A NEW LEAF
Agricultural Network Exchanging Witnesses and Leading Experiences Against the Fraud

AVEPA
AGENZIA VENETA PER I PAGAMENTI IN AGRICOLTURA

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EUROPEAN ANTI-FRAUD OFFICE

Technical and innovative tools and methods in support of CAP Geo referencing methods/LPIS, legal landscape and models in order to prevent frauds and corruption. A comparison among European experiences.

Padova, May 27th 2015

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JRC – IES – MARS Unit

CAP: an overall view, from policy outline to management and control methodologies

Paolo Pizziol, Philippe Loudjani

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Outline

1. Historical perspective *Paolo Pizziol*
2. Innovation impact *Paolo Pizziol*
3. EU funds risk prevention:
   A. IACS-GIS management *Philippe Loudjani*
   B. On-the spot checks *Philippe Loudjani*
4. Image acquisition process *Paolo Pizziol*
5. Copernicus: the future around the corner. *Philippe Loudjani*

Part I – The historical policy perspective

The CAP's original objectives are maintained in the Lisbon treaty:

a) Increase agricultural productivity
b) Ensure a fair standard of living for the agricultural community
c) Stabilise markets
d) Assure the availability of supplies
e) Ensure that supplies reach consumers at reasonable prices

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Development of the CAP

Productivity →

Competitiveness →

Sustainability

The Early Years	The Crisis Years	The McSharry Reform 1992	Agenda 2000	The Fischler Reform 2003	CAP Health Check 2008	CAP 2020	CAP 2020+
✗ Food security	✗ Over production	✗ Reduced surpluses	Deepening the reform process	Market orientation	✗ Reinforcing 2003 Reform	Viable food production	
Improving productivity	Exploding expenditure	Environment	Competitiveness	Consumer concerns	New challenges	Sustainable management of ✗ natural resources and climate action	
Market-stabilisation	International friction	Income stabilisation	✗ Rural development	Rural Development	Risk management	Balanced territorial development	
Product support	Structural measures	Budget stabilisation		✗ Environment			
				Simplification			
				WTO compatibility			

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Reform process: the main steps (1/2)

Mac Sharry reform in 1992

- cut in support prices
- full compensation for loss of income: direct payments
- accompanying measures

Agenda 2000

- further price cuts
- compensation for loss of income
- setting up the 2nd pillar: Rural Development

Reform process: the main steps (2/2)

Fischler Reform in 2003

- decoupled direct payments
- cross – compliance
- modulation
- more market-oriented agriculture

Health Check by Fischer Boel in 2008

- better targeting direct support to farmers
- better responding to market opportunities
- strengthen Rural Development to respond to new challenges

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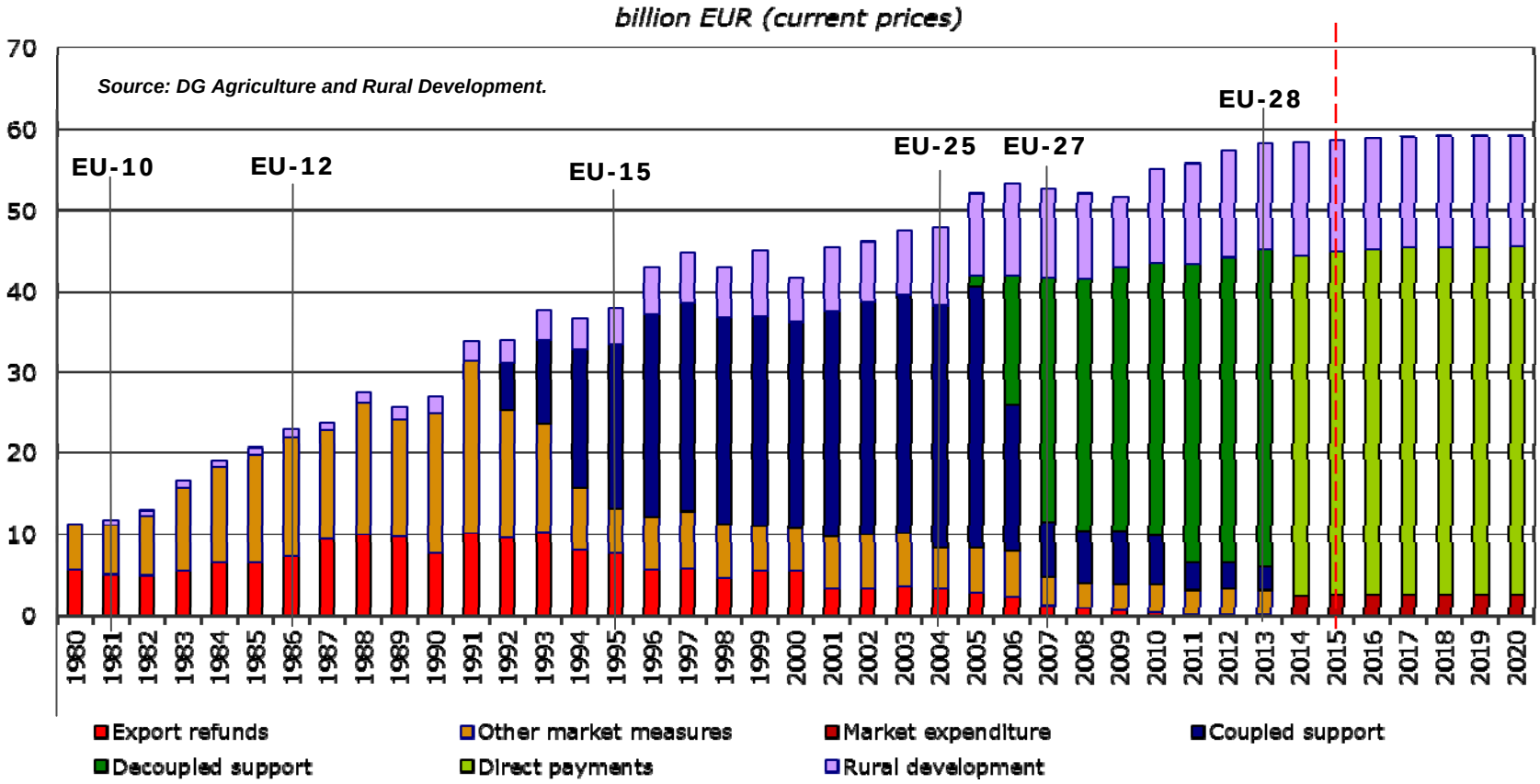
The path of CAP expenditure 1980-2020



CAP: 58 000 000 000 € / year

40 Billions Direct aids

14 Billions Rural development

Average 250 € direct aids / ha

8 millions EU farmers

Rural areas = 90% EU territory

50% farmed

CAP regularly 'up-dated' (Reforms)

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The Mac Sharry Reform in 1992

Objectives:

- Improve competitiveness
- Move away from product support towards producer support
- Stabilise markets, income and budget expenditure
- Diversify production
- Protect the environment

Measures taken:

- Support price cuts (-29% for cereals)
- Full compensation for loss of income: **direct payments to farmers ! Area payments and animal payments**
- **Compulsory set-aside**
- Accompanying measures **(agri-environment programmes,** afforestation, early retirement, diversification)

Consequences for the management and controls

- Direct payments to farmers: high number of farmers to check
- Need to have a database of farmers
- Area payments: cartographic tools are the basis of the system
- Animal payments: animal databases to use (basis, the veterinary legislation)
- Agri-environmental measures, set aside: introduction of qualitative elements to check

- **Setting up of an Integrated Administration and Control System (IACS)**

Consequences for the management and controls

- **In parallel, reflection on the MSs controls and supervision by the Commission**

- More responsibility put on MSs. They have to designate Paying Agencies responsible for the management and controls
- The Commission supervise MSs controls through audits (financial audits and conformity audits)
- Possibility to recover in the EU budget undue spendings trough "financial corrections"

- **Reform of the clearance of accounts**

The principles of the IACS

The **main elements** are:

- A system of management of aid applications and areas and animals declarations
- A system of identification and registration of animals
- A land parcel identification system (LPIS)
- A farmers register

In the initial regulation 1992, only the 2 first elements needs to be computerised (Database).

The LPIS become digital (IACS GIS) only in 2000 Regulation.

The body in charge of controls and payments is the formally established Paying Agency.

The principles of the IACS

The **main elements** are (1/2):

- Checks of farms are based on administrative checks and on-the-spot checks (OTSC)
- Administrative checks (100%) are perform between all claims and reference databases
- An annual minimum rate of OTSC (5%, ...) checks must be carried out ; this rate must be increased if the number of infringements is too high
- The selection of the sample includes both a random sampling (20-25% of the sample) and a risk analysis

The principles of the IACS

The **main elements** are (2/2):

- Detailed control reports are established
- The Paying Agency decides on the payments (incl. possible sanction) on the basis of the control reports
- Payments are calculated and made after all on-the-spot checks are carried out

Agenda 2000

Objectives:

- Improve competitiveness
- Rural Development Policy
- Facilitate the enlargement of the EU
- Consistant move towards sustainability

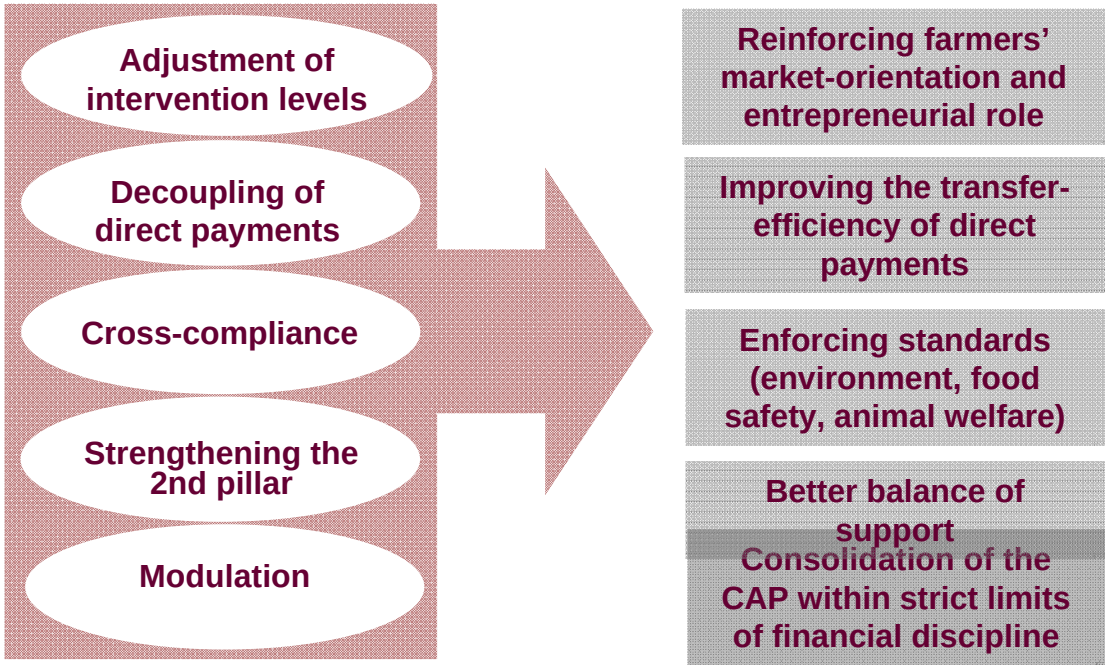
Measures taken:

- Further price cuts
- Partial compensation = more focus on direct payments
- New rural development policy: **Second Pillar of the CAP**

Consequences for the management and controls

- Basic principles of the IACS are still valid !
- More focus on direct coupled payments: the IACS becomes even more relevant for controling the CAP budget.
- The setting up of a real Rural Development policy raises control questions: the main expenditure is based on area measures (AEM, LFA, etc) where the IACS has an important role to play.
- Notion of "IACS compatible measures".

The Fischler Reform in 2003



Consequences for the management and controls

- Basic principles of the IACS are even more valid !
- The introduction of decoupled payments (Single Payment Scheme) entails the need for a database of entitlements
- Less onus put on land use (less coupled payments)
- More onus put on land parcelling and land cover. 3 categories of agricultural areas: arable land, permanent pastures and permanent crops. The LPIS gains importance in the system.
- Agricultural land remains eligible even not in production but must be kept in GAEC: new challenges in term of controls !
- The qualitative elements of the areas gain importance: cross compliance, AEM, art 69 measures, etc

- *2004- 2007 The enlargement of EU to 25 then 27 MS leads to a number of specific adaptations (SAPS, ...)*

The CAP Health Check in 2008

Fine-tune the 2003 CAP reform during the 2009-2012 period:

- Better targets direct support to farmers (flexibility, **art 68**, etc.)
- Responds to market opportunities and price crises by removing supply controls (**abolition set aside**, more decoupling, phasing out milk quotas, etc.)
- Strengthens Rural Development to respond to new challenges (increased modulation, targeting, etc.)
- Simplifies cross compliance (scope, controls, etc)

Consequences for the management and controls

- New challenges introduced by the 2003 Reform remain.
- The IACS now covers more than 85% of EAGF and more than 70% of EAFRD
- The Court of Auditors has said in 2007 that "*IACS, where properly applied, is an effective control system for limiting the risk of error or irregular expenditure*"
- The IACS therefore plays an important role in the implementation of the CAP budget (annual assurance that the CoA gives and discharge given by the budgetary authority –EP and Council).

The CAP today

A substantially reformed policy…

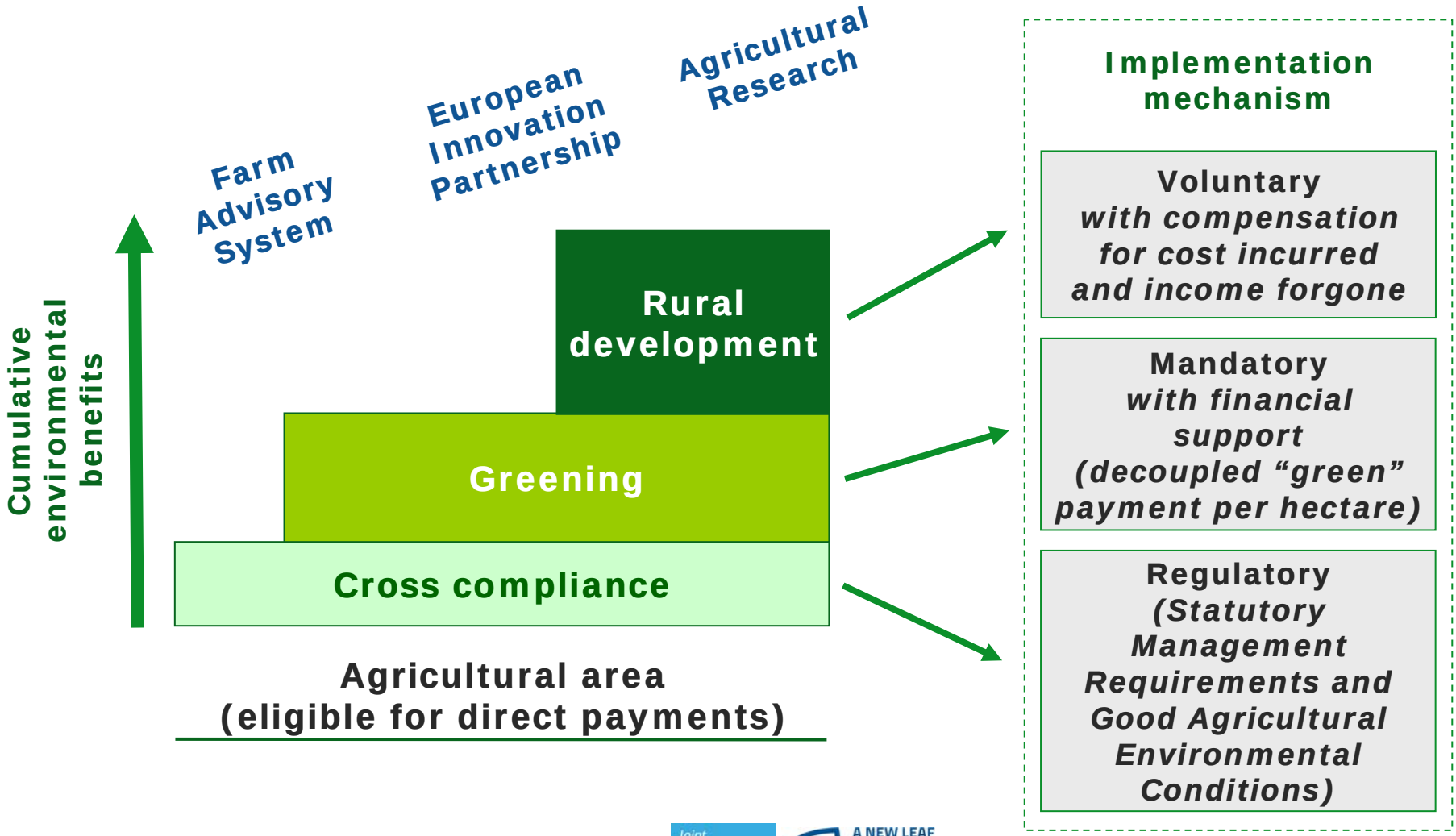
- Structured in two complementary pillars
- Farm support mainly decoupled and subject to cross-compliance
- Role of market intervention mechanisms significantly reduced to safety net level
- Rural development policy strengthened with funds and new policy instruments

… better performing…

- Surpluses belong to the past
- Competitiveness improved
- Improved transfer efficiency
- More sustainable farming
- Integrated approach for rural areas
- Contribution to EU budget stability

… and resulting in a territorial and environmentally balanced EU agriculture

The new greening architecture of the CAP



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New CROSS COMPLIANCE

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PAYMENTS

Direct payments **:**

- **Basic payment**
- **Green payment**
- **Less-favoured areas**
- **Young farmers**
- **All coupled direct payments**

Rural development**:**

- **Agri-environment and organic farming**
- **Forest-environment**
- **Less-favoured areas**
- **Natura 2000 payments**
- **Water Framework Directive payments**
- **Animal welfare payments**
- **Afforestation**

Wine **:**

- **Restructuration**
- **Green harvesting**

RULES

Statutory Management Requirements (13 SMR)

- **Birds and Habitats Directives**
- **Nitrates Directive**
- **Animal Identification & Registration**
- **Pesticides authorisation Regulation**
- **Hormones ban Directive**
- **General Food Law**
- **Notification of diseases (1 act)**
- **Animal welfare (3 acts)**

Good Agricultural and Environmental Conditions (GAEC): 7 standards

1. **Buffer strips along water courses**
2. **Authorisation of water use for irrigation**
3. **Groundwater protection**
4. **Minimum soil cover**
5. **Minimum land management**
6. **Maintenance of soil organic matter**
7. **Retention of landscape features**

- **Sustainable Use of pesticides Directive**
- **Greening and land maintenance**
- **Certain RD measures**

+ Voluntary measures

FARM ADVISORY SYSTEM (after)

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New design of direct payments (1)

In 2015, EU farmers would have access to:

Compulsory schemes *(all MS):*

- Basic payment scheme
- 'Green' payment*
- Young farmers scheme

(+)

Voluntary schemes *(MS choice):*

- Coupled support
- Support in natural constraint areas
- Redistributive payment

All payments subject to cross compliance

All farmers will have access to the Farm Advisory System

OR

A simplified scheme for small farmers *(voluntary for MS)*

Exemption from Cross Compliances rules for "small farmers" under simplified scheme

** Payment for agricultural practices beneficial to climate change and the environment*

New design of direct payments (2)

Capping voluntary for the MS
Degressivity of 5% over 150 000 €

Cross compliance
- Streamlined – Climate change

Coupled support

- Wide range of sectors
- Up to 8% (or to 13% depending on past level) of DP envelope, +2% for protein crops

Natural constraint support

- For areas with natural constraints – or part of them
- Up to 5% of the DP envelope

Young Farmer Scheme

- Up to 2% of DP envelope
- < 40 years commencing activity
- +25% (/payment entitlements)
- For 5 years

«Green» Payment

- Crop diversification
- Permanent grassland
- Ecological focus area
- 30% of the DP envelope
- Thresholds & exemptions
- Equivalence

Basic Payment Scheme

- New BPS entitlements in 2015
- SAPS extended until 2020 (EU-10)
- Internal convergence / derogation with external convergence model to reach more similar levels per ha (min. 60% of average within a region/country by 2019)
- Voluntary redistributive payment (+max.65% on max. 30 ha or national average size ; max. 30% of DP envelope).
- Definition of 'active farmer'

OR

Small Farmer Scheme

- Simplification of claims and controls
- Lump sum payment to be determined by MS under conditions [500 to 1250 €]
- Entrance in 2015
- Up to 10% of the DP envelope

The green direct payment

30% of the direct payment envelope for applying three basic practices :

- Maintaining **permanent grassland**

✓ ban on ploughing in designated areas
✓ national/regional ratio with 5% flexibility

- **Crop diversification**

✓ at least 2 crops when the arable land of a holding exceeds 10 hectares
✓ at least 3 crops when the arable land of a holding exceeds 30 hectares
✓ the main crop may cover at most 75% of arable land, and the two main crops a maximum of 95% of the arable area

- Maintaining an **"ecological focus area"** of at least 5% of the arable area of the holding

✓ only applicable for farms with more than 15 hectares arable land.
✓ figure to rise to 7% after a Commission report in 2017 & a legislative proposal
✓ EFAs may include: field margins, buffer strips, fallow land, landscape features, afforested area, terraces, areas with catch crops, green cover and nitrogen fixing crops, short rotation coppices, agro-forestry, strips of land along forest edges

Equivalence: MS can decide that, instead of applying these three practices, a farmer can undertake practices which are considered equivalent (e.g. crop rotation instead of crop diversification).

Part 2 : Innovation impact

- **What does mean innovation ?**
- **Looking 20 years back**
- **Which criteria to assess a successful IACS innovation?**
- **What have been the enabling conditions for such innovation process ?**
- **Conclusions**

Innovation ?

Is sometimes used to characterize a novel idea or product

Is not invention, which refers to the creation of the idea, method or product itself.

When Innovation refers to the use of a novel idea, method or product.

Innovation is more the notion of doing something different or differently (Lat. in-novare) rather than doing the same thing better.

Luecke and Katz (2003), considers that

- *"Innovation . . . is generally understood as the successful introduction of a new thing or method . . . Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services"*

Innovation as a process…

i.e. the fact of diffusing novelty in real life, so that it become finally normal use / practice.

If all innovation begins with creative ideas or inventions from Research and development …. The innovation itself is the successful implementation of these creative ideas within an organization or an given activity.

In this view, research is a necessary starting point for innovation, but not sufficient condition for it …

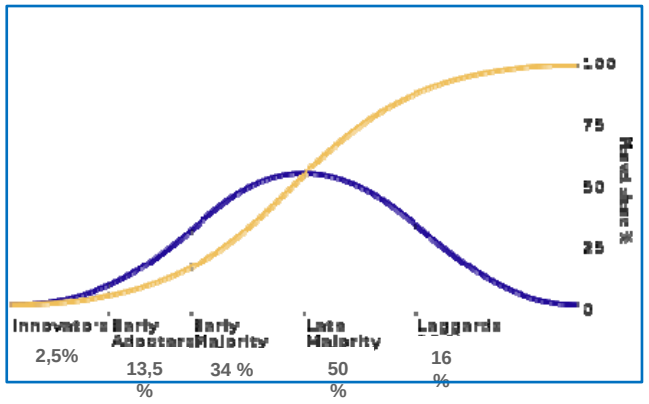
Research → Invention → innovation

Innovation as a process…

«Individuals» progress through 5 stages: **knowledge, persuasion, decision, implementation, and confirmation**

(E. Rogers, 1962 Diffusion of Innovations)

An S-curve describing the innovation process



4 main factor influencing this diffusion process:

- **The innovation itself** (new product)
- **The time / rate of adoption**;
- **The Communication channels**,
- **and a "social system".**

Social system : ***"a set of inter-related units that are engaged in joint problem solving to accomplish a common goal".***

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Innovation is a slow and complex process …

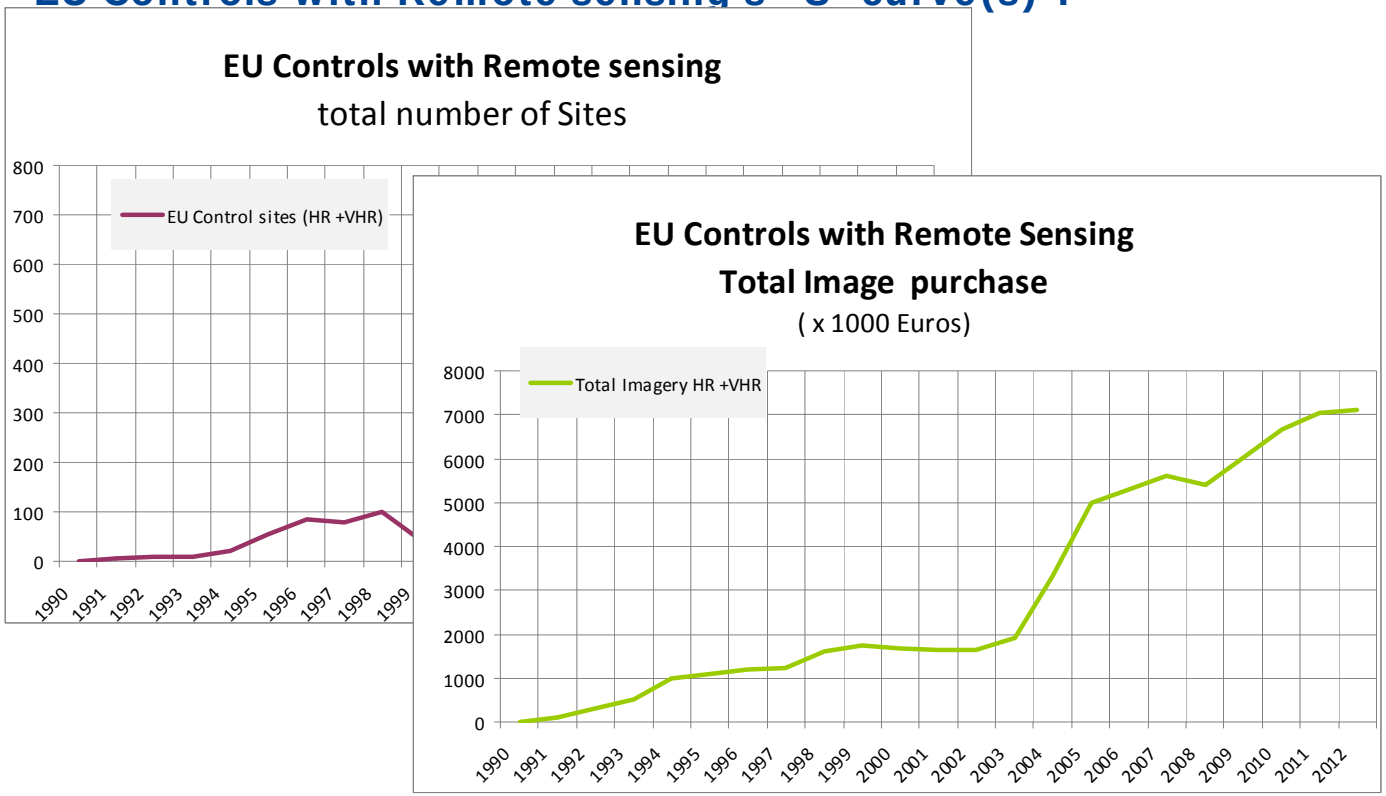
involving many human factors and enabling conditions

The interest of looking 20 years back

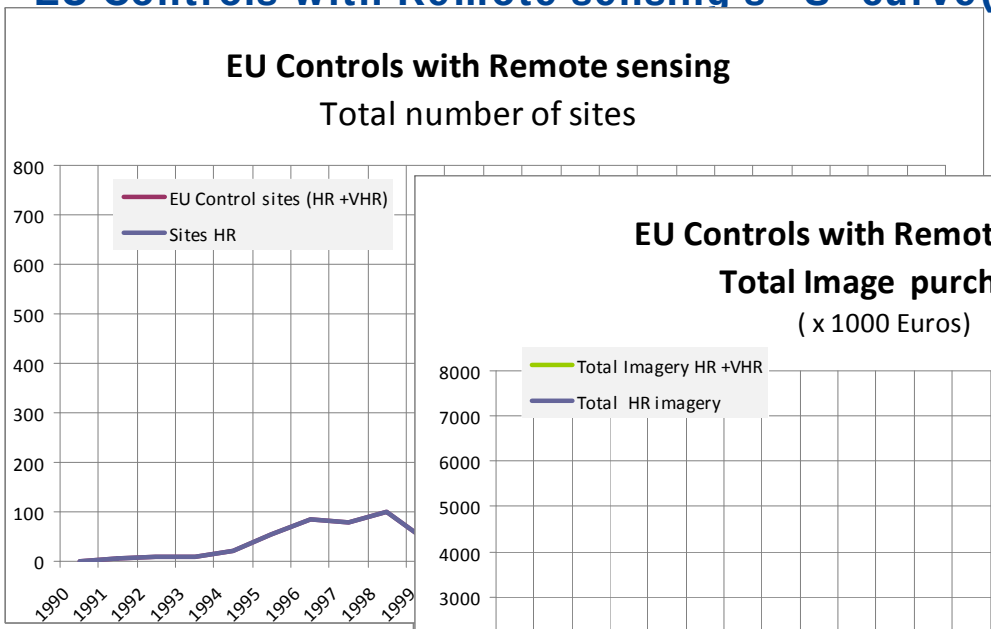
- to measure the dramatic changes introduced in the management and control of the CAP
- to identify these enabling conditions & environment…
  - Controls with Remote sensing
  - Use of GPS in field measurement
  - Land parcel identification Systems

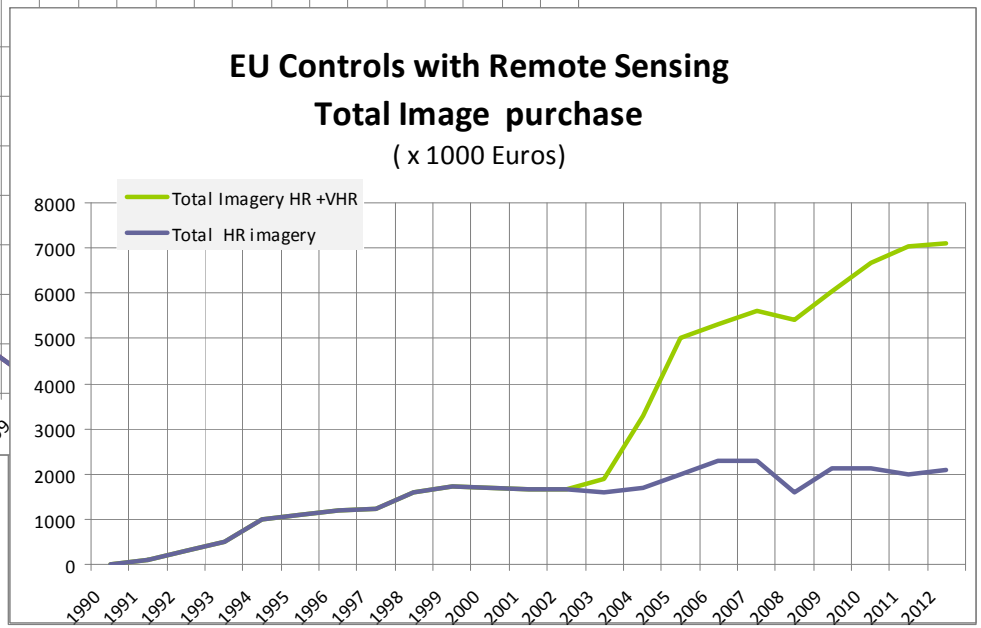
A question in such exercise is to replace a specific innovation added value in a broader context of evolution technology …

EU Controls with Remote sensing's S- curve(s) ?



EU Controls with Remote sensing's S- curve(s) ?





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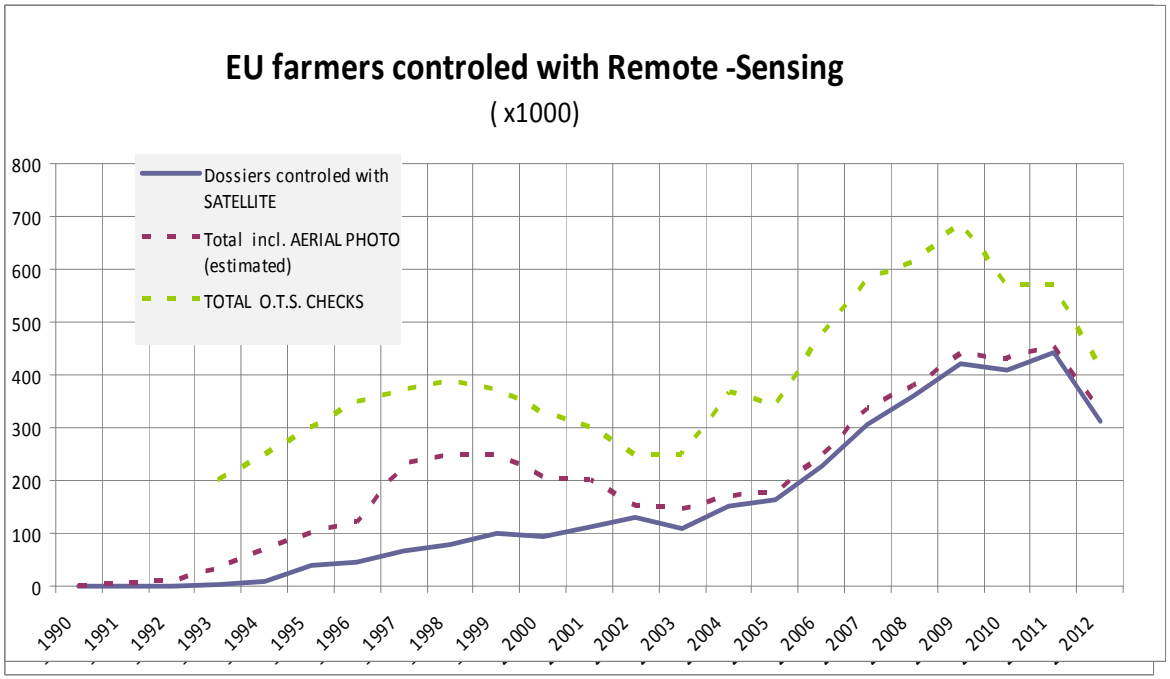
EU Controls with Remote sensing's S- curve(s) ?



21 November 2012

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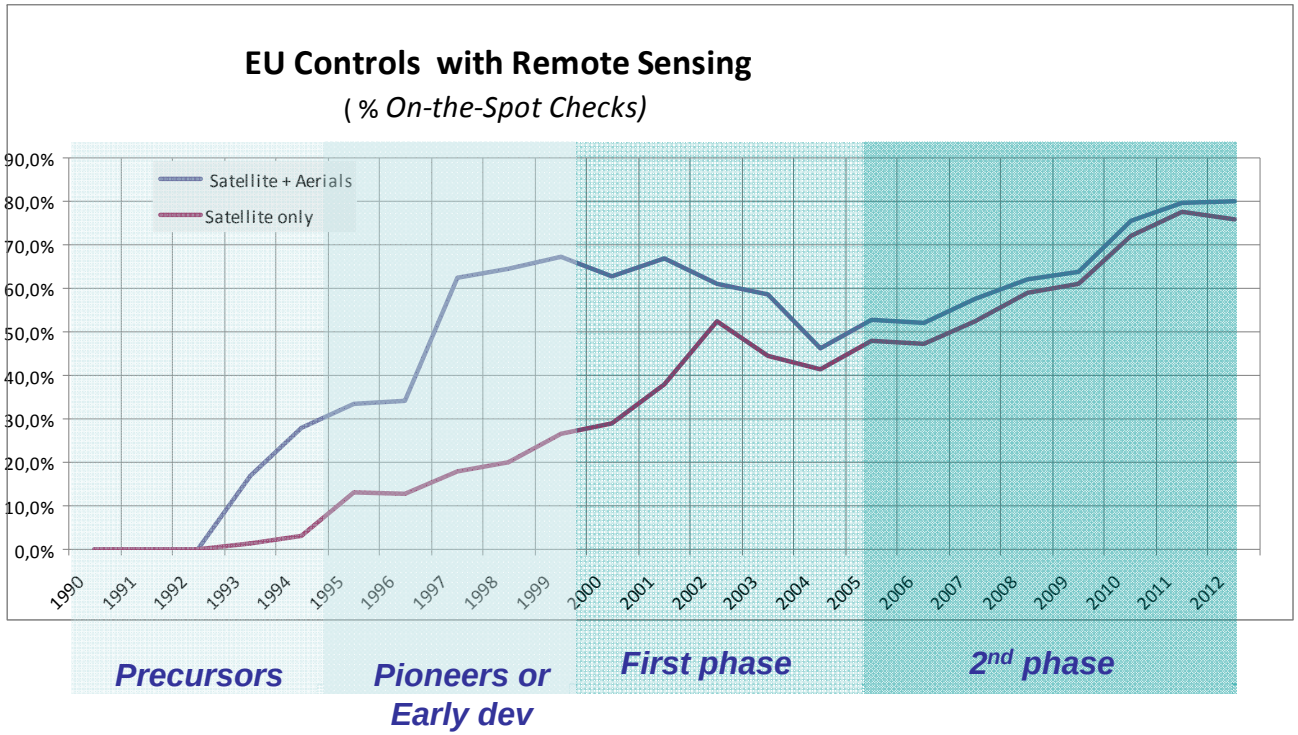
EU Controls with Remote sensing's S- curve(s)



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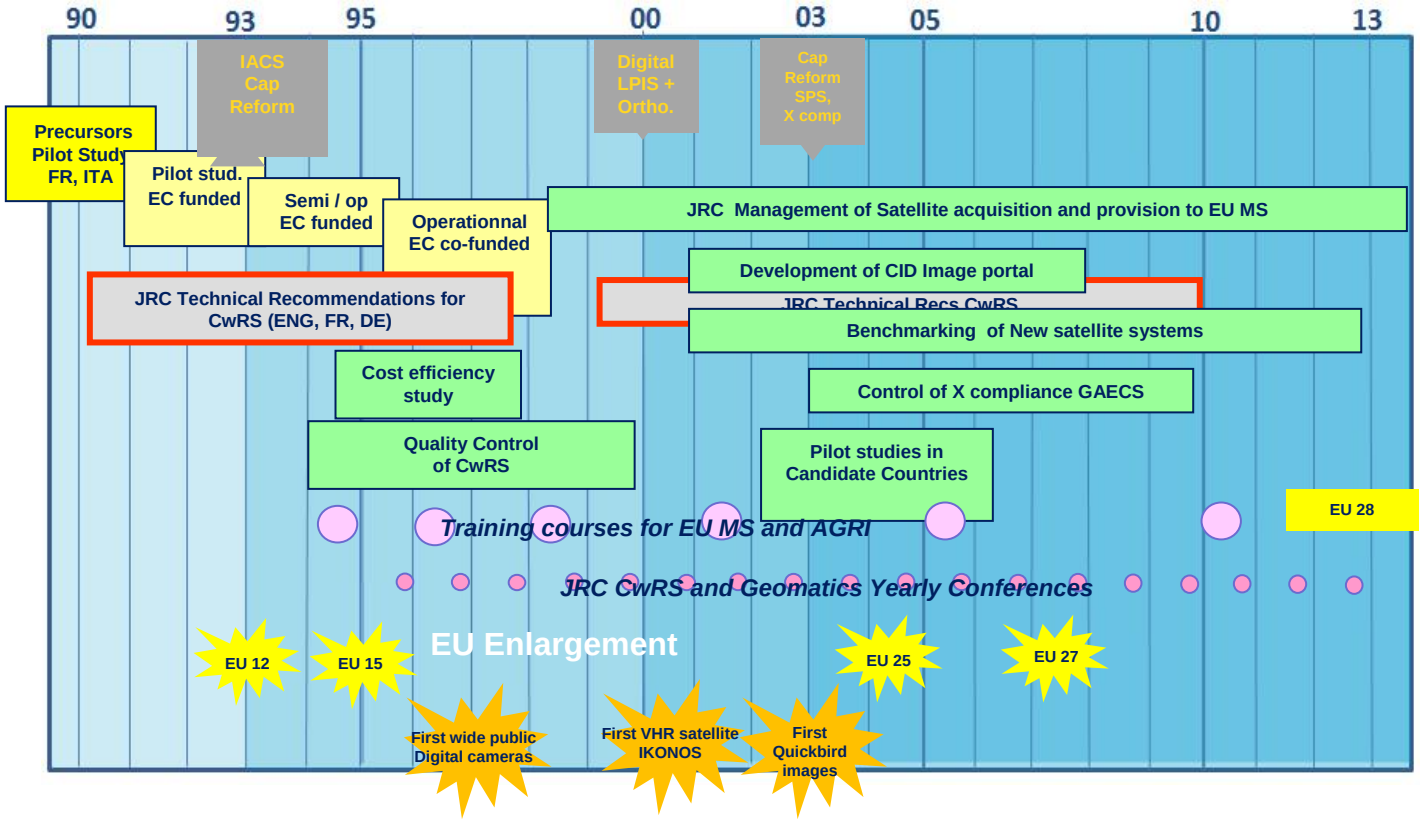
20 years of Controls with Remote Sensing (CwRS)



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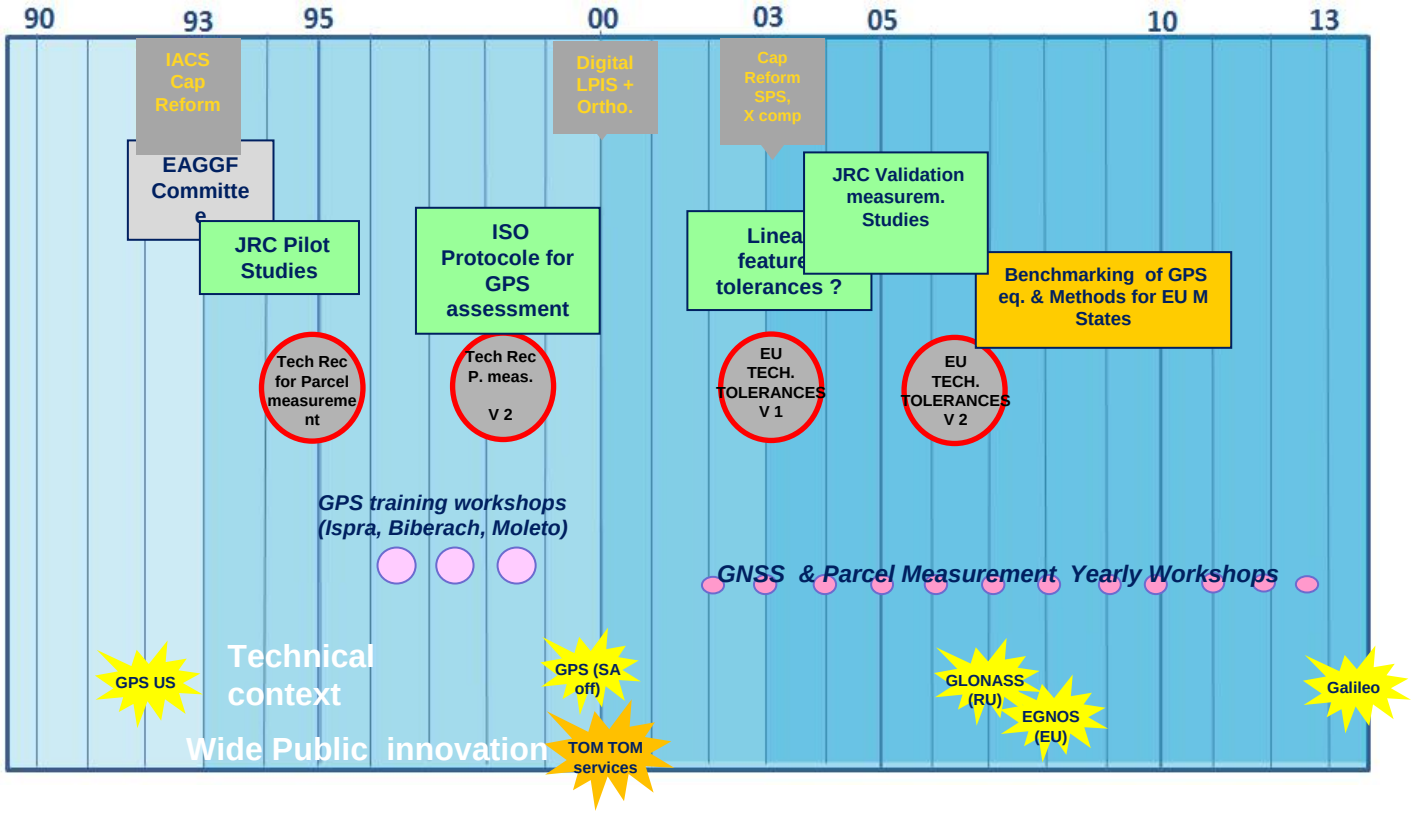
20 years use of GNSS in field measurements



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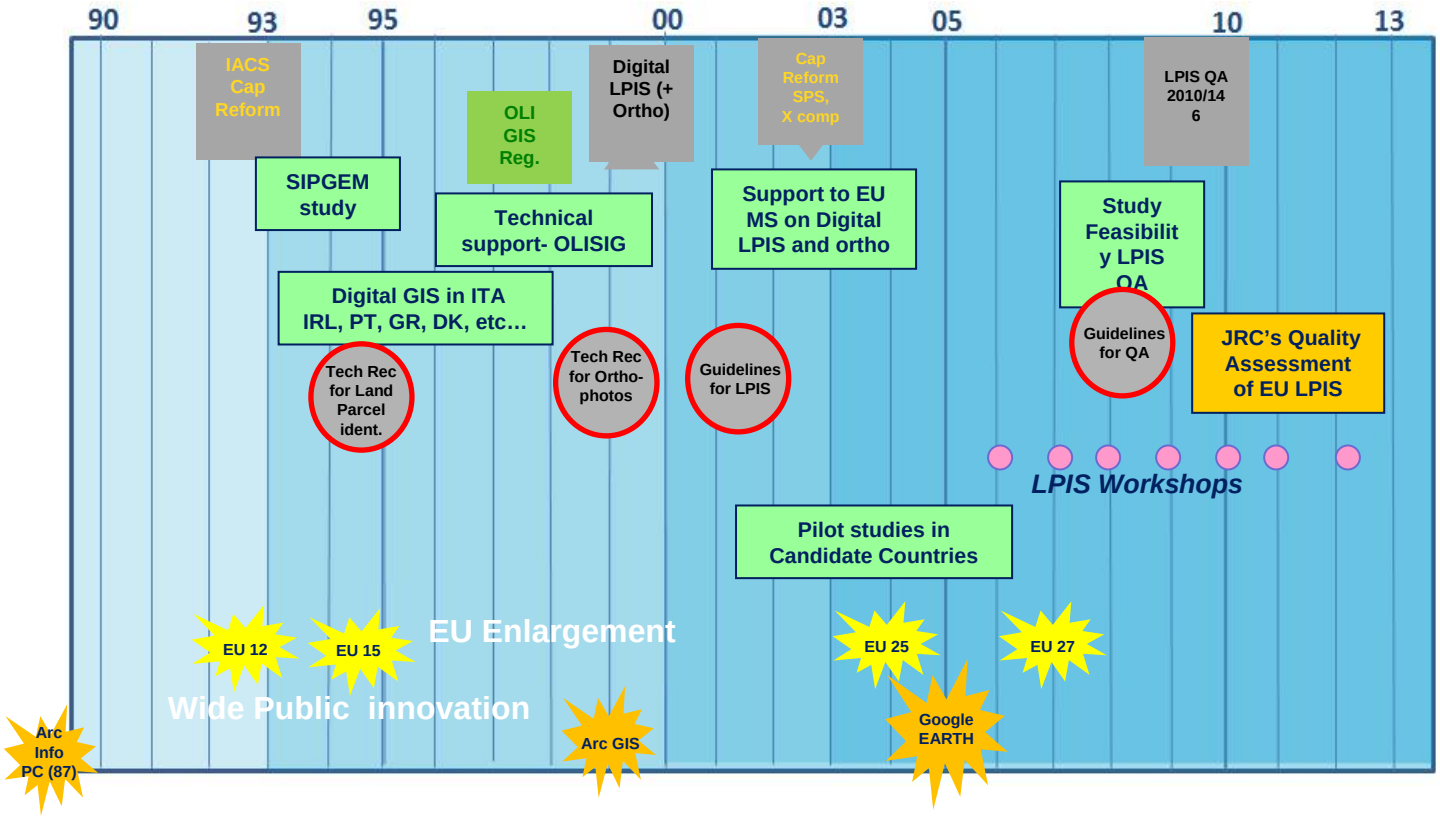
20 years of Land parcel identification Systems



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Overall outcome of IACS innovation

The EU On-the-Spot Checks are made with RS for 75 % of the dossiers (slightly more in area) and 24 EU MS over 28 uses CWRS

Similarly 28 EU MS / 28 use GPS for field measurement with the guidelines and recommendations developed by JRC

Digital LPIS are available in all EU MS, based or combining recent Ortho-imagery; implemented by Candidate Countries at accession!

Which criteria to measure a successful but also useful innovation?

Remote sensing, Digital LPIS and GPS are fully part of IACS management and control

- ***Part of the Acquis Communautaire for Candidates Countries***

Not only a technological push

- **Overall improvement of efficiency**

Cf Court of Auditors Statement on IACS

- **So, "What if" no support by EC JRC and AGRI ?**

I.e. no anticipation of technological evolution, co-funding, technical support and recommendations…

We would have lost between 7 and 10 years?But have also clearly a 2-speed Europe !

A useful innovation…

More efficient management by IACS Admin.

- *Digital LPIS / / Paper cadaster*
- *Pre-printed maps and info for farmers*
- *Efficient cross checks - focus on doubtful cases / possibility of "rapid field inspections" …*

Easiest declaration by Farmers

- *On line declaration or consultation*

Clearer rules and suitable measurement methods

- *Tech. tolerances fully coherent between methods (Remote sensing / /Field)*
- *Methods also accessible for farmers (GPS) …*

A useful innovation…

More transparency & trust between EU MS

- *Cf Olive-tree sector*
- *Recent Ortho-photos*
- *Digital LPIS - Quality Assessment …*

Increasing homogeneity between EU MS

- *Common recommendations, EU Standards, technical tolerances*
- *Systems implemented in 2-3 years by candidates Countries*

Some of “human” factors

Need to find appropriate concepts and vocabulary
to reach common under-standing (multi-cultural context)

Need to bridge between chapels (typically between EO and Photogrammetry)

Keeping synergies and respect clear mandate between actors in Policy, Support, Audit

Dealing with lobbies… Cadastre, Land surveyors, Space industry, Aerial photo companies…

Answering to questions from Parlementary, Court of Auditors…

Many future Challenges

- Cross compliance, Greening of the CAP
- Agri-environment and farm level indicators
- Impact monitoring….

We will need a lot of creativity and innovation

- **Taking advantage of existing experience**
- **using the principles which allowed IACS success**
- **Possible interest of new techniques (UAV)**

In Summary:

Be proud of the past…

and brave for the future !

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Part 3A - IACS-GIS (Land Parcel Identification System - LPIS)

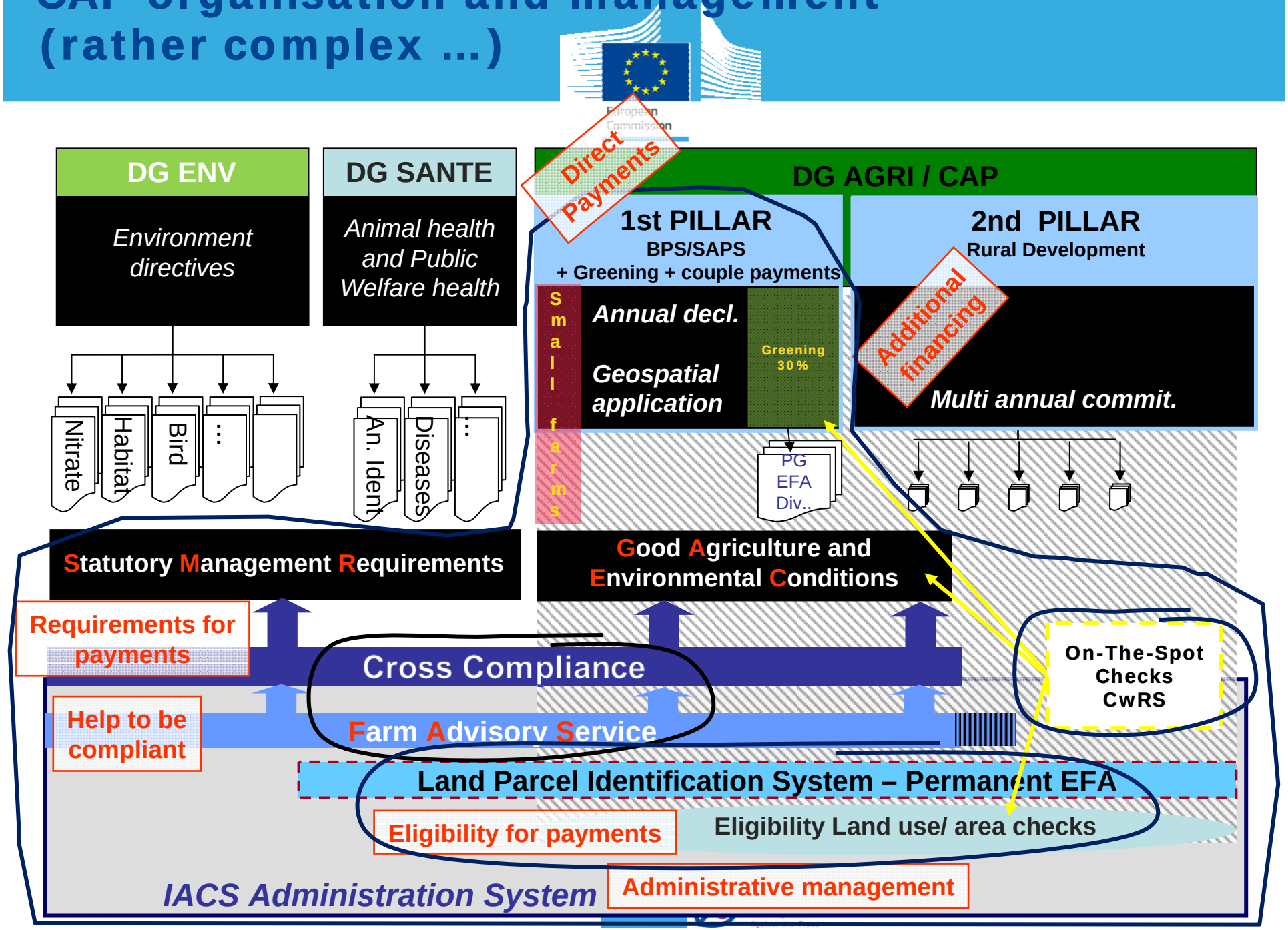
2004

- LPIS shall hold:
  1. A **stable identification of land cover and/or use** units (i.e. the basis for eligibility for any scheme):
  2. The "**eligible hectares**" value for area aids, originally delineated (vectorised) by survey compatible with 1:10,000 scale or better, and subsequently updated by the various IACS processes

- LPIS is a spatial database that permits (spatial and alphanumeric) queries and data retrieval operations in function of the farmer aid application and administrative cross checks

- LPIS ≡ **the single GIS** for IACS

CAP organisation and management (rather complex …)



Reference vs agricultural parcel

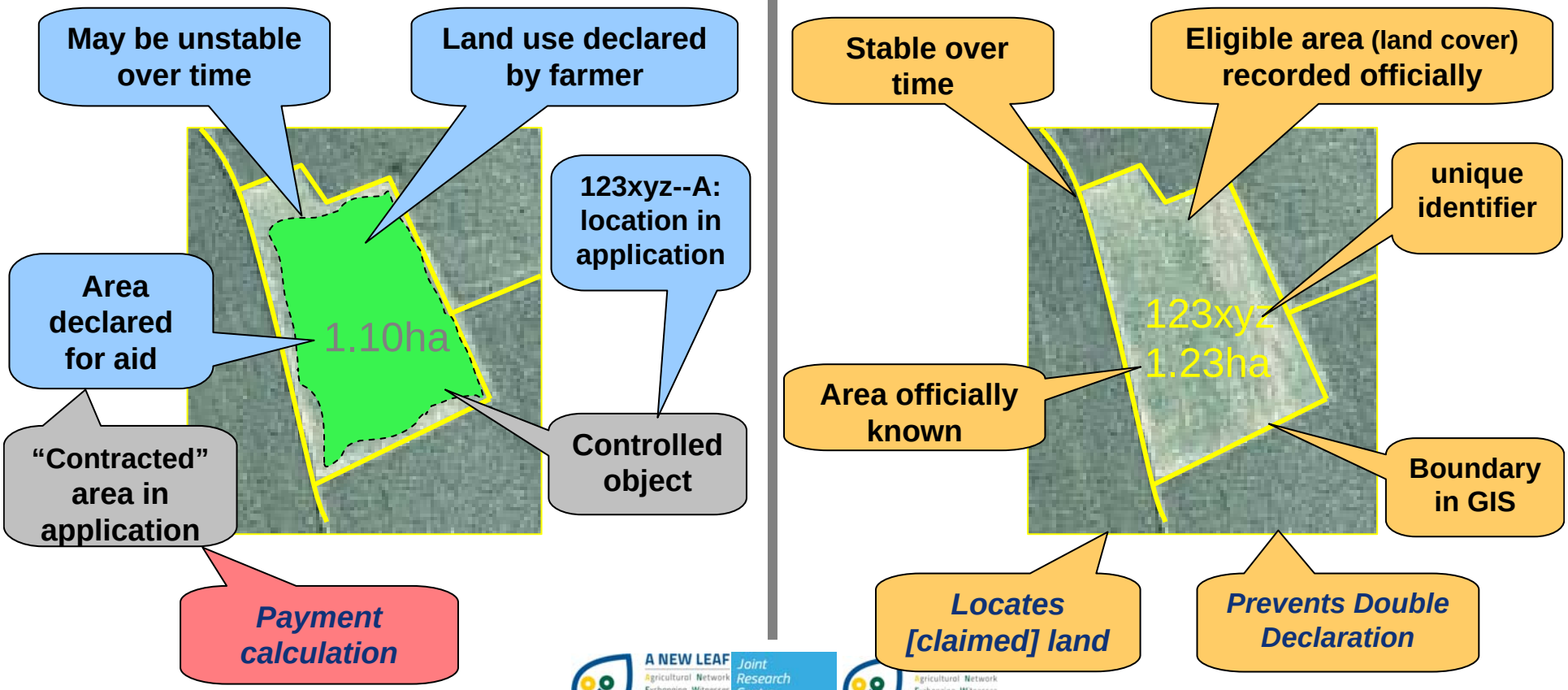
Agricultural Parcel
unit of payment and inspection

farmer and inspectors

REFERS TO

LPIS Reference Parcel
unit of administration and control

LPIS custodian



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Defining “parcel” of LPIS

“The identification system for agricultural parcels shall be established on the basis of maps or land registry documents or other cartographic references. Use shall be made of GIS techniques, including preferably orthoimagery, ..” Council Regulation 2009/73 - Article 17

source subdivided by	**existing map/** document	**exclusive ortho-image**
physical boundary	Topographic block [≈ “City” block]	Physical block
Person (land user)	Cadastral parcel	Farmer’s block
land use (crop group per user)		Agricultural Parcel
	➔ 2 layer system separate eligibility	➔ single layer, 100% “production block”

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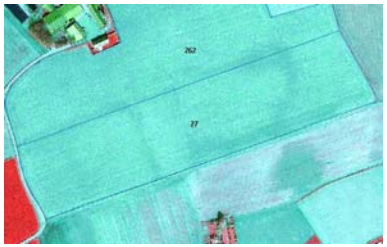
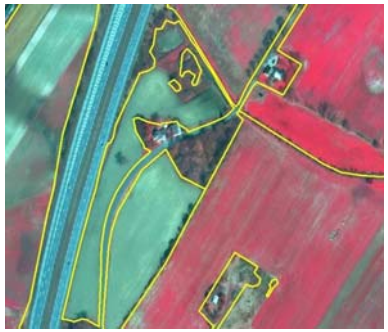
Consequences





RP	= Agricultural parcel (spatial)	< Farmer 's block / ilot	< Physical block	Cadastral / topo parcel
content / coverage	one single crop group or even "crop"	ideally one crop group	one or more crop groups	agricultural and non-agriculture
applicants	single farmer	single farmer	one or more farmers	often single farmer
temporal aspect	annual	multi-annual	semi-permanent	permanent
author	farmer	farmer	administration	3rd party
dominant perimeter	land use	land use	land cover	land tenure

CAP reform new requirements for LPIS

The new CAP regulations (R 1305/2013, 1306/2013, 1307/2013 and the related delegated and implementing acts) set new requirements for the LPIS component too. In order to support its implementation, DG JRC has prepared a set of technical guidelines:

- Assessing pro-rata eligibility
- LPIS core model and eligibility profile development
- LPIS upkeep
- LPIS quality assessment

LPIS Upkeep

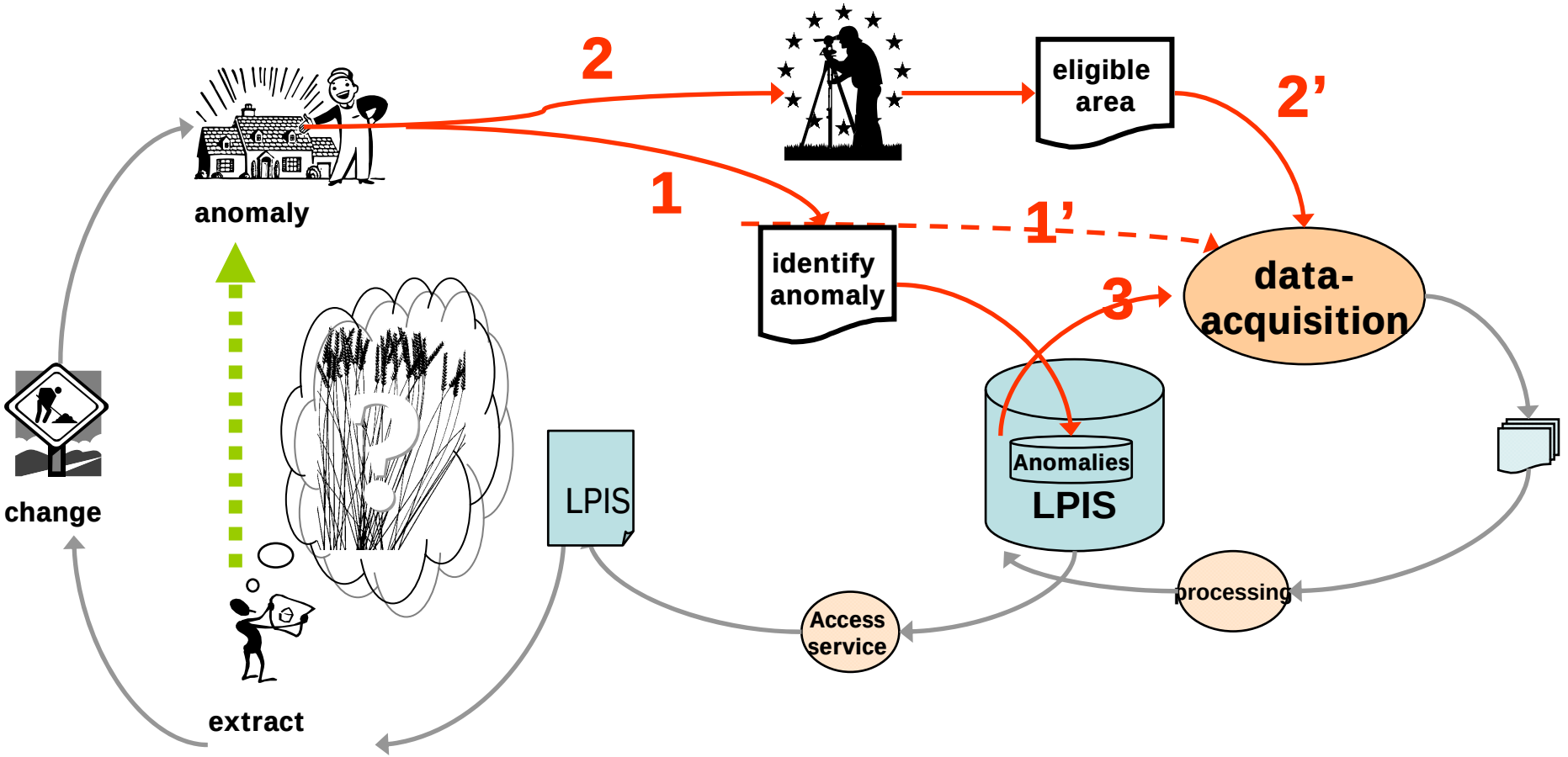
LPIS Upkeep aims at maintaining an information system that fully responds to the requirements and that hosts current and correct data. It is well elaborated for two major processes – upgrade and update, and the related quality assessment procedures (LPISQA). Update is triggered by anomalies and results in the correction of the recorded data.

In order to arrive to a reliable categorisation and monitoring of the anomalies, a common processing methodology is needed. The methodology proposed in the LPIS update use case describes the detection of changes, the surveys and measurements to be applied, and the decision criterion (2% stability threshold) whether data update is necessary. The resulting effectiveness of LPIS update is assessed by the Member States performing the yearly Executive Test Suite (ETS) on data.

LPIS Update

European Commission

e.g. farm land converted to building



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LPIS QA

The quality assurance framework of LPIS is an integral part of LPIS management and upkeep processes. In this framework, the LPIS of a MS/Region is regarded as a system under test (SUT), which is composed of two major components: the local application schema (eligibility profile) and the data records stored in the system. The so called Executive test suite (ETS) targets at the data component by annually assessing conformity according to Article 6 of Regulation 640/2014.

Why to deal with LPIS QA?

European Commission

LPIS quality assessment

Target: well functioning LPIS

1. good localisation
2. correct quantification of eligible area
3. facilitates operations by farmer, inspector and paying agency,

➔ a better performance, a higher efficiency

- a reduction of inspections
- lower IACS operating costs for the member states.

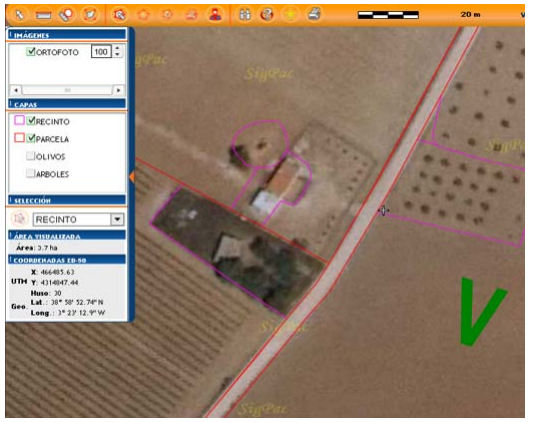
➔substantially reduced risks for the EU Funds

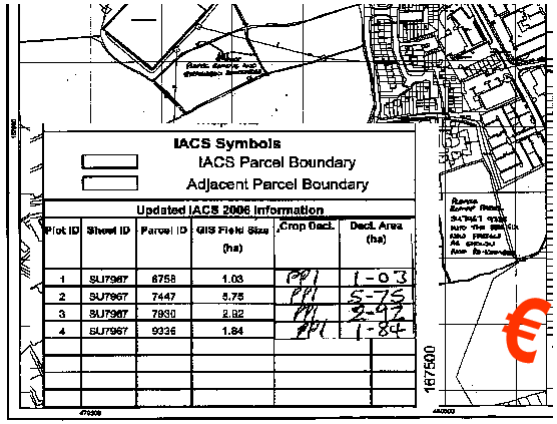
Output: reliable quality report with

1. comparison between MS
2. a pan-European overview

Use: basis for

1. planning remediate actions by the MS
2. considerations about the effect of weaknesses found





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LPIS quality assurance framework

Combines minimized workload for the MS
with assurance of reliability and representativeness

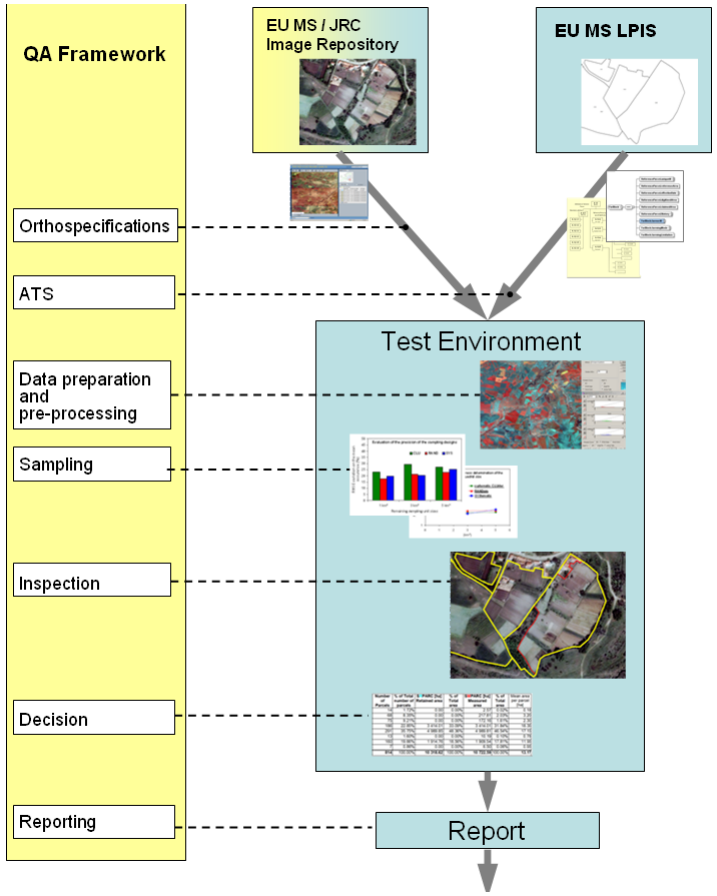
Through shared management of the inspection procedures

The EC (JRC) provides:

1. Detailed common documentation
2. Sampling
3. High quality reference imagery
4. Automatic and manual screening

The MS does the actual inspection, assessment and analysis

>0.1% of the RP is sampled >< > 5% of farmer applications is (OTSC)



CAPI inspection

Agricultural lands are measured

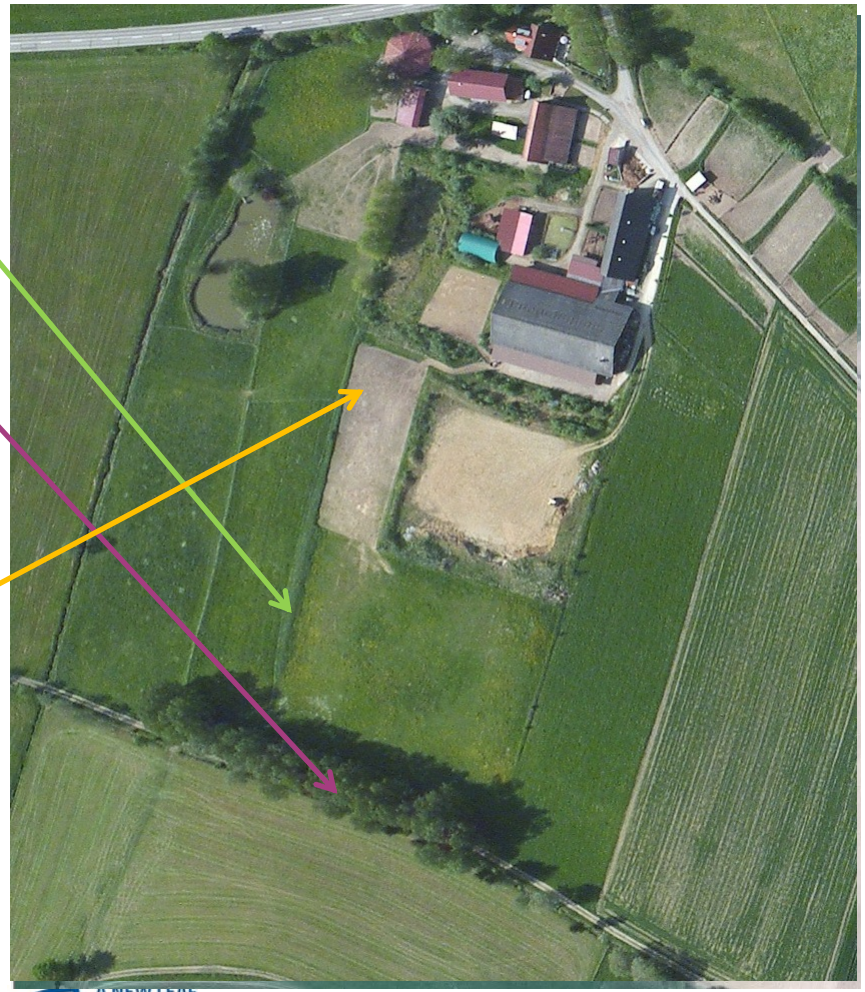
Grassland (G): Agriculture land polygon area = 9414m²

Hedge (BR):Landscape Feature polygon Area = 317m²

Non agricultural areas are counted

Natural Bare Areas

CAPI benefits from crosschecking (2009 Bing imagery)



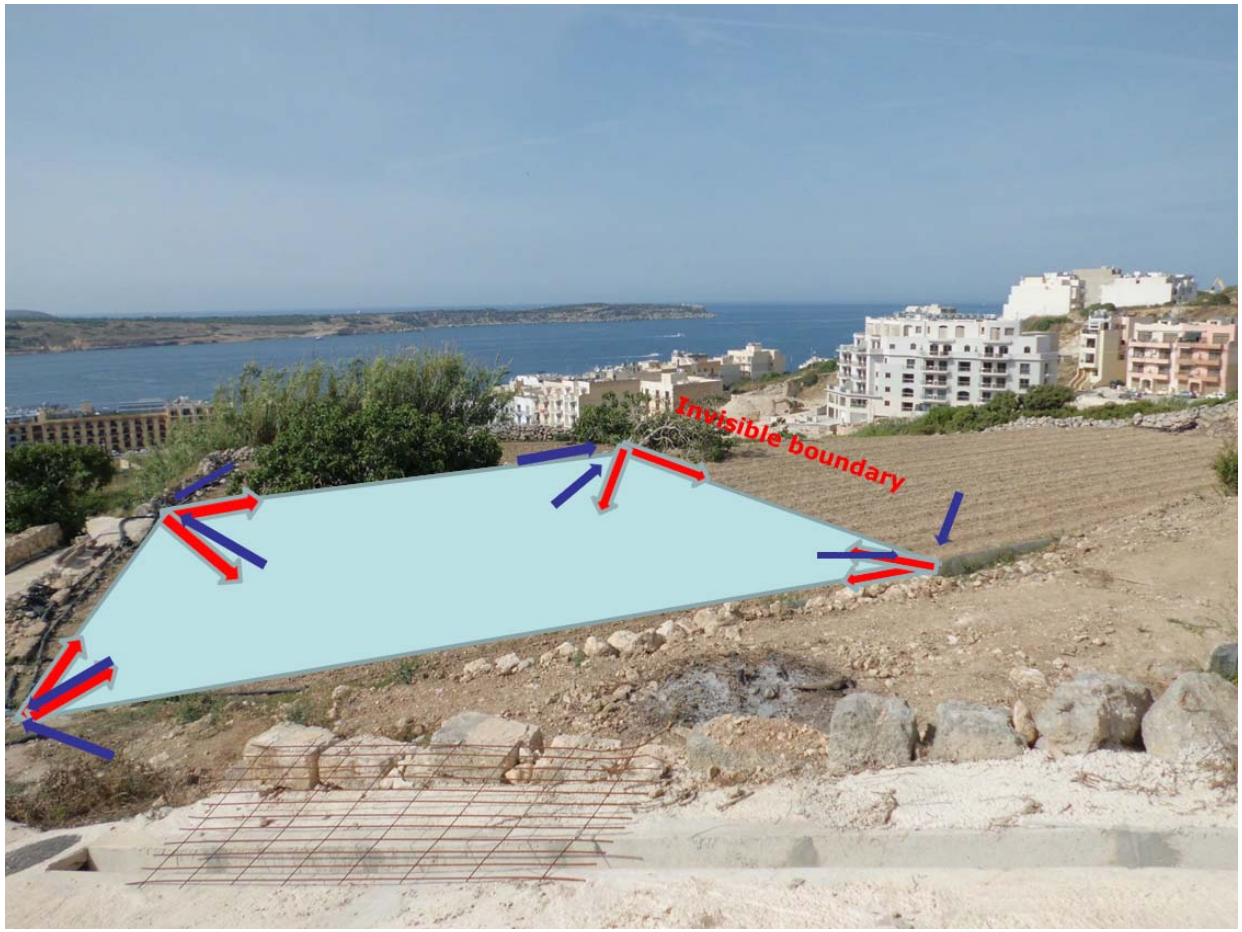
ETS 2011 delineation performed by the MS

Field inspection

Alternative to CAPI

GNSS vertices":
2 pics of field
2 pics of vertex

Labour intensive



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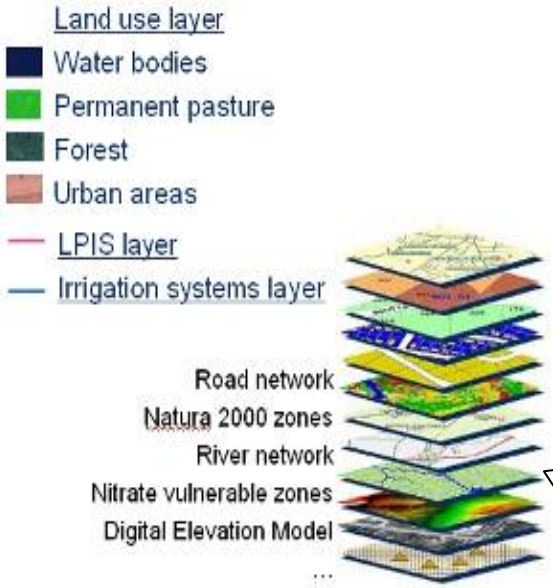
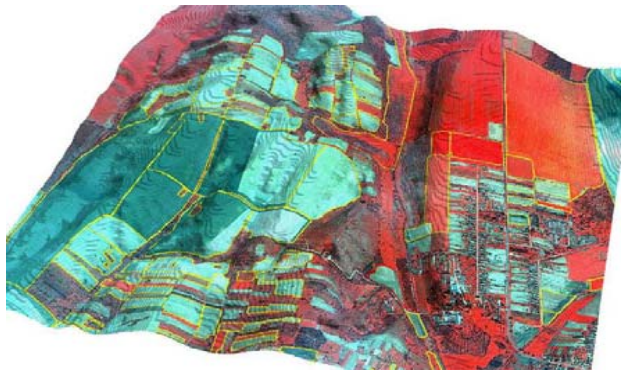
Possible evolution of LPIS?

LPIS + **Satellite imagery** + additional GIS layers (Digital Elevation Model, …)

Location of: Parcels in vulnerable zones, rivers and green cover buffer, features ..

Taking benefit of INSPIRE directive





3D view of rural landscape

Most of themes derived from geospatial data

Provide relevant **information** to farmers (digital, paper)
Increase awareness on Cross Compliance (**Advice**: FAS)
Reduce risk of infringements
Evaluate & monitor CAP impact on natural resources

Sound management of rural areas (LPIS as cornerstone)

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Part 3B : OTSC

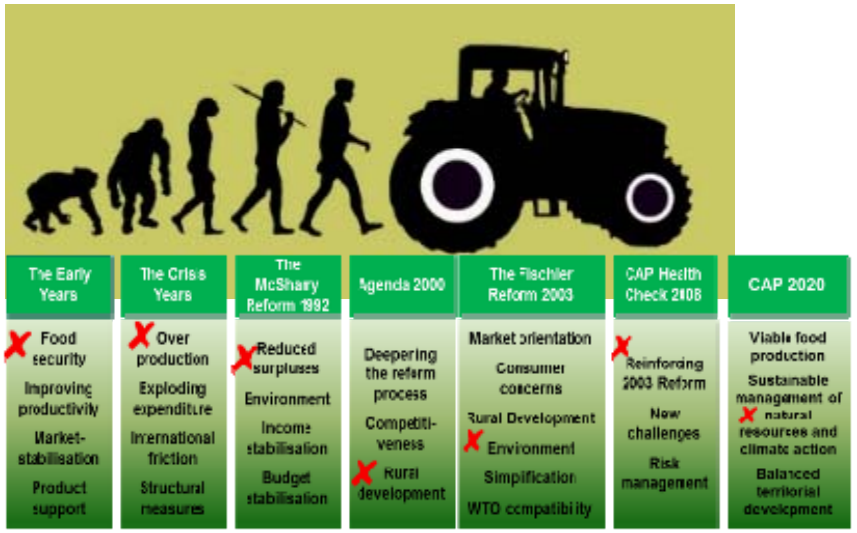
Control campaign steps

1. Selection of control sample
2. Selection of control method
3. Reporting
4. Feedback and corrective actions
5. DG AGRI Audits
6. CoA Audits

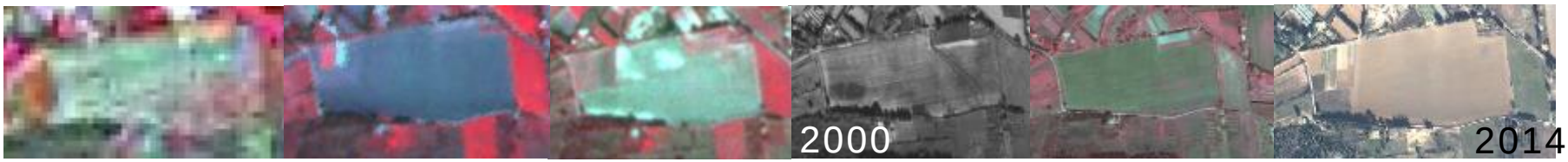
On-The-Spot checks

Objectives: check <u>all conditions</u> for which aid is granted

But <u>conditions</u> constantly <u>evolve</u>



Technology is also evolving



GSD 14,5m GSD 8m GSD 6,5m GSD 1m GSD 0,6m GSD 0,5m

→ OTS checks methods constantly need update if not upgrade

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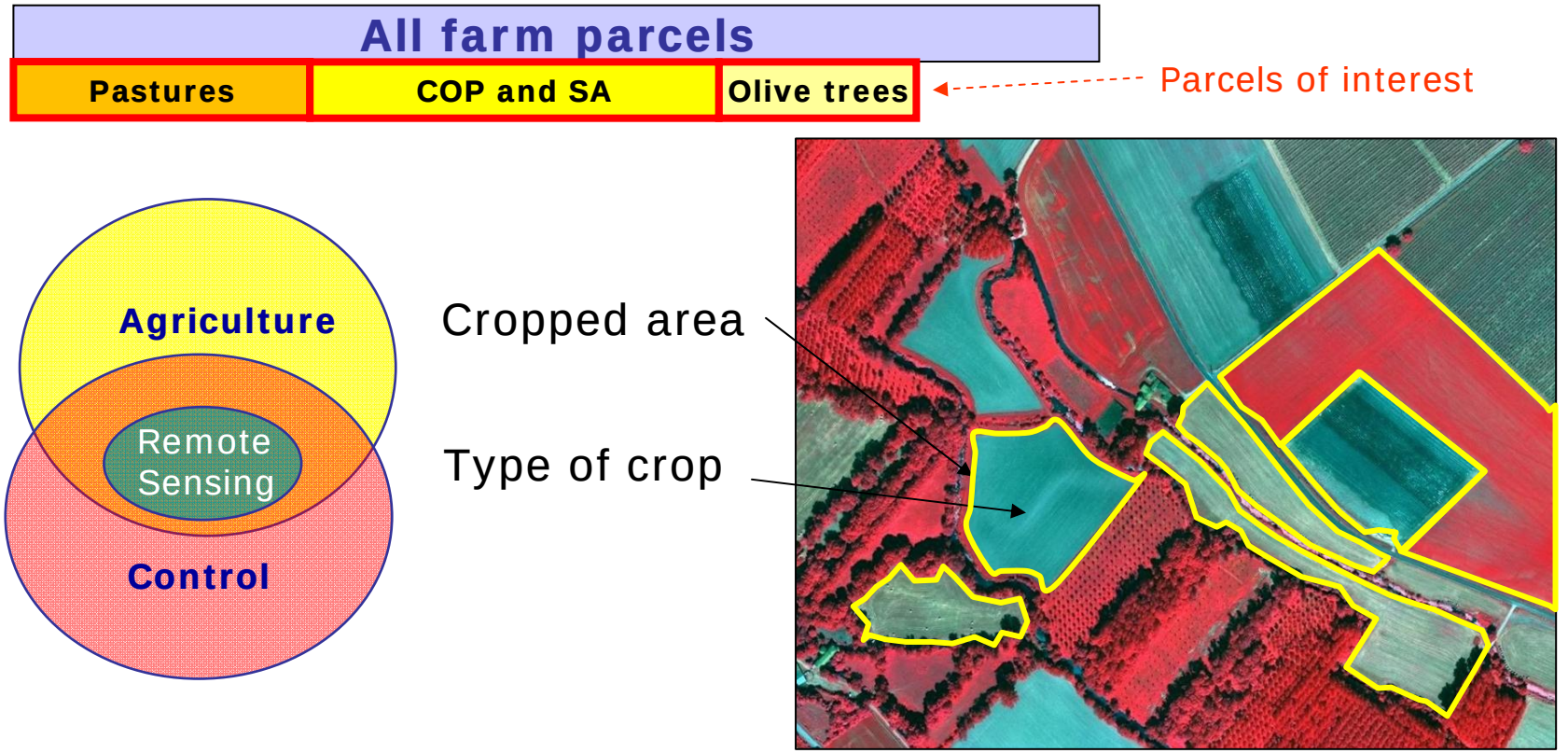
Before 2003 CAP reform = coupled payments

European Commission



Aerial images + several High Resolution images
Then first VHR images (after 2000)

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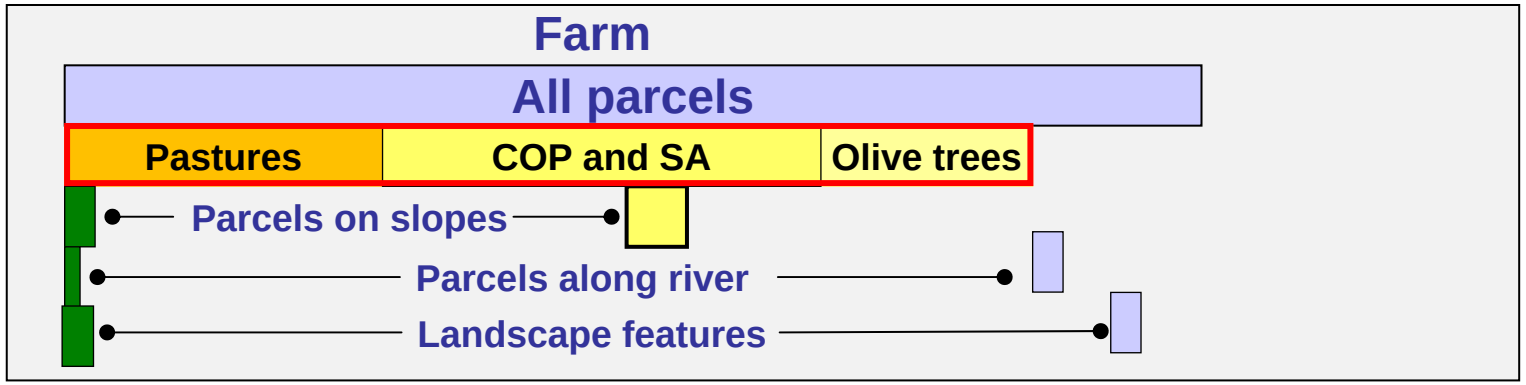
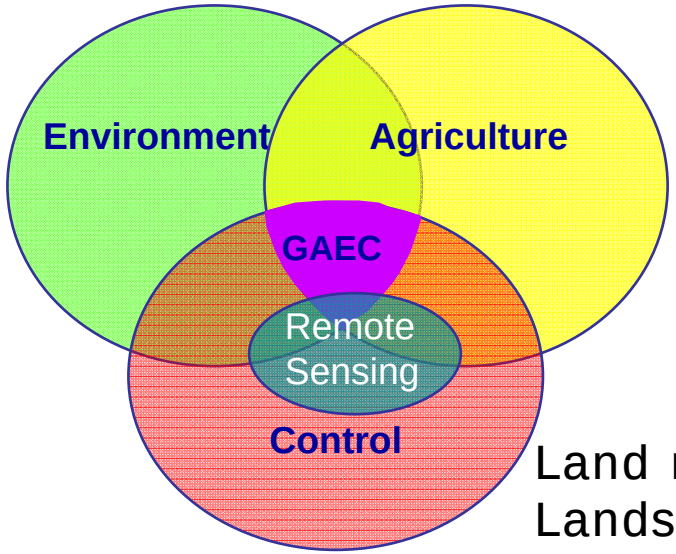
After 2003 CAP reform = decoupled payments

European Commission

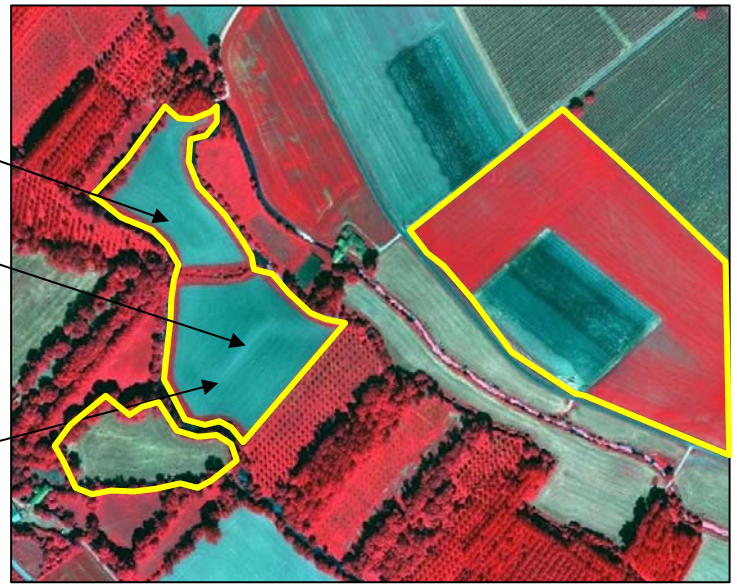




Area

Crop group

Land maintenance
Landscape elements



Except few cases, VHR images needed (less and less HR images and Radar too coarse)

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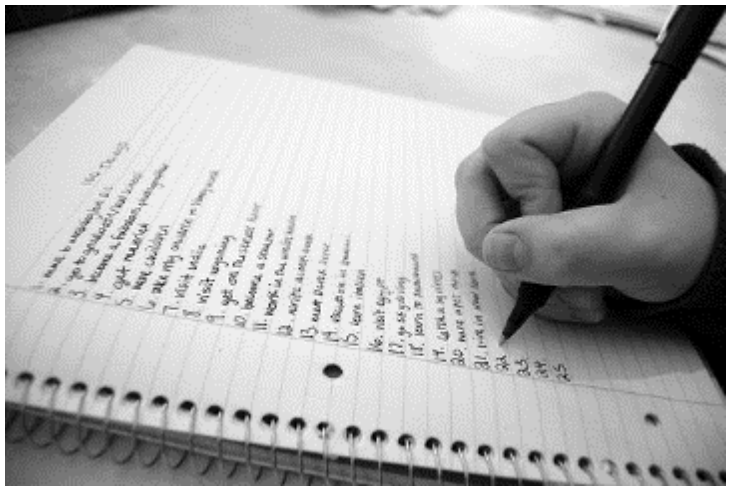
What to check now?

New CAP 'checking list'

- Area

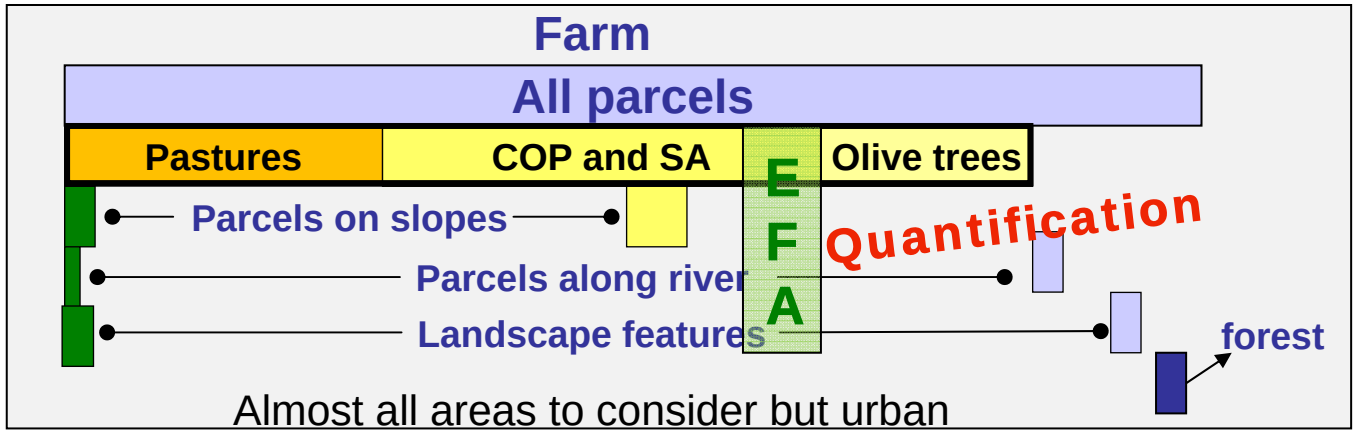
- Lengths

- Different land use / land cover aspects
  - Eligibility of land ('minimum activity')
- Crop type
  - Voluntary Coupled Support
  - Diversification
  - Permanent grassland
  - 'Exemption thresholds'
- Landscape feature types
  - Traditional cropping practices
    - GAEC
    - EFA
- Tree counting
- Land maintenance
  - Erosion, land abandonment, hedge-tree removal …



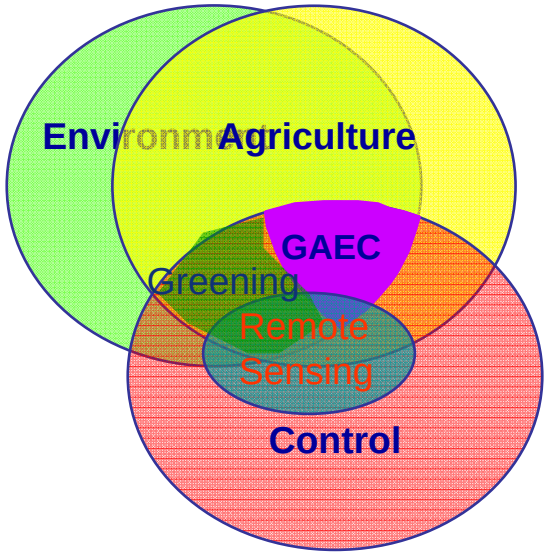
Ensure an exhaustive review and description of elements to check

European Commission



Greening of the CAP (crop diversification, winter cover, permanent pasture …)

More complex land use-land cover management



Area

Crop group

Land maintenance

EFA quantification

Increased VHR images need (at least 50 cm + maybe 3D information)

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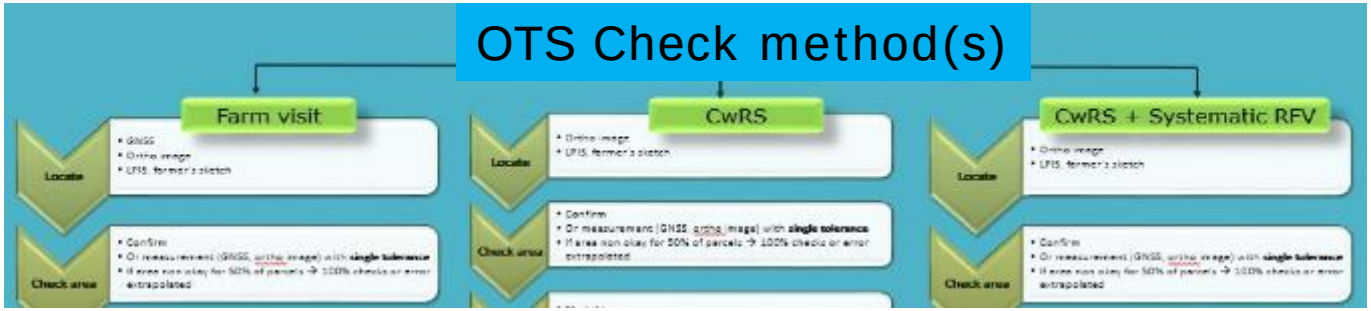
Against the Fraud

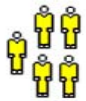
Definition of OTS check method(s)

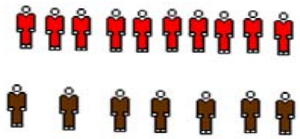
European Commission



Depends on

- Landscapes
- What to check
- Staff / budget availability
- OTS Checks Samples



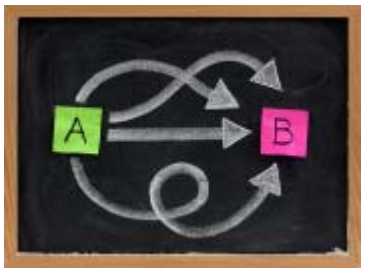


Use or no of imagery

Use of VHR imagery

Use of HR imagery

→ Choice is on Member States



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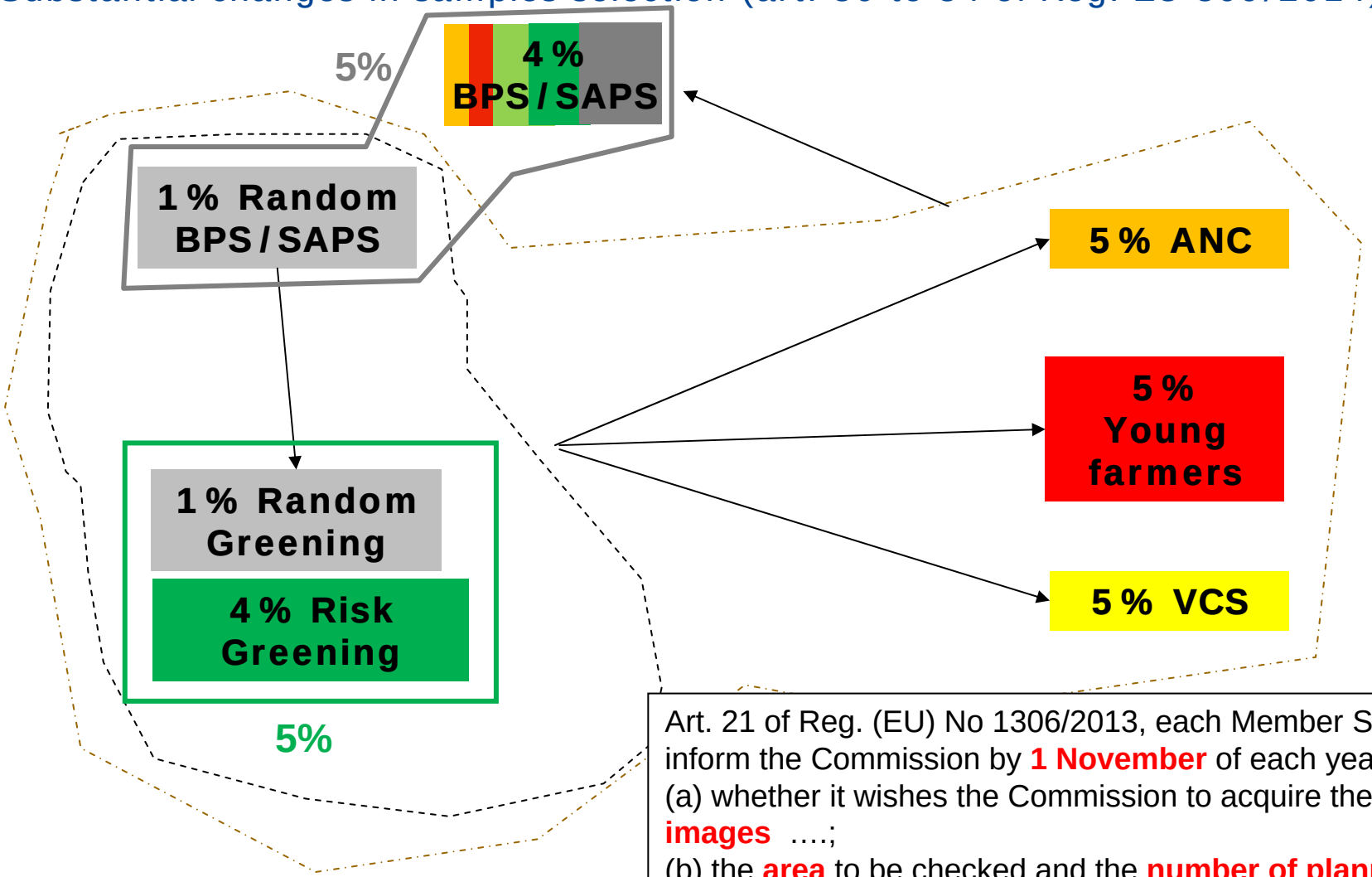
fit for purpose

Sample selection

Substantial changes in samples selection (art. 30 to 34 of Reg. EU 809/2014)



Art. 21 of Reg. (EU) No 1306/2013, each Member State shall inform the Commission by **1 November** of each year:
(a) whether it wishes the Commission to acquire the **satellite images** ….;
(b) the **area** to be checked and the **number of planned control zones**

Prepare the OTS checks

European Commission

Data

- Geospatial application
- LPIS
- Ortho image
- Ancillary data
- …

Measurement tools

- GNSS
- VHR Ortho image
- …

Land use / land cover identification tools

- VHR image
- HR image
- HHR image

Image processing

CAPI Guide

Ground truth collection

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Prepare the OTS checks

From LPIS QA experience

Essential step of image processing

The ratio of the ortho-image pixel size to the GSD of the raw image is smaller than 1.3
The resampling of the ortho-image is applied correctly (DEM quality)
Absence of artifacts caused by the pan-sharpening
Absence of local artifacts caused by the ortho-rectification
Absence of saturation of the histogram and poor bit depth
Absence of artefacts revealed by the mosaicking (geometric discrepancies visible at seam lines; heterogeneous feature condition across tiles)

Move from 1/10.000 to 1/5.000

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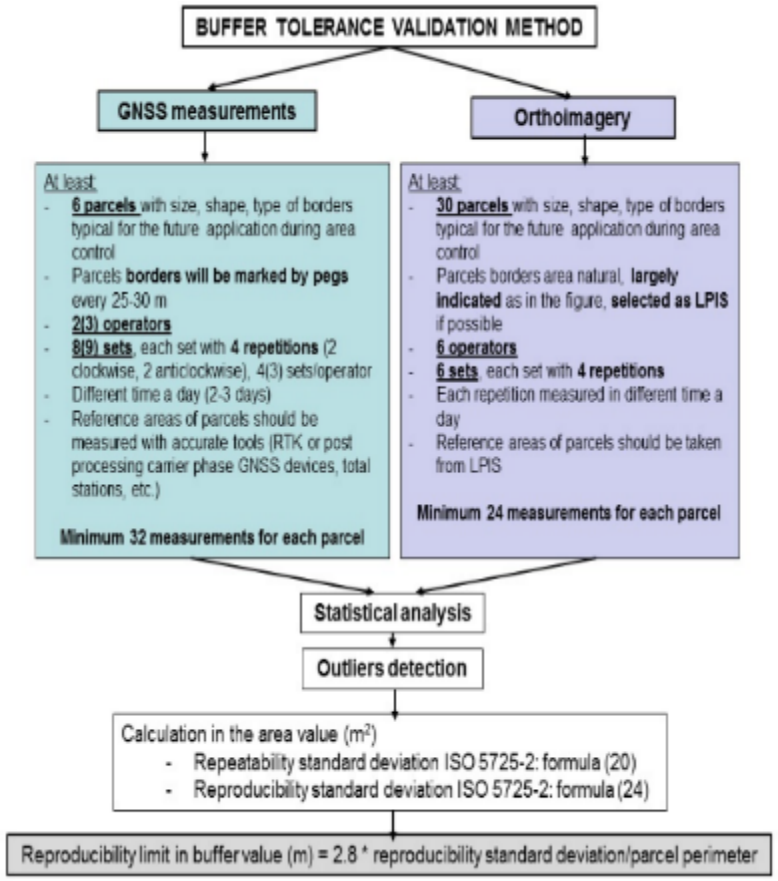
Prepare the OTS checks

European Commission

Validate area measurement tools



Determine the Inherent tool error (accuracy)

To be used in ‘real conditions’

Single buffer tolerance value

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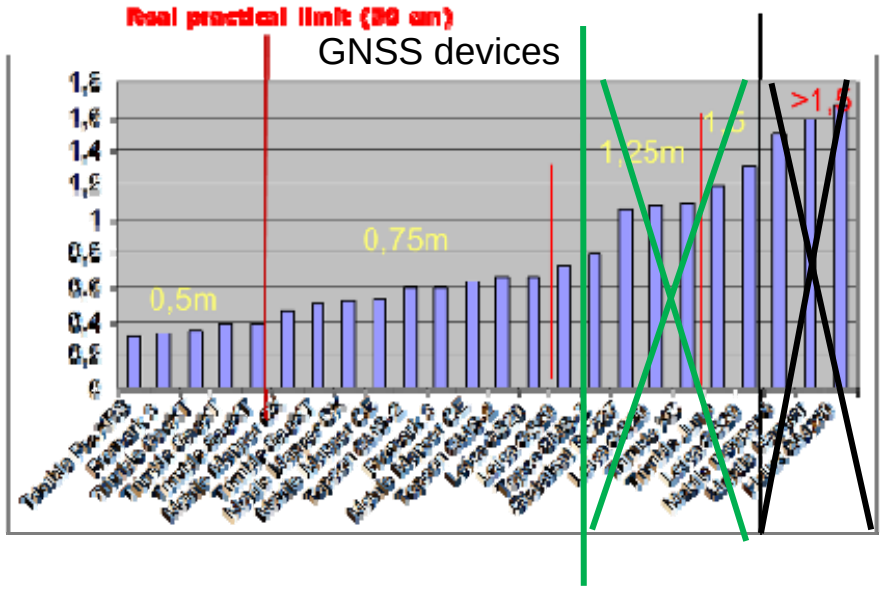
Prepare the OTS checks

Single buffer tolerance value

Please Note

Only for parcel area measurement in the frame of OTS checks



Up to 2014

- Maximum tolerance 1.5 m
- Use of tolerance value of tool used
- Tools with tolerance up to 1.5 m

From 2015

- Maximum tolerance 1.25 m
- One tolerance for all (single value)
- Tools with tolerance up to 1 m

→

Ease measurement process

Better acceptance by farmers

Reflect ‘real conditions’ of checks

‘Only’ accurate tools

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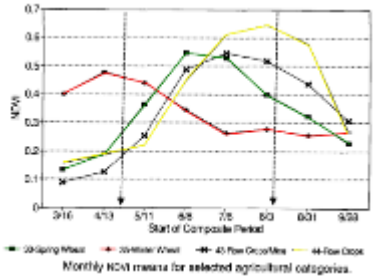
Prepare the OTS checks

European Commission

Create image interpretation guidelines
(with field example)



Essential role of clear features' definition
Essential role of definition of common measurement rules

Same area on field and
on image

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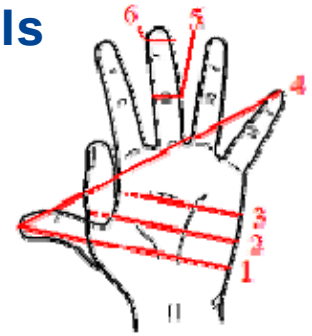
Perform checks

Use appropriate tools

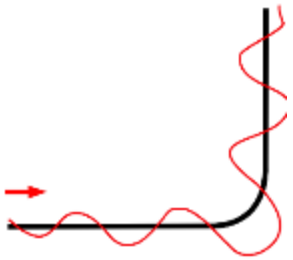


Use tools appropriately

Same conditions, settings as validated

"Stay on the line"

But define your line …



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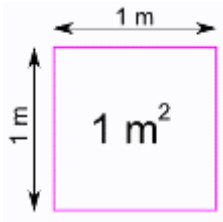
Perform checks

- Use common rules

→ diagnosis CwRS and diagnosis field should be identical

- Measurements only if needed



- Use of Single buffer Tolerance

- Possibility to limit to 50% of parcels

→ Results extended to 100%

- Have imagery on field

- Ensure good timing of RFV

- Have digital OTSC manual on field (with examples)

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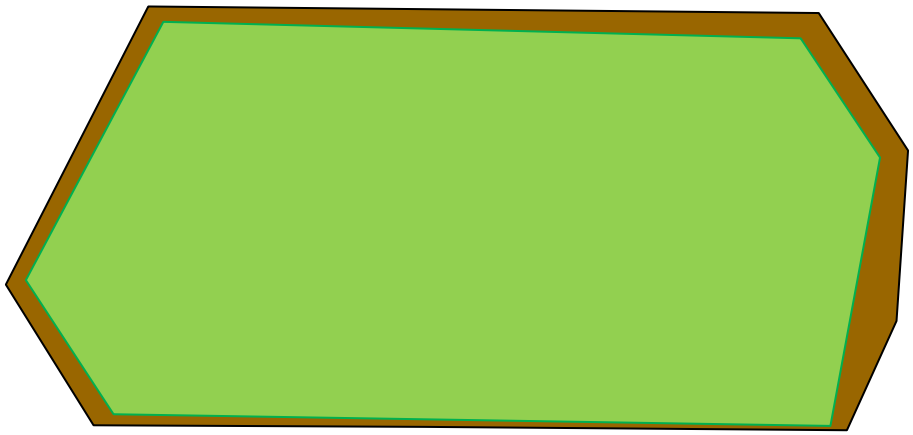
What to measure ?

Specificities of the Greening payment

The OTSC will determine the area of each crop based on the cropped areas‘ limits that are visible in the field (the crop itself or the crop residues) or on the imagery used in CwRS



How to measure ?

EFA elements – “linear features”

Orthoimage

Area

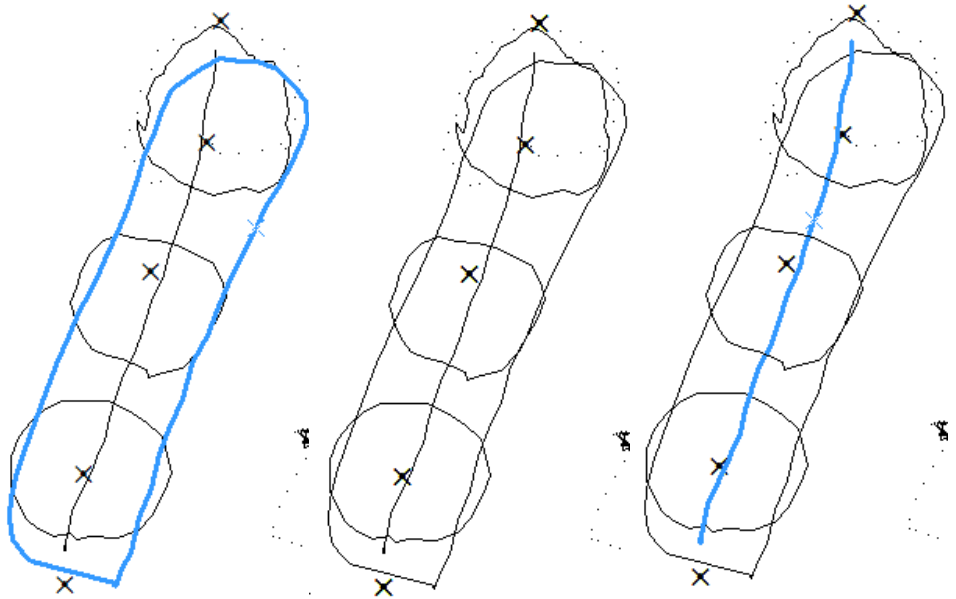
Line

GNSS

Area (global)

Area (individual)

Line

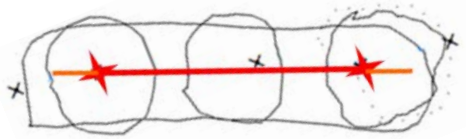


Complete and clear definition of the object to be measured !!!

How to measure ?

e.g. seasonal – inter annual variation of crown size

Need of consistency between field and image measurements



Very varying situations for EFA

European Commission

MS */ Landscape features (LF)	Hedges or wooded strips *(maximum width = 10 m)*	Isolated trees * *crown diameter < 4 m allowed*	Trees in line * *crown diameter <4 m allowed*	Trees in groups and field copses *(no correction factor)* *max 0,3 ha*	Field margins *(width=1-20 m)*	Ponds *(no correction factor)* *max 0,1 ha size defined by MS*	Ditches *(maximum width=6m)*	Traditional stone walls *heigth* ***width***	No of LF per MS
Austria						GAEC 7 *0,01-0,10 ha*	GAEC 7 *10 m*	GAEC 7	3
Belgium - Flanders	Art. 45			Art. 45	Art. 45	Art. 45	Art. 45		5
Belgium - Walonia	GAEC 7 c.f. 10 m	GAEC 7 c.f.	GAEC 7 c.f.	GAEC 7	GAEC 7 c.f.	GAEC 7 *0,01-0,1 ha*	GAEC 7 c.f. *6 m*		7
Bulgaria	Art. 45 c.f.	Art. 45 c.f.	Art. 45 c.f.	Art. 45	Art. 45 GAEC 7 c.f.	Art. 45	Art. 45 c.f.		7
Croatia	GAEC 7 c.f. *2 m*	GAEC 7 c.f.	GAEC 7 c.f.	GAEC7		GAEC7 *0,01-0,1 ha*	GAEC 7 c.f. *2 m*	GAEC 7 c.f. 0,5-2 m	7
Czech Republic		GAEC 7	GAEC 7	GAEC 7	Art. 45		GAEC 7		5
Denmark						GAEC7 *0,01-0,2 ha*			1
Estonia	GAEC 7 30 m		GAEC 7	GAEC 7			GAEC 7 *12 m*	GAEC 7 0,3-1,7 m 0,5-2,8 m	5
Finland									0
France	Art. 45 c.f.	Art. 45 c.f.	Art. 45 c.f.	Art. 45	Art. 45 c.f.	Art. 45	Art. 45 c.f.	Art. 45 c.f.	8
Germany	GAEC 7	GAEC 7 c.f.	GAEC 7	GAEC 7	Art. 45 GAEC 7 *(2-20m)*		GAEC 7 *2 m*	GAEC 7	7
Greece			Art. 45 GAEC 7 c.f. *	Art. 45			Art. 45 c.f.		3
Hungary	Art. 45	Art. 45 GAEC 7 c.f.	Art. 45 c.f.	GAEC 7	Art. 45	GAEC7 *0,1-0,5 ha*	Art. 45		7
Ireland	GAEC 7 c.f. 10 m		GAEC 7 c.f.	Art. 45			GAEC 7 c.f. *6 m*		4
Italy	GAEC 7 SMR 2 SMR 3 c.f. 6 m	GAEC 7 SMR 2 SMR 3 c.f.	GAEC 7 SMR 2 SMR 3 c.f. *	Art. 45	Art. 45 c.f.	Art. 45	Art. 45 c.f.	GAEC 7 SMR 2 SMR 3 c.f. *0,3-5 m* *0,5-5 m*	8
Latvia				Art. 45	Art. 45 c.f.	Art. 45			3
Luxembourg	GAEC 7 SMR 2-3 c.f. 10 m	GAEC 7 SMR 2 SMR 3 c.f. *	SMR 2-3 c.f. *	GAEC 7 SMR 2-3	Art. 45	SMR 2-3 *0,01-0,1 ha*			6
Malta		Art. 45	Art. 45	Art. 45	Art. 45				4
Netherlands					Art. 45				1
Poland	Art. 45 c.f.	Art. 45 GAEC 7 c.f.	Art. 45 c.f.	Art. 45	Art. 45 c.f.	Art. 45 GAEC 7 *maximum width=0,01 ha*	Art. 45 GAEC 7 c.f. *2 m*		7
Portugal									0
Romania	Art. 45 c.f.	Art. 45 c.f.	Art. 45 c.f.	Art. 45	Art. 45 c.f.	Art. 45	Art. 45 c.f.		7
Slovakia		GAEC 7 SMR 2 SMR3 c.f.	GAEC 7 SMR 2 SMR3 c.f.	GAEC 7 SMR 2 SMR3	GAEC 7 SMR3 c.f.				4
Sweden					Art. 45 c.f.				1
UK England	GAEC 7 c.f.								1
UK Northern Ireland	GAEC 7 c.f. 4 m						GAEC 7 c.f. *2 m*	GAEC 7 c.f. 0,5-2,3 m 0,25-4 m	3
UK Scotland					Art. 45				1
UK Wales	Art. 45 c.f.							Art. 45 c.f.	2
N of LF activated	16	13	16	18	17	13	16	8	

MS */ Landscape features (LF)	Hedges or wooded strips *(maximum width = 10 m)*	Isolated trees * *crown diameter < 4 m allowed*	Trees in line * *crown diameter <4 m allowed*	Trees in groups and field copses *(no correction factor)* *max 0,3 ha*	Field margins *(width=1-20 m)*	Ponds *(no correction factor)* *max 0,1 ha size defined by MS*	Ditches *(maximum width=6m)*	Traditional stone walls *heigth* ***width***	No of LF per MS
Ireland	GAEC 7 c.f. 10 m		GAEC 7 c.f.	Art. 45			GAEC 7 c.f. *6 m*		4
Italy	GAEC 7 SMR 2 SMR 3 c.f. 6 m	GAEC 7 SMR 2 SMR 3 c.f.	GAEC 7 SMR 2 SMR 3 c.f. *	Art. 45	Art. 45 c.f.	Art. 45	Art. 45 c.f.	GAEC 7 SMR 2 SMR 3 c.f. *0,3-5 m* *0,5-5 m*	8
Latvia				Art. 45	Art. 45 c.f.	Art. 45			3

How to read the table	
	line or point measurement
	area measurement
art. 45	EFA landscape feature not in GAEC
GAEC 7	EFA landscape feature in GAEC
c.f.	use of the correction factor

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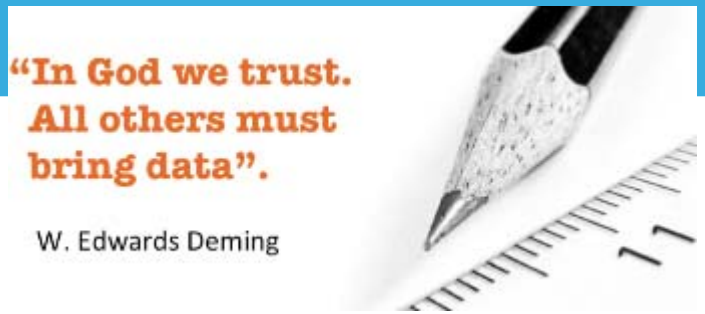
Produce OTS check REPORT



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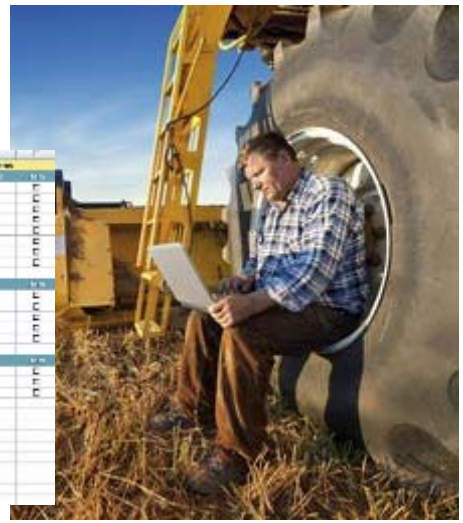
Document (justify) and record every diagnosis

- Who, when, where
- Measurement conditions (N.B.: same as validation)
- Take pictures



Digital format reporting

- Scrolling menu, check list
- Common between CwRS and Field check (N.B. Mutual training field and screen)

Have a reporting section dedicated to follow-up

- LPIS, EFA layers needs for verification

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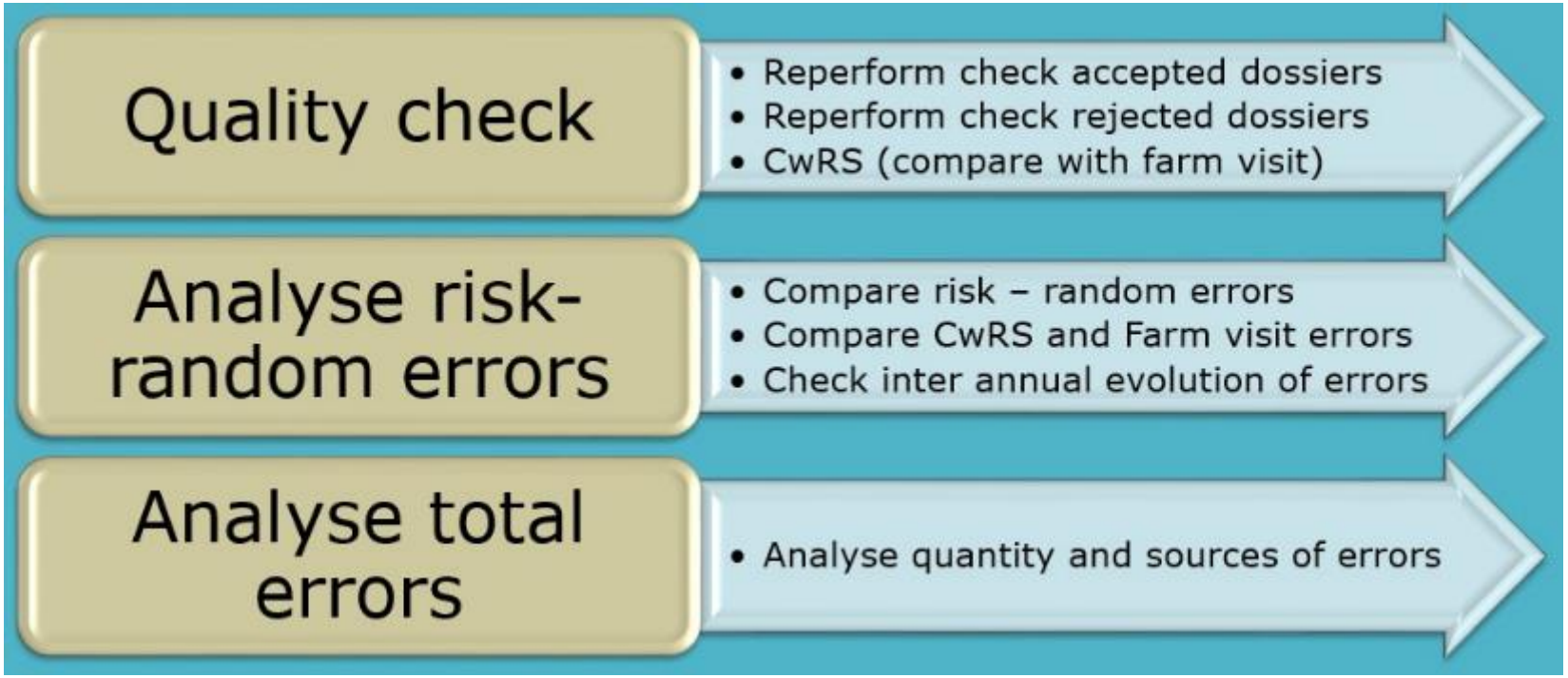
Check and Analysis of OTS checks results



Future tools, support?

Need for new tools?

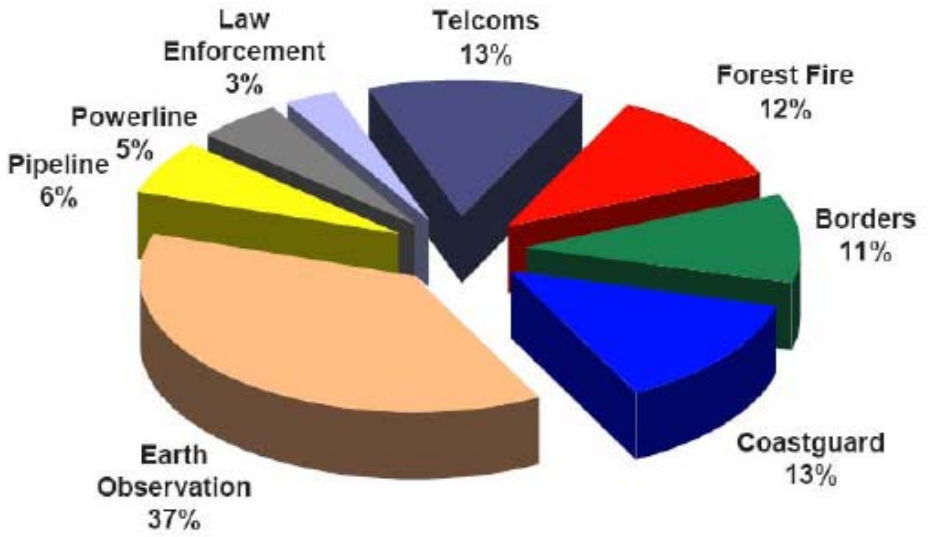
- Use of RPAS as support to OTSC checks?
- 3D images?
- Radar imagery?
- Pictures used as evidence by farmers?

Or others (sensors from precision farming)?

Method for “OTS Check Quality management”?

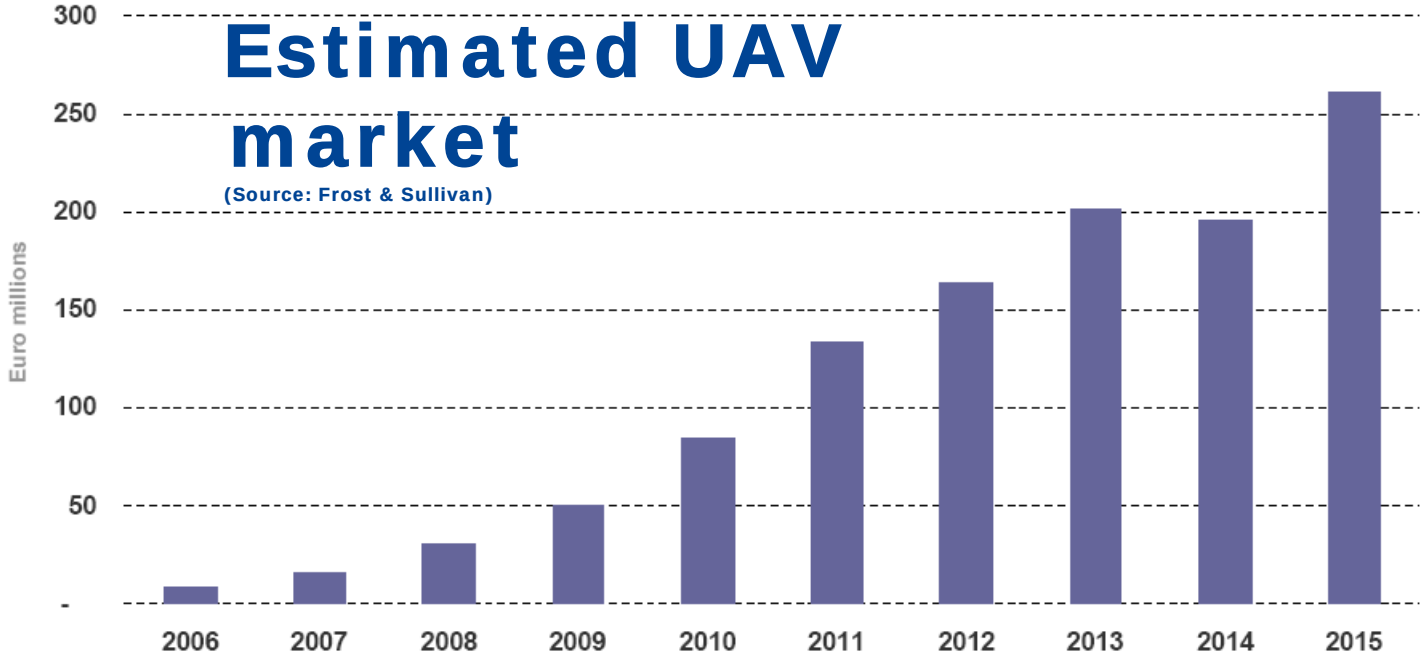
UAV market in commercial sectors

(Source: Frost & Sullivan)



Estimated UAV market

(Source: Frost & Sullivan)



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UAVs are autonomous platforms with a range of size / endurance / payload specs:

- **Advantages**
  - Flexibility operationally
  - Very high resolution (cm) → fly low
  - Cost effective

- **Disadvantages**
  - Need for miniaturizing instrumentation
  - Need for experience to operate UAV systems
  - Compromises regarding accuracy / low cost solutions
  - Legal issues
  - Coverage → not intended for covering EU / countries

UAV image

European Commission

- Big farms
- Not easy to access parcels
-Mountainous terrain

- Live = more detailed checked

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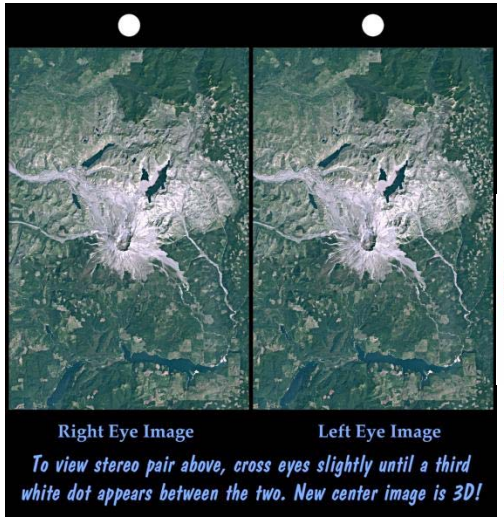
3D imagery

RPAS
Remotely Piloted Aircraft System
and 3D imagery
(DEM – DSM)



Stereoscopic images

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Ancillary data?

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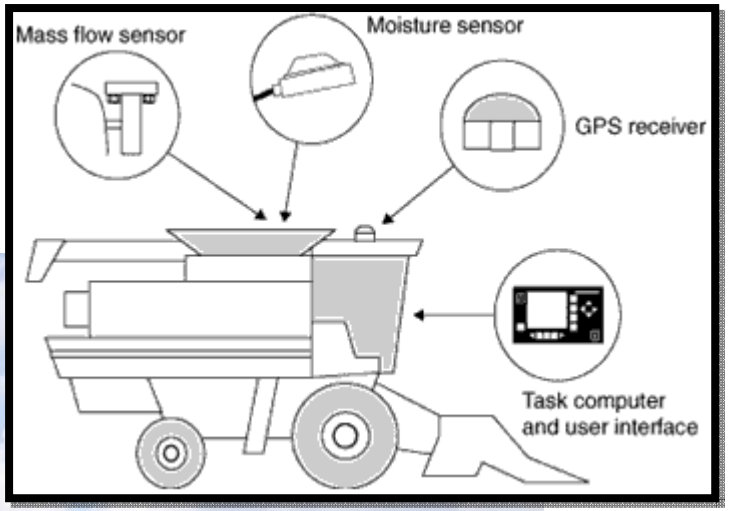
Accept and certify 'evidences' provided by farmers in order to contribute to the conclusiveness of the control?

Pictures



Data from sensors
(Precision farming)

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Quality Control

General principles

What ?: "*Quality control (QC) is a procedure or set of procedures intended to ensure that a product meets a defined set of quality*."

How ?: Check the set of quality on (**a sample of**) the product

When ?: After the production, before to issue the product

Be self-assured that the final product is accurate and of the requested quality

For the OTSC

Assess the overall quality of the OTSC results (and thus method):

- No inconsistency in the data
- Rules correctly applied
- Appropriate methods

Emphasize on CwRS
(cost/time effective + less invasive for the farmers)

but for MSs, also important have a look at field controls

How can we **increase effectiveness** ?

- Reduce cost: if too strong in rejecting

  → Reduce risk for the fund by more Rapid Field Visits (costly)

- Reduce financial risk: if too loose in accepting

  → Less dossier follow up but risk for the fund

Check different levels within OTSC process

Effect of data/data preparation ? (e.g. quality of control tools (GNSS, Imagery …)

Effect of controller ? (e.g. consistency of control instructions)

Effect of control method ? (e.g. CwRS vs. field)

Effect of sample selection ? (e.g. risk vs. random, control zones vs. full random)

Verification *intra*-method

"The dossier is re-controlled using the exact same conditions and tools"

Typically, the dossier is passed to another controller and the check is re-performed not knowing the first diagnostic

Observables:

- Are they consistent…
  - at parcel level ?
  - at dossier level ?

- If not, look for the reason:

  - Rules/guidelines not clear enough…
  - Controller not following rules

Verification *inter*-method

"*The control tools are assumed to be equivalent*"

= "*The conclusions should be the same regardless of the control tool*"

Is it a correct assumption ?

How to assess it ?

Typically, the same parcels/dossiers should be checked using both methods (even if already accepted using CwRS).

E.g., a dossier selected at random for field inspection that is in a CwRS zone can be checked twice.

Observables:

- Are they consistent…
  - at parcel level ?
  - at dossier level ?
- If not, again, it could be the rules/guidelines or the control tools are not equivalent in such conditions ???

What can I learn ?

If nothing was found => Good for you ! Hopefully next time too…

If something was found => The most important part of the work starts …

- Why this issue ?
- How did it happen ?
- Is it unfortunate or systematic ?
- Do other MSs have experience on that ?
- For how long has it been there ?
- …

Expected impacts

- Detect issues upstream (before audit)
- Increase awareness, mastering and effectiveness of control methods
- Take remedial action

- It is an investment !

  “Allocating some time to double-check could save money on long term!”

Part 4: Image acquisition process

1. MS requests
2. Budget release
3. Feasibility study
4. Sensors allocation
5. Start of the campaign
6. Acquisistion windows
7. Image use and return
8. Campaign closing

new CAP reform, new requirements…..more images!

- Regulatory basis for the CAP, Control with Remote Sensing programme is given in Council Regulations (EU) 1305/2013 on rural development, 1306/2013 on horizontal measures, and 1307/2013 on direct payments and their Delegated and Implementing Regulations 639/2014, 640/2014, and 641/2014
- CAP reform is implemented from 2015 and includes for example a basic payment, and a green payment, etc.
- Green payment includes measures of crop diversification, permanent grassland, landscape features and measures where farmer has to ensure that 5% of their land is set aside as an Ecological Focus Area (EFA), (eligibility issues…)
- Increase no. of checks; need of more imagery; need of higher quality imagery (both radiometric, and geometric); but also places higher requirements on imagery to be 'fit for purpose'
- 2 new big tenders (15 M euro) ongoing

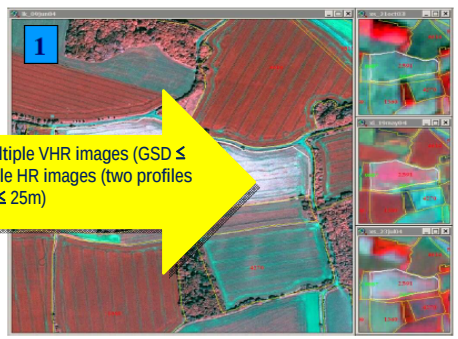
CAP Images acquisition process

The CAP image acquisition: since JRC innovation to use satellite Very High Resolution (VHR) data (data with a resolution better than 1m) for the CAP controls in 2003 the volumes of satellite data captured and used in the CAP controls have increased 40 times increasing from 12.000 km2 to 470.000 km2. This has been achieved maintaining a very high image acquisition success rate (>95%) in collecting satellite imagery over the risk and random selected control zones requested by the MS Administrations.

CAP controls: On-The-Spot checks methods

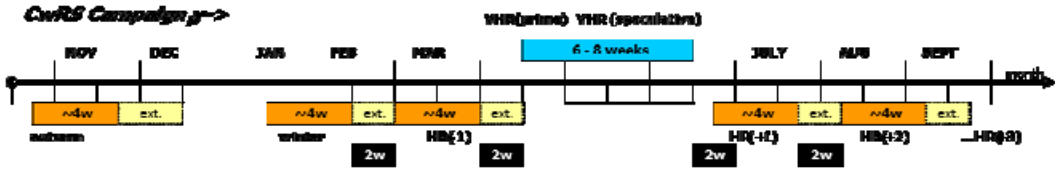
1- The standard scenario: 1 Very High Res. + n High Resolution images.

2- The Very High Res. + Rapid Field Visit scenario.



CAP 2015 => Trend is multiple VHR images (GSD ≤ 75cm) coupled with multiple HR images (two profiles ≤ 3m, ≤ 25m)

RFV = Rapid Field Visit (efficient, and independent from farmer)



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NEW sensors (1/2)

- Geometry benchmarking of new sensors becomes more important
- Required for the CAP
- “in-house” knowledge
- Kompsat3, SPOT7 done in 2014
- Deimos2, Skybox etc. upcoming

© Airbus D.S.

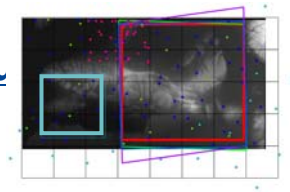
© EUSI, DE; KARI, Korea

NEW sensors (2/2)

WorldView3 (WV3)

- GSD (at nadir) 0.31m PAN, 1.24m MSP (8 bands), 3.70m SWIR (8 bands)
  - ✓ Programmed and ongoing tests (3 images already acquired)
  - ✓ Geometric benchmark on imagery of 32,5deg and 14deg
  - ✓ Geometric test, and interpretation tests on high angle (44deg ONA)
  - ✓ CwRS imagery will “preliminarily” not be above 36deg ONA (≈ 50 deg ELA)

⇒ **Ready for 2015 VHR Campaign (hopefu**



Maussane, FR; JRC test site

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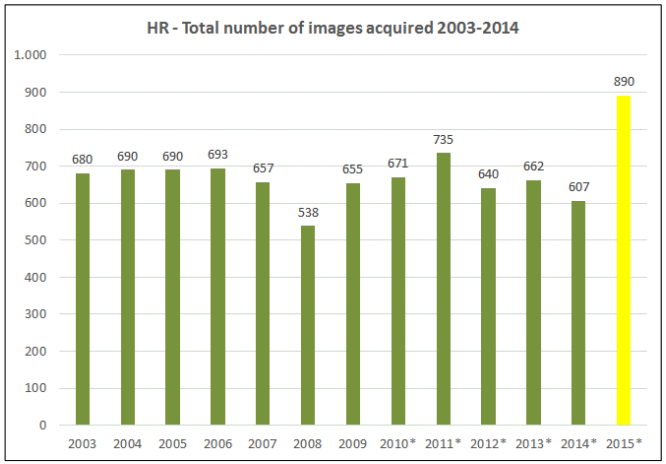
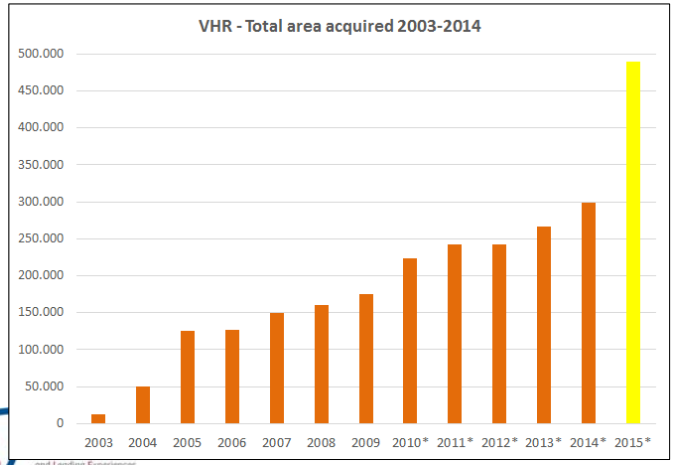
CAP checks evolution

		2003	2004	2005	2006	2007	2008	2009	2010*	2011*	2012*	2013*	2014*	2015*
HR	N. images	680	690	690	693	657	538	655	671	735	640	662	607	1048**
	Cost [M€]	1,60	1,70	2,00	2,30	2,30	1,60	2,13	2,12	2,00	1,57	1,6	0,72	1.32
VHR	Area [Km^2]	12000	50000	126000	127000	150000	160000	174700	224000	242000	242300	267000	299000	497836
	Cost [M€]	0,30	1,60	3,00	3,00	3,30	3,80	3,90	4,55	5,10	4,87	5,3	4,34	7.2
Total cost [M€]		1,90	3,30	5,00	5,30	5,60	5,40	6,03	6,67	7,10	6,44	7,00	5,06	8.52
MS participation		12	22	24	23	24	24	25	27	27	27	28	28	28

(*) - includes LPIS

(**) - HR total area 2015 campaign: 863 074 km²





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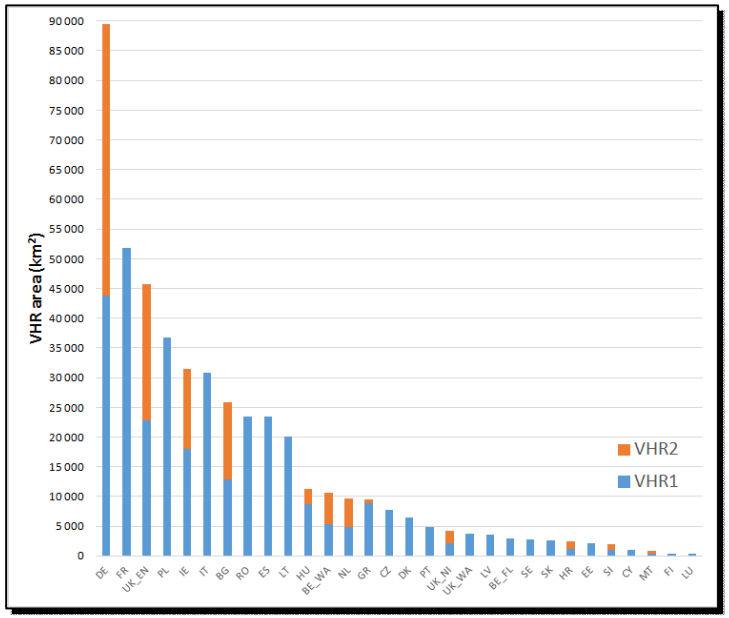
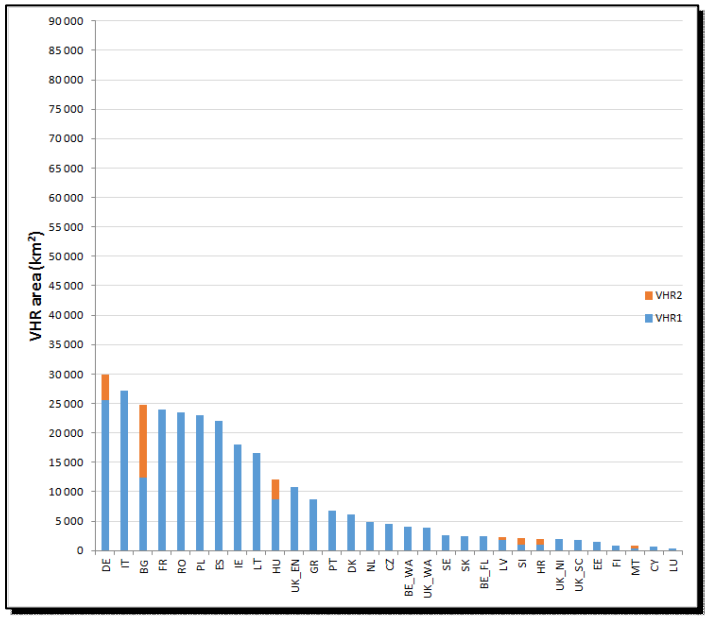
VHR requests (1 / 2)

2015





2014

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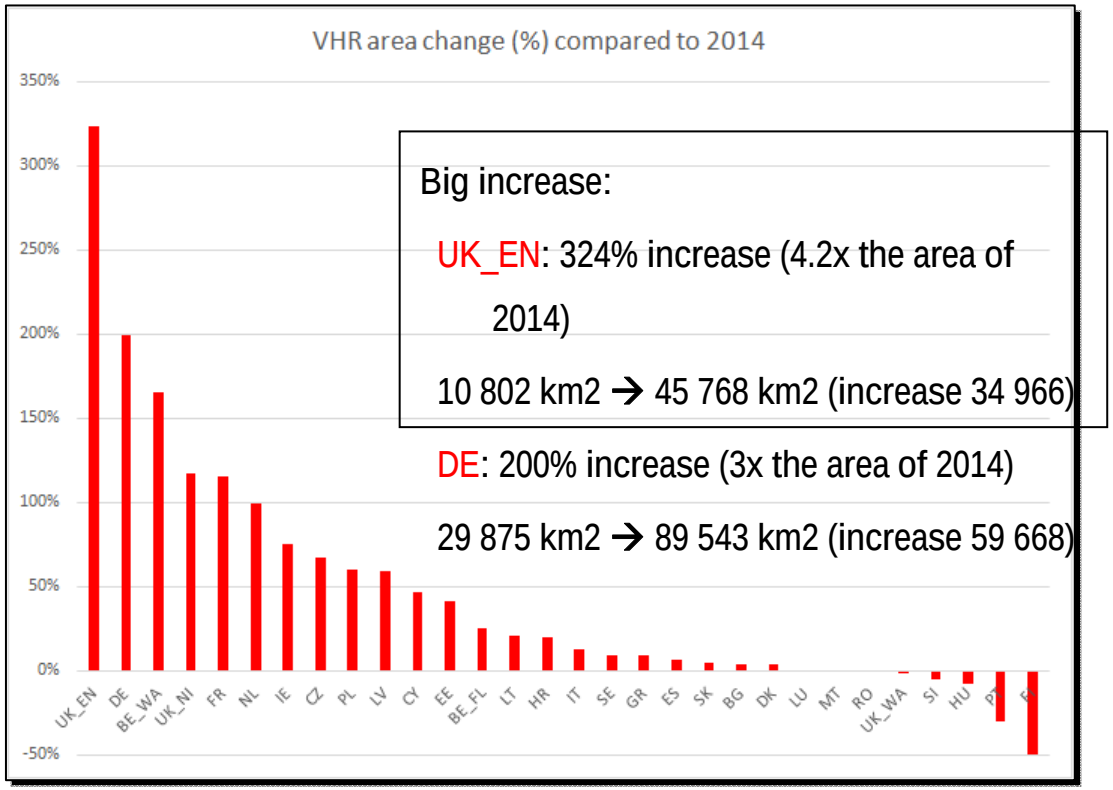
VHR requests (2 / 2)



Big increase:

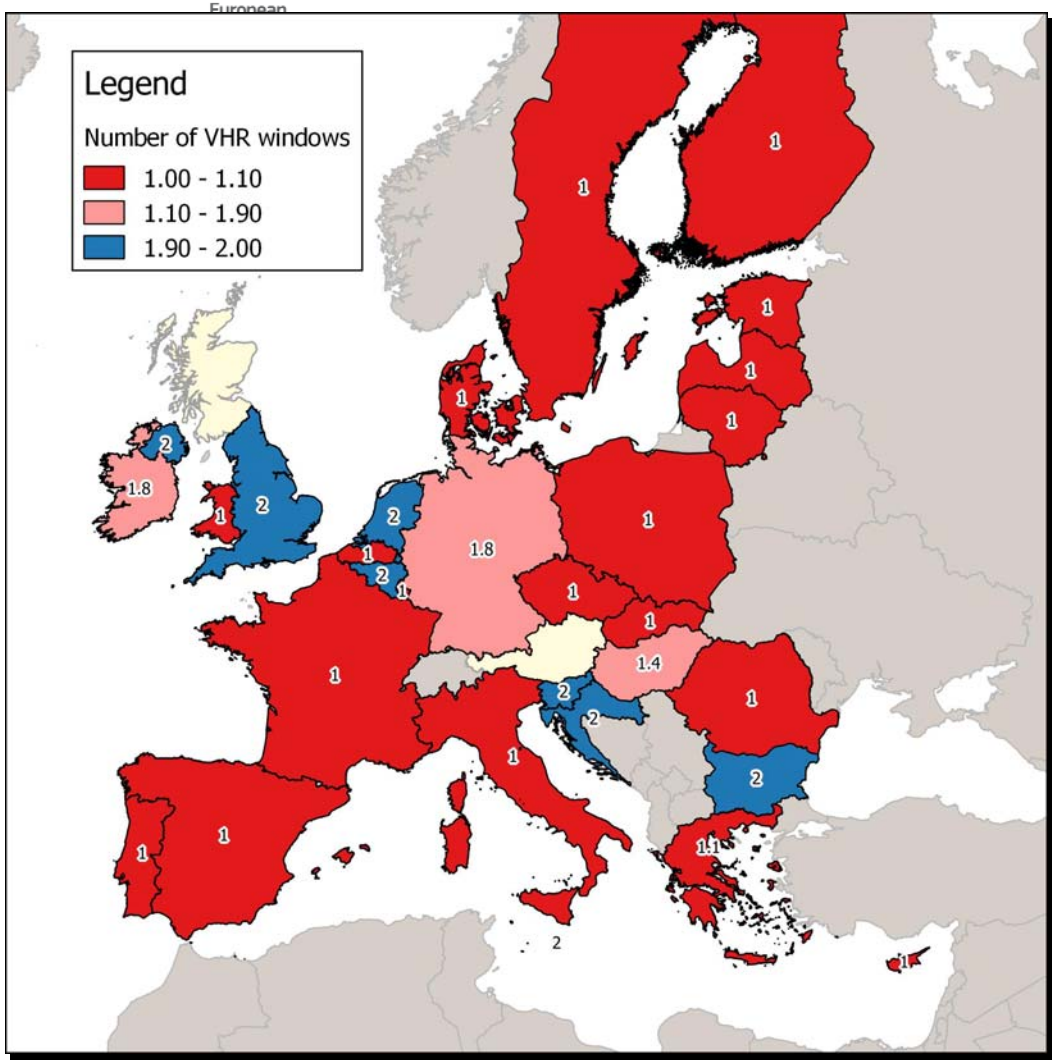
UK_EN: 324% increase (4.2x the area of 2014)

10 802 km2 → 45 768 km2 (increase 34 966)

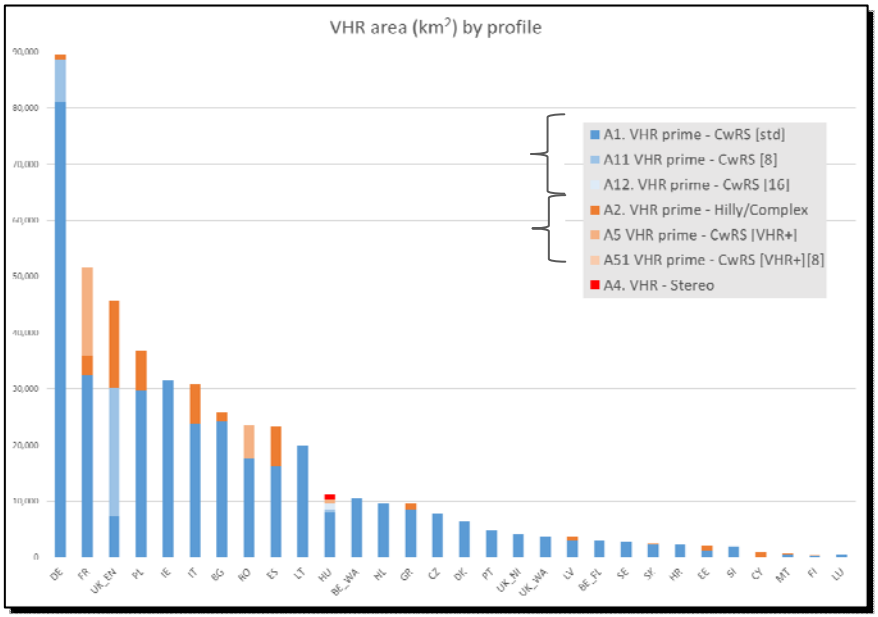
DE: 200% increase (3x the area of 2014)

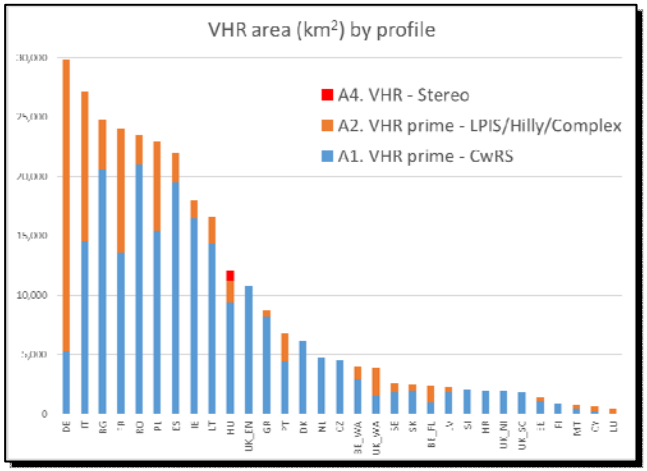
29 875 km2 → 89 543 km2 (increase 59 668)

Average number of VHR windows per zone

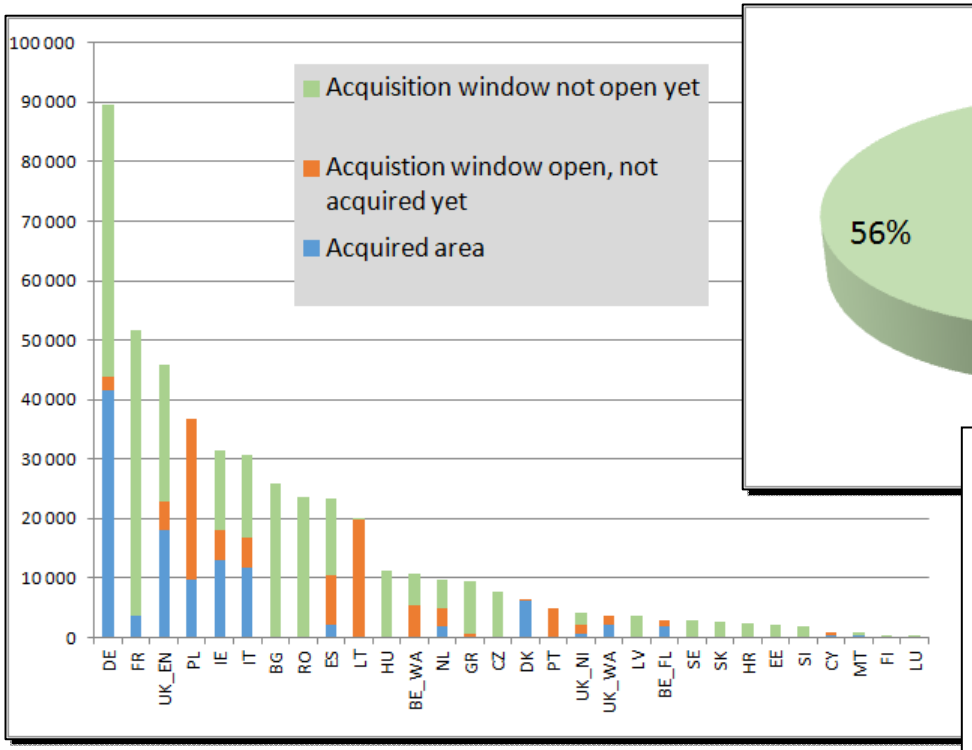


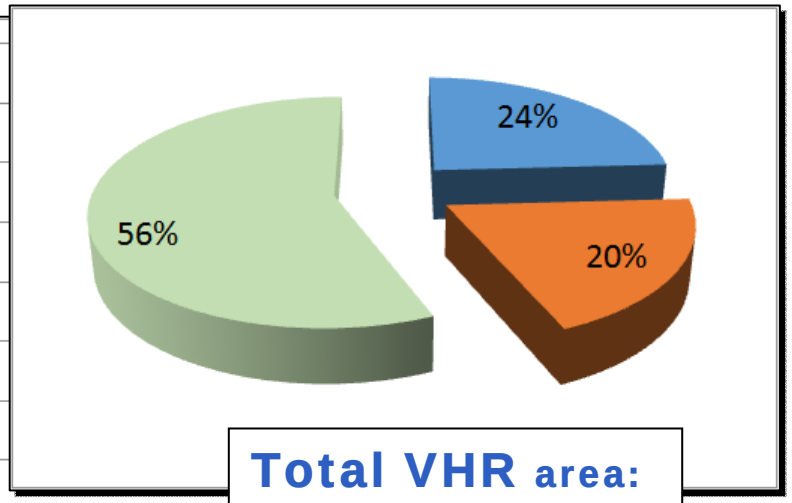
VHR profiles





Status of VHR image acquisitions 17/04/2015





Total VHR area: 467 911 km² (excluding LPIS QA zones)

(nota. LT opened on 17/04/2015)

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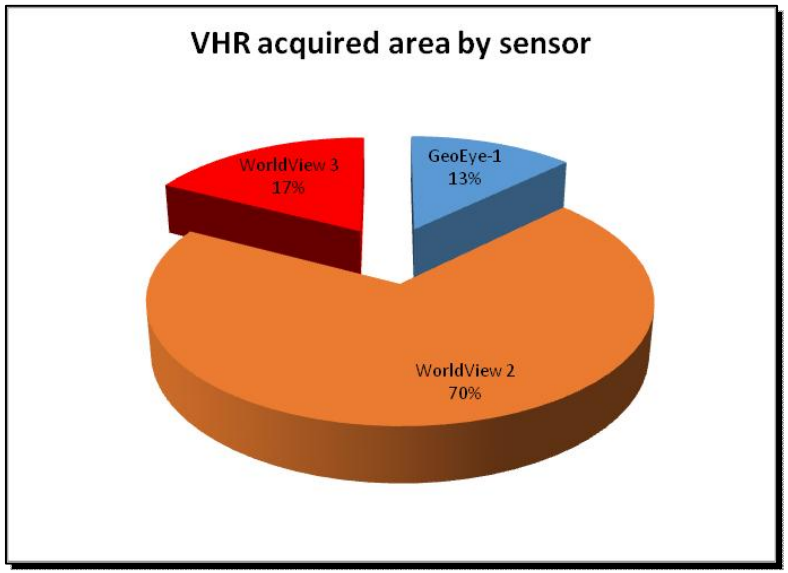
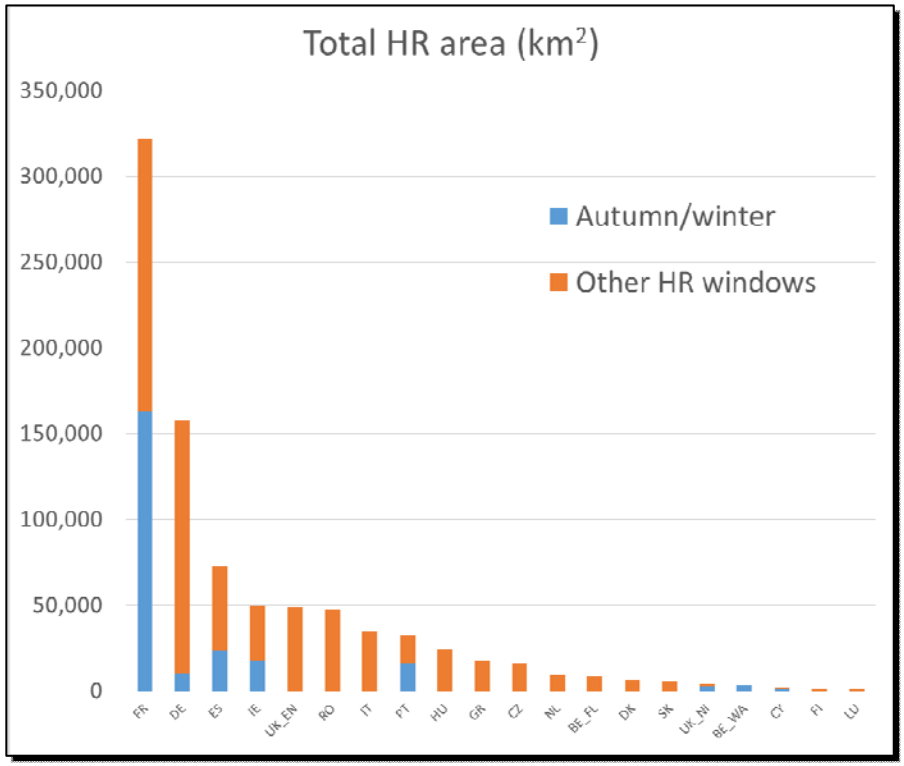
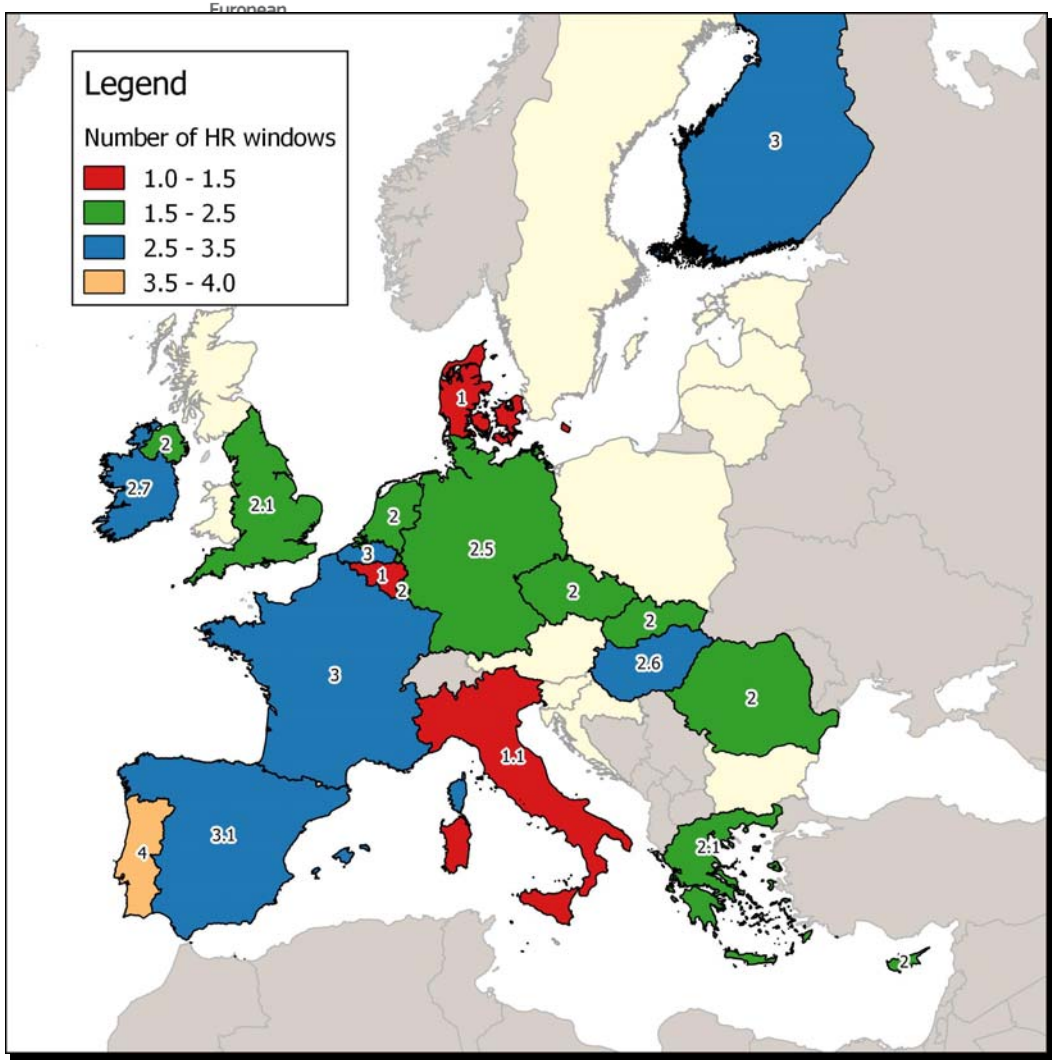
Acquired area by sensor(VHR) up until 17/04/2015



HR area by MS (km²)



Average number of HR windows per zone



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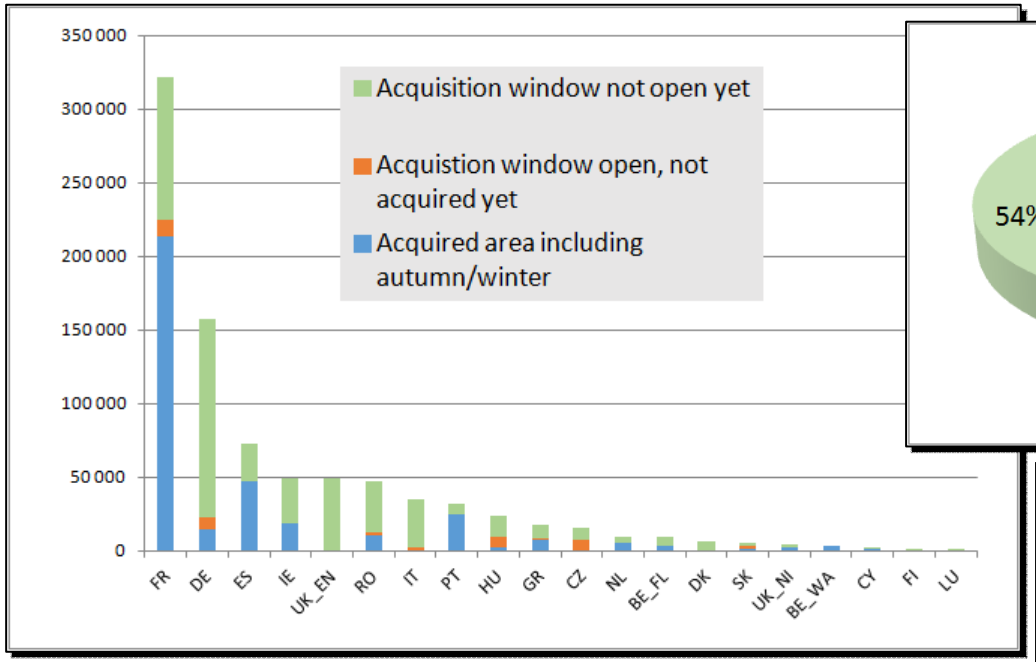
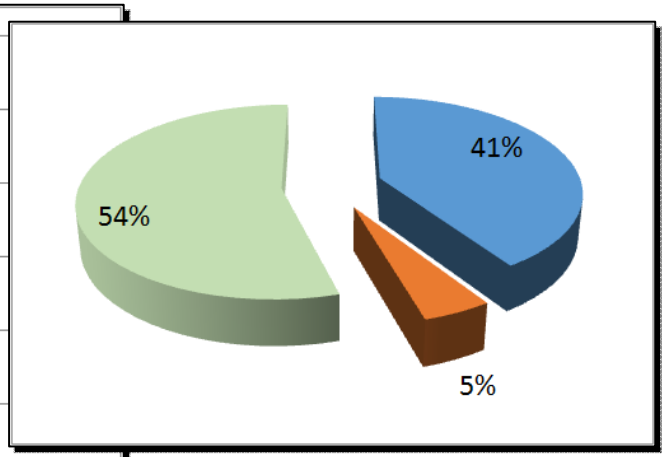
Status of HR image acquisition 17/04/2015





Total HR area: 863 074 km²

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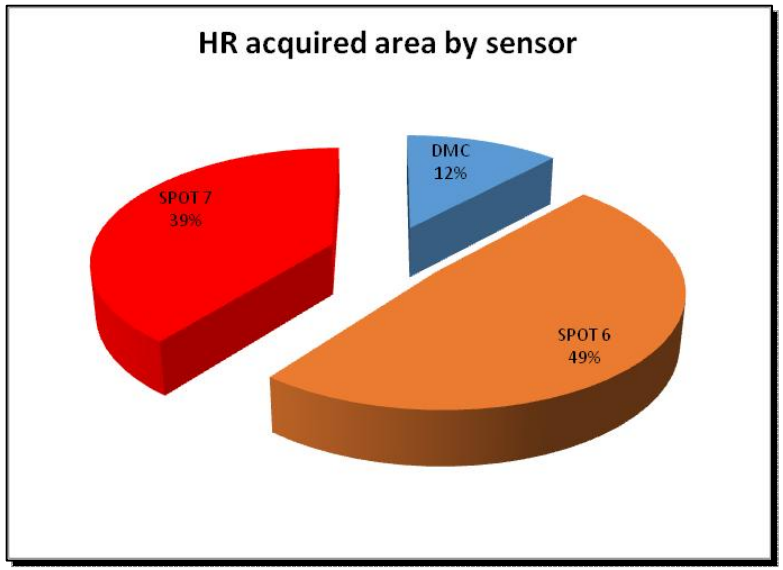
Acquired area by sensor (HR) up to 17/04/2015



HR without autumn/winter

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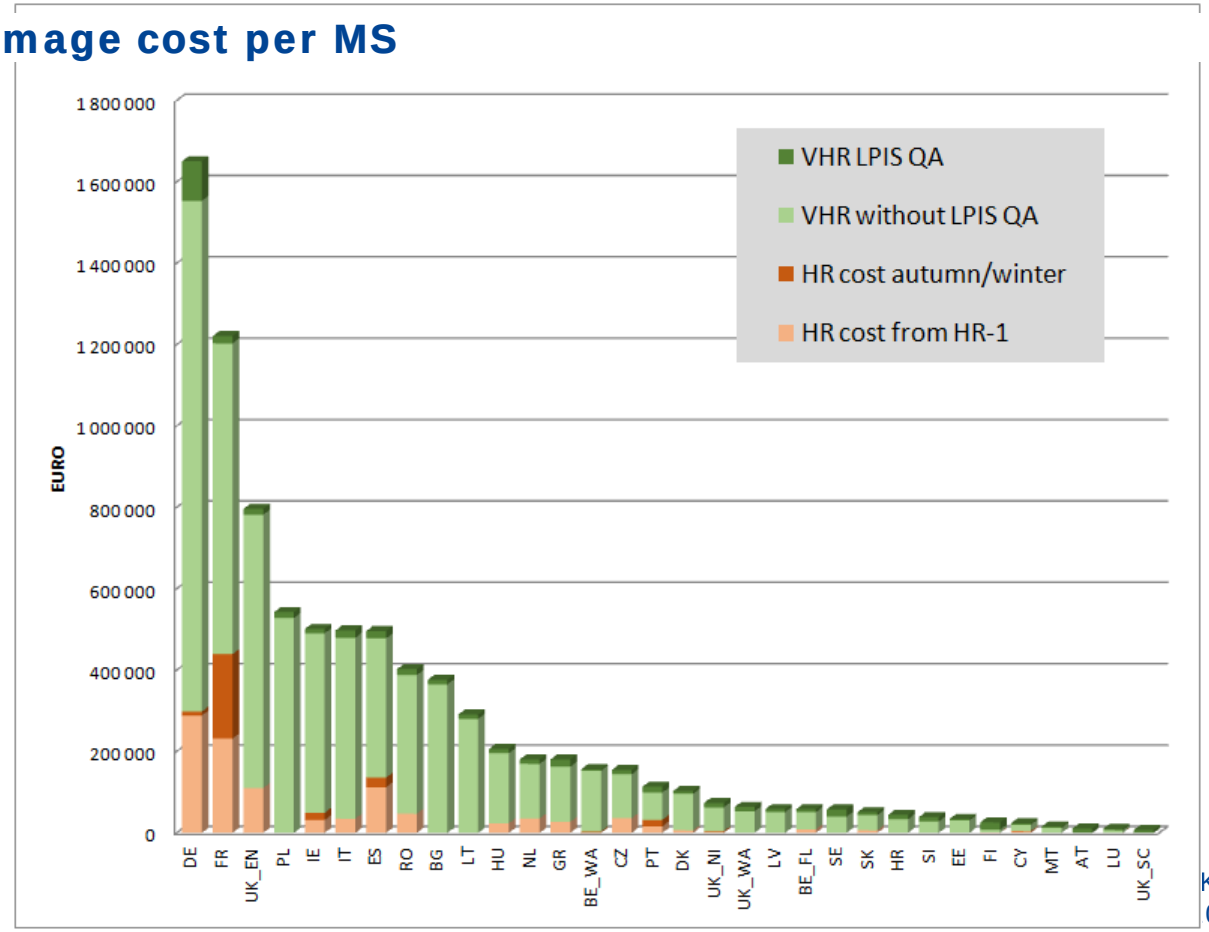
Total image cost per MS



KO
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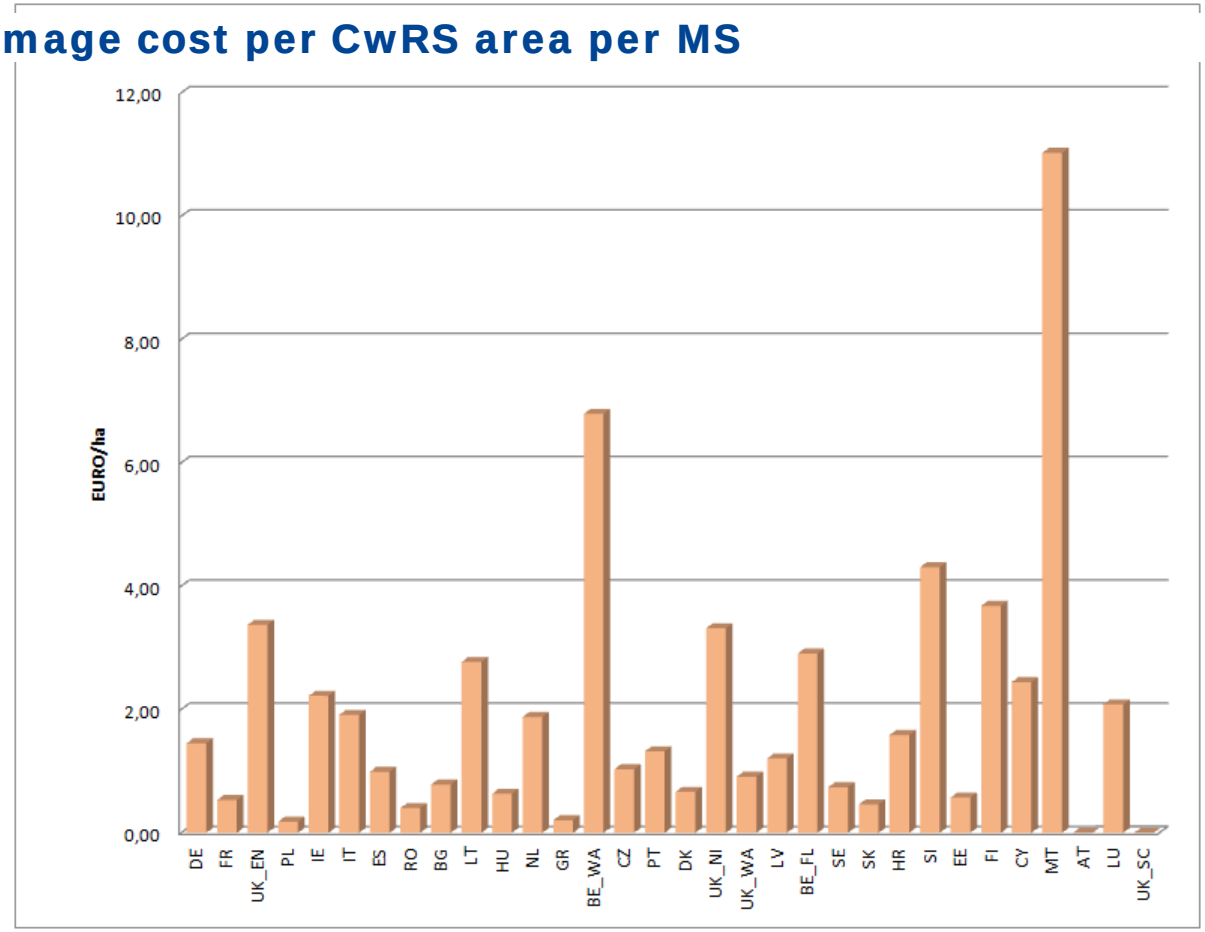
Total image cost per CwRS area per MS



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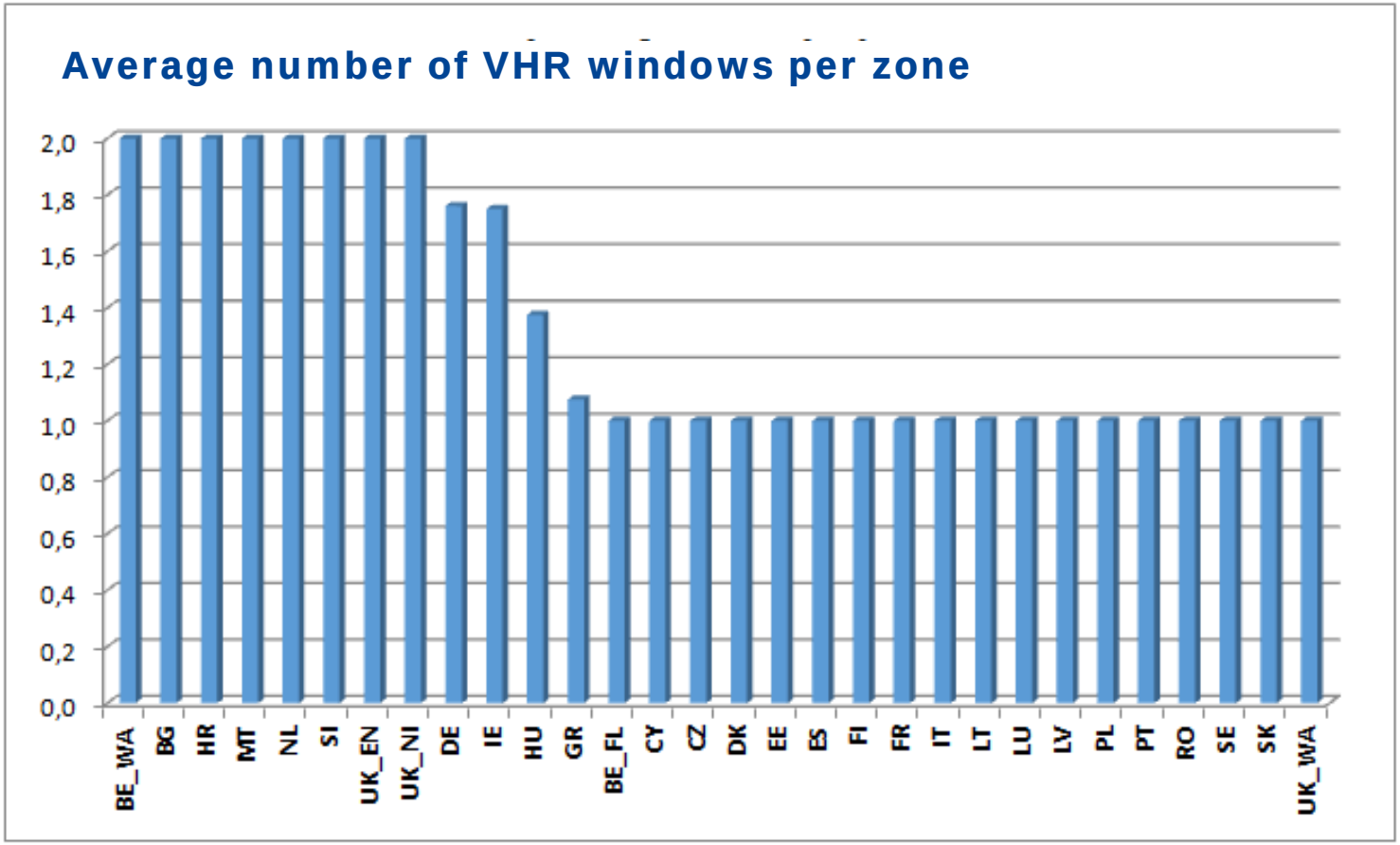
Average number of VHR windows per zone



Average number of HR windows per zone

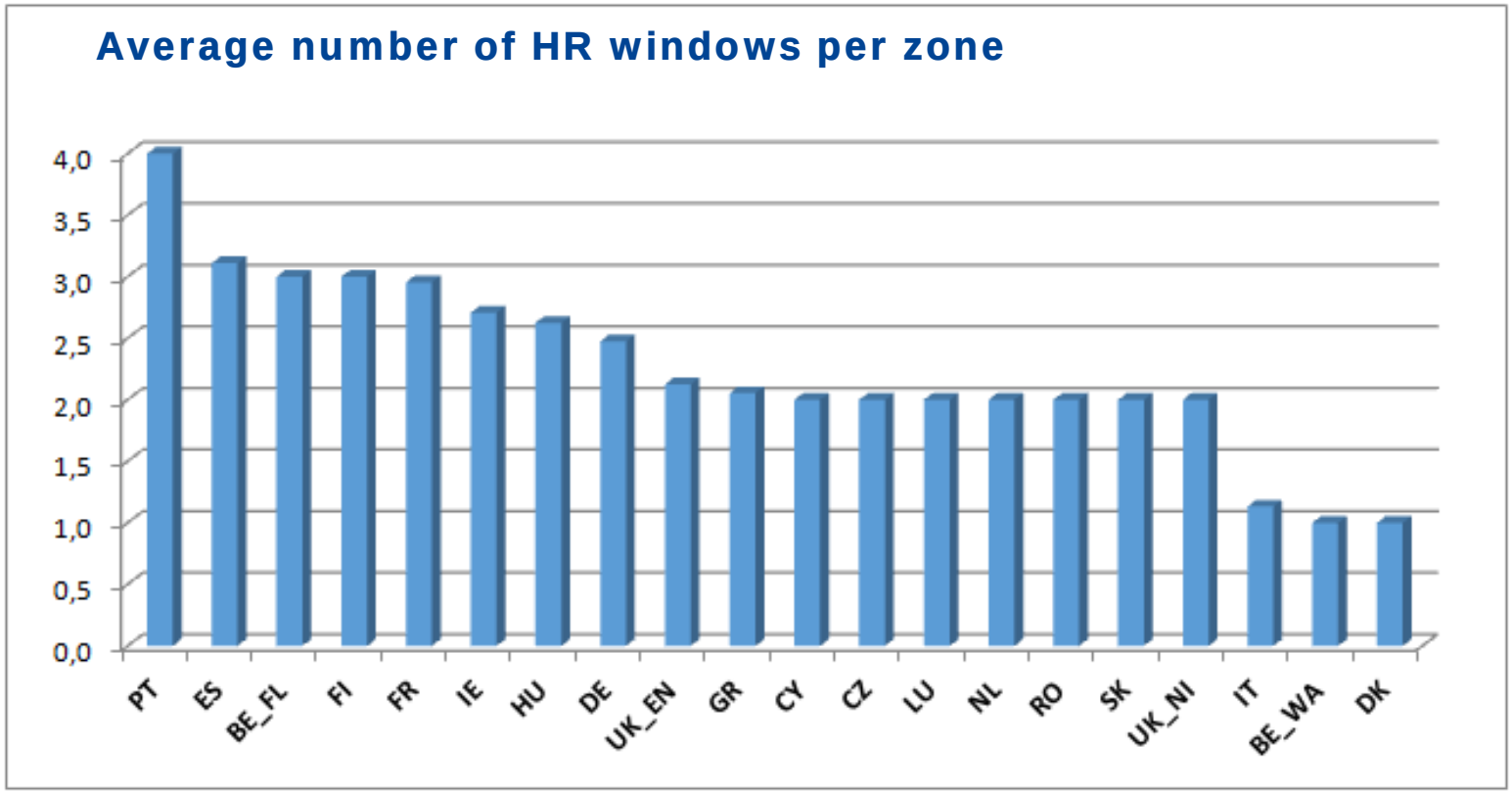


Image return to JRC

- **Status 2014**
  - **HR / VHR Source data: is completely delivered to JRC.**
  - **HR Ortho Image Return (OIR): all MS contractors delivered, except of PT. Some data not finally accepted.**
  - **VHR OIR: all MS contractors delivered. Some image files need to be substituted (not readable) or re-delivered due to incompleteness (mosaics). This issue is still ongoing and if necessary JRC or EUSI will contact you.**
- **CAP data 2014:**
  - **Source: 10,8 TB**
  - **Ortho VHR: 7,2 TB**
  - **Ortho HR: 1,5 – 1,6 TB**
- **CID portal and Big Data**
  - **CID portal presently contains approx. 150 TB of EO data (not only CAP data)**
  - **CID portal => development into a new architecture (storage, processing, access)**

Spatial data for CAP

The role of spatial data is ever increasing in the implementation of the Common Agricultural policy. The CAP reform has extended the content of the Land Parcel Identification System and introduced the geospatial application. Moreover, the greening process, with crop diversification, permanent grassland maintenance, and various ecological focus area types has created new challenges for controls. Spatial information, including that stemming from remote sensing has to be handled in a coherent way, wherever it resides in IACS.

Copernicus Sentinels

	**S1A/B:** Radar Mission	3 Apr 2014/early 2016
	**S2A/B:** High Resolution Optical Mission	**JUNE 12, 2015**/2016
	**S3A/B:** Medium Resolution Imaging and Altimetry Mission	2015/2017
	**S4A/B:** Geostationary Atmospheric Chemistry Mission	2021/2027
	**S5P:** Low Earth Orbit Atmospheric Chemistry Mission	2015
	**S5A/B/C:** Low Earth Orbit Atmospheric Chemistry Mission	2021/2027
	**S6A/B:** Altimetry Mission	2020/2026

Copernicus: the (near) future

S1A will eventually produce approx. 1 Tb/day (~ Q2/2015).

S2A will produce 3 Tb/day (10 m (4 visible and near-infrared bands), 20 m (6 red-edge/shortwave-infrared bands), 60 m BNS (3 atmospheric correction bands) with global land coverage, every 12 days.

S1B and S2B scheduled for launch in 2016. Another 4 Tb/day.

S1/2 C&D planned to guarantee continuity until, at least, 2025.

To be followed by S1/2 “next generation”.

“**Big Data**”, but still manageable at Member State scales!

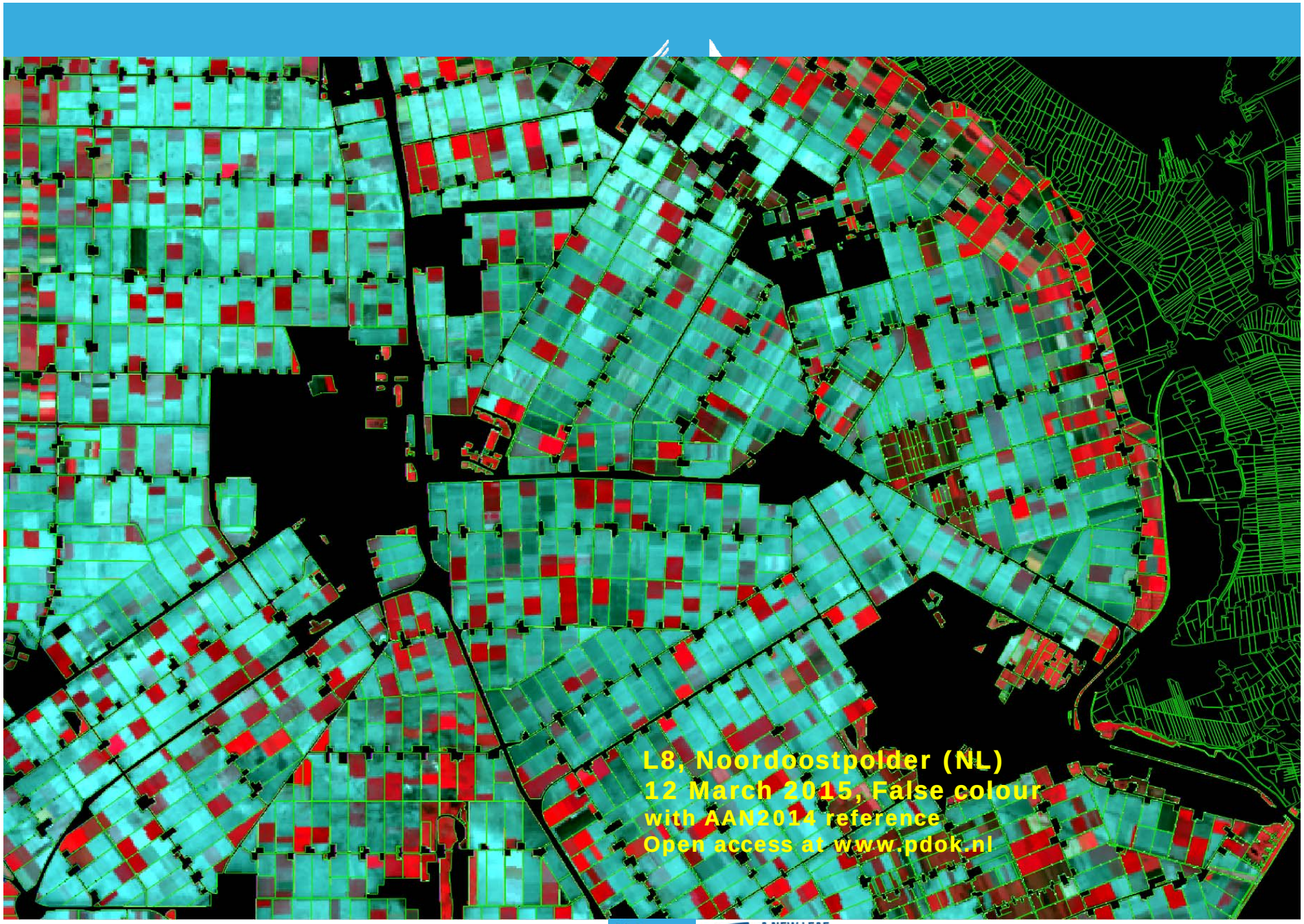
Relevance for CAP OTSC

Sentinel-2 will become the prime HR satellite source for agri-monitoring applications, with Landsat-8 as a gap-filler, and S-1 as complimentary, consistent reference;

In the context of controls, S-1 and S-2 may contribute to checks on crop rotation/crop diversity, grassland conversion, some EFA elements (TBD) and alternative sampling schemes;

Potential for highly automated processing, with moderate needs for processing infrastructure [and fully based on open source software]

→ Deliver crop maps



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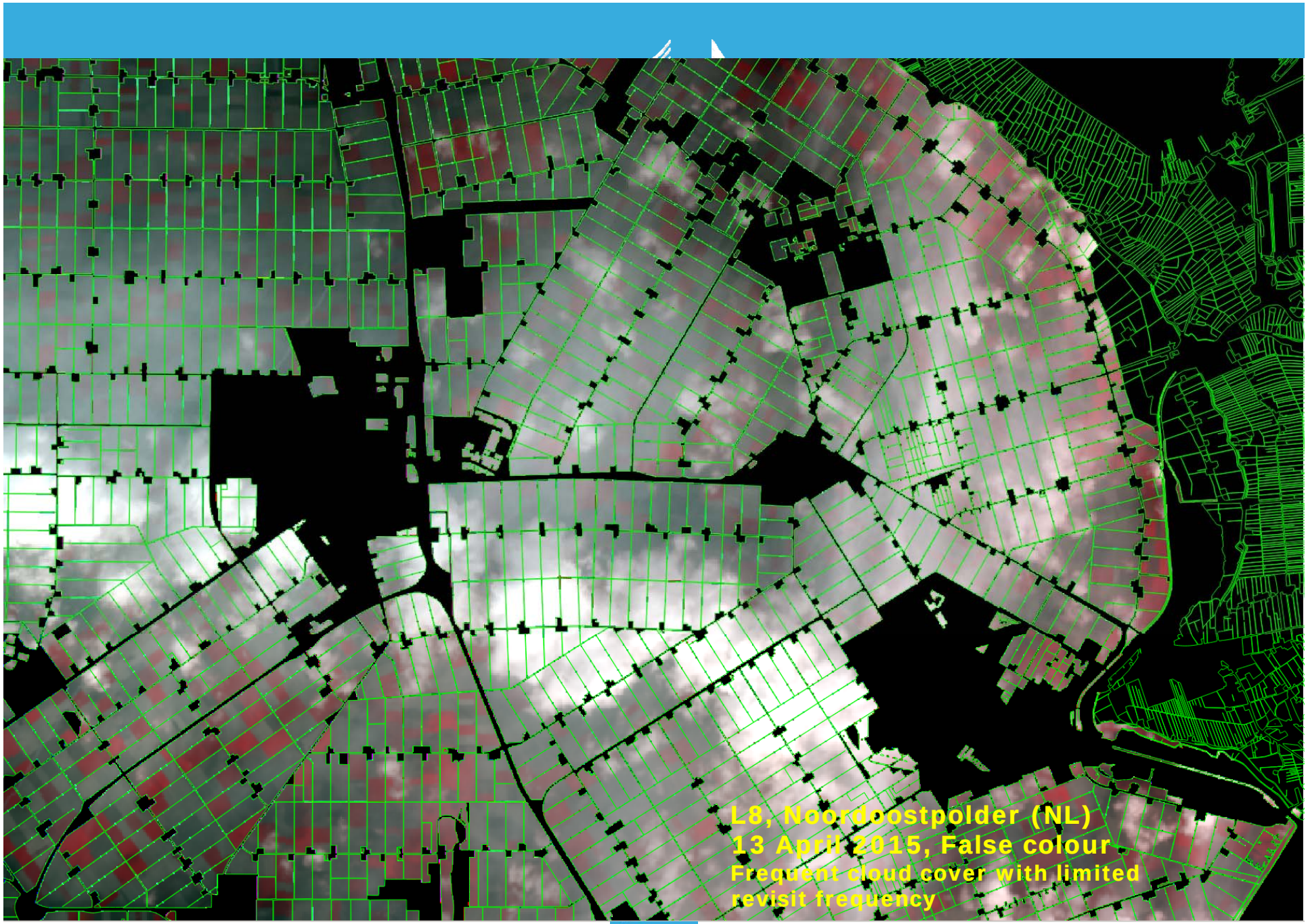

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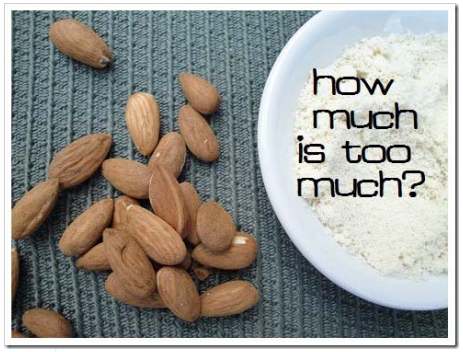
Conclusions

1. Innovation triggered high throughput control methods (i.e. RS)
2. Technology potential support policy targets achievement (but …sometimes overestimated!)
3. EU financial support fundamental to large deployment of new technology
4. EU scientific support fundamental to speed up and harmonise large technology deployment
5. Data quality maintenance is a crucial step in the control system
6. Experience sharing, exploratory research, pilot sites are essential to test new technologies and new methodologies, to find new solutions
7. Cost effectiveness always a priority
8. Error rates always within acceptable ranges



Thank you

Why Who

Constraint

Disagree Advantage

Clarification Opinion

Question

Agree

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