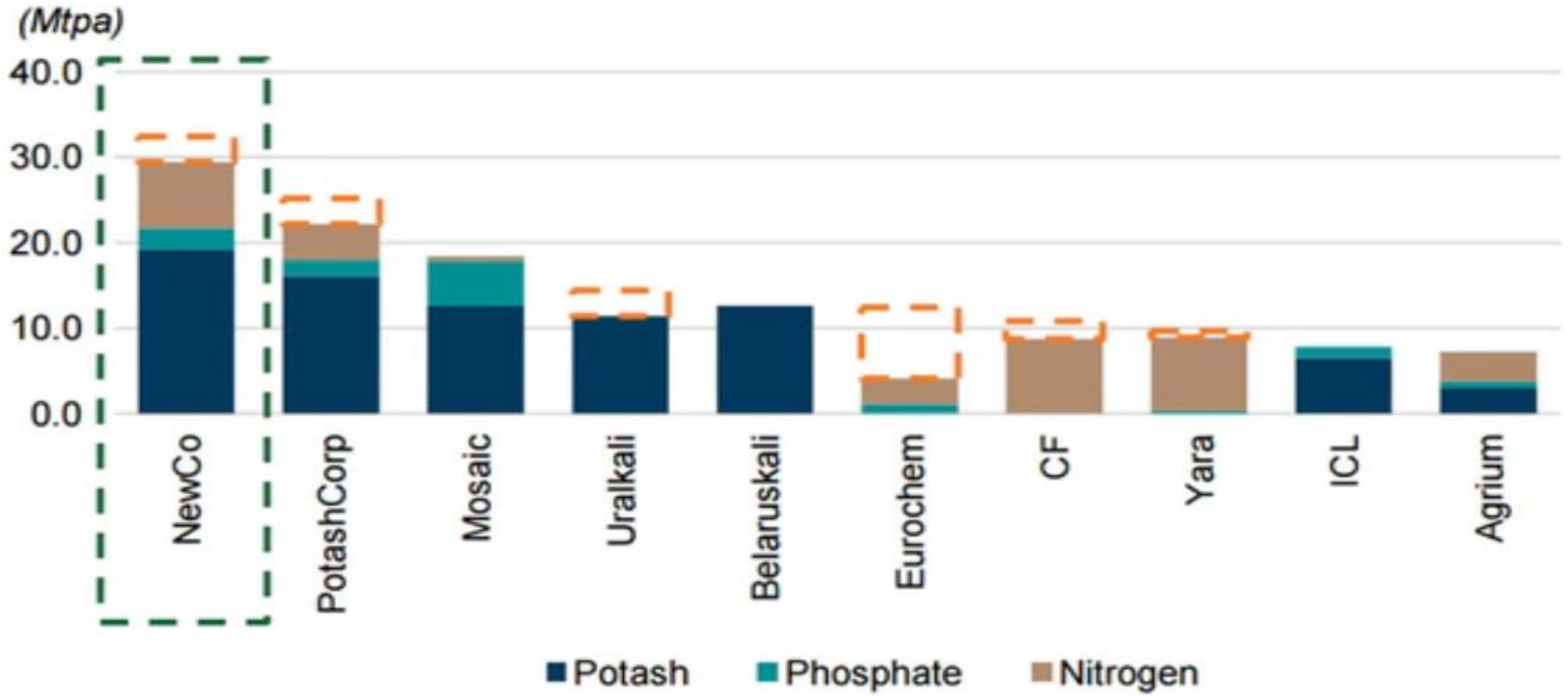
Generate a digital surface model to address irrigation variability and pinpoint erosion-prone areas.



More data and control for your trial plots

Compare the trends derived from vegetation index maps to ensure the sustainability of new techniques.

AgroFood Industry Sector - Dividing UR by group – Agrochemical Industry Companies



Market Realist

Source: PotashCorp. Merger Presentation

AgroFood Industry Sector - Dividing UR by group – Agrochemical Industry Companies

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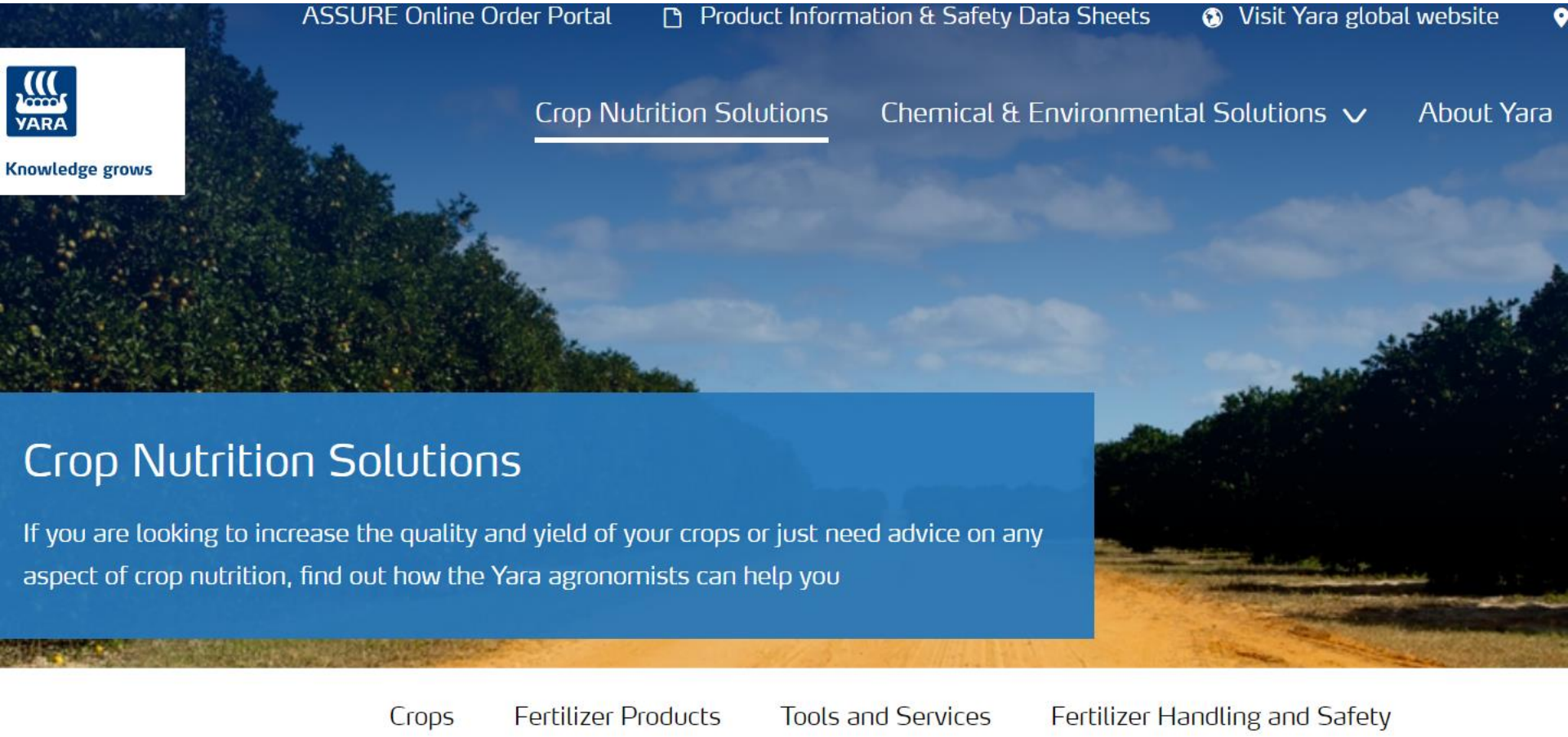
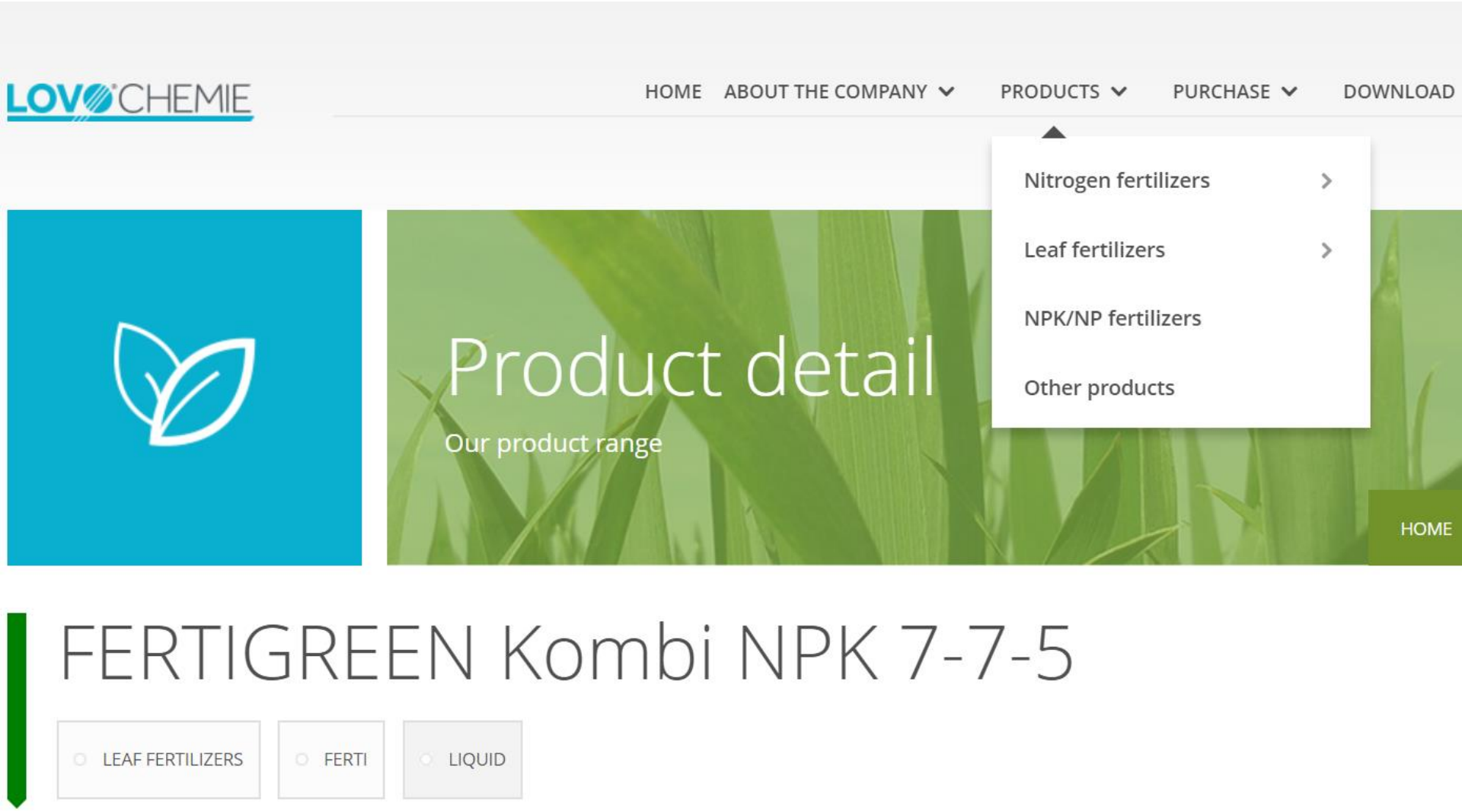
News

AgroFood Industry Sector - Dividing UR by group – Agrochemical Industry Companies



AgroFood Industry Sector - Dividing UR by group – Agrochemical Industry Companies



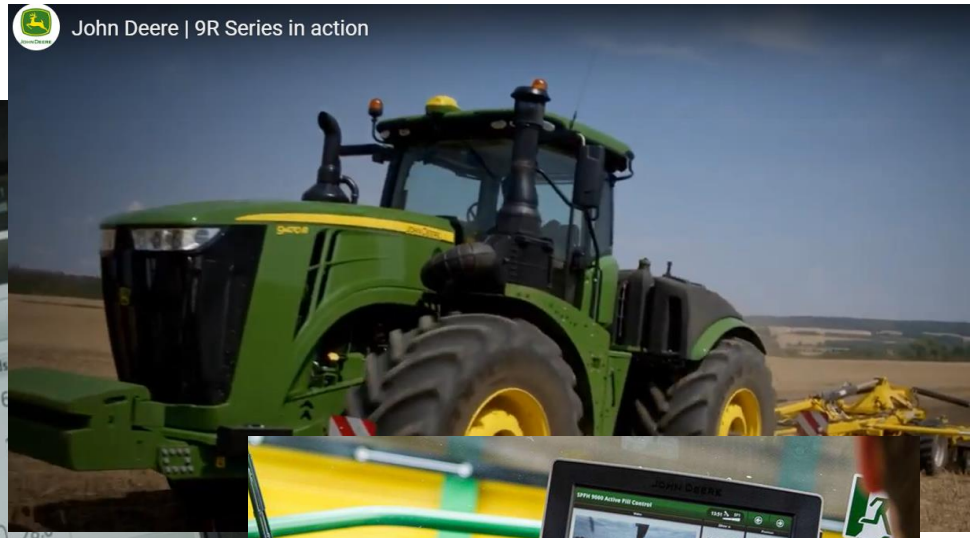
AgroFood Industry Sector - Dividing UR by group – Manofactures of agricultural machinery

- traditional tractor manufacturers, which can also offer sensors and software solutions. E.g. John Deere, Claas, CNH, AGCO

- traditional suppliers, big companies of complementary hardware for tractors (steering, application controlling), software (monitoring), parts of the tractor equipment and aftermarket services: Raven industries, Trimble, Topcon or Ag Juction

- following companies also provide farmers with software packages sensors, software and some services: Monsanto, Bayer , Corteva Agriscience, Geo-Prospect, Syngenta, BASF, YARA, Water sensor

AgroFood Industry Sector - Dividing UR by group – Manofactures of agricultural machinery

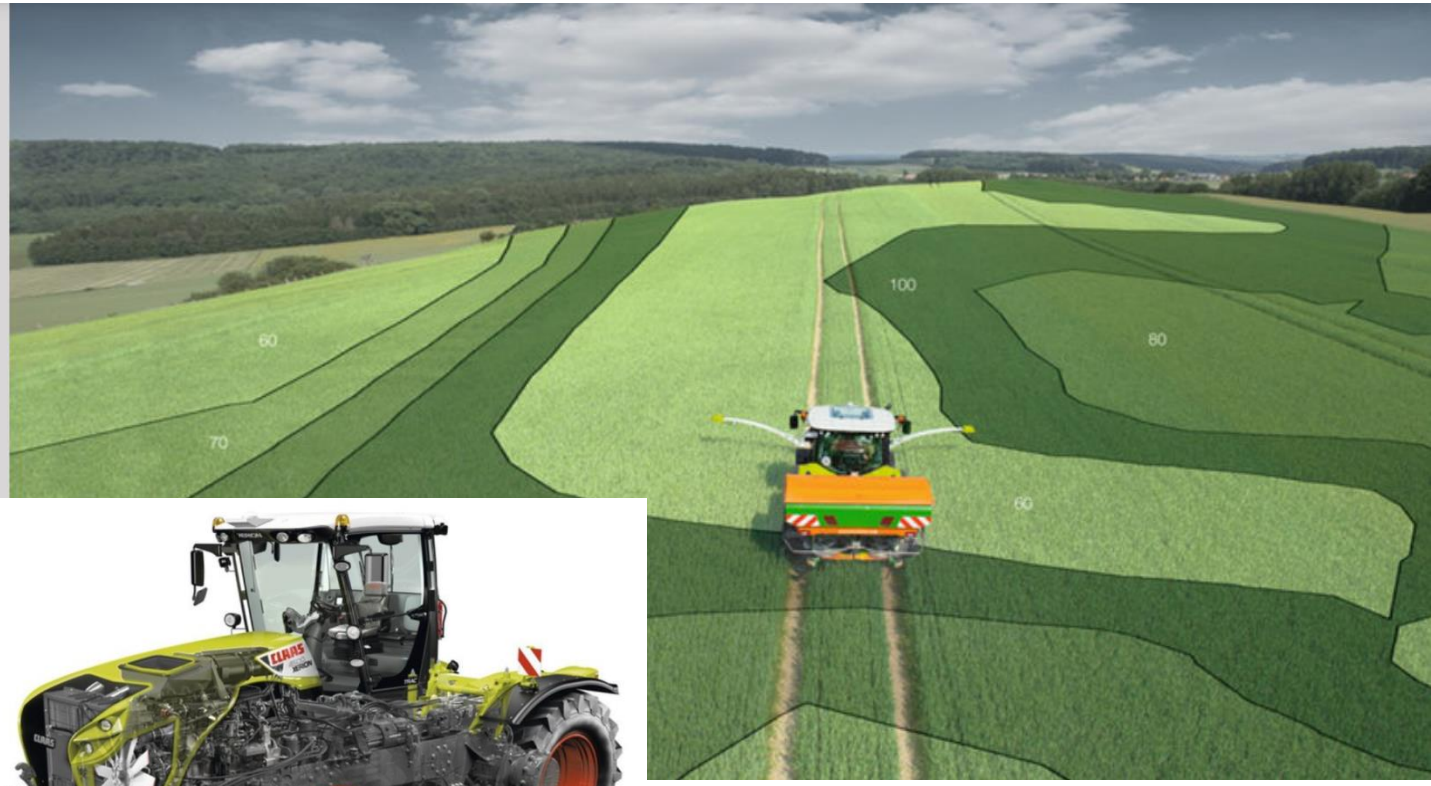


AgroFood Industry Sector - Dividing UR by group – Manofactures of agricultural machinery

Precision farming.

Site-specific management

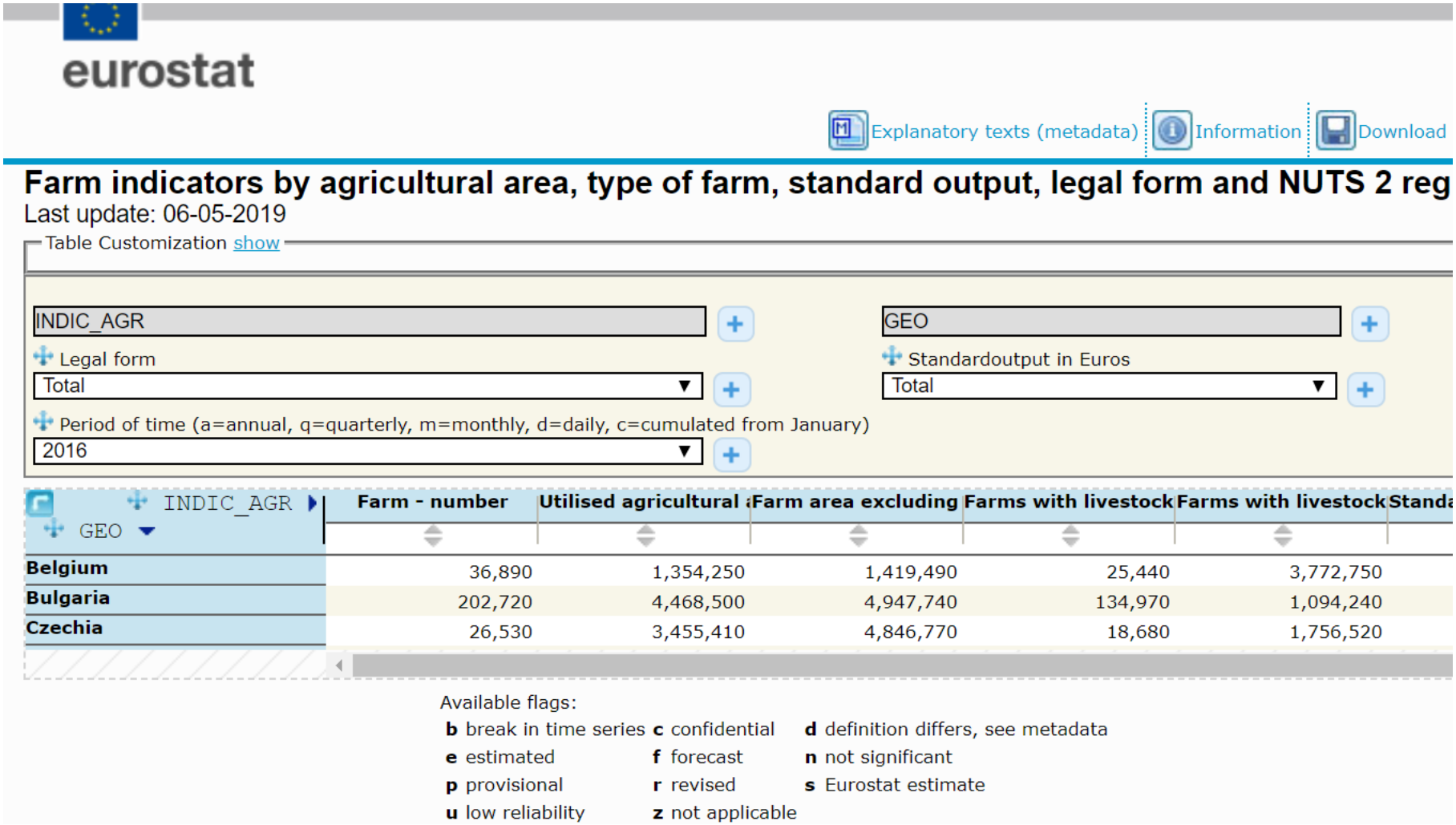
Productivity and efficiency are the buzzwords in modern farming. Only those who farm successfully with these principles in mind will survive in a climate of fluctuating markets and uncertain political conditions to create a sustainable foundation for future generations.



AgroFood Industry Sector - Dividing UR by group – Farmers

A typical farmer in Europe owns **16ha of land**. However, this value is very variable in different countries of the European Union. There are 760 farms (16,3%) in the Czech Republic, which farm on an area of more than 1150 hectares and cultivate 91% of agricultural land. Even family farms often have more than 800ha. In the Czech Republic, over 50% of farms are smaller than 5 ha and they account for a total of only 1.1%. Although most of the farms in the EU were small; **65% of EU agricultural holdings were smaller than 5 ha**, 7% of farms with 50 ha or more managed far more than two-thirds (68%) of EU farmland.

AgroFood Industry Sector - Dividing UR by group – Farmers



eurostat

Explanatory texts (metadata) | Information | Download

Farm indicators by agricultural area, type of farm, standard output, legal form and NUTS 2 reg

Last update: 06-05-2019

Table Customization show

INDIC_AGR

GEO

Legal form: Total

Standardoutput in Euros: Total

Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January): 2016

INDIC_AGR / GEO	Farm - number	Utilised agricultural a	Farm area excluding	Farms with livestock	Farms with livestock	Standa
Belgium	36,890	1,354,250	1,419,490	25,440	3,772,750	
Bulgaria	202,720	4,468,500	4,947,740	134,970	1,094,240	
Czechia	26,530	3,455,410	4,846,770	18,680	1,756,520	

Available flags:

b break in time series **c** confidential **d** definition differs, see metadata
e estimated **f** forecast **n** not significant
p provisional **r** revised **s** Eurostat estimate
u low reliability **z** not applicable

AgroFood Industry Sector - Dividing UR by group – Farmers

The farm usually concludes a contract with the agriculture service providers for delivering the data :

- data collecting of the land site variability
- detailed analysis of information on a specific plot of land
- data used for agronomic recommendations
- crop yield maps
- monitoring appearance of disease or damage
- estimating the extent of disease or damage (loss)
- validity measurement also on sustainable and long-term factors
- agronomic information related with sowing, organic fertilization etc.
- maps of accessible nutrients, soil reaction, sorption complex status
- plan for using pesticide
- sensory measurements and exhausted soil
- erosion precaution