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9th ANNUAL CONFERENCE ON CONTROL WITH REMOTE SENSING OF AREA-BASED SUBSIDIES

PROCEEDINGS

Köln, Germany

27th and 28th of November, 2003

S.P.I. 04.50

MARS Monitoring Agriculture with Remote Sensing

Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

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MARS Unit

9th Annual Conference on Control with Remote Sensing of Area-based Subsidies

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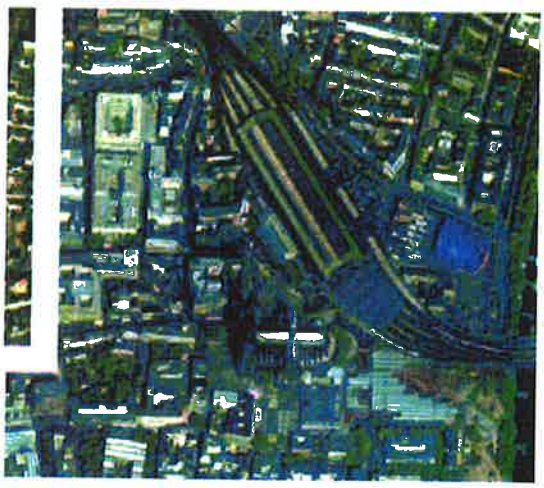

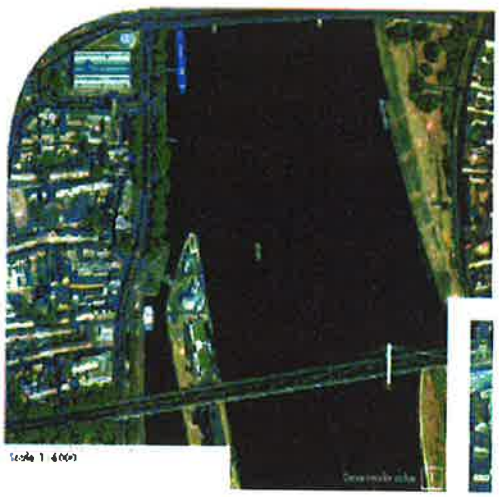

Prepared by:	Mihaela Fotin	**Status:**	**Proceedings of Conference**
		Diffusion:	Internal: JRC, MARS Unit/ DG AGRI National Administrations Participants to the Conference
Approved by:	Pär-Johan Åstrand, Jacques Delincé		
Date: March 2004		**Ref:**	

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INTRODUCTION

The 9th Conference on *"Controls with Remote Sensing for area-based subsidies"* was held in Köln on 27th and 28th of November 2003, organised by the JRC (Institute for the Protection and Security of the Citizen, MARS Unit) in collaboration with the German Bundesministerium Verbraucherschutz, Ernährung und Landwirtschaft (BMVEL).

A high number of participants attended this event (216, from 30 different countries), 28 presentations (of which 15 were from the JRC), and more than 25 posters and 7 software demonstrations. Such a high number of participants (image providers, competent authorities, paying agencies, contractors, software companies etc.) demonstrated the interest, the importance and the crucial role of such a conference. Members of senior management participated from both the JRC and BMVEL: Jean-Marie Cadiou, IPSC Director and Herbert Küster, BMVEL General Director of BMVEL, lead qualified team representatives from the respective organisations. Key officials from Directorates General for Agriculture were also represented.

The Conference was structured into 7 sessions, focusing on:
- CAP Reform (to which has been dedicated a podium discussion),
- Results of the 2003 Campaign,
- VHR systems and pilot testing,
- High Resolution Airborne digital sensors,
- New issues in the Campaign 2004 and
- New Common Technical Specifications.

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The reason for the high interest in the conference was the upcoming changes within the CAP and EU: the CAP Reform and Enlargement; and the effects of these two on Remote Sensing and GIS. Specific issues of interest were related to the tighter rules on maximum tolerances for area measurements as stipulated by DG AGRI (and thus the increased possible role of VHR satellite sensor technology in the forthcoming campaign) and the implementation of CwRS in the New Member States.

Enlargement in the context of the CwRS programme has been a main issue since 1999, when contacts were first made with the CCs. Some CCs attended the 1999 CwRS Conference in Stresa. Today, after many missions, workshops, training sessions, Pilot Projects, ITTs, etc., good contacts have been established with all 10 New MS, with the three future members (Turkey, Bulgaria and Romania). The work continues, Croatia was present at the conference with 2 representatives!

The Reform of the CAP defined by the Council Reg. N° 1782/03 of 29 September 2003 is a major re-orientation of the Common Agricultural Policy, and has an importance comparable to the first CAP Reform of 1992. That reform introduced the principle of direct payments based on area, the IACS (Integrated Administration and Control Systems), and the essential role of digital LPIS (Land Parcel Identification System) as a horizontal system, ensuring compatibility and geographic crosschecks between a number of Schemes. The ongoing Reform covers only the 1st pillar of the CAP (but concerns indirectly the Rural Development). In 2005 it will introduce a number of important changes in management and controls: *Single Payment Scheme*, *Entitlements*, *Modulation*, the *Cross-Compliance* with *Statutory management requirements* and *Good Agricultural and Environmental Conditions*.

The Commission is preparing an implementing Regulation to define and clarify modalities for the application of the Council Reg. N° 1782/03: implementation, management and control of the new CAP.

Remote Sensing remains a sound and reliable technology to perform controls. Indeed, CwRS will become more efficient; VHR data will simplify field visits, ensuring reliable area measurement. Most probably the future methodology for the second pillar will be the use of VHR imagery coupled with field/farm visits.

The role of MARS is to assist DG AGRI and all MS to develop a control system to suit future CAP and SAPs in the use of HR/VHR imagery in risk analysis and fraud detection. The increased use of VHR data will allow for regulatory tolerance requirements set up on area measurements to be achieved, and for other regulated criteria to be fulfilled.

In conclusion, I would like to thank BMVEL for their contribution to the success of this conference and for their warm hospitality.

Jacques Delincé,
MARS Unit Head

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FINAL AGENDA

Wednesday, 26th of November, 2003, Evening

17.00	Registration of the participants
16.00 - 18:00	Posters and Software Installation
18.00 – 20.00	Site Seeing Köln
20.00 – 22.00	Ice Braker

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Thursday, 27th of November, 2003, Morning

08.30 - 09:15	Registration of the participants
09.15 - 10:00	Opening address *Axel Heider - BMVL* Introduction *Jacques Delincé –Head of MARS Unit* *Pär Åstrand - JRC IPSC MARS*

Session 1 *Chairman: Axel Heider*

10.00 – 11.00	**CAP Reform**
20'	Introduction to the CAP Reform *Daniele Bianchi – EC/ DG Agri H.1*
20'	The Control System of the Reformed PAC *Richard Etievant - DG AgriJ.3*
20'	CAP Reform: Technical consequences on management of geographic information, LPIS, CwRS *Olivier Léo- JRC IPSC MARS*
11.00 – 11.30	**Coffee break**
11.30 – 13.00	**Podium Discussions** Effects of the CAP Reform on the Control System and implications on RS and GIS *EC - Richard Etievant, Daniele Bianchi, Jacques Delincé ; MS Administrations - Axel Heider, DE; Bill Duncan, UK; Giancarlo Nanni, IT; Sibylle Slattery, FR; new MS Administrations - Gabor Csornai, HU; Jolanta Orlinska, PL; contractors - Axel Relin, DE; Lubos Kucera, CZ*
13.00 – 14.30	**Buffet lunch, Maritim Hotel**

Thursday, 27th of November, 2003, Afternoon

Session 2 *Chairman: Pär Astrand*

14.30 – 17.00 **Rewiew of 2003 years CwRS Campaign**

20' Summary Statistics of the 2003 Campaign
Philippe Loudjani – JRC IPSC MARS

30' Results of QC 2002 and consequences on recommendations
Hervé Kerdiles – JRC IPSC MARS

20' Acquisition and delivery of satellite data CwRS 2003
Csaba Wirnhardt - JRC IPSC MARS

15.40 – 16.10 **Coffee break**

10' Acquisition of VHR satellite data for pilot tests
Pär Åstrand - JRC IPSC MARS

20' Pilot CwRS Campaigns in new Member States
Giuseppe Nesti - JRC IPSC MARS

20' Land Parcel Identification System: Status of implementation
Olivier Léo- JRC IPSC MARS

Session 3 **Posters session and Software Demonstrations**

17.00 – 19.00 Presentation of posters session and Software Demonstrations
Pär Astrand – see list at the end

19.30 **Gala Dinner at Maritim Hotel offered by host BMVEL**
Key note: H. Küster – General Director of BMVEL
Key note: JM Cadiou – Head of Institute, IPSC

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Friday, 28th of November, 2003, Morning

Session 4	*Chairman: Simon Kay*
9.00 – 11.00	**New VHR satellite data processing and geometry**
10'	Overview of the VHR systems and testing – Spaceborne VHR validation, 2003 *Simon Kay – JRC IPSC MARS*
30'	VHR satellite data processing and geometry. Results of the geometric tests – Eros, Quickbird, Ikonos *Jerzy Chmiel – JRC IPSC MARS*
20'	Using VHR satellite imagery in the Czech Republic: testing with Ikonos *Lubos Kucera – GISAT, Czech Republic*
20'	QuickBird coverage for the Cyprus LPIS *Kyriacos Alexandrou – Ministry of Agriculture, Cyprus*
20'	Use of IKONOS for LPIS coverage in Poland *Jacek Jjarzabek – ARiMR, Poland*
20'	Conclusions - VHR geometric tests and quality control *Simon Kay – JRC IPSC MARS*
11.00 – 11.30	**Coffee break**
Session 5	*Chairman: Philippe Loudjani*
11.30 – 13.00	***CAPI crop identification and parcel measurement with VHR data*** **(+ Agri-Environmental AEM issues)**
10'	Crop Identification and Parcel Measurements with VHR Data + AEM issues *Philippe Loudjani - JRC IPSC MARS*
15 '	Processing of VHR imagery to optimize CAPI *Hervé KERDILES - JRC IPSC MARS*
15 '	Test of the use of SPOT5 Pan Multispectral super mode data in parcel area estimation *Jorgen FORSGREN - METRIA (SE)*
15 '	Evaluation of Ikonos data in the UK CHAR control zone Mike WOODING - RSAC (UK)
15'	VHR Imagery – More than extra pixels *Tom McHUGH - ICON (IE)*
15'	The experience of using Spot5 Ms & VHR images in the Spanish Remote-sensing Control of Arable & Forage Land (2003 campaign) (*Charo ESCUDERO - TRAGSATEC, SP)*
15'	Control assisted by remote sensing of Agri-Environmental Measures (AEMS) compliance using VHR data *Jean-Paul GACHELIN - SIRS (FR)*
13.00 – 14.30	**Buffet lunch, Maritim Hotel**

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Friday, 28th of November, 2003, Afternoon

Session 6	*Chairman: Simon Kay*
14.30 – 15.15	**Airborne digital VHR imagery**
15'	High resolution Airborne Digital Sensor [ADS40] for photogrammetric and thematic applications *Andreas ECKARDT - DLR*
15'	Study on the acquisition of digital airborne data for agricultural control purposes *Gilles PICHON – ISTAR*
15'	Assessment and Quality control of ADS40 image deliverables *Peter SPRUYT (Simon KAY) – JRC ISPC MARS*
Session 7	*Chairman: Olivier Léo*
15.15 – 16.30	**Preparation of 2004 years CwRS Campaign**
20'	New Issues in the specifications *Pär ÅSTRAND – JRC ISPC MARS*
30'	Definition of CwRS Sites: past, present and future optimisation; demonstration of the use of LPIS *Olivier LÉO, Csaba WIRNHARDT – JRC ISPC MARS*
10'	Future of QC *Hervé KERDILES – JRC ISPC MARS*
15'	Any other issues – support to new MS, training, organisation of controls, lateness in delivery *All*
16.30	**Conference closure**

Session 1 – Introduction to CAP Reform

Chairman: Axel Heider, BMVEL

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Presentation 1 – Introduction to Conference

Pär Åstrand

JRC/ IPSC/ MARS Unit

Abstracts

A brief introduction to the Köln Conference.

The main themes of the conference:

- the Reform of the CAP
- the Enlargement
- overview of 2003, preparation of 2004 Campaigns

Presentation of the CwRS Programme and of the MARS Team.

A briefing of the program / participants / logistics.

Keywords: CwRS Control with remote Sensing, VHR Very high resolution, CAP Common Agricultural Policy, MARS Monitoring Agriculture with Remote Sensing.

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9th Annual Conference

"Control with Remote Sensing of Area based Subsidies"

Köln, DE, 27 & 28 November 2003

Introduction to Conference

- 2003... the 9th Annual Conference
  - the 10th year of Control with Remote Sensing

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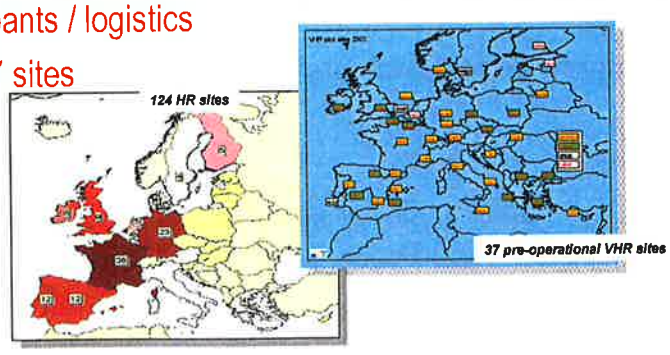
presentation outline

- main themes of the Conference
- the CwRS Programme, the MARS Team
- program / participants / logistics
- a view of 124 / 37 sites



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main themes of the conference

- the Reform of the CAP
  - effects on RS and GIS
    - what role for CwRS in 2005/2007 ?
    - CwRS is being integrated into a digital IACS GIS - 1st of January 2005
- the Enlargement
  - expanding common methods to 10 new MS – 1st of May 2004
  - SAPs
- overview of 2003, preparation of 2004 Campaigns
  - the operational use of Very High Resolution satellite imagery

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the CwRS Programme - planning

- collaboration through the year between
  - EC (DG AGRI, JRC MARS)
  - MS ADMIN
  - CONTRACTORS
  - IMAGE PROVIDERS

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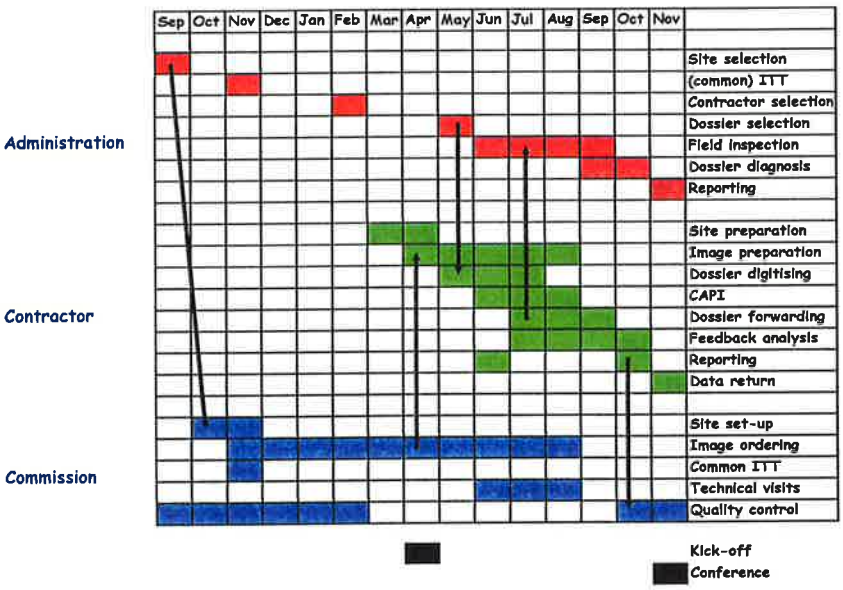

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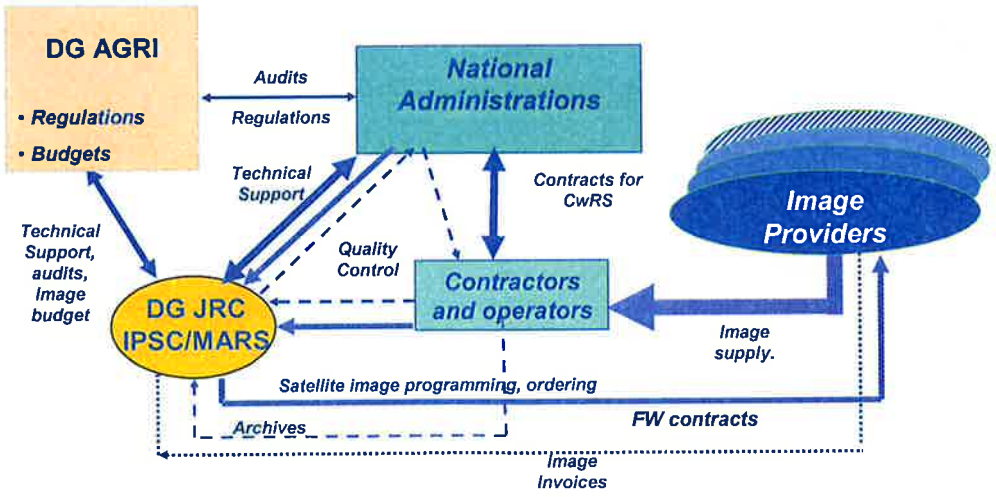
the CwRS Programme - organisation



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the MARS Team – a group of 7 people (not all full time)

MARS WP 1: Control with Remote Sensing
Pär ÅSTRAND
- *Hervé KERDILES: QC, rules, audits, site definition*
- *Cherith ASPINALL: image ordering, archive*
- *Paolo PIZZIOL: image acquisition, audits*
- *Csaba Wirnhardt : image acq. , site definition, new MS*
- *Philippe LOUDJANI: statistics, audits (40%)*
- *Åke HELGSTRAND: image ordering / archive system*

CAP Action - Olivier LEO

MARS Unit – Jacques DELINCÉ

IPSC – Institute for the Protection and Security of the Citizen

D.G. JRC *6th Framework Programme*

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program – 7 sessions

- THURSDAY
  - Session 1: CAP Reform, Podium Discussion (3) (chair A HEIDER)
  - Session 2: Review of 2003 years CwRS Campaign (6) (chair P ÅSTRAND)
  - Session 3: Posters and sw demonstrations (25+ / 7)
  - Gala dinner: key note speakers Herbert KÜSTER (BMVEL), Jean Marie CADIOU (IPSC)
- FRIDAY
  - Session 4: New VHR satellite data processing and geometry (6) (chair S KAY)
  - Session 5: CAPI crop id. and parcel measurement with VHR data (+ AEMs) (6) (chair P LOUDJANI)
  - Session 6: Airborne digital VHR (3) (chair S KAY)
  - Session 7: Preparation of 2004 years CwRS Campaign (4) (chair O LÉO)

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program – cont.

- 28 presentations
- 25+ poster presentations
- 7 computer sw demonstrations

- proceedings a.s.a.p.

if you have not provided us with a digital copy of your presentation contact chairman of your session or Pär Åstrand a.s.a.p.

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participants

- ±216 participants !!!
  - 115 (96), 126 (97), 140 (98), 135 (99), 174 (00), 160 (01), 160(02)
- 39 Invited experts from 28 countries
  - EU15, new MS 10, CCs (BG, RO, CR, not TR)
- 20 (+1) Commission representatives
  - 6 DG-AGRI J-3, H
  - 14 DG JRC MARS
- 30 countries total
  - companies from Switzerland, and Israel
- ± 45 companies

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logistics - reimbursement

- Administration Delegates from current and new MS, invited experts
  - please go to registration desk: Nathalie MAGONETTE, Ulrike WINTER
  - please bring your
    - pre-filled reimbursement and financial forms
    - ticket and BOARDING PASS (for copy)

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logistics MARITIM Hotel Köln

- all conference presentations, plenary sessions
  - Saal 1 / Maritim - on ground floor
- posters
  - next to Saal 1 / Maritim
  - no thematic division / re-arrange on mutual agreement
- sw demonstrations
  - Saal 3 – Neumarkt
  - Internet via WLAN (contact Davide AUTERI), 1 PC available for browsing etc.
- lunch
  - in big hallway
- coffee
  - next to Saal 1 / Maritim
- dinner
  - Maritim Hotel BMVEL invites to gala dinner

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logistics - translation

- translation
  - 5 spoken languages: EN, FR, DE, ES, IT
  - 3 translated languages: EN, FR, DE
  - please be careful with the equipment
  - please do NOT talk with headphones on!

- please, switch off cell phones

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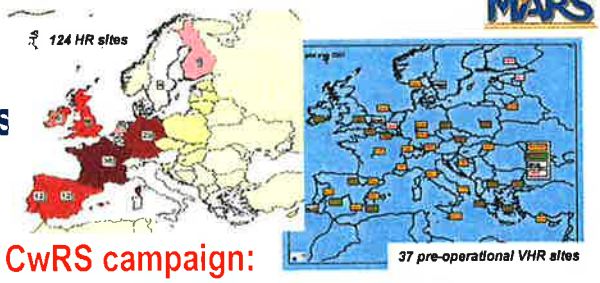
a view of 124 / 37 sites



- **summarizing 2003 years CwRS campaign:**
  - *total number of sites controlled with RS-data* — *124*
  - *total no. of IRS, Landsat, Radarsat, SPOT 2, 4, 5 images distributed to MS* — *680*
  - *total no. of VHR sites (various size)* — *37*
  - *total area of Ikonos, Quickbird, EROS imagery* — *15.000km2*

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thank you

- and thank you to BMVEL for hosting us!

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Presentation 2 – Introduction to CAP Reform

Daniele BIANCHI
European Commission/ DG Agricultural Law Unit (H.1)

Abstracts

COUNCIL REGULATION - establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers.

- Scope and definitions;
- General provisions: Cross compliance, modulation and financial discipline,farm advisory system, Integrated Administration and Control System, other general provisions);
- Single payment scheme (General provisions, Establishment of the amount, Payment entitlements);
- Other aid schemes ;
- Transitional and final rules (Management Committee for Direct Payments, implementing rules, amendments to other CMO regulations, transitional rules, entry into force and application).

Keywords: cross compliance, modulation, farm advisory system, Integrated Administration and Control System (IACS), payment scheme.

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Reform of the Common Agricultural Policy

THE "HORIZONTAL" REGULATION

- European Commission
Directorate General for Agriculture

Daniele Bianchi
DG AGRI - Agricultural Law Unit

COUNCIL REGULATION

establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers

- TITLE I SCOPE AND DEFINITIONS
- TITLE II GENERAL PROVISIONS
- TITLE III SINGLE PAYMENT SCHEME
- TITLE IV OTHER AID SCHEMES
- TITLE V TRANSIT. AND FINAL RULES
- ANNEXES
- (156 Articles/11 Annexes)

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TITLE I SCOPE AND DEFINITIONS

- *Article 1 Scope*
  - common rules on direct payments under income support schemes in the framework of the CAP which are financed by the "Guarantee" Section of the EAGGF, except those provided for under RD;
  - an income support for farmers ("single payment scheme");
  - support schemes for farmers producing durum wheat, protein crops, rice, nuts, energy crops, starch potatoes, milk, seeds, arable crops, sheep meat and goat meat, beef and veal and grain legumes.

TITLE I SCOPE AND DEFINITIONS

- *Article 2 definitions*
  - (a) "*farmer*",
  - (b) "*holding*",
  - (c) "*agricultural activity*",
  - (d) "*direct payment*",
  - (e) "*payments in a given calendar year" or "payments in the reference period*",
  - (f) "*agricultural products*".

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TITLE II GENERAL PROVISIONS

- Chapter 1 Cross compliance
- Chapter 2 Modulation and financial discipline
- Chapter 3 Farm advisory system
- Chapter 4 Integrated administration and control system
- Chapter 5 Other general provisions

TITLE IV OTHER AID SCHEMES

- Chapter 1 durum wheat quality premium
- Chapter 2 Protein crop premium
- Chapter 3 Crop specific payment for rice
- Chapter 4 Area payment for nuts
- Chapter 5 Aid for energy crops
- Chapter 6 Aid for starch potato
- Chapter 7 Dairy payments
- Chapter 8 Specific regional aid for arable crops
- Chapter 9 Seed aid
- Chapter 10 Arable crops area payment
- Chapter 11 Sheep and goat premiums
- Chapter 12 Beef and veal payments
- Chapter 13 Grain legumes aid

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TITLE V TRANSITIONAL AND FINAL RULES

- Management Committee for Direct Payments
- implementing rules
- amendments to other CMO regulations
- transitional rules
- entry into force and application
  - 2004 (durum wheat, protein crop, rice nuts energy crops starch potato dairy premiums)
  - 2005 (SPS, modulation, cross compliance, IACS, seeds, partial decoupled payments)
  - 2006 (Financial discipline)
  - 2007 (FAS)

ANNEXES

- ANNEX I List of support schemes
- ANNEX II National ceilings for additional amount
- ANNEX III Statutory management requirements
- ANNEX IV Good agricultural and environmental condition
- ANNEX V IACS Compatible support schemes
- ANNEX VI List of direct payments under the SPS
- ANNEX VII Calculation of the reference amount
- ANNEX VIII National Ceilings
- ANNEX IX List of arable crops
- ANNEX X Traditional production zones for durum wheat
- ANNEX XI List of seed species

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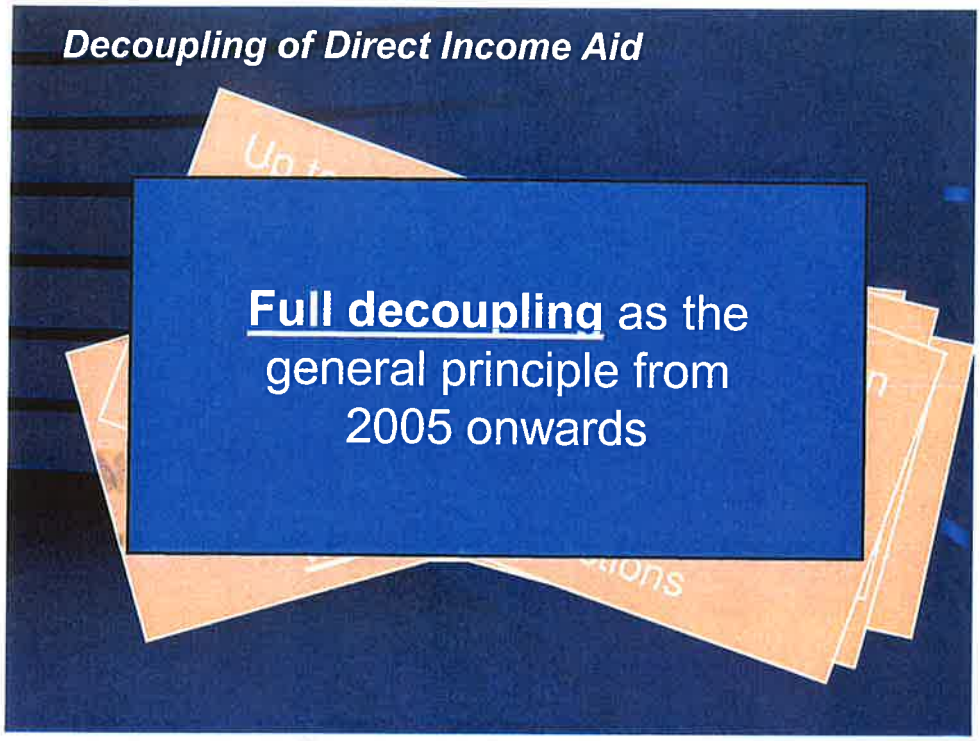

TITLE III SINGLE PAYMENT SCHEME

- Chapter 1 General provisions
- Chapter 2 Establishment of the amount
- Chapter 3 Payment entitlements
  - *Section 1* *Payment entitlements based on area*
  - *Section 2* *Payment entitl. subject to special conditions*
- Chapter 4 Land use under the single payment scheme
  - *Section 1* *Use of the land*
  - *Section 2* *Set-aside entitlements*
- Chapter 5 Regional and optional implementation
  - *Section 1* *Regional implementation*
  - *Section 2* *Partial implementation*
  - *Section 3* *Optional exclusions*
  - *Section 4* *Optional transition*

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SINGLE PAYMENT SCHEME

- **Why decoupling?**
- **Shift of support from production to producer**
- Improved market orientation of the CAP
- Farmers should benefit from market opportunities
- Strengthening the entrepreneurial role of farmers
- Payments better secured internationally

Decoupling - Single Farm Payment

- Establishment of **payment entitlements** by dividing the **reference amount** (2000-2002) by the **reference area** (premia generating area, including forage area)
- **Possibility of redistribution** of payments between regions and farms
- Payments granted only for entitlements accompanied by an **eligible hectare** (all agricultural and except permanent crops)
- **Premia entitlement** can be transferred with or without the land within the boundaries of a possible regional ring-fencing
- **Use restrictions** for eligible land: set-aside, cross-compliance, no permanent crops

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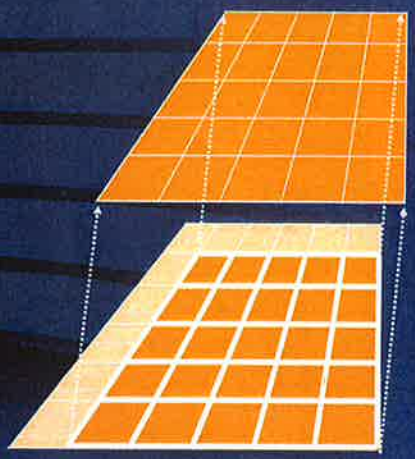
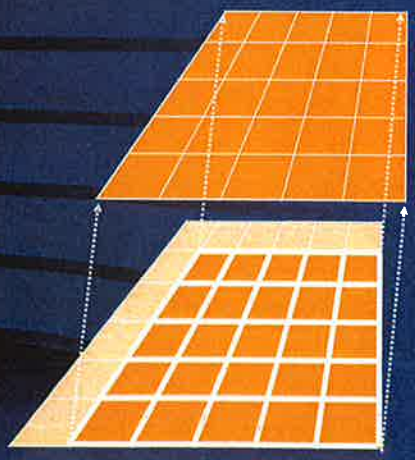
Single Farm Payment - Example



- The farm has received direct payments of annually **€ 7.500** *(reference amount)*
- The farm manages **36 ha** of *eligible land* of which **25 ha** have generated direct payments *(reference area)*
- The *reference amount* of € 7.500 is then devided by the *reference area of* 25 ha in order to create 25 *payment entitlements* each worth **€ 300.**
- The farmer gets payments for his 25 *payment entitlements* only, if he has at least 25 ha of *eligible land*.

Single Farm Payment - Example



- This farmer may sell up to **11 ha** without affecting his *single farm payment* (**7.500 €**)

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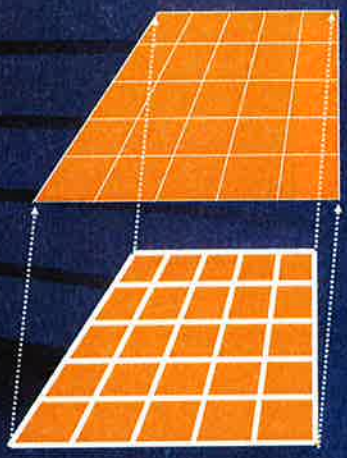
Single Farm Payment - Example



- This farmer may sell up to **11 ha** without affecting his *single farm payment* (**7.500 €**)
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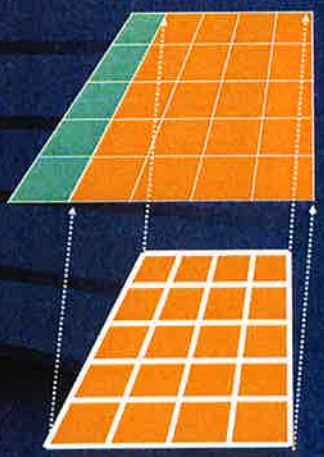
Single Farm Payment - Example



- This farmer may sell up to **11 ha** without affecting his *single farm payment* (**7.500 €**)
- If the farmer looses more than 11 ha, for instance another **5 ha** due to the ending of his rental contract, he will have only 20 ha of *eligible land*. This means that **5** *payment entitlements* remain unpaid.
- The farmer has two options for his *unused entitlements*:
  - He can sell *unused entitlements* to other farmers

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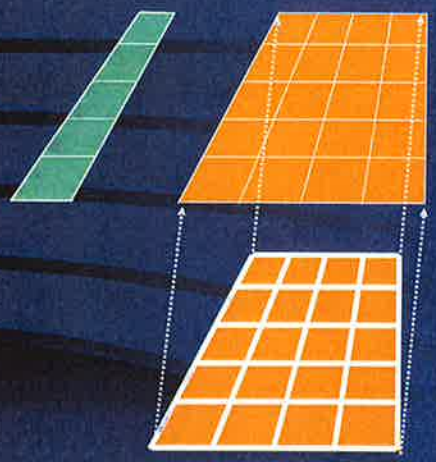
Single Farm Payment - Example



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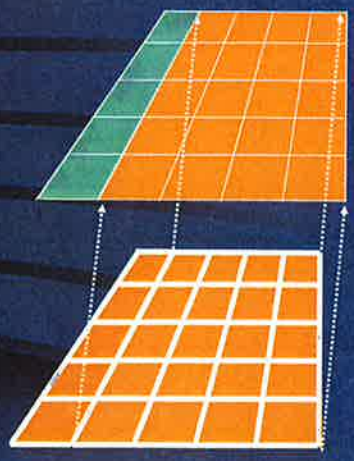

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  - He can sell *unused entitlements* to other farmers
  - Or he can rent or buy *eligible land*

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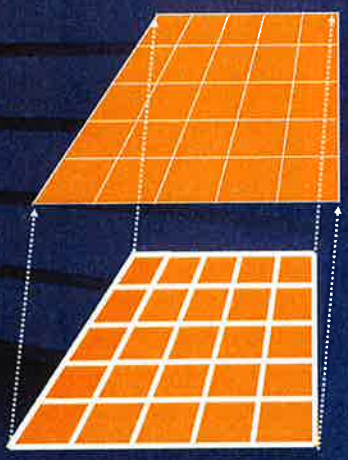
Single Farm Payment - Example



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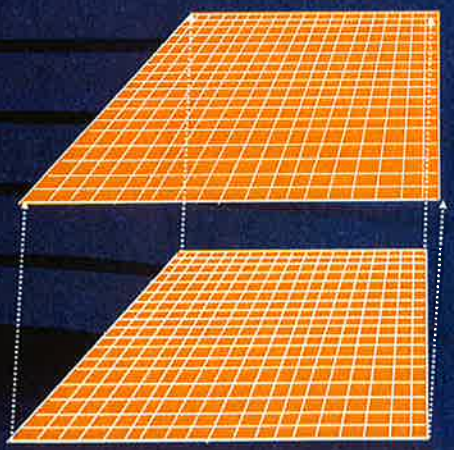
Regionalisation of the Single Farm Payment



- Establishment of payment entitlements by dividing the regional reference amount by the total number of eligible hectares
- Allocation of the (uniform) payment entitlements to all eligible hectares under the disposal of the farms in a region concerned

Implications:

- Redistribution of direct payments among farms
- No scope for trading payment entitlements without land, since every eligible hectare has already a matching payment entitlement

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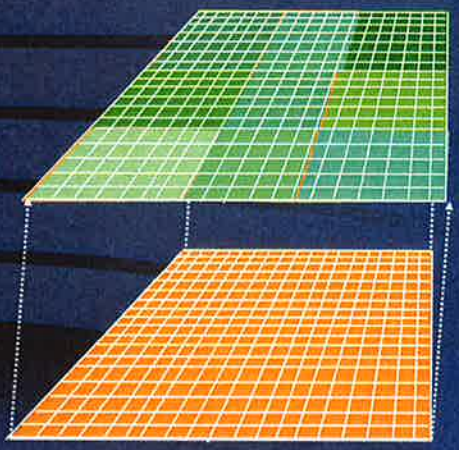
Regionalisation of the Single Farm Payment



Option: Combination of regional and standard approach:

- Possibility of excluding types of payments in part or totally from the regional "redistribution pot" and allocation of related reference amounts on an individual basis
- Regional and individual payment entitlements amalgate into single units of payment entitlements
- As a result, per-unit values of payment entitlements will differ among farms

Regionalisation of the Single Farm Payment

Further Options:

- **Variation of payment** levels between **grassland** and **arable land** (historical not actual use)
- **Recalculation** of the regional per-unit value of entitlements (**phasing in**)
- **Redistribution** between regions
- **Derogation** for activating payment entitlements on land used for the production of **fruit**, **vegetables**, or **table potatoes** within the limit of historical production levels

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Presentation 3 – The Control System of the Reformed PAC

Richard ETIÉVANT

European Commission/ DG Agriculture, Unit J3 (IACS and audit of Direct Aid)

Abstracts

The CAP reform adopted by the Council (Council Regulation n° 1782/2003 of 29 September 2003) represents a historic step for the CAP, mainly by introducing the decoupling of direct payments to farmers.

As with each reform, and even each modification of CAP aid schemes, both the control measures and more generally the architecture of the control system must be carefully adapted, in order to maintain (and possibly to improve) the protection of the Community's financial interests.

In addition, an efficient control system is the best guarantee for correctly implementing the schemes and consequently, for achieving the objectives of the reform.

During the reform process, the different features of the new CAP proposed by the Commission were analysed from a control point of view, in order to define the most appropriate control system (applicable to areas declared as well as cross-compliance).

The presentation will explain the logic and principles behind the proposed control system, both as a result of the above Council Regulation, and also in the context of the Commission declarations made at the time of its adoption.

It is hoped that the presentation will shed light upon the next steps in implementing the reform - the preparation of more detailed Commission Regulation.

Keywords: CAP Reform, IACS, LPIS Control with Remote Sensing, Cross-compliance, Farm advisory system, Audit, Clearance of accounts.

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THE CONTROL SYSTEM OF THE REFORMED CAP

Richard ETIEVANT
Head of Unit J3 (IACS and audit of Direct Aid)

Main features of the Commission proposal (from a control point of view)

- DECOUPLING
- CROSS COMPLIANCE
- *FARM ADVISORY SYSTEM (ex Farm audit)*
- SUPPRESSION OF ANIMAL PREMIA (finally OPTIONAL)

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How to define the new control system ?

Immediate question marks:

- **Role of the Land Parcels Identification System, Remote sensing, Geographical Identification System?**
- **How to control cross-compliance?**
- **Role of „farm audit"?**
- **Impact on the clearance of accounts?**

General objective

- **The current level of efficiency of controls of EAGGF expenditure must be preserved in this new CAP**
- **In particular:**
  - **the control of the areas must be (at least) as accurate as before**
  - **cross compliance must be effectively controlled**
  - **areas + cross compliance controlled in an integrated way (one subsidy → one control system)**
  - **clearance of accounts must apply to areas + cross compliance**

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Control of areas (1)

- Arable crops **coupled scheme**: aid paid per hectare cultivated with certain crops
- **Decoupled scheme**: aid paid on the basis of the entitlements, if the beneficiary has a corresponding number of ha cultivated or in good agricultural conditions

This difference could have suggested simplifications of the areas controls.

However, it was found necessary to keep the LPIS, the remote sensing, and the GIS (as from 2005).

Why?

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Control of areas (2)

Reasons to keep the current or planned tools (LPIS, etc.)

- transfers of land
- set-aside
- interdiction of certain crops
- remaining coupled aids (durum wheat)
- risk of incorrect signal to the administrations
- finally, the option of partial coupling.

Solution proposed by the Commission:

➔to keep and adapt the current IACS provisions

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Management and Control of entitlements

- Key aspect of the new scheme:

aid paid on the basis of the entitlements, if the beneficiary has a corresponding number of ha cultivated or in good agricultural conditions

solution: ➔ to add a new element of IACS:

"*a system for the identification and registration of payment entitlements*"

Cross compliance: general approach

- **Cross compliance will instead apply through a system of sanctions, rather than through eligibility conditions**
- **Cross compliance must be effectively „controllable". This implies a selective list of standards**
- **Cross compliance controls should rely on existing control forces of the administrations**

solution:

➔ create a selective list of standards

➔ expand the IACS definition, with a view to making use of the findings of the specialized control bodies.

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Control system of cross compliance (1)

Declaration of the Commission on the control system of cross compliance

Links between IACS and cross compliance

- 5% sample rate: - applies to eligibility control + as a basis for further risk analysis, to cross compliance controls
- The list of the 5% sample is transmitted to the different specialised control bodies

  Each control body has the choice between 2 options

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Control system of cross compliance (2)

Option 1:

Apply risk analysis to the **5%** IACS sample

Retain minimum **20%** of the beneficiaries to whom the relevant standard applies

The final rate is minimum **1%** of the beneficiaries to whom the relevant standard applies

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Control system of cross compliance (3)

Option 2:

The specialized control body establishes, based on its own risk criteria, its own list of farms to be controlled (minimum **1%** of the beneficiaries to whom the relevant standard applies)

- sub-option 2a

replace beneficiaries by non-beneficiaries to the extent that the higher risk of the latter can be demonstrated

- sub-option 2b

control at the level of undertakings instead of farm level. In this case 1% of beneficiaries must be covered indirectly.

Identification and Registration of the animals

In the decoupled scheme:

- I & R = one of the cross-compliance standards

In the optional coupled animal premia schemes:

- I & R = an eligibility condition = an element of the IACS

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Audit of cross compliance by the Commission

Commission audits main elements

1. Transfer of appropriate information by the Paying Agency to the specialized control body
2. Selection method according to option 1 or 2
3. Set up of control reports containing the detected non-compliance, the gravity of the infringement, and all relevant information on the investigations performed
4. Transfer of the reports to the Paying Agency
5. Application of the sanctions by the Paying Agency

Clearance of accounts

- Application of the rules of Regulation n° 1258/1999

- financial corrections proportionate to the risk to the fund (= risk resulting from the non-application of sanctions)

- preventive role is maintained (recommendations, guidelines)
- cases of incorrect, inadequate transposition, or absence of transposition of directives will not be dealt with by the clearance of accounts procedure, but by proceedings under art. 226 and 228 of the Treaty.

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Next Step

- Drafting of the Commission Regulation(s) on direct aids (including proportionate sanctions to be applied to the farmers)
- Working document on indicators of cross compliance
- Reflection on the impact on the use of remote sensing, LPIS , GIS

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Podium Discussions on

"Effects of the CAP Reform on the Control System and implications on RS and GIS"

Participants:

- *European Commission (Richard Etievant, Daniele Bianchi, Jacques Delincé);*
- *MS Administrations -Axel Heider, DE; Bill Duncan, UK; Giancarlo Nanni, IT; Sibylle Slattery, FR;*
- *new MS Administrations (Gabor Csornai, HU; Jolanta Orlinska, PL, Axel Relin, DE; Lubos Kucera, CZ);*
- *Paying Agencies;*
- *Contractors*

The main topics covered during the podium discussions:

- **"Quo vadis" remote sensing/GIS?**

  The discussions were focused on the eligibility conditions that can, in future, be monitored by remote sensing/GIS: parcel size; use, as appropriate (areas under fruit-, vegetable- and potato cultivation; set-aside areas; permanent crops); cross-compliance conditions; measures regarding rural areas.

- **Relationship remote sensing/GIS to traditional on-the-spot checks** (new article 23 Regulation (EC) no. 2419/2001; objectives of the Commission/Member States when using highest-resolution satellite images (VHR); cost/benefit aspects).

- **Outlook** (digital filing of applications; remote sensing as an element of an "open GIS").

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Presentation 4 – CAP Reform: Technical Consequences on management of geographic information, LPIS, CwRS

Olivier LÉO

JRC/IPSC /MARS Unit

Abstracts

The Reform of the CAP defined by the Council Reg. N° 1782/03 of 29 September 2003 is a major re-orientation of the Common Agricultural Policy, with an importance comparable to the first CAP Reform of 1992 which introduced the principle of direct payments based on the area, the IACS (integrated Administration and Control Systems), and the essential role of the digital LPIS (Land parcel identification System) as an horizontal system, ensuring compatibility and geographic cross-checks between a number of Schemes.

The ongoing Reform covers only the 1st pillar of the CAP (and concerns indirectly the Rural Development). It will introduce in 2005 a number of important changes in the management and controls: *Single Payment Scheme*; *Entitlements*, *Modulation*, *Farm Advisory System*, the *Cross Compliance* with *Statutory management requirements* and *Good Agricultural and Environmental Conditions…*

A Regulation will be issued by the Commission to define and clarify a number of modalities for the application of the Council Reg. N° 1782/03: implementation, the management and the control of the new CAP.

However, and more as a basis for the round table, the presentation will try to analyze the different concepts and their technical consequences, in order to formulate a number of issues on what could be in the future the role of Control with Remote Sensing, LPIS, and more generally of the geographic information in the CAP Reform and in the process of enlargement (SAPS scheme in some of the 10 new Member States).

Keywords: CAP Reform, IACS, LPIS Control with Remote Sensing, Cross compliance, Farm advisory system.

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Joint Research Centre

CAP Reform & management of geographic information LPIS, CwRS

Olivier LÉO, Jacques DELINCEÉ
http://www.mars.jrc.it
http://www.jrc.cec.eu.int

9th conference on Controls with Remote sensing

Köln, 28-29 November 2003

Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

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Warning:

- *This presentation*
  - *is a preliminary analysis, driven by technological concerns*
    - *a real requirement to anticipate modifications for CWRS in 2005.*
  - *But it has no legal value*
    - *and reflects only opinions of its authors*
    - *with the purpose of supporting / stimulating discussions*
- *Commission Regulations will define a number of modalities for the application of Council Reg. N°1782 /03*
  - *The present analysis will have to be revised accordingly !*

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Summary: 4 parts

- The new concepts of 1782/03 and incidences on Geographic information
  - Entitlements, Single Payment Schemes, Cross Compliance, Farm Advisory Systems ?
- What could be the changes or future development
  - for the "LPIS" and IACS-GIS
  - for the "Controls with Remote sensing"
  - for other future applications ....
- A few words on SAPS
- Conclusions
  - a critical calendar in 2005

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A main Reform

- Council Reg. N° 1782/03 introduces a number of new concepts:
  - Entitlements, Single Payment Schemes, Modulation, Cross compliance, Farm advisory system...
- What are the possible functions behind ?

Focusing on the ones involving geographic information

Art.	ENG	FR	DE
43	Payments Entitlements	Droits au paiement	Zahlungsanprüche
33	Single Payment Scheme	Régime de paiement unique	Einheitlichen Betriebsprämie
10	Modulation	Modulation	Modulation
03	Cross compliance	Conditionnalité	Einhaltung anderweitiger Verpflichtungen
04	Statutory management requirements	Exigences réglementaires en matière de gestion	Grundanforderungen an die Betriebsführungen
05	Good agricultural and environmental conditions	Bonnes conditions agricoles et environnementales	Guter landwirtschaftliche und ökologischer Zustand
16	Farm Advisory System	Système de Conseil Agricole	Landwirtschaftliche Betriebsberatungssystem
17	IACS (Integrated Administration and control System)	SIGC (Système intégré de Gestion et de contrôle)	InVeKoS (Integriertes Verwaltungs und Kontrollsystems)
20	LPIS (Land Parcel identification System)	SIPA (Système d'identification des parcelles agricoles)	FIS (Feld Identifizierung System)

Most of the *Acquis* from IACS are remaining in 1782/03

- IACS — *Art. 17, 18*
  - but without animal databases — *Art. 18*
  - plus entitlements databases — *Art. 18, 21*
  - link to 3Y archive ('til 2000 marketing year) — *Art 19, 21*
- LPIS and IACS GIS — *Art. 20*
  - Provision of graphical data to farmers — *Art 22*
- Controls with Remote sensing — *Art. 23*
  without noticeable changes
- More generally are maintained:
  - The main IACS functions: Adm. checks, risk analysis, OTS — *Art. 25*
  - The compatibility and cross checks with other schemes — *Art. 26 Annex V*

NB: The reform covers only the first pillar of the CAP

- The second Pillar continues to rely on LPIS ,etc... but is indirectly concerned through *modulation* in order to support implementation of the Reform (standards, food quality)

Art. 10 & Counc. 1783/00 amending 1257/99

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Entitlements ?

- Based on the areas of 3 reference years (2000-2002), but after
  - attached to the person (who has lodged the applications)
  - and completely decoupled from any geographic area...
- In practice:
  - Probably two types of entitlements
    - With or without SET-ASIDE obligation
  - Creation of a database of entitlements (part of IACS)
    - Creation of the data (validation with farmers) implementation of the system with a number of functions of administration and control...
- Some critical points
  - Yearly use and management of portfolio of entitlements (different values, with or without set aside, etc) *Art 44 -46, 54*
  - Management and attribution of the national/ regional reserves ? *Art 42*
  - Reference Years for New MS : how to manage conflicts between farmers and land owner during the IACS implementation?

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Eligibility of SPS

- A new cross-check between total area eligible / payment entitlements
  - Administrative (on 100% of applications) *Art 23*
  - But at the level of the farm, no geographic basis (except if entitlements for various regions) *Cf Art 46, 59*
- Eligibility of land uses?
  - All agricultural land uses except *Art 51*
    - Permanent crops
    - Fruits and vegetables (fresh or processed)
    - Non-starch potatoes.
  - Specific obligation for set aside
    - Size , land use , possible rotation *Art 54, 56*

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Eligibility of SPS

- Eligibility of geographic areas ? (reference eligibility)
  - The ref. eligibility (Dec 91) apparently disappear
  - The condition: Area in GAEC at 30 June 2003 (any agricultural land use, incl. fallows... and permanent crops?)
- Other conditions:
  - Management of production zone for specific crops
    - Durum wheat, rice...
    - Generalized or in case of regionalization plan

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Cross compliance

- A key element of the CAP reform
  - But already existing in the 2nd Pillar *Reg. 1257/99 (R. Dev.)*
  - In the "simplified schemes" *Reg. 1259/99 & 1244/01 (+SAPS)*
- 2 main components of Cross-compliance
  - Statutory Management Requirements (SMRs)
  - Good Agricultural and Environmental Conditions (GAECs)
- Hopefully consistent with SAPS:
  - GAECs: Annex IV of 1782/03 identical to annex III of draft Com Reg on SAPS
  - But: SAPS do not include Statutory Management Requirements.

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Cross compliance

- Calendar of implementation
  - Statutory Management Requirements: 3 batches 2005, 2006, 2007
  - GAECs (2005 ?)
- Definition of the GAECs
  - Annex IV provides more an indicative list of concerns
  - MS have to define appropriate GAECs standards *Art 3.2*
  - A best definition should be specific for geographic region / landscape
- The level of detail of standards for GAECS (or SMRS?)
  - Should be realistic,
  - Acceptable by farmers, controllable ...
  - Clearly documented to farmers .

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Cross compliance

- Differences in the Control
  - Cross compliance # eligibility criteria (different principle and rules)
    - May involve many commitments and elements to checks
      - At the parcel or at the farm level
      - All year long (including winter period)
      - Different types of evidences:
        - » Objective observations
        - » Indirect evidences : Registers, equipments, invoices, seeds, etc...

Cf experience of 2nd Pillar

  - Modalities & penalties to be specified (# from eligible area)
    - Generally: incidence at the farm level
    - Modulated according to intentional or negligence.

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Cross compliance: SMRs

- 18 standards to be implemented 2005-2007

A) Applicable from January 2005				
Environment				
1	Direct. 79/409 Art. 3,4,7,8,9.	Conserv. Wild birds- ***BIRD Directive***	Parcel	RS, LPIS
2	Direct. 80/ 68 Art 4,5	Protection of groundwater	Parcel	LPIS/ GPS
3	Direct 86/278 Art 3	Protec. Env and soil for sludge	Parcel	LPIS / GPS
4	Direct. 91/676– Art 4 and 5	Water protect. / ***Nitrate Directive***	Parcel	LPIS/ GPS
5	Direct 92/43 Art 13,15,16,22	Conser of Habitat – ***FFH or Habitat Dir.***	Parcel	RS, LPIS
Identification and Register of Animals				
6	Direct. 92/102 - Art. 3-5	Animal identification & registers	Farm	-
7	Com Reg.2629/97 - Art. 6,8	Animal identification & registers	Farm	-
8	Reg.1760/ 00– Art. 4, 7.	Bovine identification	Farm	-
B) Applicable from January 2006				
Public, animal and plant health				
9	Council Dir. 91 / 414 – Art. 3	Marketing plant protection	Farm	-
10	Council Dir. 96 / 22 – Art. 3,4,5,7	Prohibition of hormones	Farm	-
11	Council Reg.178/ 02 – Art 14,15, 18-20	***General Food Law***	Farm/ parcel	LPIS, GPS
12	Counc. Reg.999/01 - Art.14,15, 17-20	Prevention & eradication of ESB	Farm (parc.)	-

Environmental Directives are directly linked to geo. area, but:

•modalities very specific in MS and Reg.

• possible overlaps with 2nd pillar in Natura 2000

Mainly cross checks at farm level (e.g. with animal registers)

General food law provides huge opportunity in geo-traceability

NB: LPIS with stables and forage parcels for crisis management

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Cross compliance : SMRs

... 18 standards to be implemented 2005-2007

Notification of diseases				
13	Council Dir 85/511 – Art. 3	Foot and mouth disease	Farm (parc)	-
14	Council Dir 92/119 – Art. 3	Var Animal diseases and Swine vesicular disease	Farm/ parcel	-
15	Council Dir 2000/75 – Art. 3	Control & eradic. of Blue-tongue (ovine)	Farm/ parcel	-
B) Applicable from January 2007				
Animal Welfare				
16	Council Dir. 91 / 629 – Art. 3-4	Protection and welfare of Calves	Farm	-
17	Council Dir. 91 / 630 – Art. 9,10	Protection and welfare of pigs	Farm	-
18	Council Dir. 98 / 58 – Art. 3	Protection of animals	Farm	-

Mainly checks at farm level... (equipments, registers)

Involvement of Veterinary Services

Clear inputs from geographic information for all the environmental Directives: Practical links within IACS will depends

- on national Regulations implementing the Directives and modalities
- detail of the rules / interdictions to be respected by farmers.

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Cross compliance : SMRs

A strong requirement of specifications according to the various area of concern... E.g.: Nitrate Directive

	Nitrate Directive in 2000			
	NVZs 1000 km2	%	EC potential Area 1000 km2	
AT	84	100,0		
BE	5,6	18,0	15,9	51 %
DK	43	100,0		
DE	356	100,0		
GR	13,9	11,0		
ES	32	6,0	70.6	14 %
FI	334	100.0		
FR	240,1	48,0		
IE	0	0	6.5	9 %
IT	5,8	2,0	88.7	29 %
LU	3	100,0		
NL	37	100,0		
PT	0,9	1	12.2	13 %
SE	41	9,0	43.7	10 %
UK	7,8	3	19.2	2, 8 %
EU 15	1202	38.0		

Very heterogeneous level between MS ...

- *Some MS with a program on the whole territory (art 3.5)*
- *More than 200 (regional) programs defined for EU 15*
- *Some countries have implemented a "manure Register" with a parcel identification.*

Source OOPEC- 2002 (ISBN 92-894-4103-8)

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Cross compliance : SMRs

... E.g.: Habitat & Bird Directives

	Bird Directive			Habitat Directive		
	SPA number	Total area 1000 km2	Area %	SCI Proposed number	Total area 1000 km2	Area %
AT	83	12,0	14,7	160	8.9	10.6
BE	36	4,3	14,1	270	3,18	10.4
DK	111	9,6	22,3	194	10.3	23.8
DE	457	27,8	8,1	3535	32.1	9.0
GR	110	8,1	6,1	236	27.2	20.6
ES	384	74,2	17,8	1276	118.5	23.5
FI	451	27,5	8,1	1671	60.1	17.8
FR	117	8,9	1,6	1174	40.6	7.4
IE	109	2,2	3,2	364	9.9	14.2
IT	358	21,4	7,1	2369	41.3	13.7
LU	13	0,16	6,2	38	0.35	13.7
NL	79	12,3	24,1	76	7.3	17.7
PT	47	8, 7	9,4	94	16.5	17.8
SE	436	23,3	5,2	3420	57.5	12.8
UK	239	14,2	5,8	567	24.1	9.9
EU 15	3 030	254,9	7.9	15 453	457.9	14.1

Around 19 000 zones defined in EU 15, on < 20% of the territory, (but no European stats available for Agricultural zones).

Very heterogeneous level of definition between MS ...

- *Sites varying from station (<1ha) to national parks (>1000 km2)*

Warning for % of area:

- *Overlaps between the 2 types of sites*
- *. Include also marine areas (NL, DK...)*

Source NATURA barometer (April 2003)

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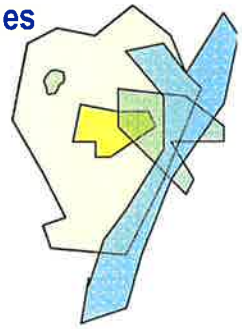
Cross compliance : SMRs

Modalities of implementation

- All these measures are attached to geographic zones
- Natura 2000 (Biodiversity)
  - Management of core site and buffer areas
  - With different level of constraints
  - Generally mapped at 1 /25 000
  - But may be implemented at cadastral level.
  - For strictly protected zone



Maintenance of the "existing" land use

Detail land use map (very large scale)

- Possible overlaps between Bird and Habitat Directive
- And with Nitrate Directives…

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Cross compliance : GAECs

- Main concerns:
  - Issues linked to soil degradation (erosion , organic matter, soil structure) maintenance of pasture-land and landscape features ...
  - Avoid using entitlements without the minimum maintenance of the agriculture lands
- Good agricultural and environmental CONDITIONS
  - Status of the land use: ⇒ objective criteria on the result of agricultural practices ?
  - List of minimum standards required (farming practices) ? ⇒ clear information to the farmer how to comply with GAEC

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Cross compliance : GAECs

- Annex IV: 4 issues and 10 standards

Issue and Standard		Comments: possible modalities	Level	Tools ?
A) SOIL EROSION – Protect soil with appropriate measures				
1	Minimum soil cover	*May include introduction of green cover crop, maintenance of stubbles, etc, defined for specific area and crops*	*Parcel*	*RS*
2	Minimum land management reflecting site specific conditions	*Tillage practices (orientation, direction, timing, etc…), Cropping and land use restrictions, where applicable; Specific techniques for some crops…*	*Parcel*	*RS, LPIS, DTM, GPS*
3	Retain Terraces	*May include maintenance or creation of different type of terraces*	*Parcel*	*RS, LPIS*
B) SOIL ORGANIC MATTER- Maintain Soil organic matter through appropriate practices				
4	Standard for crop rotation where applicable	*May include farm level criteria (% of crops), interdiction of crops succession or repetition at the parcel level*	*Parcel/ farm*	*RS*
5	Arable stubble management	*May include some practices to incorporate stubble, but also burning interdiction , etc*	*Parcel*	*RS*

….

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Cross compliance : GAECs

…. (Annex IV: 4 issues and 10 standards)

Issue and Standard		Comments: possible modalities	Level	Tools ?
C) SOIL STRUCTURE - Maintain Soil structure through appropriate machinery use				
6	appropriate machinery use	*May include equipment characteristic, bu also correct use (tillage depth, direction/ slope) at the right time (calendar) + good meteo condition …*	*Farm /Parcel*	*GPS*
D) MINIMUM LEVEL OF MAINTENANCE				
7	Minimum livestock stocking rates &/or appropriate regimes	*May involve extra specific requirements on the effective grazing (access, duration…) ?*	*Farm (Parcel)*	-
8	Protect permanent pastures	*Interdiction of land-use change ? Avoid bare soil and erosion*	*Parcel*	*RS*
9	Retention of landscape features	*May be parcel boundaries, edges, trees, wall, etc……*	*Intra Parcel*	*RS*
10	Avoiding encroachment of unwanted vegetation on agricultural land	*Clearing of shrubs etc… specific for set aside and grasslands*	*Parcel*	*RS*

- *Many of the standards are inter-related (soil structure/ organic matter/ erosion)*
- *GAECs could be defined for general "landscape units", by combining a number of standards (soil specific & regional level).*
- *GAECs involve parcel level , with possible inputs from LPIS & RS*

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GAECs // GFP of 2nd pillar ?

GAECs (Good Agricultural and environmental conditions) are # from "Good Farming Practices" (GFP).

- Main differences with 2nd Pillar (Rural Development)?
  - GFPs include specific commitments, extra practices on a voluntary basis... justifying extra payments
  - GAECs include standards , conditioning IACS payment
  - GFPs should not include standards (already applied by all farmers) or respect of Regulations / Directives in force
    - *2 exceptions*
      - *Natura 2000 (FFH)* — *1257/99 Art. 16*
      - *Transition period of 3 years in new MS.* — *1257/99 Art 33.c*

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GAECs // GFP of 2nd pillar ?

- Practical consequences:
  - The level of commitments for GAECs (or SMRs related to environment) should be lower than for GFPs of the 2nd Pillar.
  - However the formulation of GAEC should better take into account the 2nd Pillar
    - with clear borders between the 2 schemes
    - to avoid potential conflicts and confusions between the two systems
      - More and more farmers will benefit from 1st and 2nd pillar
      - And GFP and GAECS may apply on the same area ...
  - A possible dynamic management of the Standards and GFPs

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Summary: 4 parts

- The new concepts of 1782/03 and incidences on Geographic information
  - Entitlements, Single Payment Schemes, Cross Compliance, Farm Advisory Systems ?
- What could be the changes or future development
  - for the "LPIS" and IACS-GIS
  - for the "Controls with Remote sensing"
  - for other future applications ....
- A few words on SAPS
- Conclusions
  - a critical calendar in 2005

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Future of the LPIS ?

- Reference parcel ?
  - Single Payment Scheme will obviously increase the interest of Production Block *(Farmers block, "ilot", Feldstück)*
  - Defining a better net area ? (exclusion of building, non eligible areas)
- Remain a crucial element for cross checks between schemes
- Regularly updated orthophotos
  - Eligibility checks
  - Support to define / check cross compliance issues
- Interest to integrate many other information
  - Physical (slope, DTM, etc)
  - Land use elements (Edges, terraces, etc) and landscape feature
- Requirement to integrate all the zones and maps related to the Directives ...

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Future of the LPIS ?

Integrating zones related to the Directives

- GIS can overlap any kind of data (scale, projection)
- But requires a clear consolidation: preferable adjustment to ref. parcels

  To ease implementation, management and control
- *General concern for both pillars (cf LFA, AEM...)*

  Advantage to New MS

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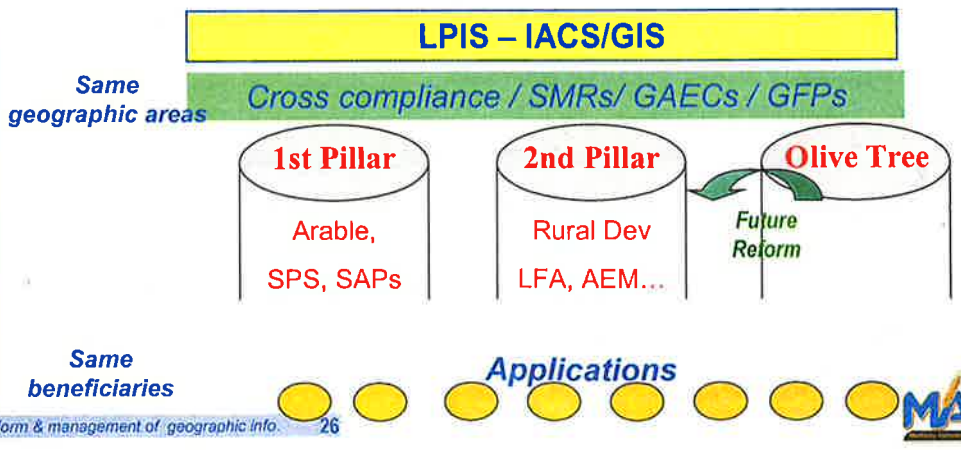
Future of the IACS-GIS ?

Importance of an horizontal approach to consolidate geographical issues of cross-compliance between the various schemes / Pillar



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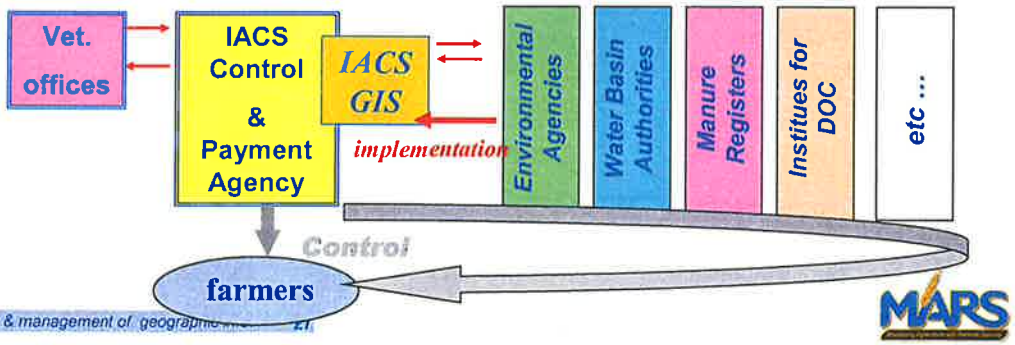
Future of the IACS-GIS ?

Management of IACS-GIS will involve more exchanges of information with various agencies

- Veterinary Services (animal)
- Environmental Services in charge of Natura, Water Basin Agencies, Manure Registers, etc...

For the purpose of :

- implementation, control
- and evaluation cf *production of geographic Statistics & indicators*



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Future of CwRS ?

- **Main changes due to SPS**
  - Land use checks less sensitive
  - Area measurement more global
  - Cross compliancy issues require multi-purpose inspections <u>at the level of parcel and farm</u>
    - Evidence of equipment, machinery
    - Certified seeds, soil analysis, etc....
    - Contracts with industry ,registration to producer associations
    - Animal register and welfare, etc
  - May require different dates and involve various competences (specific agencies)

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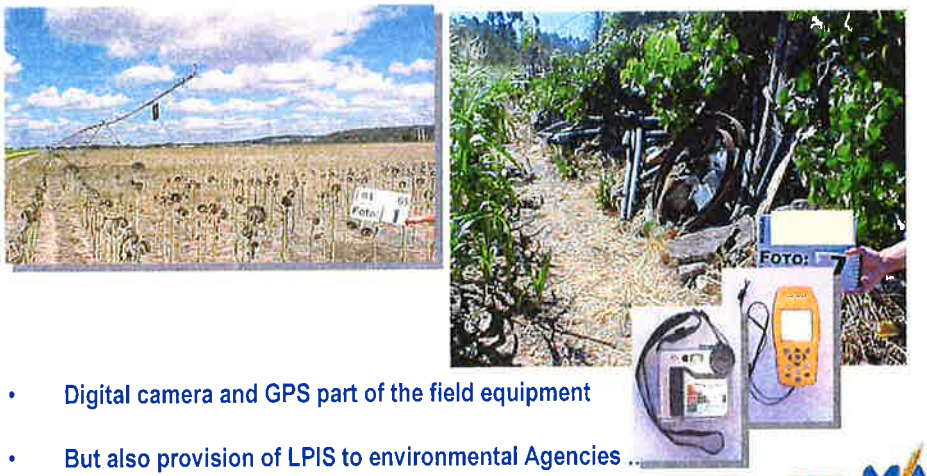
Future of CwRS ?

- Reinforcement of Rapid field visit for cross compliance
  - Improve documentation and recording of findings



- Digital camera and GPS part of the field equipment
- But also provision of LPIS to environmental Agencies ..

Courtesy of M. Miranda

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Other applications and development?

1. Farm Advisory Systems (FAS) Art 13-16

- Are a key instrument for the sustainable implementation of the GAECS (and SMRs)
- A support to farmers to adopt new standards
  - Information on the complex issues related to cross compliance
  - NB: optional use by farmer and deadline January 2007.
- Have to be independent of Control function
  - But will need to disseminate updated and clear information related to geographic areas
  - Should provide access to LPIS and updated geographic documentation for SMRs, GAECs, etc...

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Other applications and development?

Implementation of Farm Advisory Systems (FAS)

- Will be supported by the 2nd pillar cf Article 21 of 1783/03
  - Investment and use by farmers
    - degressive , for 5 years
    - 80% of the costs of use (<1500 € / year)
- Should include provision of software packages
  - with useful GIS module
  - And possible links to GPS devices (+ machinery?)
  - Interest of Extranet applications to share common databases with a centralized updating (orthophotos, GIS, Documentation)...

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Other applications and development?

2. Food Quality issues
   - Protection of DOC and geographic indications
   - Specific certifications and labels, Organic farming...
- Will be reinforced by the 2nd pillar cf Article 24 of 1783/03
  - Both Payment / ha and investments (< 3000 €, 5 years)
- Similar request of geographic information
  - With a key role of the LPIS
  - and a strong Interest of Extranet applications to share common databases
- Join many private / corporate initiatives on Geo-traceability in the general concern of the FOOD LAW.

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A few words on SAPS ?

Single Area Payment Scheme (for the new Member States)

- Legal basis
  - Will entry in force through Accession Treaty (1st may 2004)
  - by an amendment of Counc. Reg. N° 1529/99 (as amended by 1244/01)
  - Draft Com. Reg in preparation (Doc of 12/09/03) *voted last week*
- Option proposed to new MS - Adoption for 3 years (+ 2x 1 years)
- General content of SAPS
  - Single payments
  - Respect of GAECs
  - Eligibility: Agric. Area in GAEC at 30 June 2003
  - + National top-ups : extra premiums for specific crops or land uses
  - Possibility of defining a min Area of farm (< 1 ha)

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SAPS ? similar to SPS, but

- Single payments include also permanent crops and vegetable gardens...
  - Vineyards, orchards etc... will receive the same amount of aid.
- Does not repeal the specific requirements of other schemes
  - Olive Tree GIS, Vineyard registers...

In practice:

- Requirement to declare the different agricultural parcels
  - Or at least the parcel eligible for top-ups ...
- Locate on a sketch map of the different land uses ?
  - at least for the top-ups ?
  - But also for an efficient control (compulsory in case of blocks ?)

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SAPS: Use of CwRS in 2004 ?

- Single payments include almost all land uses
  - Poor interest of multi- date imagery to recognize land uses
  - Most of measurement by subtraction of non eligible (building, forest, water)
- National top-ups : "full" multi-date CwRS could be justified...

In practice:

- If 1st year of declaration (delays in administrative controls, high number of anomalies, LPIS problems) and/or lack of real time experience of CwRS
  - *Better focus on support to field inspections with preliminary office work on orthoimagery:*

    1 aerial orthophoto or 1 bundle VHR image + Rapid field visits
- If system already used by Farmers (LPIS consolidated), important top-ups foreseen, and available experience of real time CwRS
  - *Possible use of multi-date imagery*
    - If sketch maps are provided by farmers
    - With a provision of rapid visits to solve specific cases

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SAPS: Use of CwRS in 2004 ?

- **GAECs**
  - Conditions and criteria to respect will be poorly defined in 2004...
  - Define at least criteria (in CAPI or field insp.) to flag doubtful parcels:
    - Eroded area, grassland poorly maintained, set aside with bushes...
- **Reference eligibility in new MS (SAPS or not)**
  - Ref date for arable land are fixed for each new MS (cf Accession Treaty)
    - Between 31/12 /2000 and 1/12/2002

But does this eligibility still apply for arable land within SAPS?

  - For SAPS: Agricultural area in GAECs at 30 June 2003

In most of the cases, available orthophotos will allow an overall eligibility check , with a deterrent effect for possible negative trends: cultivation of wasteland, deforestation...

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Conclusions

- **CAP reform is a Challenge for the National Administrations**
- **But Geographic Information Systems and RS data will keep an essential role in support of management & control**
  - General reinforcement of LPIS and IACS-GIS' role
  - Possible "reduction" of CwRS in its present modalities
  - Modernization of "traditional field inspection"
    - Border line between "with" or without RS" ?

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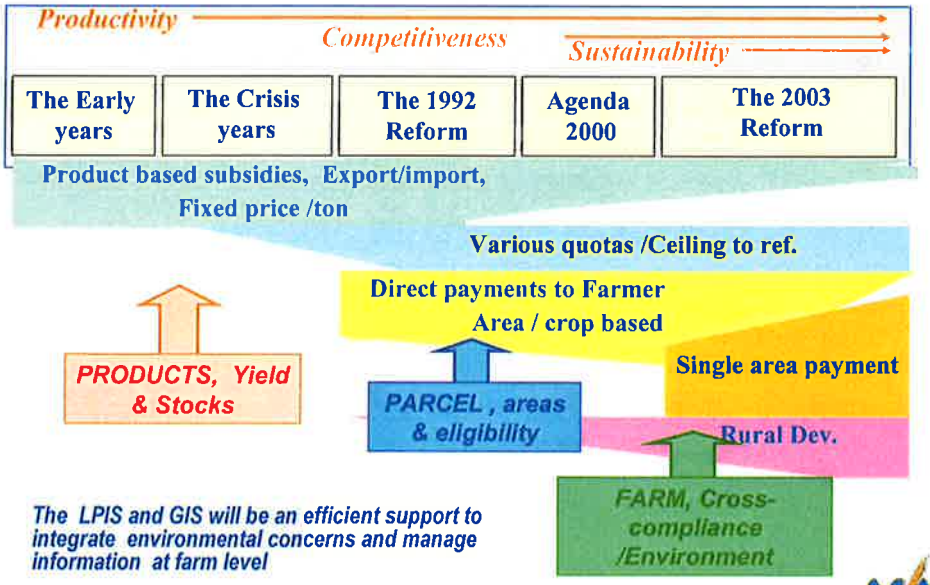
Historical Perspective : Instruments & concerns



The LPIS and GIS will be an efficient support to integrate environmental concerns and manage information at farm level

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Conclusions

- **MARS is ready to contribute to the sound implementation of the Reform by technical inputs for**
  - The modalities of control / management
  - the definition and implementation of Standards GAECs & SMRs
- **2005 will be a critical year**

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Short Term: A critical calendar for 2005 CwRS

- Common Tech. specs of CwRS will have to be strongly revised
- Main deadlines
  - Draft Common technical Specs — 1st September.
  - General orientations for CwRS sent to MS ? — July ?
  - Possible expert meeting with MS on cwRS — Mid Sept ?
  - Draft technical recommendations (esp. 1,3) — Mid Nov.
- Indicative reverse schedule

–	Publication of the ITT:			25 Nov.
–	Validation of the CTS	:	- 4 weeks	31 Oct.
–	Deadline for inputs from MS:		- 3 weeks	10 Oct.
–	2nd draft sent to Member States		- 5 weeks	1 Sept.
–	First draft validated by DG AGRI		- 2 weeks	15 Aug.
–	First draft submitted to DG AGRI		- 3 weeks	25 Jul.
–	Start of redaction of TCS draft by JRC		- 6 weeks	13 Jun.
–	General strategy /orientation JRC/ DG AGRI	- 1 weeks		6 Jun.
–	Analysis by JRC		- 4 weeks	6 May.
–	Availability of Commission Reg.			1 May

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Vielen Dank für Ihre Aufmerksamkeit !

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Session 2 – Review of 2003 years CwRS Campaign

Chaiman: Pär Åstrand - JRC/ IPSC/ MARS Unit

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Presentation 1 - Summary Statistics of the 2003 Campaign

Philippe Loudjani
JRC/ IPSC/ MARS Unit

Abstracts

The presentation cover the topics:

- Main changes from 2002 to 2003 (Buffer tolerance at parcel level, codification rules, completeness test at dossier level);
- On-the-spot (OTS) checks and remote sensing;
- Evolution of % of total and of on-the-spot applications checked with RS ;
- Remote sensing checks (2002 and 2003);
- Number of control sites per contractor and image type (without VHR data);
- Mean number of applications and mean area per site and per contractor;
- Conformity test at crop group level (Groups accepted);
- Completeness test at application level (complete applications);
- Final diagnostic at dossier level (year 2003) (COP & set-aside scheme);
- Deadline for 2003 CwRS statistics (1st February 2004);
- Next campaigns (some tables available since June).

Keywords: Summary statistics, CwRS

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Control with Remote Sensing

Summary Statistics of the 2003 Campaign

Philippe LOUDJANI

Olivier LEO and Hervé KERDILES

MARS Unit

9th Conference on CwRS, 27-28 November 2003, Köln, DE

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2003 CAMPAIGN

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- 14 European Member States
  - Austria not participating
- 19 contractors (22 in 2001, 17 in 2002)
  - **Belgium** (CTS)
  - **Denmark** (DIAS)
  - **Finland** (NLS)
  - **France** (GSE, ONIC, SCOT)
  - **Germany** (EFTAS, GAF)
  - **Greece** (ERATOSTHENES, GEOANALYSIS)
  - **Ireland** (ICON)
  - **Italy** (AGRISIAN)
  - **Luxembourg** (GAF)
  - **Netherlands** (GEORAS)
  - **Portugal** (GEOPROC)
  - **Spain** (DAP, TRAGSATEC)
  - **Sweden** (METRIA)
  - **United-Kingdom** (RSAC)

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Status of tables

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MS	Contractors 2003	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15A	15B	16A	16B	17	18	19	20	21	22	23	24a	24b	24c	24d	24e	25
BE	CTS	X	X	X	X	X	X	X	O					X	X	O	X	O	X	X	X	X	X	X	O			O	O	O	O	X
DE	EFTAS	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	O							
DE	GAF	X	X	X	X	X	X	X	O					X	X	X	X	X	X	X	X	X	X	X	O			O	O	O	O	
DK	DIAS	X	X	X	X	X	X	X	X					X	O								X	X								
ES	DAP	X	X	X	O	X	X	X	O					X	X								X	X	O	O	O	O	O	O	O	
ES	TRAGSATEC	X	X	X	X	X	X	X	X					X	X								X	X	O		O	O	O	O		
FI	NLS	X	X	X	X	X	X	X	X					X	X								X	X	X							X
FR	GSE	X				X	X							X	X								X	X	O			O	O	O	O	
FR	ONIC	X				X	X							X	X													O	O	O	O	
FR	SCOT					X	X							X	X													O	O	O	O	
GR	ERATOSTHENES	X	X	X	X	O	X	X	X					X	X								X	X	O	O	O	O	O	O	O	X
GR	GEOANALYSIS	X	X	X	X	O	X	X	X					X	X										O							X
IE	ICON	X	X	X	X	O	X	X	X					X	X								X	X	O							
IT	AGRISIAN	X		X		X	X	X	O															O	O							
LU	GAF	X	X	O	X	X	X	X	O					X	O								X	X	O			O	O	O	O	
NL	GEORAS	X	X	X	X	X	X	X	X					X	X	X	O	X	O	X	X	X	X	O	X			O	O	O	O	X
PT	GEOPROC															O		O							O							
SE	METRIA	X	X	X	X	X	X	X	O					X	O	X	O	X	O	X	X	X	X	X	O			O	O	O	O	X
UK	RSAC	X	X	X	X	O	X	X	X					X	O	X	O	X	O	X	X	X	X	X	O							

Feedbacks of field survey

Costs ??

Early In The campaign

X = Provided
O = N/A

= Not provided
= Not complete/inconsistency
= RFV on one site only
= Sub-contracted

Summary statistics 2003

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Main changes from 2002 to 2003

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- Buffer tolerance at parcel level
  - 1.5 m or 5% (Aerial + VHR images of the year)
  - 3 m or 5% (recent archive aerial combined with satellite Pan images)
- Codification rules
  - Less technical codes (T1 land use, T5 parcel limit)
  - More rejection codes (T1-T5 → C4)
- Completeness test at dossier level
  - Retained area with T codes < 50% → < 20%
    - Not applied by FI, FR and some Landers in DE

Summary statistics 2003

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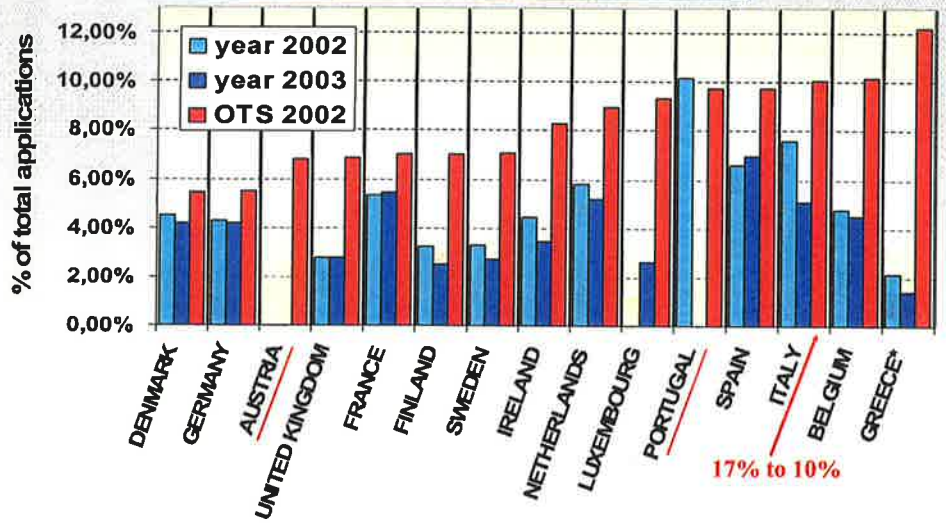
On-the-spot (OTS) checks and remote sensing

Joint Research Centre

• *Total OTS checks from year 2002 (GR: 2001) (Given by DG AGRI)*



-Total 'OTS checks' 2002 varies from 5,5 % (DK, AUT, UK) to 12,2% (GR) [same as 2001 except IT]
- Proportion of RS control on total controls varies from 0 (Austria) to almost 100% (Portugal)

Summary statistics 2003

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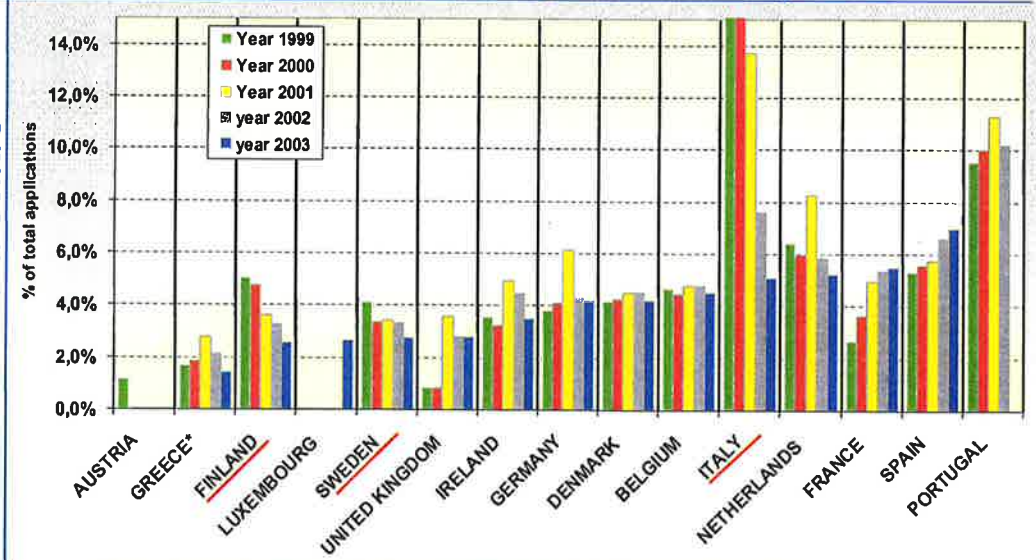
Evolution of % of total applications checked with RS (1999 to 2003)

Joint Research Centre



- For most countries, increase and now stabilization of the use of RS for controls
- For SP, FR still increasing
- For UK, several sites were added in 2001 (due to Foot and Mouth disease)
- Exceptions for Finland, Sweden and Italy (historical)

Summary statistics 2003

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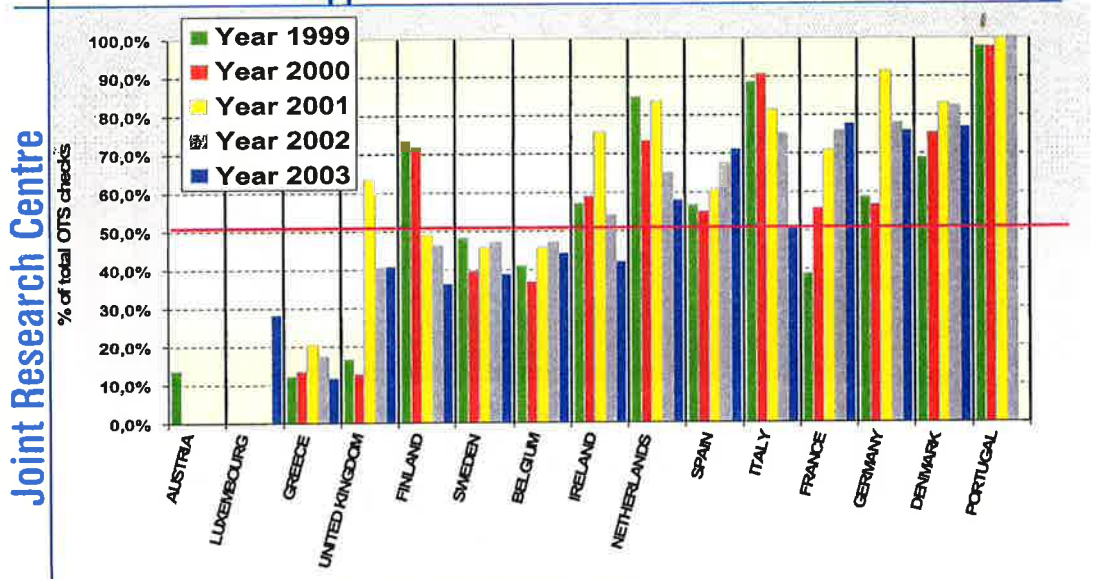
Evolution of % of total on-the-spot applications checked with RS



- Same trend than for total applications
- 50 % of countries with > 50% OTS done with RS

Summary statistics 2003

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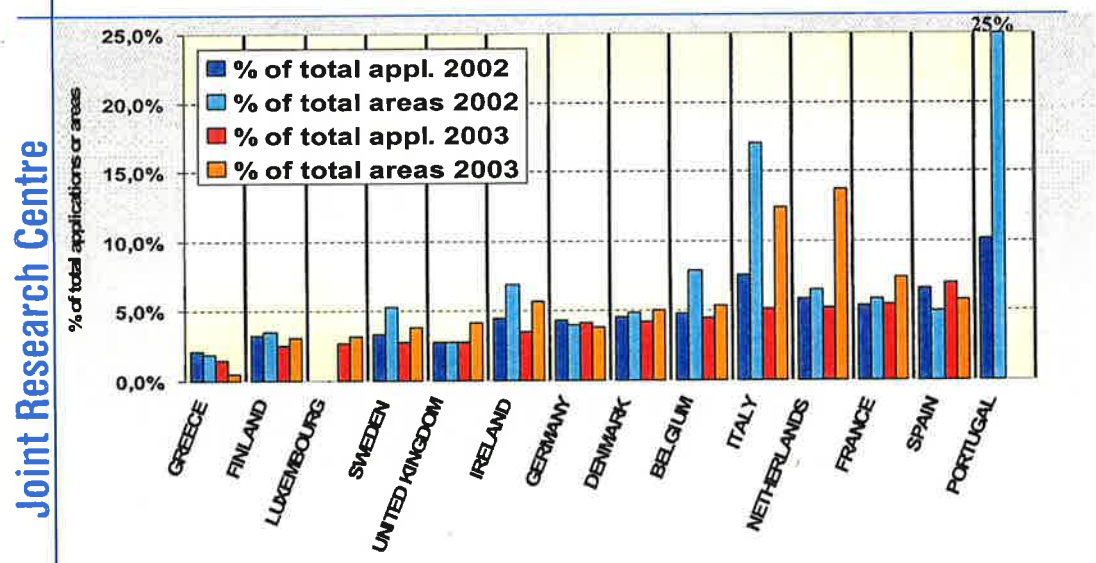
Remote sensing checks (2002 and 2003)



Two main groups observed
- IT and PT where a higher % of applications are checked with 'RS' but for targeted big parcels
- This year change for NL (change of site selection method)
- All other countries. Almost all kind of surfaces are considered

Summary statistics 2003

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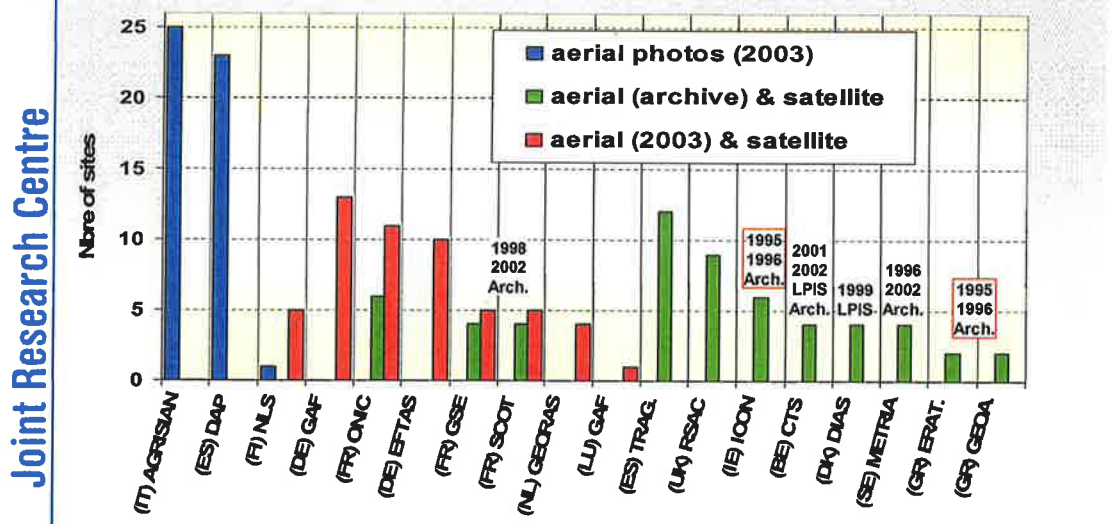
Number of control sites per contractor and image type (without VHR data)



- 100% (less than 80% in 2000) of sites are controlled with the use of aerial photographs alone or combined with satellite data which allow access to all range of parcel sizes.
- Among 'sat. & photos' around 50% of sites with 2003 photos (control campaign)
- Aerial 2003 photos around 65 % of total sites

Summary statistics 2003

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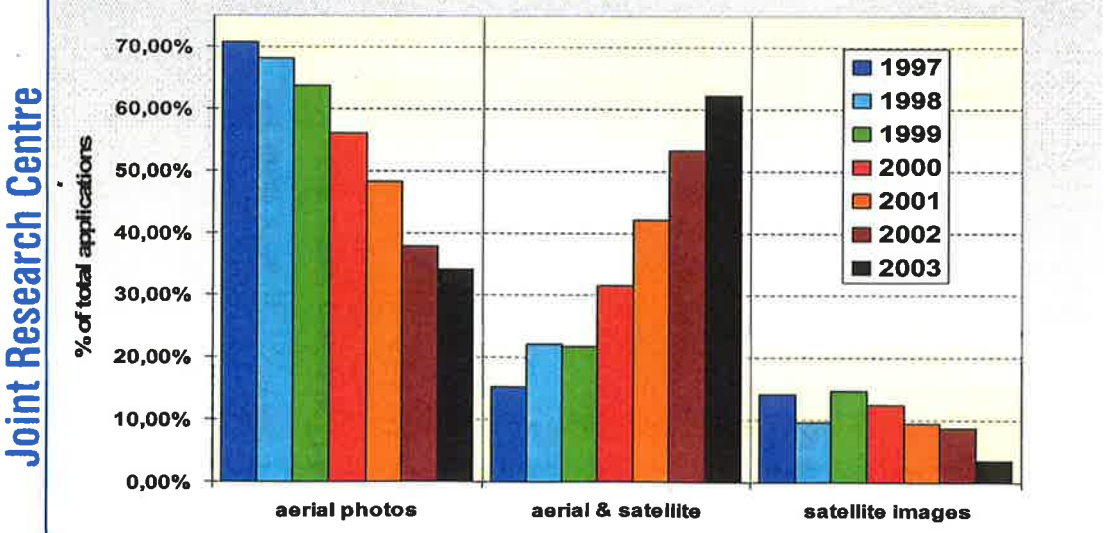
% of total applications per image type (years 1997 to 2003)



- Decrease of the use of aerial photos alone is due to the large decrease of the sampling rate in Italy
- Use of aerial photos for area control and satellite for crop type control

Summary statistics 2003

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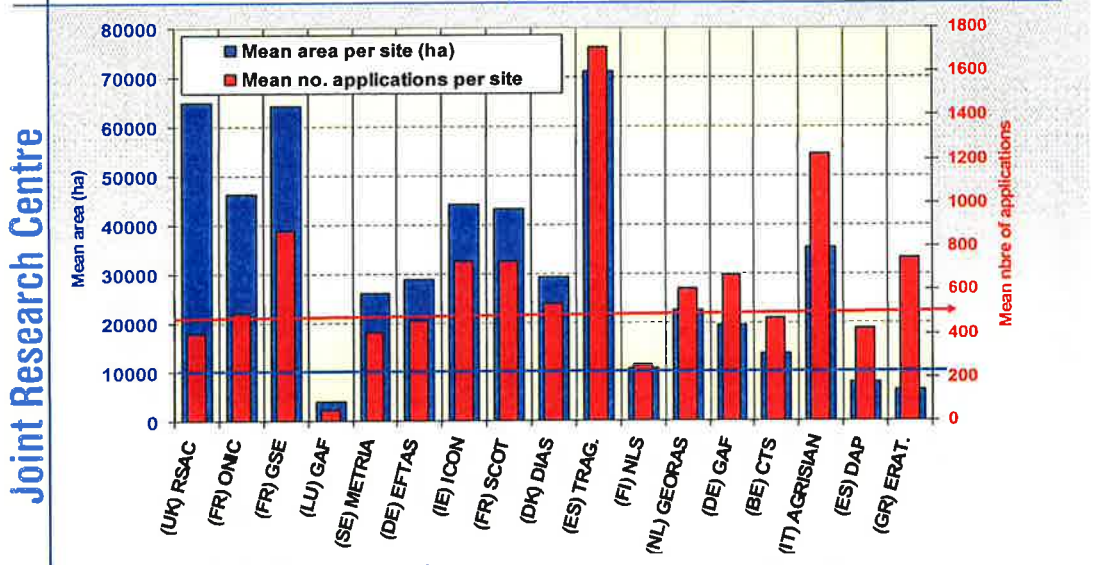
Mean number of applications and mean area per site and per contractor



Two groups of countries are observed.
- Greece, Netherlands and Italy with little farms (Italy artifact)
- Sweden, Ireland, France and UK with large farms

(selection criteria of control sites are informal → modification with VHR data)

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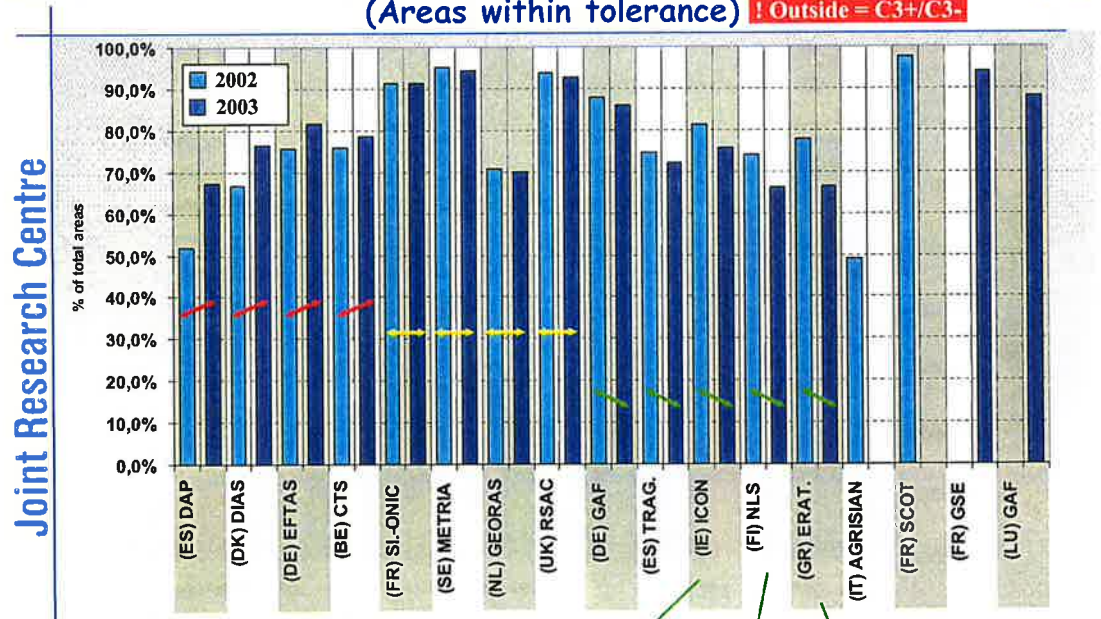
Summary statistics 2003

Results of diagnostic test at parcel level (Areas within tolerance) ! Outside = C3+/C3-



1.5 m with max. 5%
Less strict than last year

3m → 3 m 5%
Stricter for small
Outside perimeter?

3m → 1.5 m

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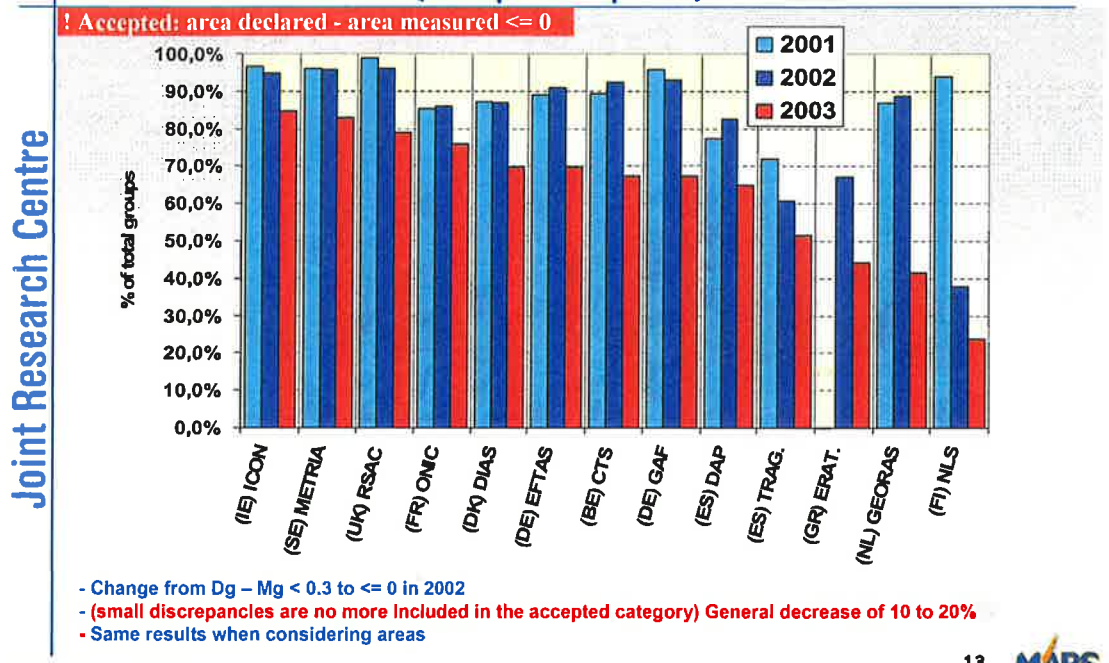
Summary statistics 2003

Conformity test at crop group level (Groups accepted)



- Change from Dg – Mg < 0.3 to <= 0 in 2002
- (small discrepancies are no more included in the accepted category) General decrease of 10 to 20%
- Same results when considering areas

Summary statistics 2003

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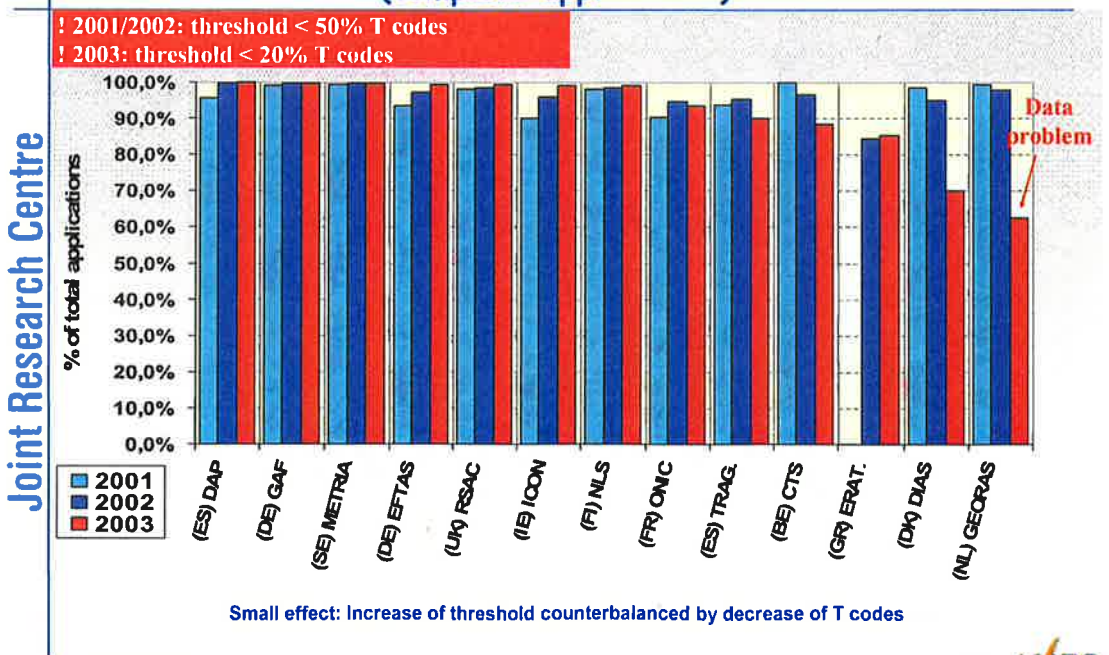
Completeness test at application level (complete applications)



Small effect: Increase of threshold counterbalanced by decrease of T codes

Summary statistics 2003

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Proportion of final diagnostic codes T (% of total parcels)

(after CAPI and RFV)

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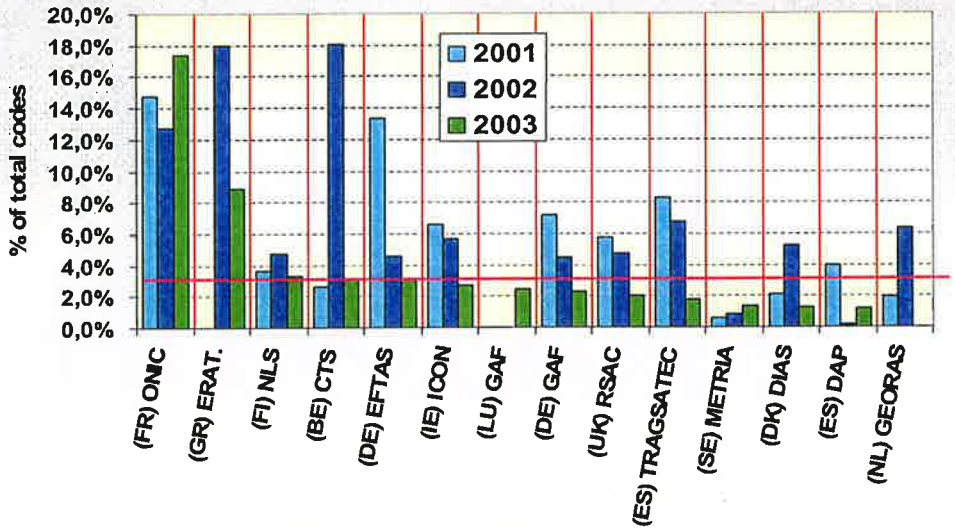

- Decrease of % of T codes resulting from changes in codification rules
- FR (outside control site)
- Generally, technical problems are reported for less than 3% of areas (6% if 2002) (RS method is efficient)

Summary statistics 2003

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Proportion of diagnostic codes A (% of total codes)

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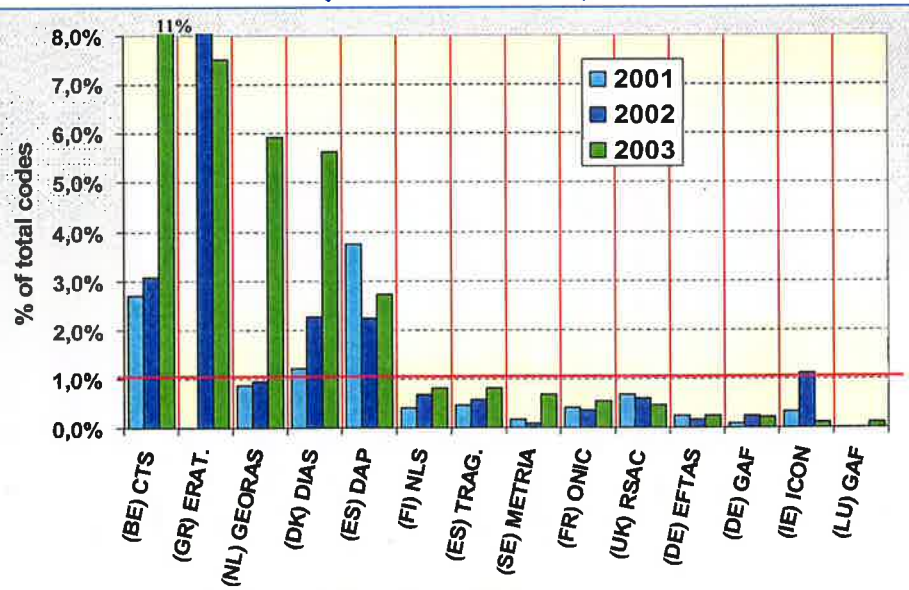

- Increase of % of A codes (small parcels, overlaps)
- On average less than 1% of areas checked by RS have A codes (efficient methodology)

Summary statistics 2003

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Global results by applications 2001-2003
(Accepted applications - COP & set-aside scheme)

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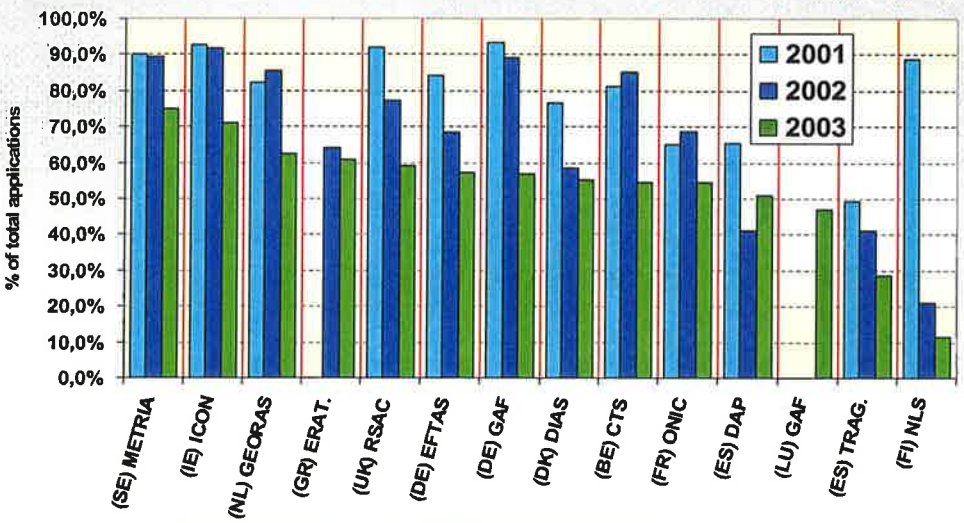

- General trend to increase rejection (change of rules)
- FI rejection rate very high (OTS check with RS methodology still valid ?)

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Final diagnostic at dossier level (year 2003)
(COP & set-aside scheme)

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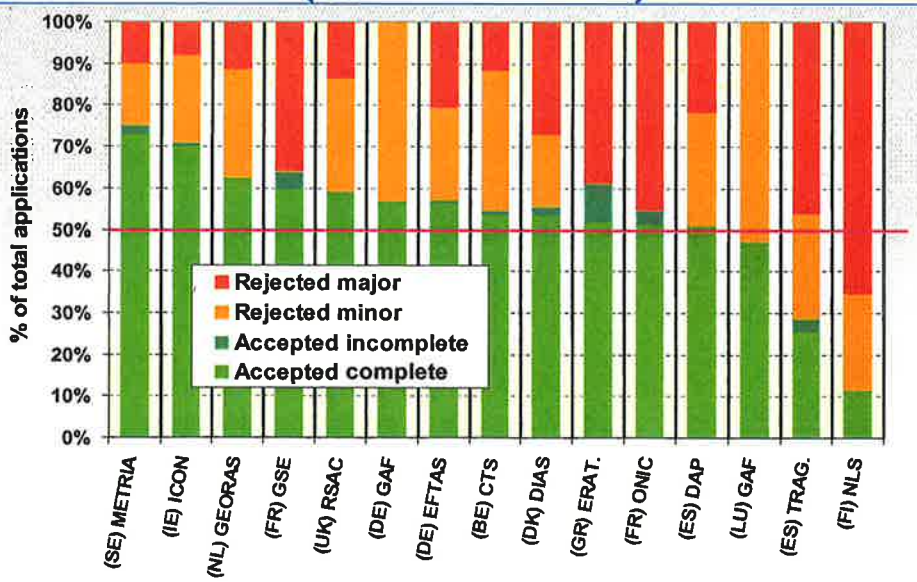

- Minor rejection that may be solved without field inspection
- OTS check with RS = efficient methodology
- Exception FI

Summary statistics 2003

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Control with Remote Sensing
Summary Statistics of the 2003 Campaign

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Conclusion (provisional !)

- Compared to previous years
  - DG AGRI (MARS UNIT) recommendations followed by MS
    - Still increase of use of CwRS
    - Still increase of use of aerial photos
- In 2003: More 'rejected' applications
  - **New rules**
    - **Buffer tolerance**
    - **Codifications**
    - **Tolerance at group level applied this year**
    - **Completeness test (small effect)**
- Presently no analysis on sites with VHR data

Control with Remote Sensing
Summary Statistics of the 2003 Campaign

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- **Delays in deliveries are still existing**
  - Missing tables (return of field survey, cost ?)
    - Despite changes in the tables
  - Full dataset missing...
- **Deadline for 2003 CwRS statistics**
  - 1st February 2004
- **Next campaigns (some tables available since June)**
  - Tables 9 to 12
    - Number of sites, Number of applications, distribution by schemes
  - 2 sets of tables ?

Danke schön !

Comment ???
QUESTIONS ???

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Presentation 2 - Results of the QC 2002 and consequences on recommendations

Hervé Kerdiles
JRC/ IPSC/ MARS Unit

Abstracts

Since 1998, Technical Recommendations are provided every year by MARS in order to clarify some technical points of the work to be carried out by the CwRS contractors. These Recommendations complete the Common Technical Specifications (CTS) issued by the Commission, in agreement with all Administrations, every year at the end of November for the next campaign.

In 2003, some relatively important changes were introduced after the publication of the CTS 2003. These changes were necessary to comply with the regulation in force (e.g. on set aside eligibility), the new recommendations on on-the-spot checks of area issued by DG AGRI in early 2003 (working document AGRI/2254/2003) and more generally to improve the control as a result of the findings of the Quality Control (QC) of the 2002 data.

These changes, which have now been introduced in the 2004 CTS, mainly regarded the technical tolerance to be applied to each measured parcel, the introduction of new technical codes (ineligible set-aside) and the modification of some thresholds (completeness test, codes for small parcels).

The QC 2002 findings at the origin of these changes will be presented and the implementation of the Recommendations in the 2003 campaign will be shown. General recommendations deriving from other QC findings will also be presented.

Keywords: CwRS, Technical Recommendations, tolerance, technical codes, completeness test.

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Main changes of the 2003 CwRS campaign

H. Kerdiles
JRC IPSC MARS

9th Conference on CwRS, 27-28 November 2003, Köln, DE

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Context & objective

- Trend for stricter control rules since 2002:
  - New constraint on measurement accuracy
  - Benefit of doubt suppressed for crop not interpretable or parcel limit not visible on imagery
  - Stricter diagnostic rules (conformity & completeness)

-> CwRS more comparable with field inspection

- rules have been applied (as much as possible) by MS
- good understanding of the new rules essential for the work of contractors...

QC 2002 / Recommendations 2003

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Outline

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Focus on main changes from Recs 2003 - Common Tech Specs 2004

- Technical Tolerances in 2002 and 2003
- Ceiling to reference area
- Management of small parcels (T6, A1 codes)
- Checking set-aside eligibility
- Conformity test
- Completeness test
- Rapid Field Visit

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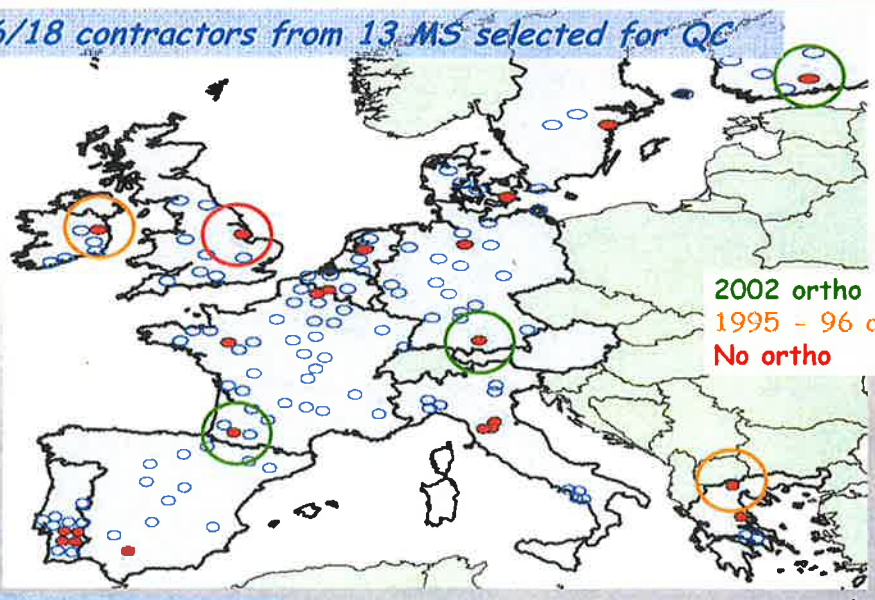
QC 2002

Joint Research Centre

6/18 contractors from 13 MS selected for QC



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Area measurement and tolerance 2003: a drastic change?

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- Target 2002: 50% area with tol ≤ 5% meas. area
- Target 2003: tol ≤ 5% meas. Area OR 1.5m buffer for all parcels (DG AGRI J3 working doc 2254/2003)
  - Rounding error for very small parcels: 0.02 ha
  - Ceiling of tolerance to 1.0 ha (as before)
- Possible options to meet DG AGRI's 2003 Recs
- Strategies applied by MS
- Buffer tolerance = L_i x perimeter
  - What perimeter?

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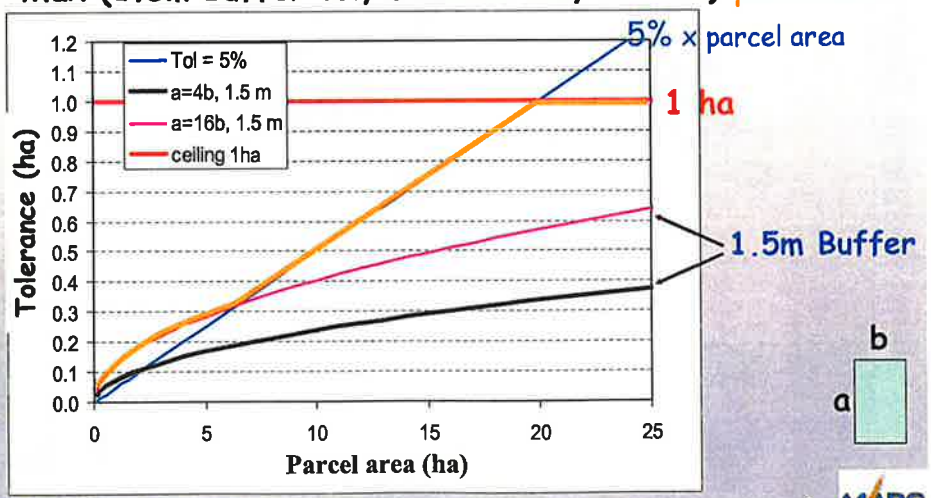
Tolerance 2003: possible options (1/2)

Joint Research Centre

1. ≤1.5m buffer tolerance -> recommended
2. Max (1.5m buffer tol, 5% area tol, 0.02ha) possible



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Tolerance 2003: possible options (2/2)

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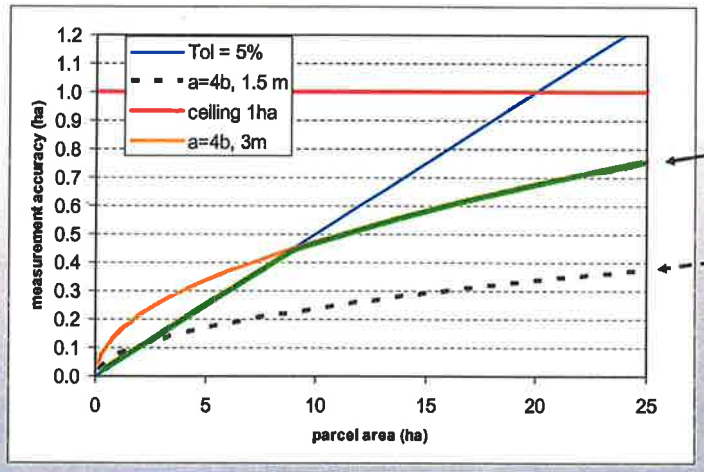
3. If 3m buffer used, check if tolerance ≤ 5% of measured area, otherwise ceiling to 5%



Buffer 3m

Buffer 1.5m

QC 2002 / Recommendations 2003 7

Technical Tolerances used in 2003

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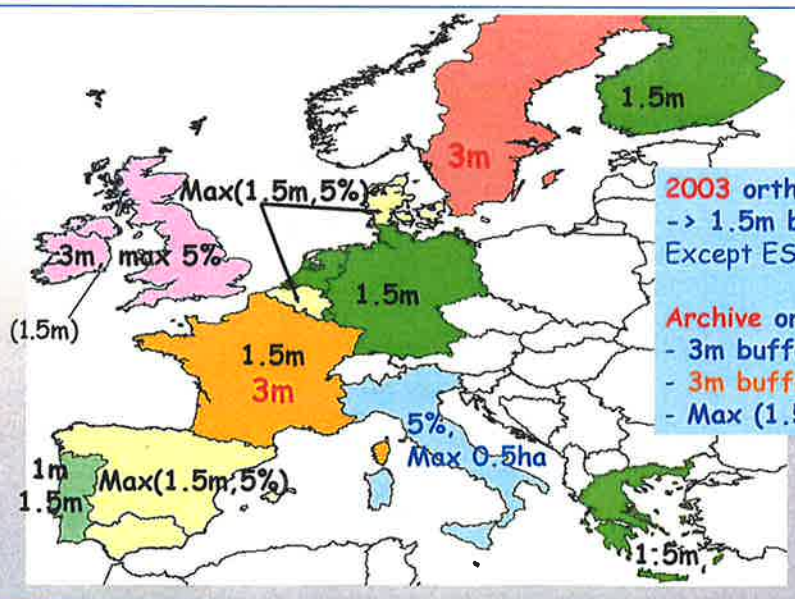

2003 ortho or VHR:
-> 1.5m buffer (or less)
Except ES-And., part IT

Archive ortho:
- 3m buffer w/ ceiling 5%
- 3m buffer
- Max (1.5m buffer, 5%)

QC 2002 / Recommendations 2003 Changes: GR - UK, IE - ES, BE, DK - (SE) 8

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Buffer tolerance, but **what perimeter?**

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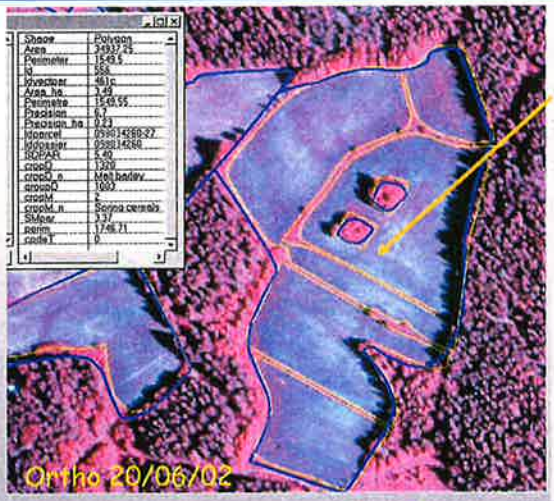

Availability of VHR imagery leads to detailed interpretation resulting in extra tolerance (due to the additional perimeter)

But what is the cost benefit of such a detailed control with the "old" perimeter rule?

- **sub-parcels or deductions -> use outer perimeter**

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Tolerance overestimated: extreme case

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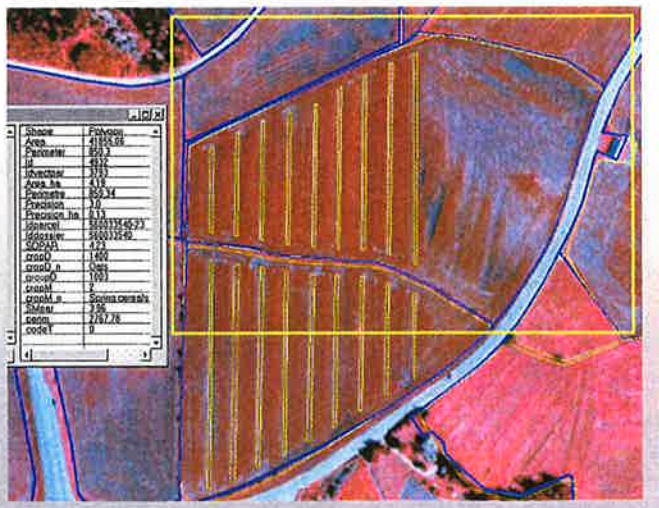

Decl: 4.23 ha, oats
Meas: 3.96 ha
Perim: 2758 m
⇔ Perim of 49 ha square
Tol (1.5m): 0.42 ha
-> Code OK
-> Retain declared
Extra work useless?

Outer perim: 850 m
Tol (1.5m): 0.13 ha
-> Code C3+
-> Retain measured

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Particular case: Tolerance of (inner) linear features

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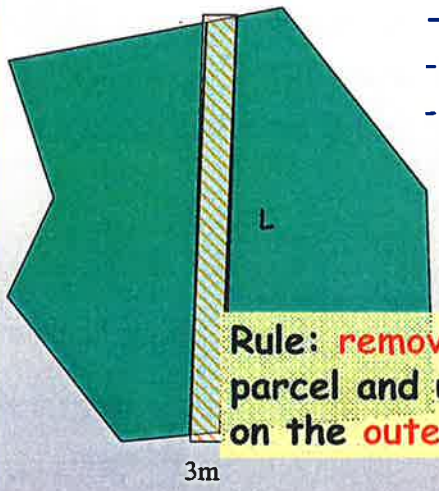

"old" practice

- Remove a 3m path (of area 3L)
- Tolerance based on total perimeter
- So add to the outer perimeter tol. a 1.5m buffer path tol. = 2(L+3) x 1.5 > 3L i.e. > path area

- no use to remove path?
- Pb: estimated path area =

Rule: remove ineligible areas inside the parcel and use a buffer tolerance based on the outer perimeter both sides of path are not independent

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Conclusion on Tolerance

Joint Research Centre

- **DG AGRI Recs** (2254/2003) **known to MS** (-> "new" 2419)
- **MS are free to fix the tolerance** (subsidiarity)
- **JRC Recs**
  - general guidelines accounting for most cases
  - Make RSC consistent with classical field inspection
- **For special cases, MS may propose rules and submit them to the Commission**

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Ceiling to the reference area

Joint Research Centre

- **Rule:** for each reference parcel,
  If Σretained areas > ref area (+tol)
  retained areas set to ref area (or to ref area + tol)

- **Recommendation:** do not apply tolerance (case already for cadastral systems) **once reference area has been communicated to farmers**

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Management of small parcels: T6 code (1/2)

Joint Research Centre

2002

- **T6 = parcel too small to be CAPIed**
  - Decl area < 0.3 ha with sat images, or sat+archive ortho
  - Declared area < 0.1 ha with current year ortho

Remarks

- If parcel only visible on HR sat images, 0.3 ha threshold (~ 7 20 m pixels) too low - threshold should be ≥ 0.7 ha

- 0.1 ha (1000 1m pixels) too high with (current year) ortho
  -> 0.1 ha is a maximum threshold

Joint Research Centre

Management of small parcels: T6 code (2/2)

- 2 strategies till now: automatic assignation (with HR sat images only) or assigned by interpreter (current year ortho)

2003: ortho (archive or current year) available for all sites

-> 0.7 ha threshold only for parcels not visible on ortho

Recommendation: T6 assigned by interpreter to parcels that cannot be interpreted due to SIZE (crop assumed OK)

- Reject parcel (C4) if doubt or unusual crop pattern
- No more automatic assignation

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Joint Research Centre

Case of small parcels: A1 code

- 2002 Rule: if parcel declared as more than 0.3 ha (0.1 ha) and found as less, retain measured area

- Original purpose of code: flag parcels found below minimum area eligible for aid

- Rule should be:

if area meas. + tolerance < minimum area eligible for aid, parcel not eligible -> retain 0

↳Set threshold to minimum area eligible for aid

Idem if area decl. < minimum area eligible -> retain 0

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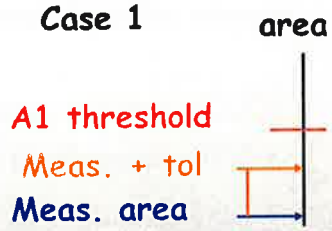
Use of A1 code (1/2)

Joint Research Centre

Decl. area ≥ A1 threshold
Meas. area < A1 threshold

Case 1



Meas. area + tol < A1 threshold
-> parcel not eligible, A1 code
-> Retained area = 0

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Use of A1 code (2/2)

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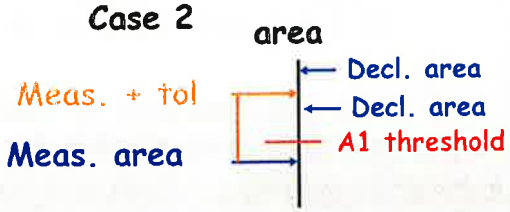
Decl. area ≥ A1 threshold
Meas. area < A1 threshold

Case 2



Meas. area + tol > A1 threshold -> parcel deemed eligible

Parcel inside tolerance, Decl ≥ A1 threshold -> OK

Parcel outside tolerance, Decl ≥ A1 threshold
-> over-declared (C3+), retained area = A1 threshold
Or stricter option: A1 code and retain 0

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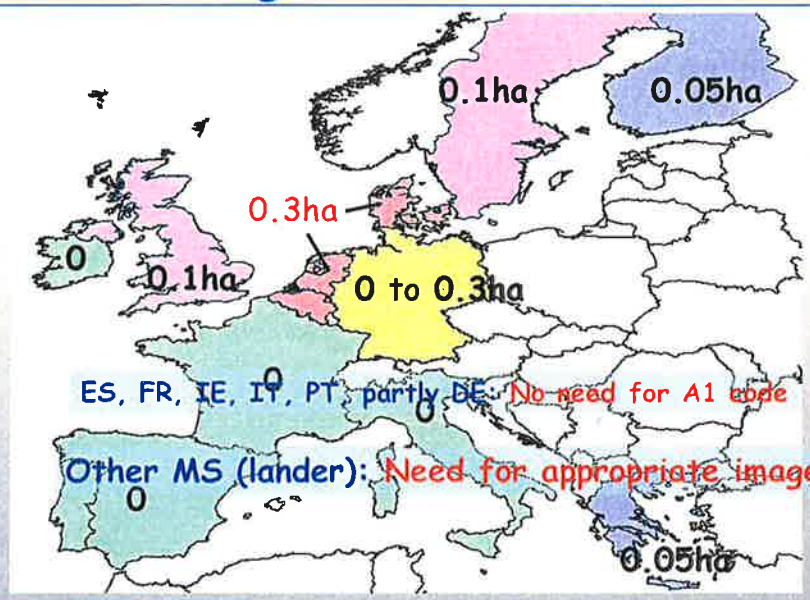
EU tour of minimum size of parcel eligible for aid



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Set-aside eligibility check

- Criteria for set-aside eligibility defined in Reg 2316/99
- Check carried out in classical field inspections
- Check now possible in RSC (due to 1m imagery)
- Check made in NL, FR, DE-Bayern, DK, FI...

Need for new codes:

- A1a: if area < 0.3 ha, retain 0 (except if permanent boundaries)
- A1b: if width < 20 m, give 0 to ineligible part (except if traditional width in the region)
- A1c: SA along watercourse, if width < 10 m, give 0 to ineligible part
- Measurement of width as in classical field inspection

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Completeness test

Joint Research Centre

- Allowed % of T coded area changed from 50% to 20%
- Consistent with definition of dossier falling in RS site
  - a dossier is complete (i.e. considered as checked) if:
    - ➢ at least 80% of areas aided have been checked (i.e. are not in T codes)

    AND
    - ➢ at least 80% of set-aside retained areas have been checked (i.e. are not in T codes)
  - other sensitive groups can be included (e.g. forage in FR, durum wheat & maize instead of set-aside in GR)

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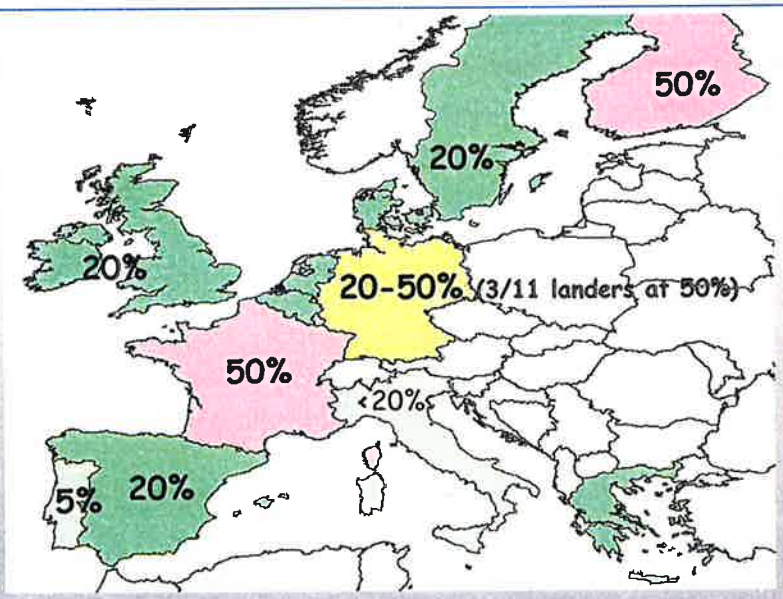
Completeness threshold used in 2003

Joint Research Centre



Number of additional dossiers incomplete with 20% threshold:

-FI: 1/1602 (+12 Reject-inc)

- DE Bayern: 5/3900

- FR: ?

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Conformity test

Joint Research Centre

- Diagnosis is at payment group level

  payment group = all crops receiving the same aid/ha

  -> e.g. compensation cereals - oilseed - linseed allowed

- However keep crop groups defined in Tech Specs

  -> interpreter should report crop group found for control traceability

  -> beyond RSC, base areas defined per crop group

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Conformity test (since 2002)

Joint Research Centre

- "Conformity": dossier in conformity if ALL groups are accepted, otherwise dossier not in conformity

- A group is accepted if Dg-Mg ≤ 0

Where Dg: declared group area

Mg: retained group area

- 2nd test: sort groups to field inspect (RFi)

MS may adapt thresholds (0.5ha,2%,2ha) & test

e.g. FR: letter below 1500€, ES: letter to all rejects

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What if check with RS not satisfactory?

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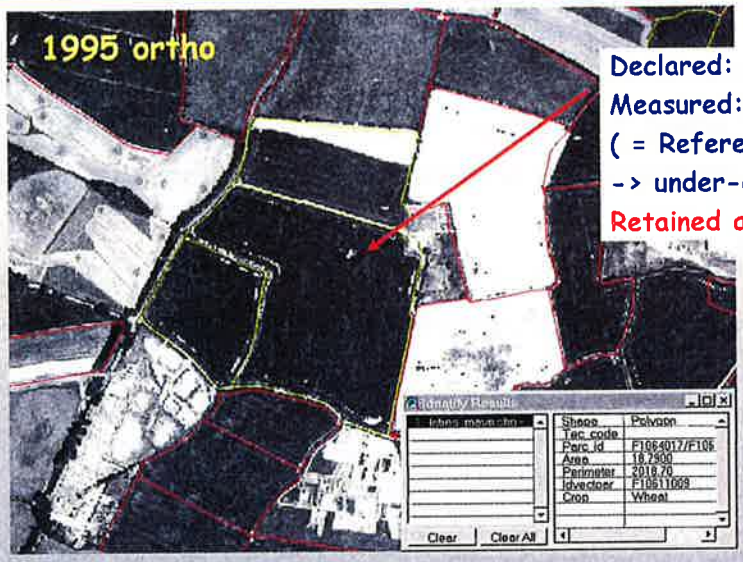

Declared: 12.6 ha Wheat
Measured: 18.8 ha Cereals
(= Reference area)
-> under-declared
Retained area = 18.8 ha

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Suggestion: Rapid Field Visit (RFV)

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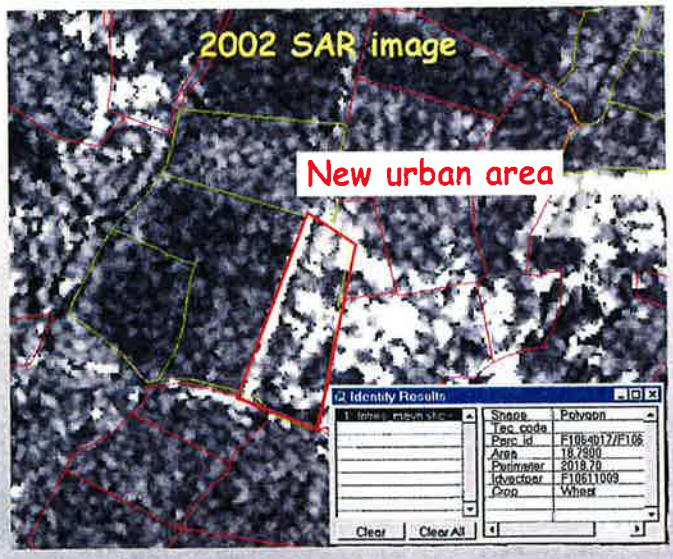

- Area check made on 1995 ortho and not on SAR data

... understandable

But doubtful case

-> Reject or RFV

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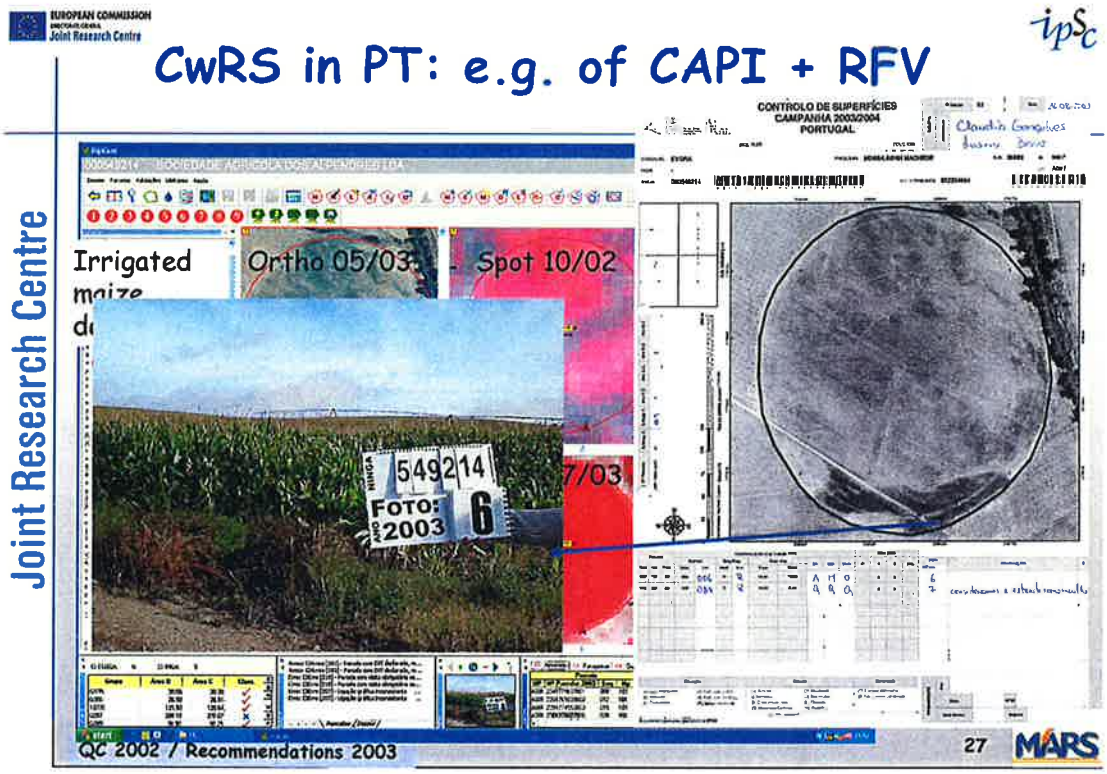

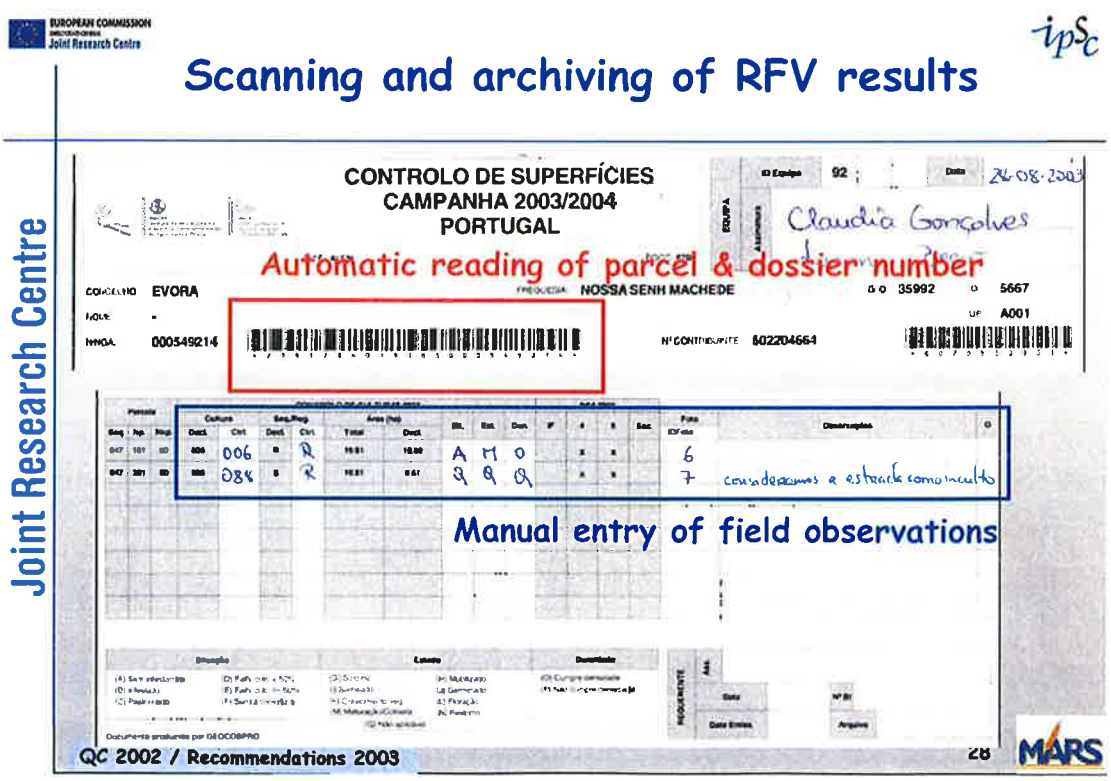

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The day this kind of methodology is implemented by all...

1. I change jobs
2. AGRI Audit of expenditure will close

Thank you

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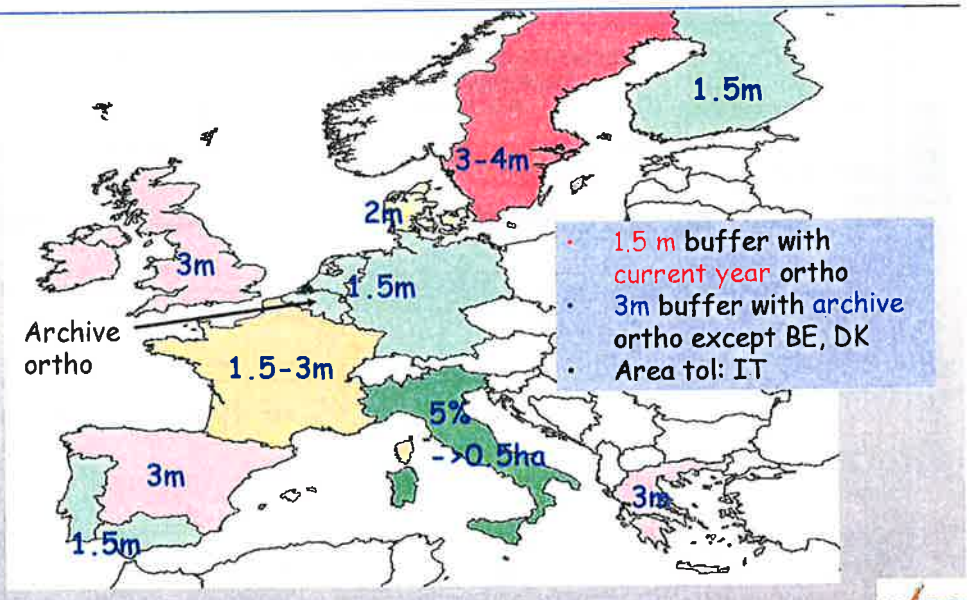
Technical Tolerances used in 2002



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Target 50% area measured with precision ≤5% assessed on QC sites 2002

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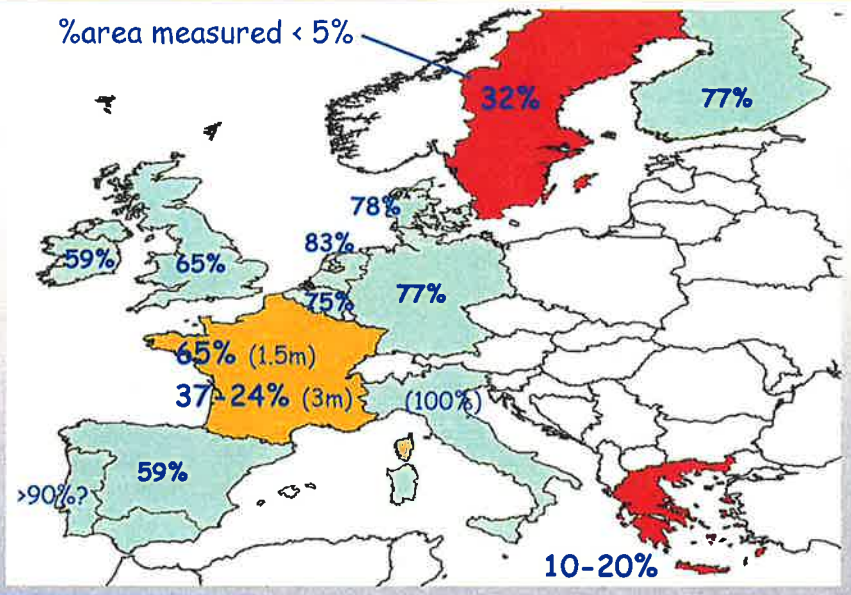

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T6: 0.3ha threshold too low with HR satellite images only

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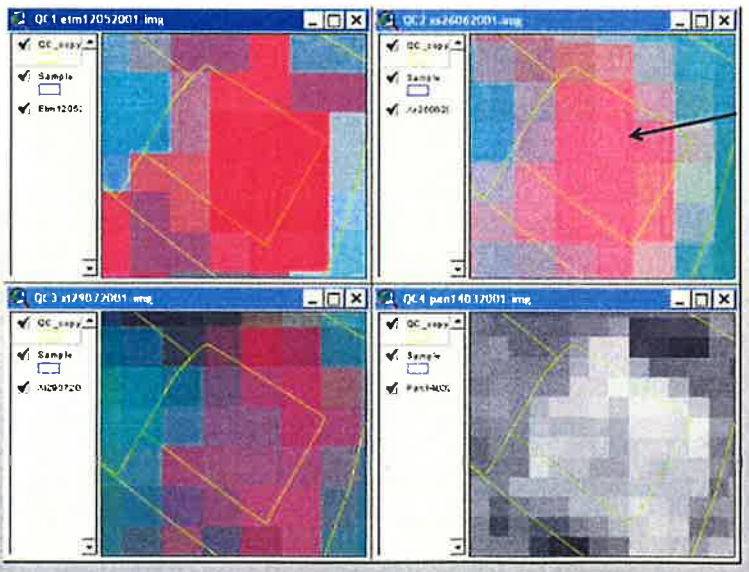

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T6: 0.1 ha threshold too high with 1m ortho
0.04 ha parcel of barley interpretable

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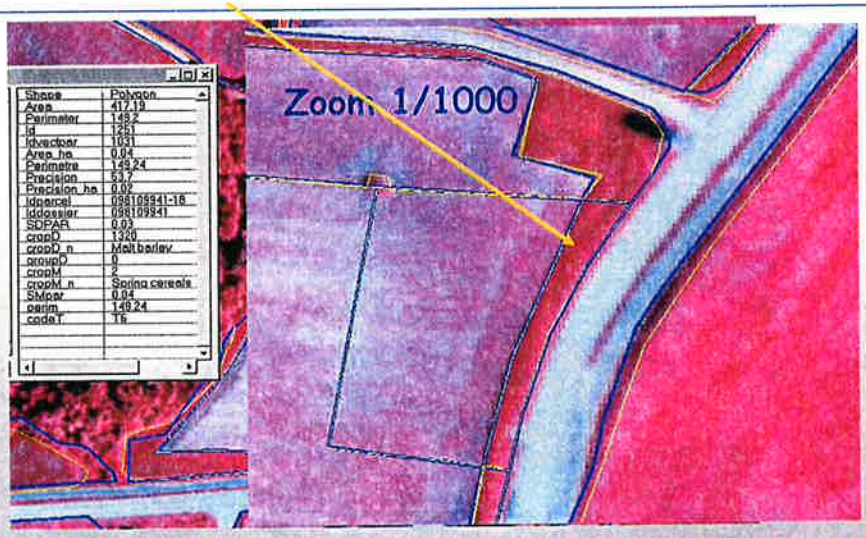

Current year ortho (20/6), scale 1/2500; FI 2002

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Automatic assignation of T6
to parcels declared < 0.3ha (1/2)

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Automatic assignation of T6 (2/2)

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Maize declared < 0.3 ha

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Set-aside eligibility: minimum area

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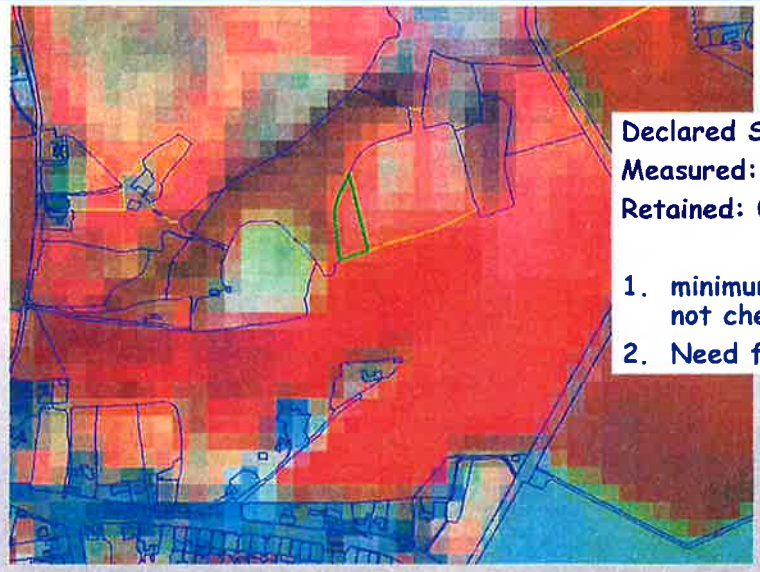

Declared SA: 0.28 ha
Measured: 0.23 ha, OK
Retained: 0.28 ha

1. minimum area (0.30ha) not checked
2. Need for ≤1m imagery

LPIS boundaries in blue

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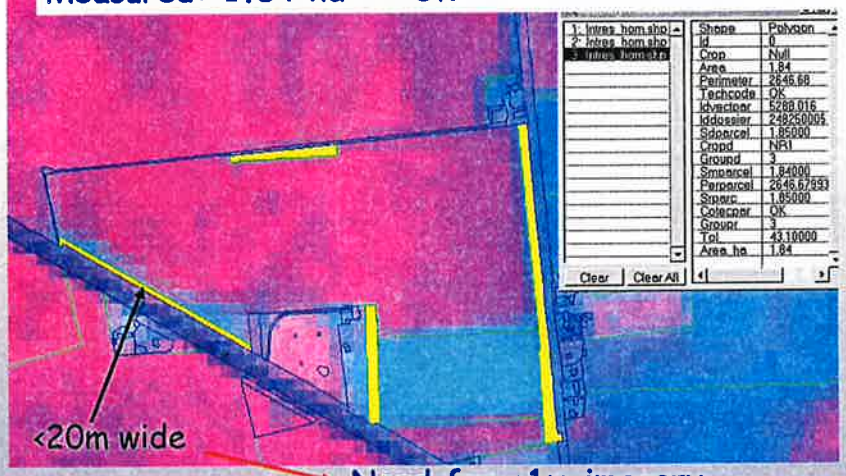
Set-aside eligibility: minimum width

Joint Research Centre

4 SA strips declared as "1" parcel of 1.85 ha (incorrect)

Measured: 1.84 ha -> OK



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Set-aside eligibility: minimum width along watercourse

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10 m wide set-aside allowed along watercourse

Declared SA: 0.72 ha
Measured: 1.28 ha
-> Under-declared
Retained: 1.28 ha

River, drain ?

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Set-aside eligibility: minimum area

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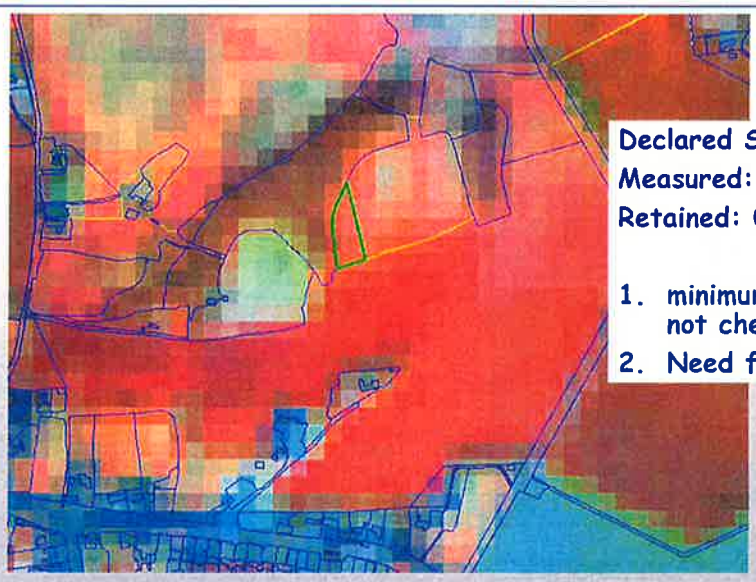

Declared SA: 0.28 ha
Measured: 0.23 ha, OK
Retained: 0.28 ha

1. minimum area (0.30ha) not checked
2. Need for ≤1m imagery

LPIS boundaries in blue

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Presentation 3 – Acquisition and delivery of satellite data CwRS 2003

Csaba Wirnhardt
JRC/ IPSC/ MARS Unit

Abstracts

The presentation gives a summary of the 2003 years High Resolution (HR) satellite image acquisition campaign as part of the operational Control with Remote Sensing activities. 12 Member States were involved with 16 contractors. For the 124 sites controlled 680 images were acquired and distributed.

The presentation gives detailed statistics on the expenditure, number and distribution of sites, imagery acquired by different high resolution satellite sensors (multispectral, panchromatic, SAR), acquisition window success rates and costs of imagery. Comparison is made between previous year's campaign and current campaign. An analysis is provided for the delay between window opening dates and actual image acquisition dates, which together with the analysis of window success rates gives an idea of the effectiveness of acquiring optical remote sensing data for control purposes.

Despite some problems the image acquisition campaign 2002-2003 was successful due to the proficiency of all the parties involved including image providers, contractors, national administrations and MARS image acquisition team.

Keywords: High Resolution Satellite Image Acquisition

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Acquisition and Delivery of Satellite Data CwRS 2003

Cherith Aspinall & Csaba Wirnhardt

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Campaign Review RSC 2003

- Remarks
- General statistics
- Sites
- Imagery statistics
- Window statistics
- Problems
- Cost analysis

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Campaign RSC 2003

- new financial regulations – LIO upgrade
- changes of framework contracts during campaign
- Cherith Aspinall is still first contact point for image acquisition
  - RSC 2004 Campaign, new to MARS image acquisition team: Paolo Pizziol
- Satellite problems: failure of Landsat 7 in June
- window closing procedure clarified – all validated images accepted until midnight
- FTP – started mid-June – successful

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General statistics RSC 2003

- Imagery Expenditure (DG-AGRI)
  - ✓ 1 661 100 € High Resolution (HR) satellite images
  - ✓ 308 265 € Very High Resolution (VHR) satellite images
- MS participants 12
- Contractors involved 16
- Sites to be controlled with RS-data 124
- Total images distributed to MS 680

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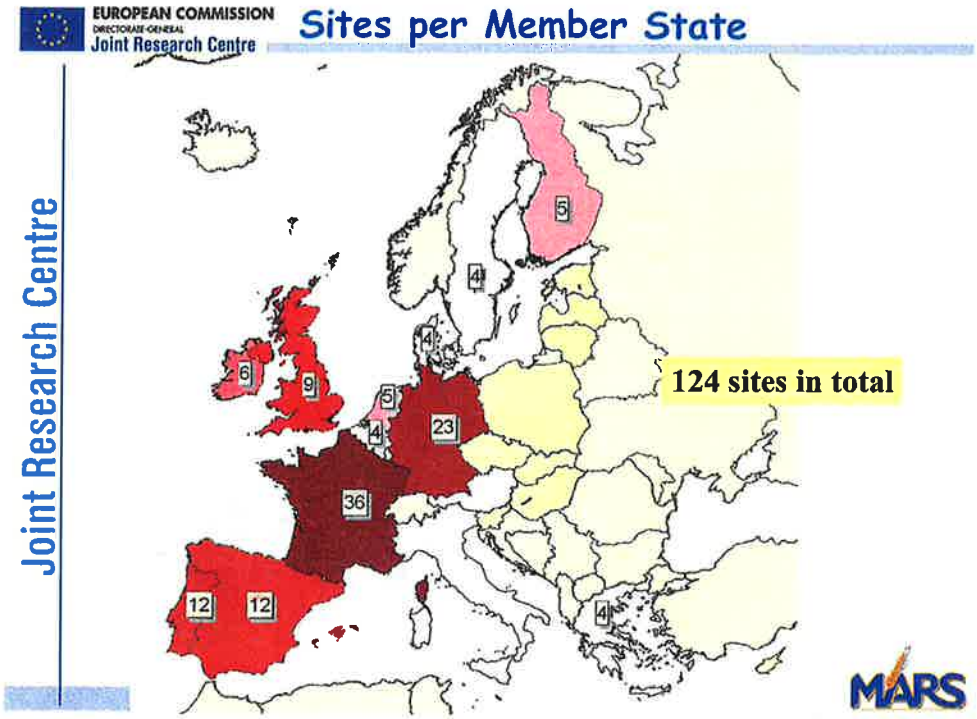

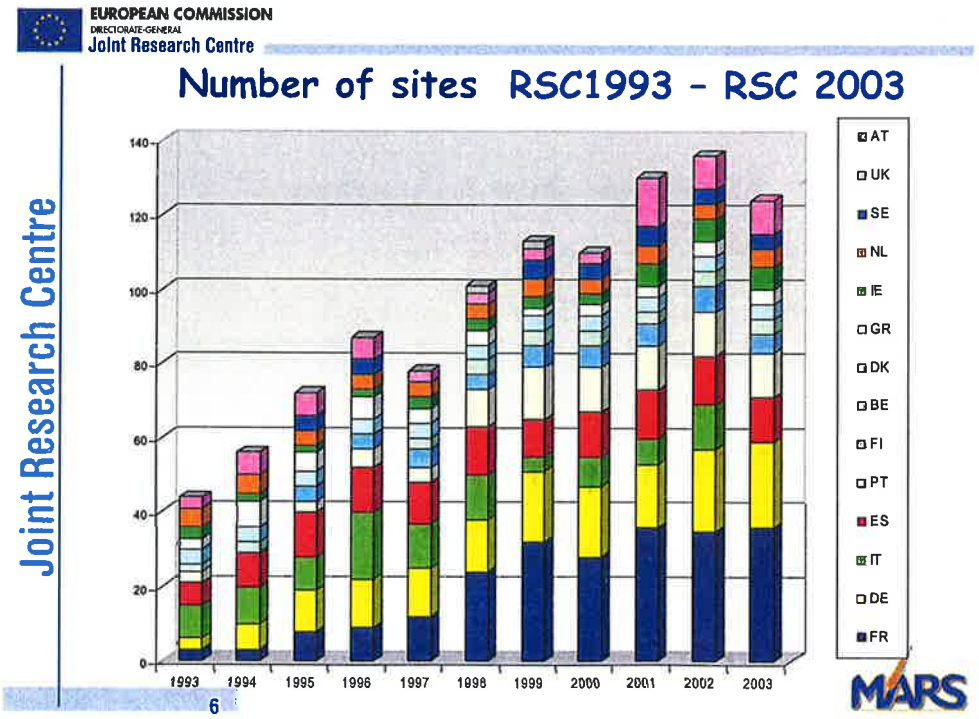

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Satellite data distributed during RSC2003

		(RSC2002)
Multispectral 2002/2003	435(*) +	(469)
(*) all required: 447, Rate of success: 97 % (previous campaign: 95%)		
Pan 2002	66(**) =	(63)
(**) all required: 66, Rate of success: 100 %, (previous campaign: 94%)		
Optical acquired 2002/2003	501 +	(532)
Reference year checks	11 +	(29)

- **Total Optical** 512 (75%) + (561, 77%)
- **Total SAR** 168 (25%) = (173, 23%)
- **Total images delivered** 680 (734)

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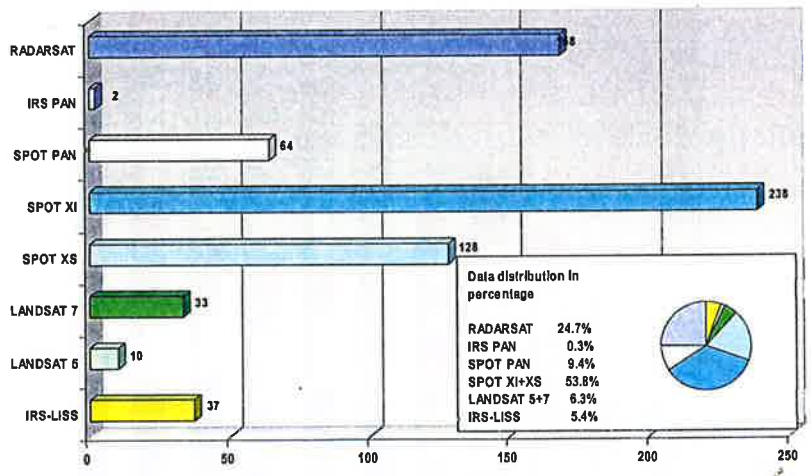
Satellite data ordered and delivered



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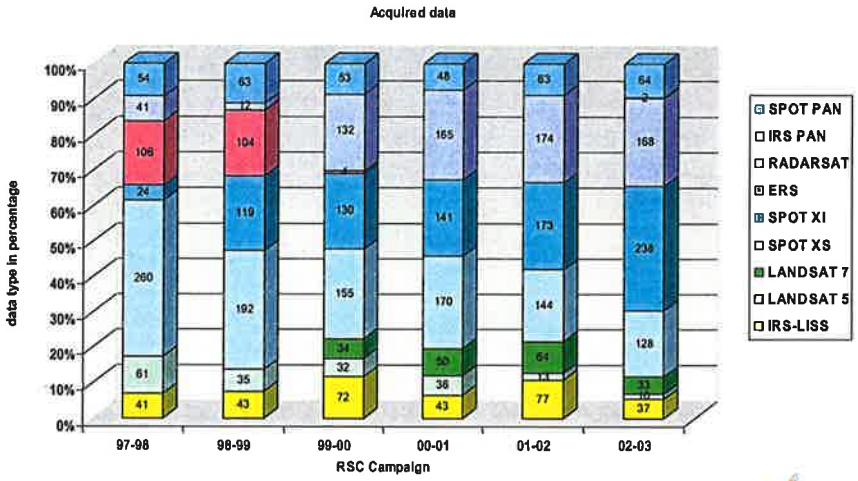
Acquired data RSC1998 - RSC2003



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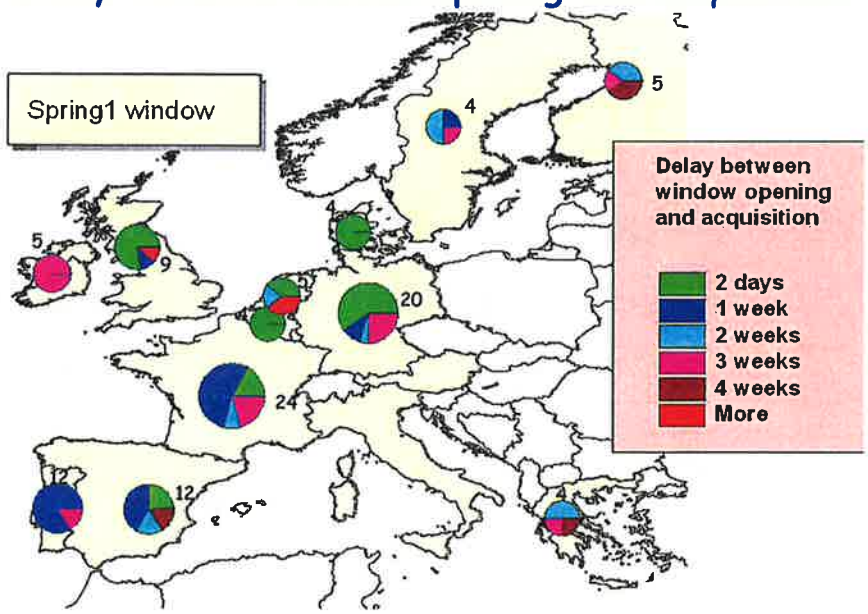
Delay between window opening and acquisition



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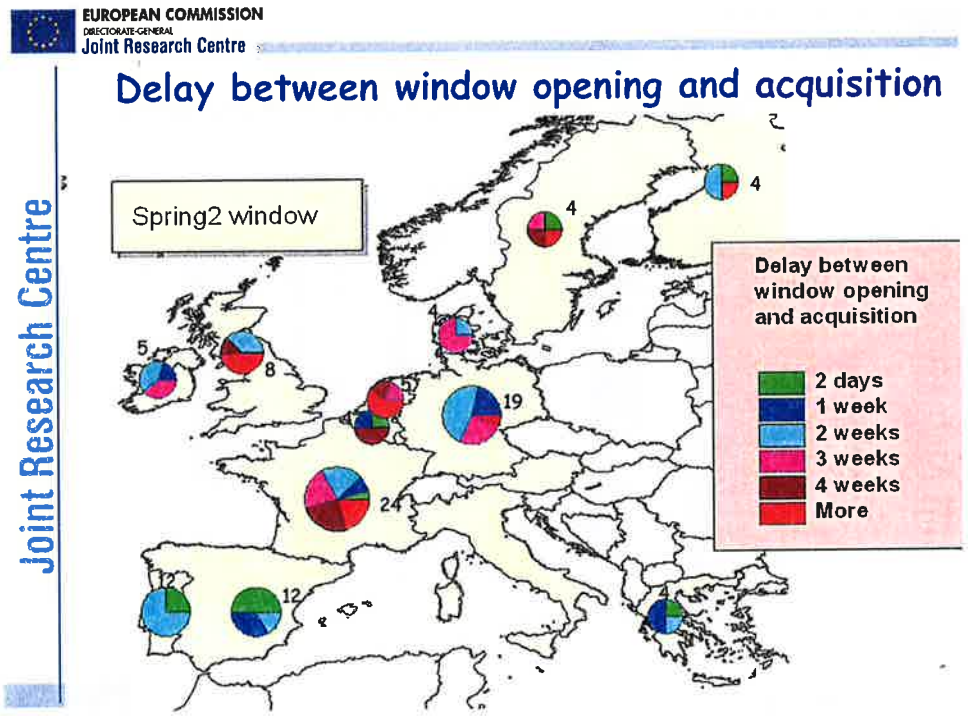

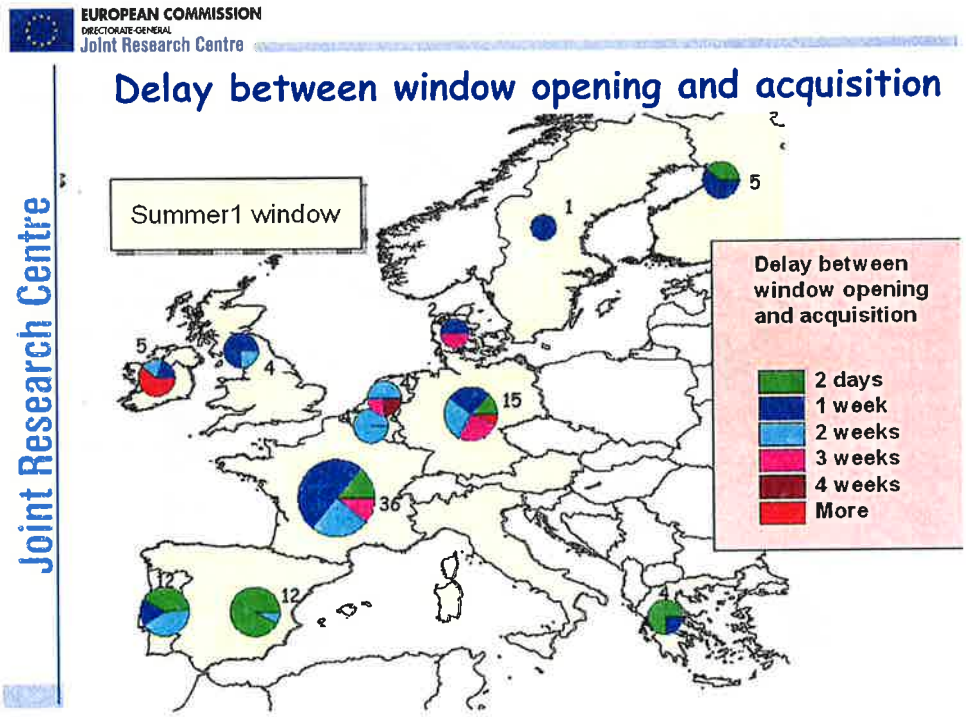

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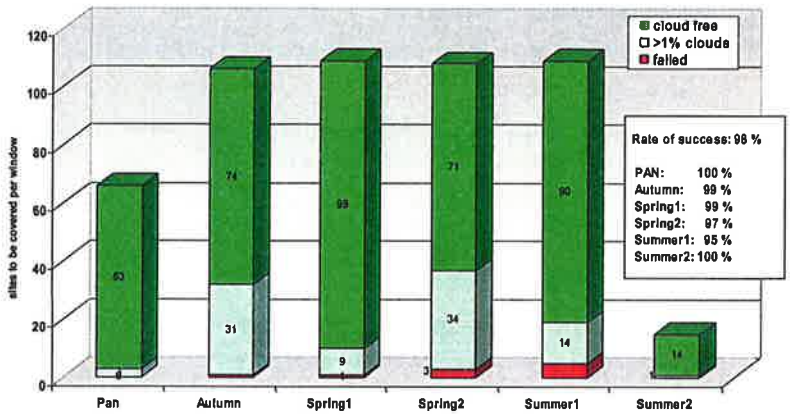
Window success - sites covered with optical data



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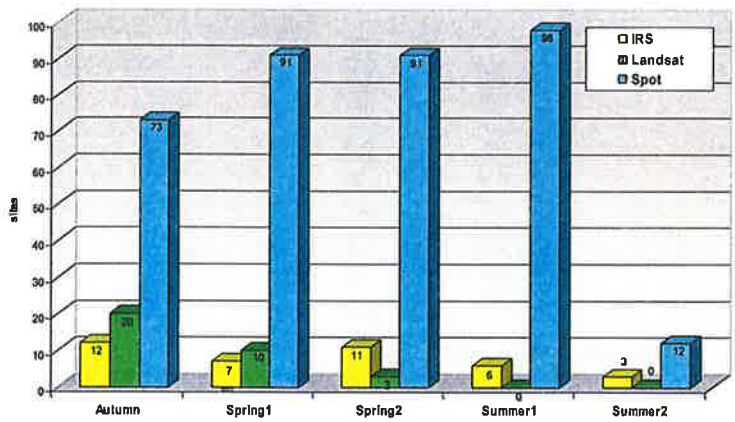
Sites covered by satellites per window



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Problems during the Campaign 2003

- site coordinates changed after successful autumn acquisitions – 2 cases
- image did not cover all of site – 6 cases
  (wrong shift, wrong SAT)
- validated autumn images with snow cover – 8 cases
  (archive search produced suitable imagery)
- Low data quality – 6 cases
  (saturation, degradation, striping, detector failures)
  - ✓ still accepted by contractor or
  - ✓ corrected and resent by provider
- Error in window opening programming – 2 cases
  (summer1 window: used Radarsat back/up)
- Empty CD box or broken CD – 5 cases (resent by provider)
- Delays of up to 5 days in notification of imagery

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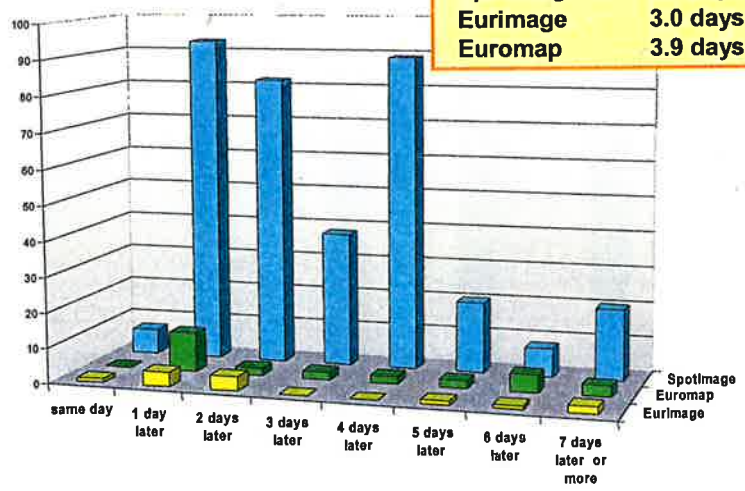
Service analysis – time between order and shipment

Spotimage	3.1 days (In 2002 2.6)
Eurimage	3.0 days (In 2002 2.7)
Euromap	3.9 days (In 2002 3.0)



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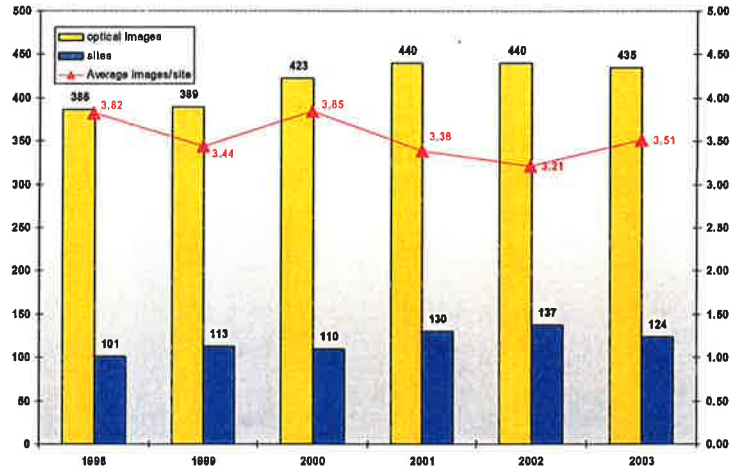
Optical images per site - last 6 campaigns



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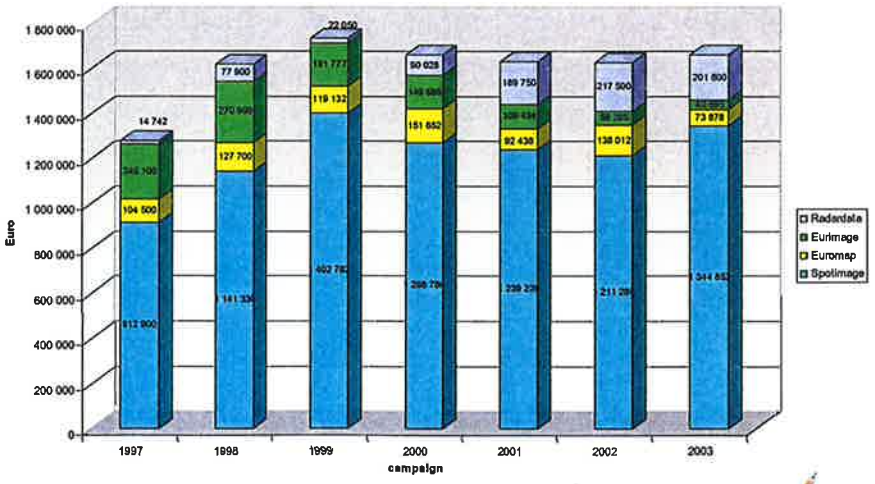
Cost analysis - total costs last 7 campaigns



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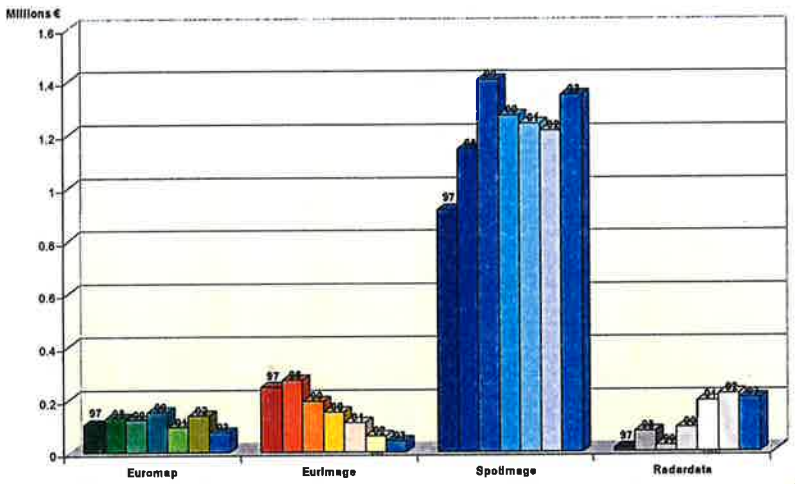
Total costs - last 7 campaigns per provider



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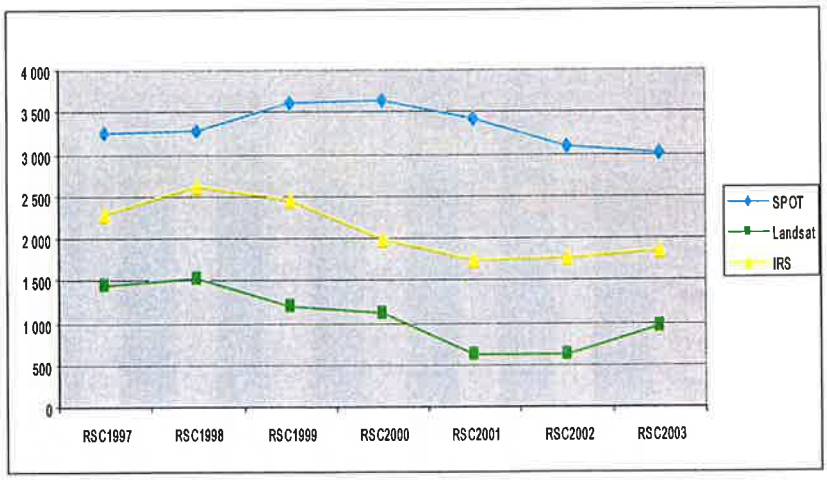
Average price per optical sensor - last 7 campaigns



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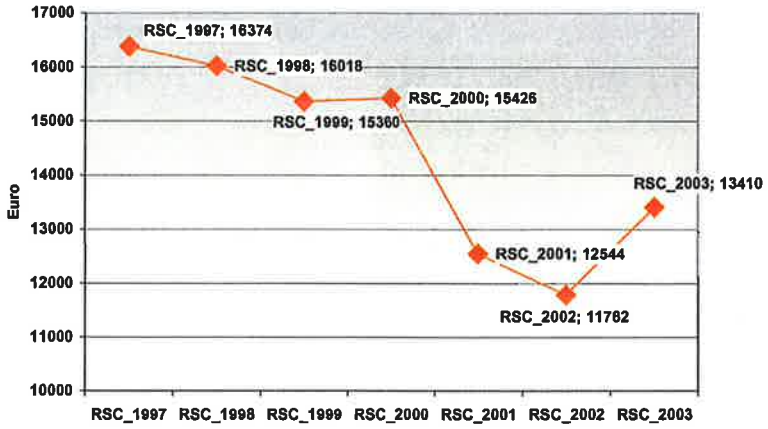
Mean costs per site during last 7 campaigns



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Summary

- in spite of problems - successful campaign
- high success rate maintained
- proficiency of the image providers
- most of Europe had good weather
- problems were dealt with & if possible, solved fast by all concerned

100% dedication of the MARS-LIO Team

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Presentation 4 – Acquisition of VHR satellite data for pilot tests

Pär Åstrand

JRC/ IPSC/ MARS Unit

Abstracts

The 2003 years VHR satellite image acquisition is analysed. 14 MS and 9 new MS participated to this "pre-operational" testing for the 2003 years campaign. The no. of sites were 37 (various sizes), and the total area ordered was approximately 15.000 km2 distributed evenly among the three sensor systems Ikonos, Quickbird, and EROS. The total expenditure (DG AGRI) for the exercise was approximately 310.000 euro.

The presentation goes through following items of the campaign:

- the VHR sites
- analysis
  - date of delivery
  - acquisition time
  - production time
  - delivery time
- cloud cover
- lessons learnt

Some conclusions are drawn regarding above and also the instruments status of operation, the data products, the sw required to process the data, the contractors' involvement in delivery of ancillary data, administration of the ordering, and the costs.

Keywords: VHR very high resolution

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Acquisition of VHR satellite data 2003

Pre operational testing

- Ikonos
- Quickbird
- EROS

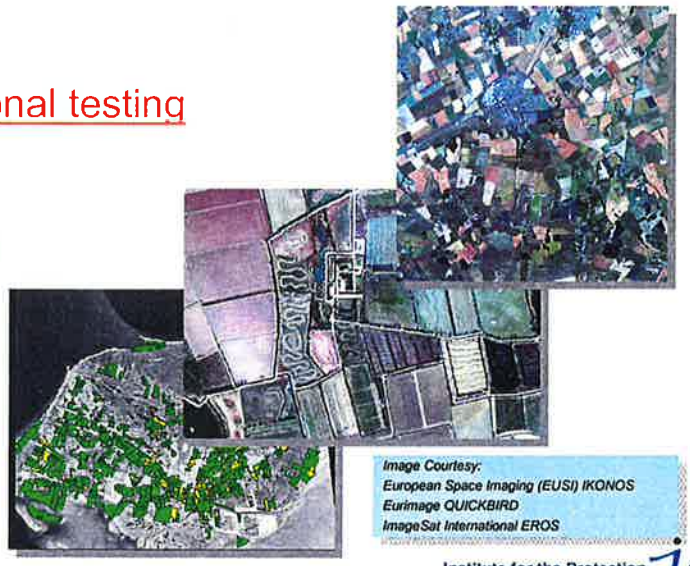

Image Courtesy:
European Space Imaging (EUSI) IKONOS
Eurimage QUICKBIRD
ImageSat International EROS

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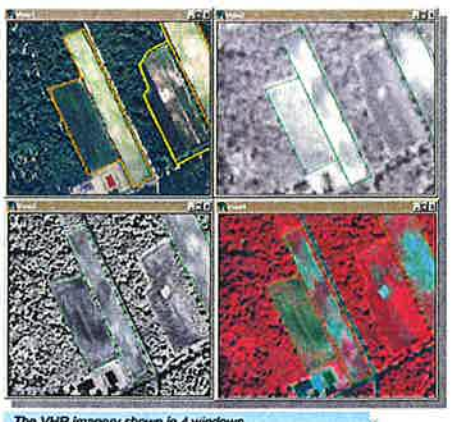
presentation outline

- the VHR sites
- analysis
  - date of delivery
  - acquisition time
  - production time
  - delivery time
- cloud cover
- lessons learnt



The VHR imagery shown in 4 windows
1) Colour orthophoto,
2) EROS pan,
3) QuickBird panchromatic
4) QuickBird multispectral.
Danish Institute of Agricultural Sciences

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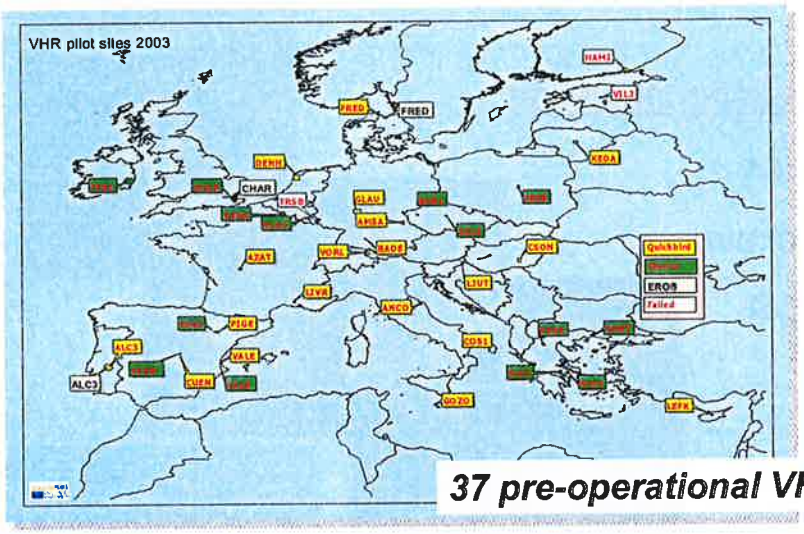
the VHR sites - 2003 Campaign



37 pre-operational VHR sites

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the VHR sites 2003 Campaign

- participants to "pre-operational" testing 2003
  - 14 MS + 9 new MS
- no. of sites
  - 37 (various size)
- area ordered
  - Ikonos, Quickbird, EROS area ordered ± 15.000 km2
- image budget (DG-AGRI) 2003
  - total 2.300.000 euro
  - VHR 350.000 euro
- expenditure VHR approx. 310.000 euro

Quickbird 21 sites
4,979 km2
success rate sites (19/21) 90.48%
success rate area 83.65%

Ikonos 13 sites
5,152 km2
success rate sites (12/13) 92.31%
success rate area 98.06%

EROS 3 sites
4,179 km2
success rate 100%

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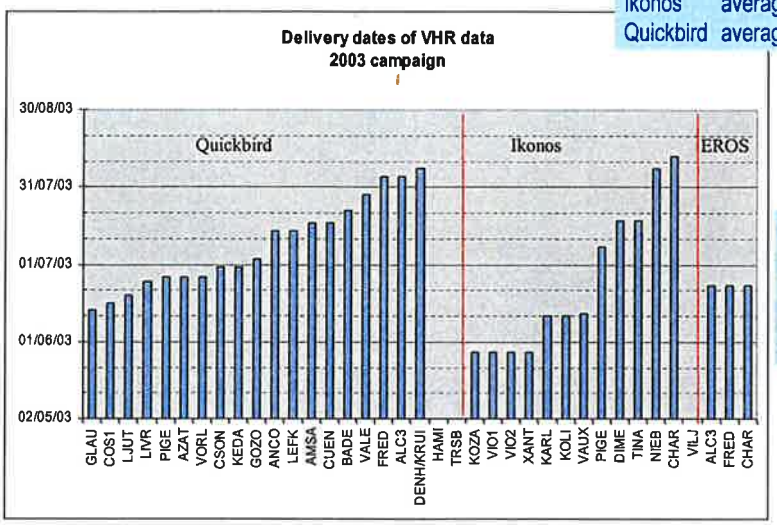
View of delivery dates – not of delay !!!

analysis

Sliding of requested / confirmed window:
Ikonos average 3 days
Quickbird average 10 days



EROS – delivery date of raw/system corrected data could have been mid May – end May (FC)

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EROS

- good acquisition time, 100% success
  - all 3 sites could have been delivered (raw / system corrected) by mid/end May, 2003
  - if acquisition made on 1st good attempt delivery could have been in 4-5 days...
- late delivery raw / system data date due to late signature of FC
- long production time (orthophotos)
  - problems in orthocorrection, and long time by image provider's subcontractor (still working on ALC3...)
  - contractors problems in delivering ancillary data
    - due to operational work in CwRS campaign
    - bad points, bad other ancillary data
- good results for single scene
  - rmse around 2.5 m (good gps points, flat terrain..)
- average results for vector scene
  - rmse around 4 – 4.5 m (quality of gcp's, model used best for single)
- delivery time
  - ftp, no big problem

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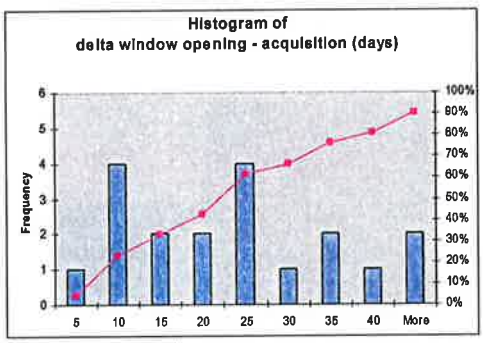
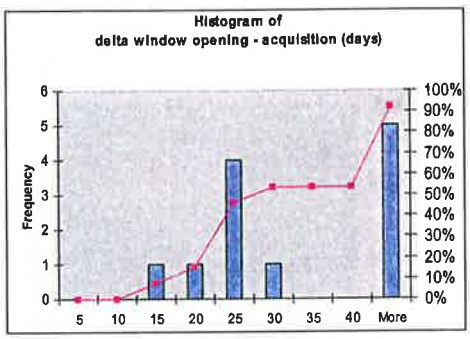
time between confirmed window opening to final acquisition... (all)

Quickbird / Ikonos – acquisitions all



average: 23 days
median: 21 days

QB – 90% collected ie. 19/21



average: 40 days
median: 28 days

Ikonos 92% collected 12/13

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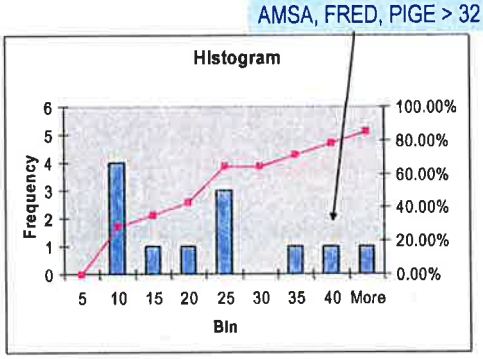
time between confirmed window opening to final acquisition ...(prio)

Quickbird / Ikonos – acquisitions with priority uplift

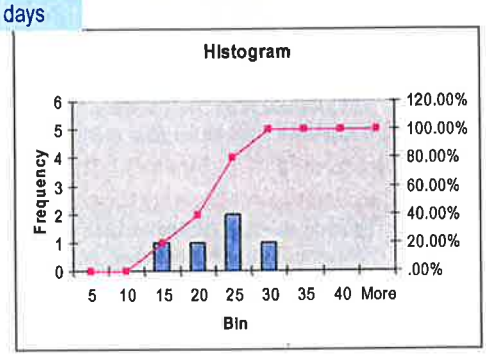
AMSA, FRED, PIGE > 32 days



average: 22 days
median: 21 days

QB - 12/21 had prio

Ikonos - 75% (9/12) after 25 days



average: 21 days
median: 23 days

Ikonos - 5/13 had prio

Ikonos - 100% (5/5) after 30 days

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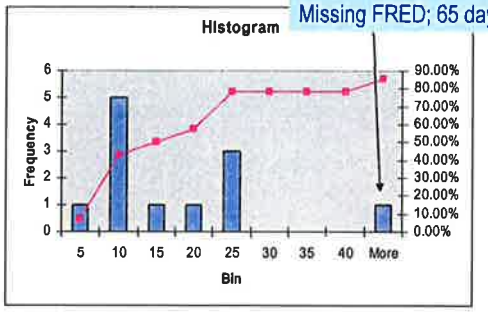
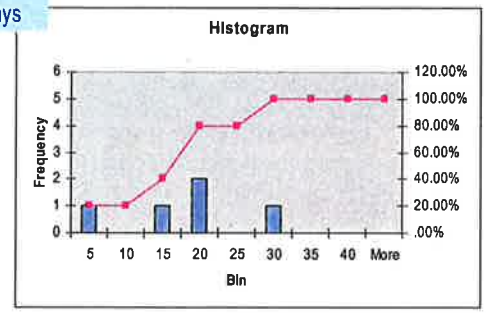
Time between confirmed window opening to first acquisition ...(prio)

Quickbird / Ikonos – until first acquisition, prio

Missing FRED; 65 days





average: 17 days
median: 11 days

QB - 92 % (11/12) after 25 days

average: 16 days
median: 18 days

Ikonos - 100% (5/5) after 30 days

Let us say we had all sites collected at 1st best acquisition....ie. QB on first fragment, Ikonos whole site in one attempt

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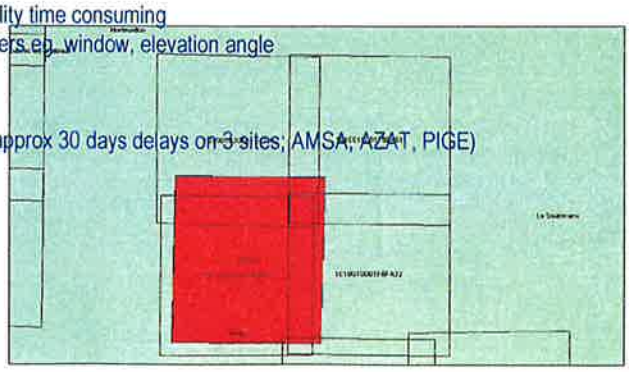
Fragments – QB full image is 16.5x16.5 km, but acquires and is tasked in 14x14km grid – when polygon ordered is bigger it will be anchored to UL, and split up into so called fragments

Quickbird

- acquisition time
  - sliding of requested / confirmed window – 10 days (max 61 (outlier))
  - JRC administration time...
  - technical and competitive feasibility time consuming
  - difficult to change order parameters eg. window, elevation angle
- fragments
  - 24 unjustified fragments
  - 5 (6) actually collected (caused approx 30 days delays on 3 sites; AMSA, AZA, PIGE)
- production time (days)
  - average 9 median 6
- delivery (days)
  - average 5 median 2



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Ikonos

- acquisition time
  - sliding of requested / confirmed window – average 3 days (max 14 days)
  - JRC administration time...
  - very good response on feasibility (direct link with receiving station) – easy to change order parameters eg. window, elevation angle etc.
  - competitive unexpected conflicts in Eastern Europe with SIEA (affected 4 new MS sites)
- extensions
  - 5/13 extensions required
  - 2/13 angle elevation lowered - (TINA, DIME) covered in 2 strips each, 2 dates (approx 60 days)
- production time (days)
  - average 3 median 4
  - CD writer failure for 2 sites (DIME, TINA caused delay of 3-5 days)
- delivery (days)
  - average 4 median 4

Elevation angles for DIME - 73.4°, 73.8°, 84.6° (2 dates)

Elevation angles for TINA - 65°, 62°, 65°, 61° (2 dates)

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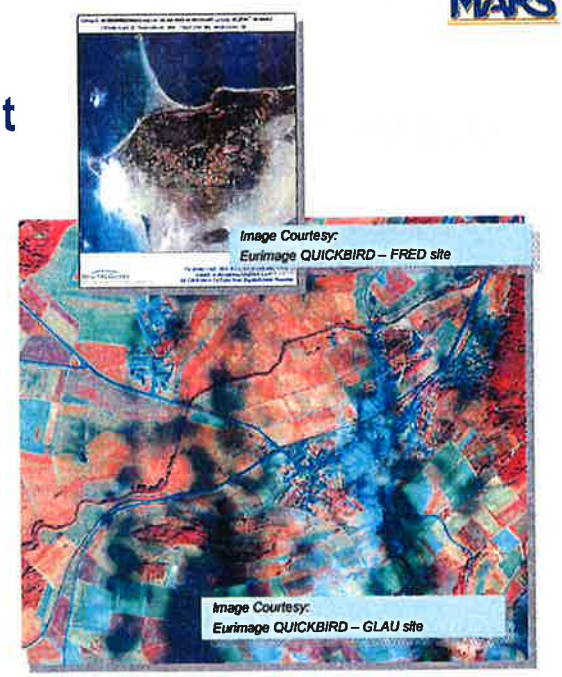
cloud cover assessment

- methods must converge
  - grid within AOI...
  - cloud, haze, shadows...
- Ikonos
  - average 2.58 % (min/max 0/10)
  - calculated on 12 used AOIs
- QB
  - average 3.44 % (min/max 0/14)
  - calculated on 27 used acquisitions
- EROS
  - average 3.18% (min/max 0/15)
  - calculated on 11 used acquisitions



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final considerations - learnt some lesson (1)

- instruments are currently operating
  - EROS A, Ikonos, Quickbird..
  - Orbview launched... not tried in this testing
- data products are straightforward to use
  - i.e., not requiring a lot of complex pre-processing using non-public domain algorithms or calibration data from many other instruments
  - very few contractors had problems to read and start work with data
- SW
  - main sw packages allow for ortho correction of above sensor data (at least space resection), block adjustment will become an important tool
  - EROS problems in vector scene correction
- Contractors
  - GCP, DEMs, ancillary data

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final considerations - learnt some lesson (2)

- administrative
  - FC, JRC Administration, budget release, ordering dates
- acquisition
  - QB/IKONOS - with right programming average delivery time 16 – 17 days (acquisition 1st fragment – prio)
  - EROS 4-5 days
  - QB fragments
  - cloud is always a problem
  - a site larger than acquisition possibility will always require > acquisition, ie. > date
  - elevation angle may be lowered in northern areas (acquisition by latitude – not analysed but of the 7 sites with > 40 days acquisition 4-5 are "northern")
- production
  - Should reach 1-3 days (Ikonos claim 1 hour CC, 1 day production)
- delivery
  - Should reach 1-3 days
- costs
  - are moving down...need to reach 15 euro/km2

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thank you !

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the sensors...

- IKONOS
- QUICKBIRD
- EROS
- SPOT

CTS – VHR 2003 / P Ástrand 5

9th Annual CwRS Conference, November 2003, Köln, DE

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the Ikonos system

IKONOS	Launched 24/09/1999	http://www.euspaceimaging.com
Single Scene	11 km x 11 km (swath)	
Sensor	*Panchromatic*	*Multi-spectral* (same bands as Landsat 4&5 TM Bands #1-4)
Resolution	1 m	4 m
Revisit Frequency (40° Lat)	2.9 days at 1-meter resolution; 1.5 days at 1.5-meter resolution. The revisit times will be more frequent for higher latitudes and less frequent for latitudes closer to the equator.	
Viewing Angle	Agile spacecraft - in-track and cross-track pointing (*)	
Dynamic Range	11-bit data or 8-bit data	

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the Quickbird system

QUICKBIRD	Launched 18/10/2001	http://www.eurimage.com
Single Scene	16.5 x 16.5 km	
Sensor	*Panchromatic*	*Multi-spectral*
Resolution	Basic: 0.61 m at nadir	Basic: 2.44 m at nadir,
	0.72 m at 25° off-nadir	2.88 m 25° off-nadir
Revisit Frequency (45° Lat)	approx. 4-5 days (0-25°), approx. 7-8 days (0-15°)	
Dynamic Range	11-bit data or 8-bit data	

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the EROS A system

EROS A	Launched 05/12/2000	http://www.imagesatintl.com
Single Scene	13.5 km x 13.5 km (hypersampled scene9.5 km x 9.5 km)	
Sensor	*Panchromatic*	
Resolution	1.8 m (with one axes oversampling or hypersampling gives 1m)	
Revisit Frequency / Viewing Angle	EROS A is highly manoeuvrable and can be quickly pointed and stabilized to image customer-specified sites at nadir (perpendicular to the surface) or at oblique angles up to 45 degrees. Oblique viewing enables the satellite to view virtually any site on the earth as often as two to three times per week.	
Dynamic Range	11-bit data or 8-bit data	

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the SPOT 5 system

SPOT 5	Launched 04/05/2002	http://www.spotimage.com
Single Scene	60 km x 60 km	
Sensor	*Panchromatic*	*Multi-spectral*
Resolution	2.5 (interleaving, interpolation, restoration) or 5 m	10 m (SWIR 20m)

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Presentation 5 – Pilot CwRS Campaigns in new Member States

Giuseppe Nesti

JRC/ IPSC/ MARS Unit

Abstracts

Pilots Projects on Control with Remote Sensing have been launched in 2003 in nine of the ten new Member States to prepare them to the full implementation of the Integrated Administration and Control System (IACS) – a key element of the Common Agricultural Policy (PAC) – starting with the 2004 agricultural season. The Commission has supported these projects by funding the acquisition of satellite imagery and providing, through the MARS Unit, technical and administrative assistance for image purchasing, project implementation and evaluation.

Eleven control sites have been used (one in each country, except PL and CZ where two sites have been used) for a total of 28 images acquired (of which 20 HR and 8 VHR images).

A key element of the MARS support has been the technical training of officials of national administrations involved in preparation activities of IACS (a Training Course on CwRS and image ortho-correction was held at Ispra in March 2003). In addition, a workshops was organized in July a the JRC to review the progresses of the pilot campaigns and discuss relevant technical and administrative issues.

The outcomes of the pilot projects clearly demonstrate the importance of the exercise in order to focus technical and administrative problems, evaluate the necessary resources and eventually take decisions on control strategy for area-based subsidies.

The positive involvement of the participants and the momentum generated by this activity in the different countries are very encouraging, although the achieved results are rather heterogeneous depending on the local contexts and the previous experience in control activities.

The presentation will review all these aspects, provide representative examples of the work performed in the pilot projects and summarize the main conclusions that can be derived from the results.

Keywords: Remote Sensing, Control, Pilot Campaign, IACS, Enlargement

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Pilot CwRS Campaigns in new Member States

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Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

9th Annual CwRS Conference, November 2003, Köln, DE

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Objectives of Pilot CwRS 2003

Support Accession Countries in preparation activities for the implementation of IACS from 2004

- Provide satellite imagery (HR and VHR data)
- Transfer of expertise and know-how
  - EC schemes, national schemes, LPIS
  - Training on CwRS
  - Discussion of common problems
- Gain of practical experience, involvement in activity
  - Test CwRS methodology (eg. normal setup, VHR tests etc.)
  - Training of administration staff and farmers
  - Verification of appropriate timing in performance of tasks
  - Evaluation of necessary human, technical and logistic resources

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Objectives of Pilot CwRS 2003

Specific technical objectives

- Check functionality and inter-operability of the (prototype) area aid registration and control systems
- Implementing CAPI and testing classification techniques
- QC of current digital LPIS vectors and (archive) ortho-photos
- Determining the limitations of satellite imagery for the intended control purposes
- Estimate total efforts on follow-up inspections, etc.
- Integrating results in direct feedback to field inspection services, etc.
- Participate to European Tests of VHR imagery for LPIS/CwRS applications

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Support by the JRC

- **Training Course on CwRS and space-borne image ortho-correction for Accession and Candidate Countries (Ispra 24 - 26 March 2003)**
- **Provision of satellite imagery (for 9 Pilot Projects)**
  - 11 control sites
  - 29 images acquired (20 HR and 9 VHR)
  - A total budget of about 120 KEUR
- **Workshop on Pilot Projects Status (Ispra 24 - 25 July 2003)**

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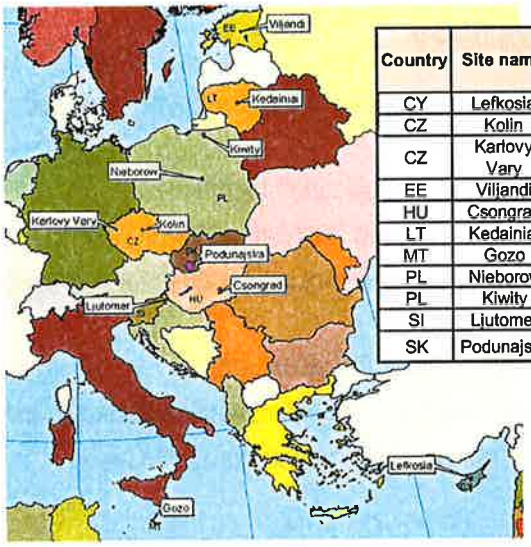
Control Sites in new Member States



Country	Site name	Horizontal extent (km)	Vertical extent (km)	Circle radius (km)	Area (km^2)
CY	Lefkosia	16	16		256
CZ	Kolin	10	10		100
CZ	Karlovy Vary	10	10		100
EE	Viljandi	10	10		100
HU	Csongrad	20	30		600
LT	Kedainiai	16	16		256
MT	Gozo	15	10		150
PL	Nieborow	10.8	18.5		200
PL	Kiwity	13	25		325
SI	Ljutomer	11	12		132
SK	Podunajska			25	1 963

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Acquired images for new Member States

Not to be shown!

Country	Site	Acquired Images	Date of acquisition
CY	Lefkosia	QuickBird VHR PAN and XS	29/06/03
CY	Lefkosia	SPOT 5 PAN, Supermode and Xi	08/01/03
CZ	Karlovy Vary	IKONOS-2 VHR PAN and XS	07/06/03
CZ	Karlovy Vary	LANDSAT 7 ETM+	26/04/03
CZ	Karlovy Vary	SPOT 4 XI	11/07/03
CZ	Kolin	IKONOS-2 VHR PAN and XS	07/06/03
CZ	Kolin	LANDSAT 7 ETM+	05/05/03
CZ	Kolin	SPOT 2 XS	27/07/03
EE	Viljandi	IKONOS-2 VHR PAN and XS	05/09/2003
EE	Viljandi	LANDSAT 7 ETM+	04/09/02
EE	Viljandi	SPOT 4 XI	25/05/03
EE	Viljandi	SPOT 4 XI	17/07/03
HU	Csongrad	QuickBird VHR PAN and XS	22/06/03
LT	Kedainiai	QuickBird VHR PAN and XS	04/06/03
LT	Kedainiai	SPOT 4 XI	04/06/03
LT	Kedainiai	SPOT 4 XI	27/06/03
LT	Kedainiai	SPOT 2 XS	12/07/03
MT	Gozo	QuickBird VHR PAN and XS	27/06/03
PL	Kiwity	IRS 1C LISS-3	26/03/03
PL	Kiwity	IRS 1D LISS-3	06/05/03
PL	Kiwity	SPOT 4 XI	17/07/03
PL	Nieborov	IKONOS-2 VHR PAN and XS	06/08/03
PL	Nieborov	IRS 1D LISS-3	06/05/03
SI	Ljutomer	QuickBird VHR PAN and XS	14/06/03
SI	Ljutomer	IRS 1D LISS-3	12/05/03
SI	Ljutomer	SPOT 4 XI	05/06/03
SK	Podunaiska	SPOT 5 PAN, Supemode and Xi	30/06/03
SK	Podunaiska	IRS 1D LISS-3	06/05/03
SK	Podunaiska	IRS 1C LISS-3	06/06/03

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Acquired images for new Member States

Country	Site	VHR	Spot SM	HR Autumn	HR Spr1	HR Spr2	HR Summer
CY	Lefkosia	29/06/03	08/01/03				
CZ	Karlovy Vary	07/06/03			26/04/03		11/07/03
	Kolin	07/06/03			05/05/03		27/07/03
EE	Viljandi	05/09/03		04/09/02		25/05/03	17/07/03
HU	Csongrad	22/06/03			(*)		
LT	Kedainiai	04/06/03			04/06/03	27/06/03	12/07/03
MT	Gozo	27/06/03					
PL	Kiwity				26/03/03	06/05/03	17/07/03
	Nieborov	06/08/03				06/05/03	
SI	Ljutomer	14706/03			12/05/03	05/06/03	
SK	Podunaiská		30/06/03		06/05/03	06/06/03	

(*) HR images acquired using national funds

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Main characteristics of controlled area

Country	Site	No. Dossier	No. Parcels	Total Area (Ha)	Area of parcels (Ha)		Notes
					Max	Average	
CY	Lefkosia	1225	21746	9350	32.7	0.4	Plain surrounded by slightly hilly areas.
CZ	Karlovy Vary	5	301	4828	191.9	16.0	Hilly region with mixture of agricultural fields, grasslands, pastures and woods.
	Kolin	26	208	2008	56.5	9.6	Flat area almost totally occupied by arable land.
EE	Viljandi	15	96	960	65.8	10.0	Quite flat area, 40% agricultural soil. Only cereals were checked by RS.
HU	Csongrad	467	2675	8292	114.2	3.1	Small land parcels (many with elongated shape).
LT	Kedainiai	102	502	2359		4.7	Medium and large farms: cereals, sugar beet, 60% agricultural soil.
MT	Gozo	-	-				Very small parcels with mixed cultivations. CwRS campaign not actually implemented.
PL	Kiwity	-	-				Farms with large size: cereals and grassland.
	Nieborov	-	-				Farms with medium size and diversified crops.
SI	Ljutomer	27	176	140	3.0	.8	Small parcels: need for VHR data.
SK	Podunaiská	29	1050	27200	584.0	25.9	Hilly area, 80% agricultural soil.

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Background in CwRS

Country	No past experience	Some past experience	Consoli.ed experience	Digital LPIS (Nation)	Area based Nat. Sch.	Notes
CY						National Subsidy Schemes already in place implemented as close as possible to EU rules in 2003. LPIS exists in GIS.
CZ						No area-based subsidies in 2003. Pilot Project based on simulated voluntary declarations. LPIS exists in GIS.
EE						Pilot Project part of a National Subsidy Scheme. LPIS ready at the end of 2003, based on OP 1996 – 2000.
HU						National area-based subsidy schemes already in place since 1997. HR acquired on national funds.
LT						A national subsidy scheme exists. LPIS ready end of 2003 based on OP 94 –99. Pilot CwRS not used for control in 2003.
MT						A national subsidy scheme exists (not for forage and cereals). A structured Pilot Project on CwRS was not implemented.
PL						Digital LPIS based on cadastre under construction. No national subsidy scheme exists.
SI						Digital LPIS based on cadastre. National subsidy scheme controlled by traditional methods until now.
SK						Control of national schemes performed without RS. Digital LPIS under completion (physical blocks)

9th Annual CwRS Conference, November 2003, Köln, DE

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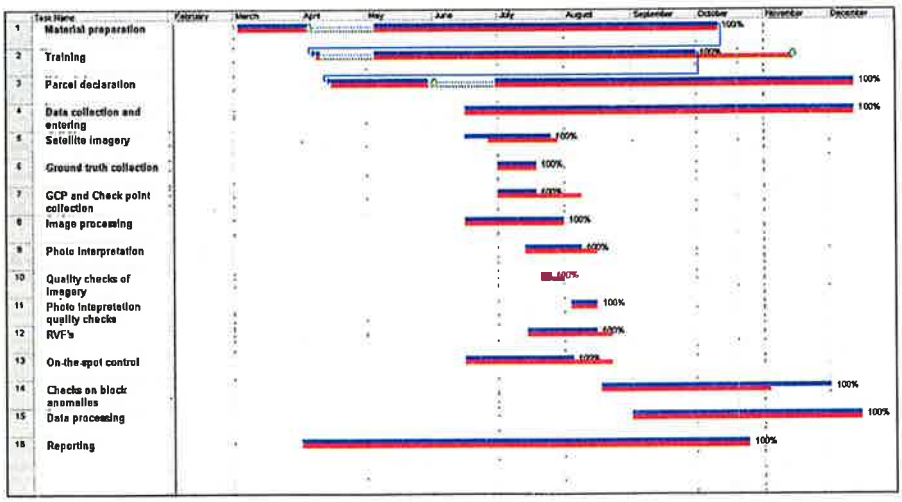
CwRS in Kedainiai - Lithuania



Activities realized (red) against the original planning (blu)

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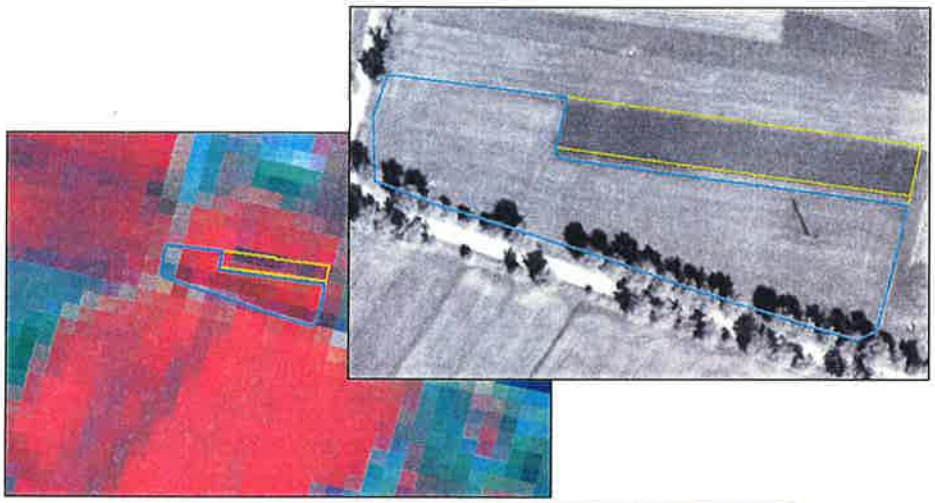
CwRS in Kedainiai - Lithuania



Crop identification impossible due to the small size of parcel

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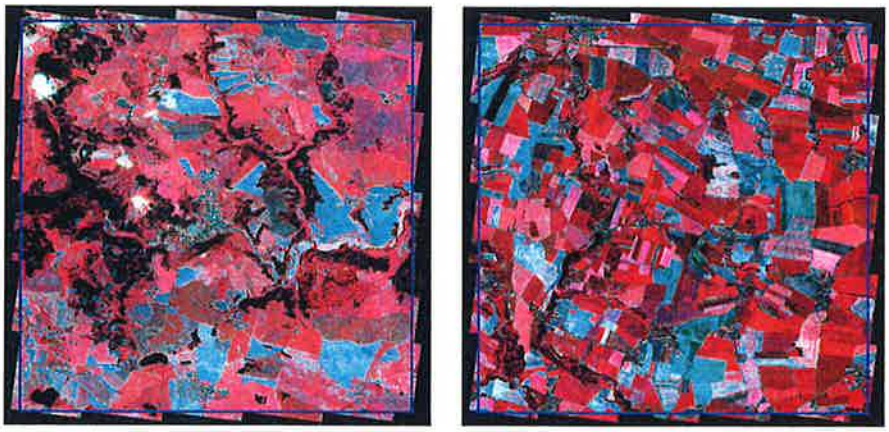
CwRS in Czech Republic



VHR images acquired for site KARL and KOLI (07/06/03, band combination 4-3-2)

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CwRS in Czech Republic

LPIS for site KARL and KOLI (colors refer to different farms)

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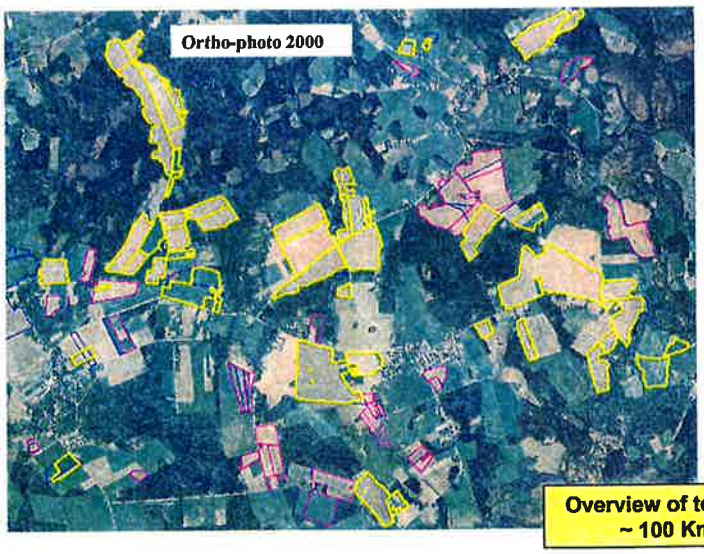
CwRS in Viljandi - Estonia



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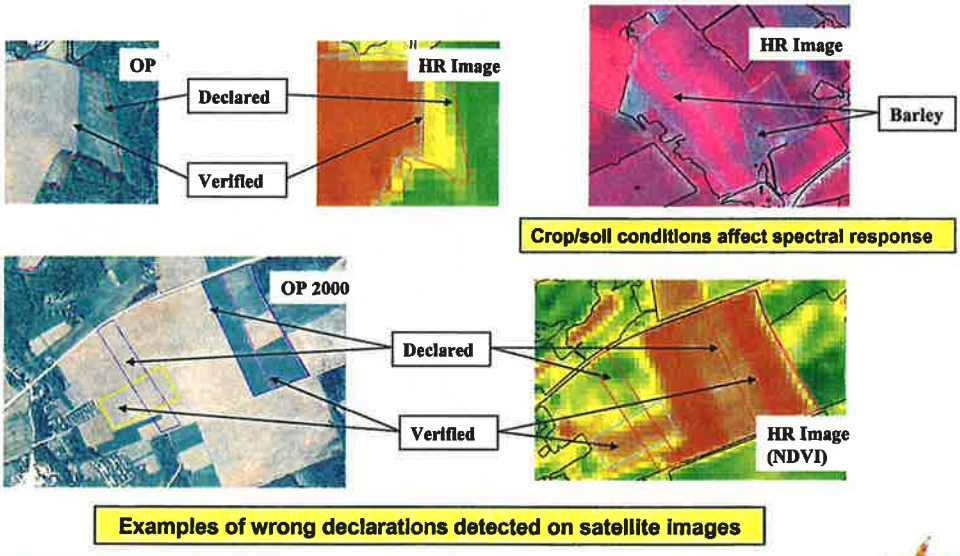
CwRS in Viljandi - Estonia



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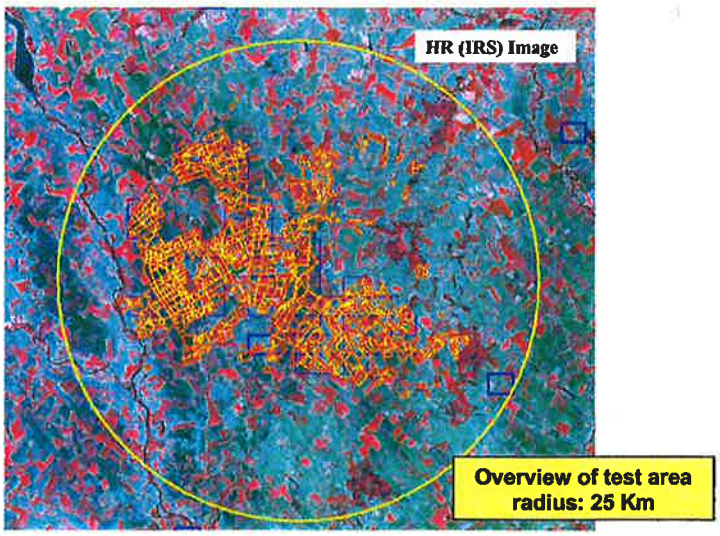
CwRS in Podunaiská - Slovakia



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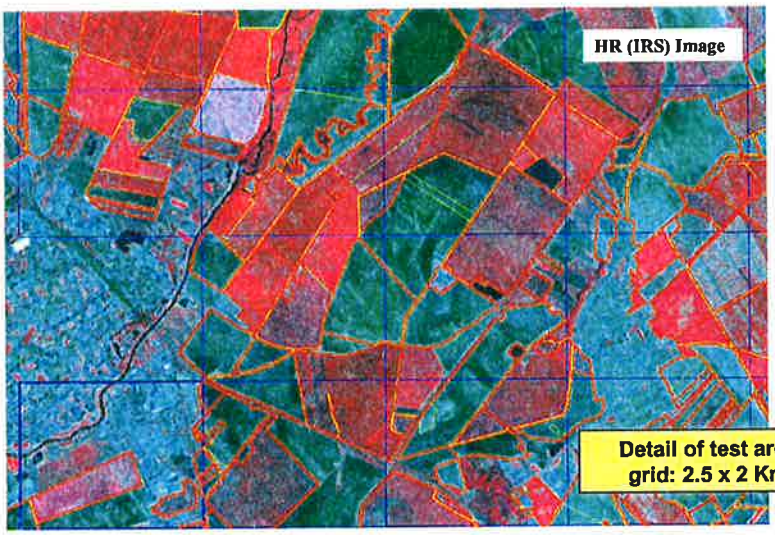
CwRS in Podunaiská - Slovakia



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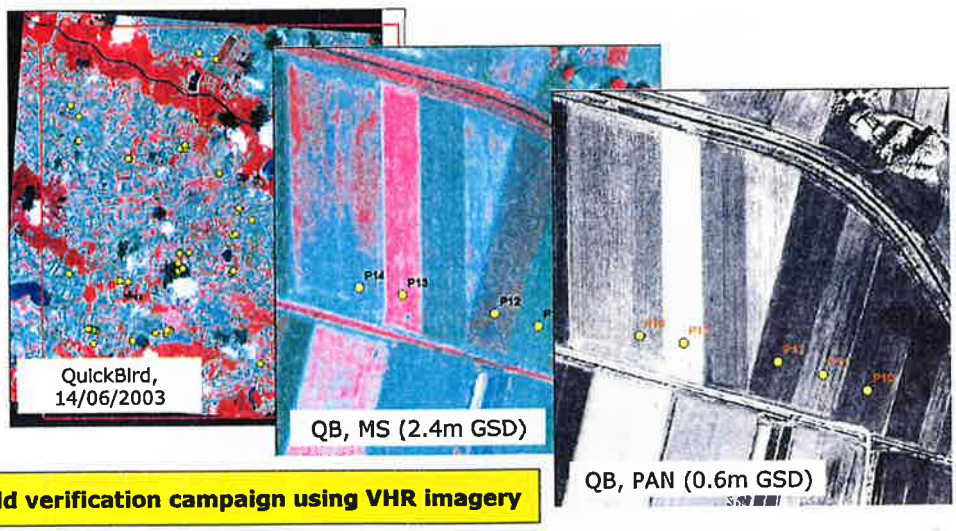
CwRS in Ljutomer - Slovenia



Field verification campaign using VHR imagery

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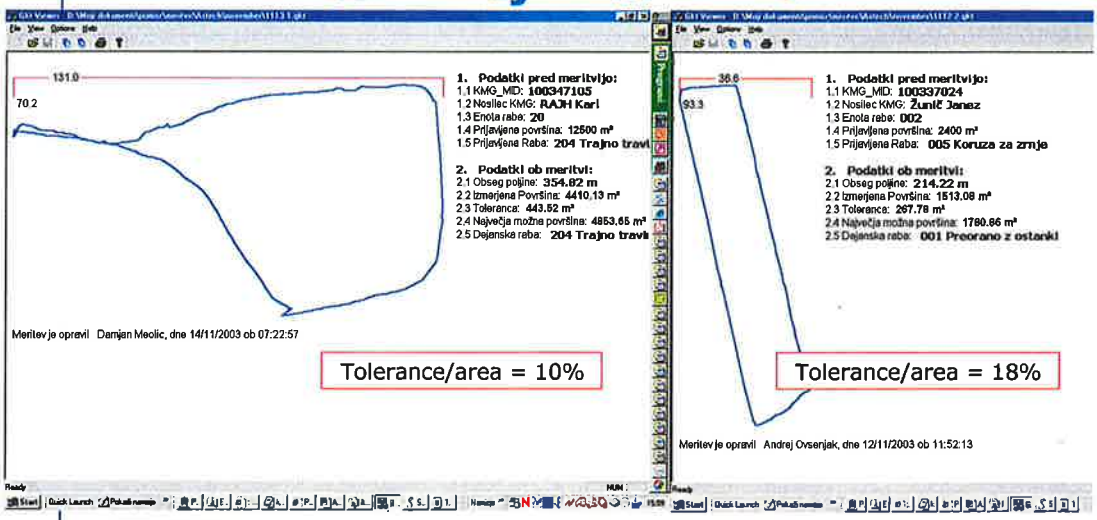
CwRS in Ljutomer - Slovenia



GPS measurement tolerance (1.25 m x perimeter) and parcel shape

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Positive Outcomes

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- Use of CwRS in future
  - Almost all countries participating to the pilot campaign (MT?, PL?) have confirmed the intention to use CwRS in future.
- Use of VHR imagery
  - Excellent results (resolution and geometric accuracy)
  - A valid substitute to current year Ortho-photos
  - Sometimes required also for crop identification (very small parcels – MT, SI)
- CwRS methology
  - No fundamental technical problems in implementation
  - Generalized effort to comply with technical recommendations

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Problem Areas

- Overall timing
  - Generalized delays with respect to planned/recommended schedule
  - In some cases administrative procedures have blocked the work (PL)
- LPIS to be completed/updated
  - Digital LPIS not yet completed in several countries (CY, EE, HU, LT, PL, SK)
  - Synchronization of updates (CZ)
- Human resources
  - Training required for local office staff (LT)
  - Lack of personnel for field controls (LT)
- Geo-referencing and ortho-rectifications
  - Matching local reference grids with international standards (SI)

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Problem Areas

- Wrong farmers declarations
  - Farmers often unfamiliar with non-cadastral parcel identification systems (LT, SK)
  - Drawing skill required for accurate declarations (EE, LT)
  - Accuracy of old cadastral data (LT)
- CAPI
  - Separation of summer crops (SK, LT): required summer2 image (Relevant for control?)
  - Definition of technical codes and tolerances (LT): training needed?
  - Resolution of HR data not adequate for specific agricultural landscapes presenting high percentage of small parcels (MT, CY, SI)

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Pilot CwRS Campaigns in new Member States

Concluding remarks

- Very useful exercise for all participants (including JRC)
- Training, technology transfer, exchange of experience, self assessment and quality check
- Positive approach and spirit of collaboration
- Quality of results depends mainly on different contexts and previous experience in CwRS
- Excellent results also from 'small' countries in spite of limited resources

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Posters on display

CZ	Pavel Trojáček, EKOTOXA • Seven years of experience with LPIS and IACS building in the Czech Republic
EE	Nele Värv - ARIB (Estonian Agricultural Registers and Information Board) • Block system in Estonia and its peculiarities
HU	FÖMI (Institute of Geodesy, Cartography and Remote Sensing) • Control of Area Based Subsidies in Hungary 2000-2003 • MePAR: Land Parcel Identification System in Hungary
LT	Agri-Information and Rural Business Center • Control with Remote Sensing pilot project in Lithuania, 2003
PL	Janusz Kosakowski , University of Warmia and Mazury in Olsztyn • Identification of weak points in data delivery for the LPIS database • Interferometric and polarimetric ENVISAT-1 /ASAR data applied for land cover and crop mapping (*only in proceedings*)
SI	INFOTERRA • Activities related to imagery and GIS applications in agriculture and land use in Slovenia and UK
SK	Michal Sviček et al. - Soil Science and Conservation Research Institute, Bratislava • Pilot Project on CwRS in Slovak Republic (in the frame of JRC CwRS pilots in Accession Countries) • Land Parcel Identification System in Slovakia, present state and LPIS development towards multifunctional GIS

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Thanks to all the persons involved in the 2003 CwRS Pilot Projects for their excellent collaboration !

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Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

9th Annual CwRS Conference, November 2003, Köln, DE

Pilot CwRS Campaigns in new MS / gn 25

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Presentation 6 – Land Parcel Identification System: Status of implementation

Olivier LÉO

JRC/ IPSC/ MARS Unit

Abstracts

The Land Parcel Identification System (LPIS) is a key component of IACS for the management and control of area based subsidies. Council Regulation N° 1782/03, makes compulsorily the implementation of a digital LPIS (or IACS-GIS) by 1st January 2005.

The MARS project provides technical support to DG AGRI and Member States for a sound implementation of the IACS-GIS: A document prepared by MARS provided a number of recommendations on the functionalities expected to be delivered (cf. Discussion paper doc ref JRC-IPSC/G03/P/SKA/ska D(2002)(1187) V. 2.2.1). The introduction of some of these requirements into appropriate Commission regulations is also foreseen.

This technical support has been essential for the 10 future MS, where the LPIS is fully part of the "acquis communautaire". Since 1999, MARS has developed contacts with Candidates Countries and has helped organized TAIEX workshops, bilateral meetings or technical visits which frequently gave many opportunities to provide advice and promote "best practice" for LPIS implementation.

The future operational deployment of IACS-GIS raises technical challenges, in particular: combining the information of the IACS-GIS with positioning tools, the use of Internet, the development of field-assistant tools. These domains were addressed in 2 workshops organized by MARS in 2003 with the themes "IACS – GIS and the internet" (7-8 April in Ispra); "Updating central databases in real time from the farm" (29-31 October in Ponte San Giovanni Umbria).

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The presentation will provide an overview of the implementation of the IACS-GIS in the EU 25 present or future Member States: All the programmes for the implementation of the IACS-GIS are well engaged within the MS, but 2004 will be a critical year to achieve the transitional deployment of the IACS – GIS modules and / or to finalize the migration of the reference parcel (in case of change from cadastre to blocks or ilots).

The use of orthophotos, which was indeed only recommended in the Council Reg. N° 1593/00, has been unanimously adopted by the MS, and will indeed provide a better quality and transparency between the systems.

Keywords: IACS, LPIS, GIS, Orthophotos, GPS.

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Overview of LPIS and IACS GIS implementation
Council Reg. 1593/00

Olivier LÉO, Simon KAY
http://www.mars.jrc.it

9th conference on Controls with Remote sensing

Köln, 28-29 November 2003

Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft

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Summary

- Implementation of Reg. 1593/00
  - **Overview in current Member States**
  - **In the 10 future Member States**
- Progress and concerns in some Countries…
- From LPIS to IACS - GIS

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Purpose of the LPIS

- A unique identification of agricultural parcel
- Thought reference parcels uniquely identified
  - **Providing a geographic location**
  - **A reference area**
  - **Others elements of eligibility**

- Reg. 1593/00
  - **Makes compulsory the implementation of Digital LPIS**
  - **And its use through appropriate tools (IACS GIS)**

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Reminder of concepts & vocabulary...

Definition of an agricultural parcel?

	Continuous Piece of land...	...cultivated by one farmer...	... with only one crop .
Agricultural Parcels	X	X	X
Farmer "Ilots"	X	X	
Physical Blocks	X		

2 Levels of simplification

Agricultural parcels =< Declarative ilots (farmer blocks) =< Physical blocks

n - 1 *m - 1*

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Reminder of concepts & vocabulary...

4 Key Reference parcels

	Agricultural parcel	Parcelle Agricole	Schlag
1 piece of Land, 1 farmer, 1 crop	Farmer (production) Block	îlot (de culture)	Feldstück
1 piece of Land 1 farmer (1-n crops)	(Physical) Block	Bloc (physique)	Feld-Block
1 piece of Land (1-n farmers, 1-m crops)	Cadastral parcel	Parcelle Cadastrale	Flurstück
Land Property			

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Implementation of 1593/00 in future MS

- **Implementation of an efficient LPIS**
  - was considered as part of the Acquis Communautaire
    - **To be implemented at Accession Date: 1 May 2004**
  - Many CC planned to implement full digital LPIS before Accession
    - **Even if 1593/00 deadline is 1 January 2005**...
- **Mars project has been very active since 3 years**
  - To provide a efficient support to Candidate Countries
  - To take advantage of the experience of current 15 MS
    - **TAIEX conferences, Bilateral workshops, technical visits, various MARS conferences**

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Implementation of 1593/00 in future MS

Summary messages of 2001 (1st TAIEX conference)

- Avoid using Cadastre without combining it with ortho-imagery
- Avoid creating a completely new system without link with Farmers

Messages were understood and support very useful

- In the recent Monitoring missions by DG AGRI, the LPIS are one of the most satisfactory elements of IACS's implementation

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Implementation of 1593/00 in future MS

Ortho imagery used by all

- Dates between 95 / 2004
- But Photos and orthophotos for end 04 PL
- Full quickbird ortho-coverage end 03 CY

- **Summary Choice of reference parcels**
  - Cadastre PL, SI, CY
  - Agricultural parcels / Ortho-photos MT
  - Farm Blocks / Ortho-photos CZ, SK, HU
  - Blocks / Ortho-photos EE, LI, LT
  - ***NB. CY will manage also Blocks / Ortho-photos***

Cf Posters of CZ, HU, EE, LT, SK, LI, CY...

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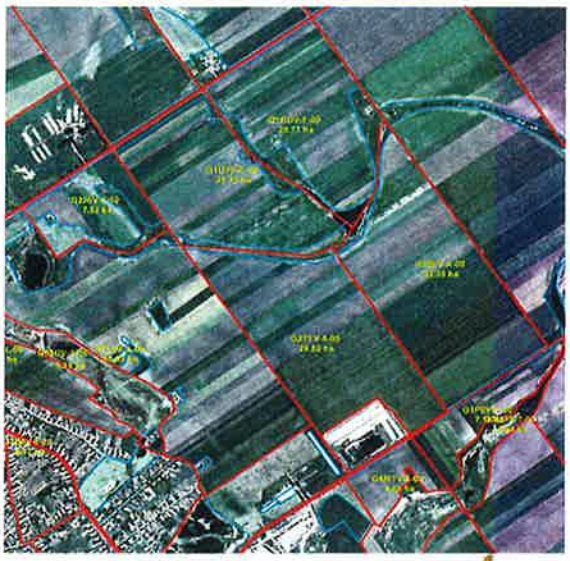
LPIS in HUNGARY

- Ortho-photos
  - 100% , colour 50cm (2000).
  - flooded Areas (5,4%) new images taken in 2003.
- Creation of the blocks:
  - 100 % in September 2003.
  - 302 000 blocks, 32 ha average size.
- Cadastre as ancillary info (Registry, Autumn 2003)
  - visible on the pre-printed maps for 2004 claims
- Link with farmers
  - Oct-Nov 2003
  - 19 regional PA + local MARD offices(135)



Courtesy of FÖMI

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LPIS in HUNGARY – IACS GIS

- IACS - GIS is a separated module but developed within the IACS software
- Should be in place in each PA regional office
  - With dedicated interface and IACS functionalities
  - and different level of access for other users (MARD, etc)
  - For the end of 2004

- In Nov 2003
  - Starting an internet service by FÖMI
  - with on line access to LPIS (colour orthos, block's info)
  - To support data collection for building- up the farmers-block database (links between blocks and farmers) ...

Courtesy of FÖMI

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LPIS in HUNGARY IACS GIS

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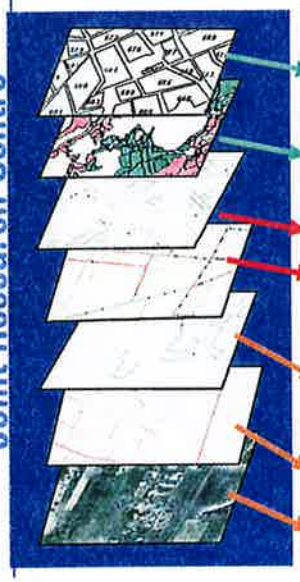

Layer	Available	Access
Agricultural parcels of RDM schemes	printed on A3 farm tailored block- maps from 2005	MARD Dep. of RDM + it's network, ARDA + sent to the farmers
Thematic layers or attributes of RDP eligibility	attribute on the A3 farm tailored block-maps	ARDA offices 19, + local offices (135) + sent to the farmers
Cadastre overlay	A3 farm tailored block- maps for claiming	sent to the farmers on paper
Area of non-subsidised excluded elements, and diffe-rent agric. usage in a block		blockmap distribution service of ARDA
Internal boundaries of non-subsidised elements, + different agricultural land-use	all prints and ARDA databases	overview block map sheets in 1:10000 scale in ARDA offices (19), + local offices (135) Internet ARDA GIS client SW
Block ID+ net utilised area		
Physical blocks		
Ortho coverage		

Courtesy of FÖMI

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LPIS in POLAND

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Cadastre is the main reference

- **Scanned & centroids**
- **Digital for 100 % of the territory…**

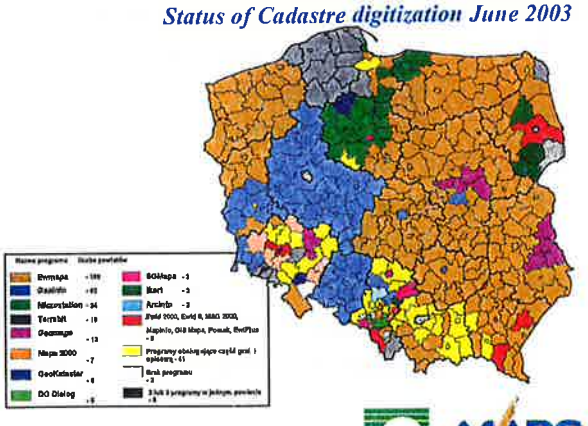
Ortho-photo coverage

- **First tests in 2003**
- **Completed in 2004**

Accent made on

- **Support to Farmers**
- **Training Reg Offices**

Status of Cadastre digitization June 2003



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Implementation of 1593/00 in 15 MS

Contrasted situation in 2000:

- After a generalized use of Cadastre/ OS maps in 93-97
- 70 % of MS (50 % of the farmers) developed a specific digital LPIS for IACS
- Combined with digital ortho-imagery for 50 % of the MS
- 6 M-S with Paper LPIS based on Cadastre/ OS : **DE, FR, SP, UK, AU, LU.**

Regulation 1593/00 make compulsory implementation of Digital LPIS and only recommend combined use of ORTHO IMAGERY:

- Various strategies in using Cadastre & choices / reference Parcels
- But consensus / unanimity in using Ortho-photos…

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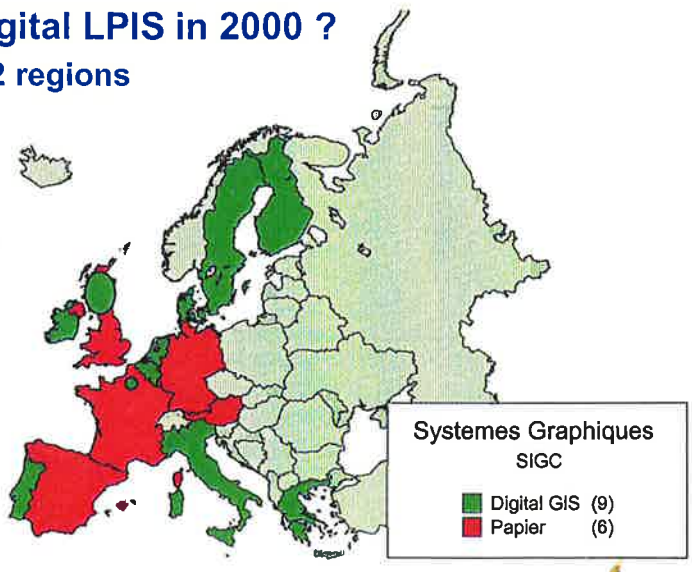
Implementation of 1593/00 in 15 MS

- **Availability of Digital LPIS in 2000 ?**

✓ **9 Member-States + 2 regions**

+/- managed by GIS

✓ **This correspond to 50 % of EU 15 farmers**



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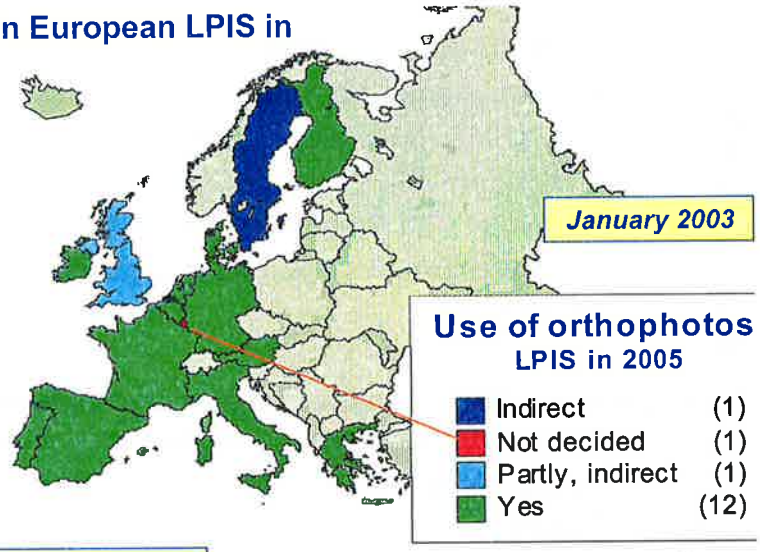
Implementation of 1593/00 in 15 MS

Orthophotos in European LPIS in 2005 ?



Mid 2003: All EU 15 MS !

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Overview of LPIS & IACS GIS implementation

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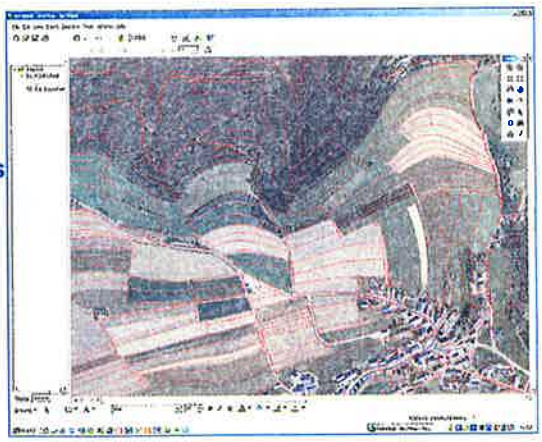
LPIS in LUXEMBOURG

- **Digital Cadastre:**
  - Already 100% available (vector)
- **Orthophotos**
  - Available 2001.
  - Update May June 04
  - Real color, 50cm (+ CIR ?)
- **Migration from Cadastre to...**
  - In 04, 05 main reference remains Cadastral parcel.
  - In 2004 farmers receive orthophotos + cadastre to define agricultural parcels
  - In 2005, preprinted maps with agricultural parcels...
  - In 2006: main reference is Agricultural parcel (or ilot)...
- **IACS GIS**
  - Preliminary analysis, Dec. end 2003.



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Overview of LPIS & IACS GIS implementation 16

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Implementation of 1593/00 in 15 MS

Summary of the Choices

- Cadastre + Ortho-photos — AU, IT, LU , SP, *Part DE*
- OS maps + Ortho-photos — UK
- Agricultural parcels / Ortho-photos — BE, *Part DE*
- Farm Blocks ilots / Ortho-photos — FR, *Part DE*
- Blocks / Ortho-photos — DK, IE, NL, SW, FI, *Part DE*
- Blocks + Parcels / Ortho-photos — PT, GR

But in fact LU will migrate to A. Parcels or ilots…

Only 3 MS and 2 German Laender of DE will continue to rely mainly on Cadastre

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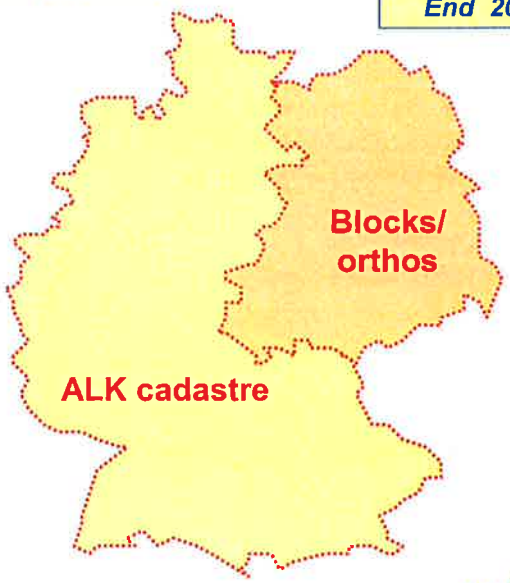
LPIS in DEUTSCHLAND

End 2000

Blocks // Cadastre ?



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LPIS in DEUTSCHLAND

January 03

In fact the distribution Block / cadastre was more North/ south than East/ West ...

Courtesy of A HAGEN, Sachsen Anhalt

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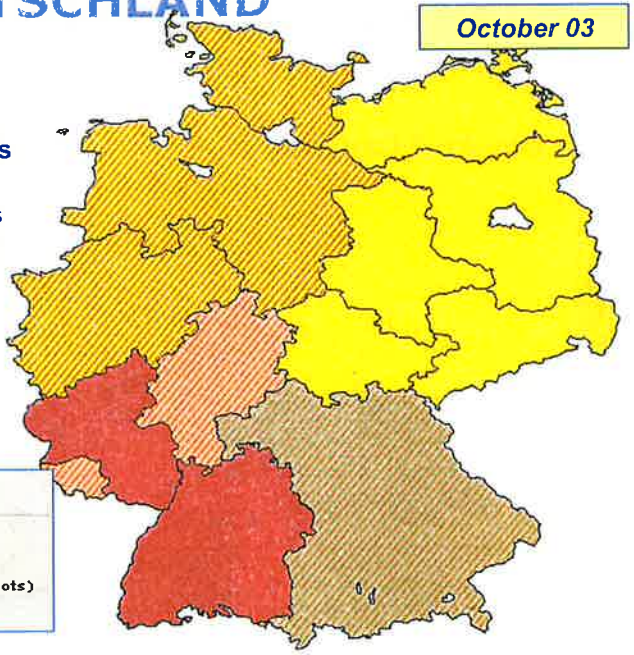
LPIS in DEUTSCHLAND

October 03

Present orientations are more complex:

- 2 Länder / Agricultural Parcels
- 1 Land with Farmers blocks
- 8 Länder with Physical blocks
- only 2 Land keep Cadastre as main reference

Confirms the general erosion of Cadastre-only systems



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LPIS in DEUTSCHLAND

	ACRONYMS	Main reference	Orthophotos	System and comments
BW	GISELa	Cadastre ALK	Color A3 to farmers	ArcGIS ArcIMS, intranet Multifunctional approach Strategy to include CWRS
BY	FeKa	FeldStuck (ilots) (ALK as support)	1999-2003 40cm	LaFIS® Declaration in 2004
BB	GIS InVeKoS	FELDBLOCK	DLK ®, Color	DFBK (digital Feldblock Karte) Integration of LFA, FFH, usw.
HE	FIS InVeKoS GIS (FIG)	Schlag (ALK as support)	2003, Color	GIS (Eftas/GDV) / Mapbuilder "Kulisse" with RD and AEM
MV	FIS	FELDBLOCK	2002-2003	LaFIS® - LFK + Manag. of Parzelle/Schlage
NS	AGRAR-GIS	FELDBLOCK	2002-2003, 50cm pixel	GIS ProDV (/WASY Eftas) ArcView-ArcSDE / Oracle Internet modules
NRW	GIS InVeKoS	FELDBLOCK (ALK as support)	Color 50cm 2003	LaFIS® - LFK KULISSE info for RD- Annual sketches
RP	InVeKoS GIS (GIS LBD)	Cadastre ALK	Color 50 cm, every 3 years	LaFIS® - LFK Strategy to include CWRS
SL	IVK-GIS	Schlag (ALK as support)	Color (2000)	Tailored system (ARGUS Plan /AFI) manage also Agric parcels
SN	FIGO	FELDBLOCK	Color ?	LaFIS® - LFK integrated approach with RD
ST	InVeKoS GIS	FELDBLOCK	Color ?	Tailored system FEB-Rohdaten
SH	Feldblock system	FELDBLOCK (ALK as support)	B&W 40 cm	Tailored system
TH	" PAULA" GIFIS	FELDBLOCK	Color ?	Tailored system / Internet (LWA /farmers) Integration of LFA and Envir.

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LPIS in DEUTSCHLAND

Apparent diversity in reference parcels

- **Cadastre**
- **Feldblock, Feldstück, Schlag…**
- **This diversity result from an optimized choice for the regional context**

But many strong common denominators

- **Use of digital orthophoto (100%)**
  - Color, 50 cm most frequently
- **Unique format of Field identification number (FLIK)**
  - Format and compatible between Lander
- **Rather complete system approach GIS - INVEKOS**
  - Some GIS solution shared by several Länder
  - Dissemination of info to local offices
  - General use of internet / Intranet

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LPIS in DEUTSCHLAND

Rote Linie: Feldstücks-Grenze
Gelbe Linie: Flurstücks-Grenze

Overview of LPIS & IACS GIS implementation 23

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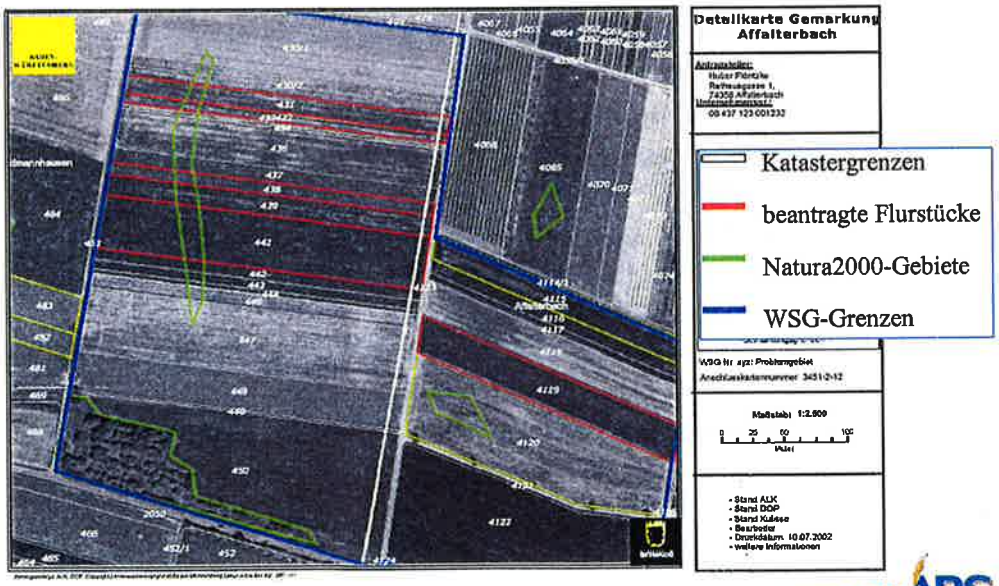
LPIS in DEUTSCHLAND



Overview of LPIS & IACS GIS implementation 24

Courtesy of Baden Wurttemberg

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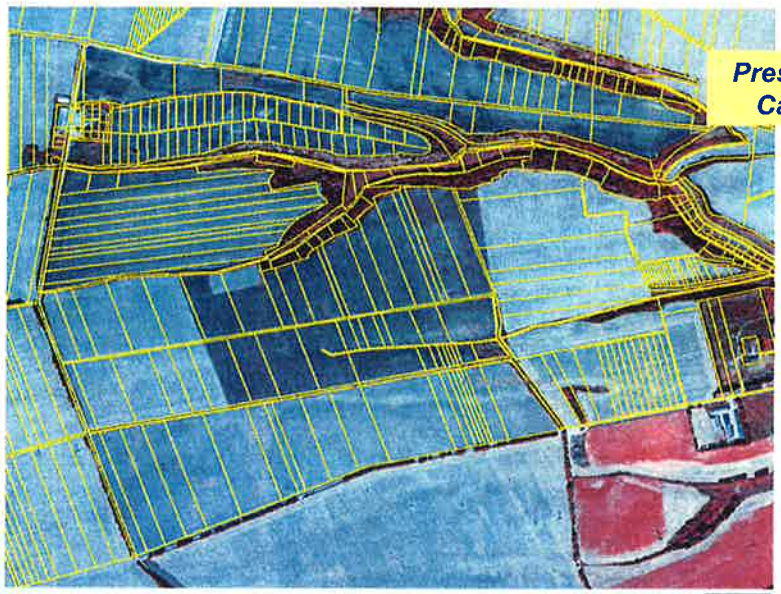
LPIS in DEUTSCHLAND



Courtesy of A HAGEN, Sachsen Anhalt

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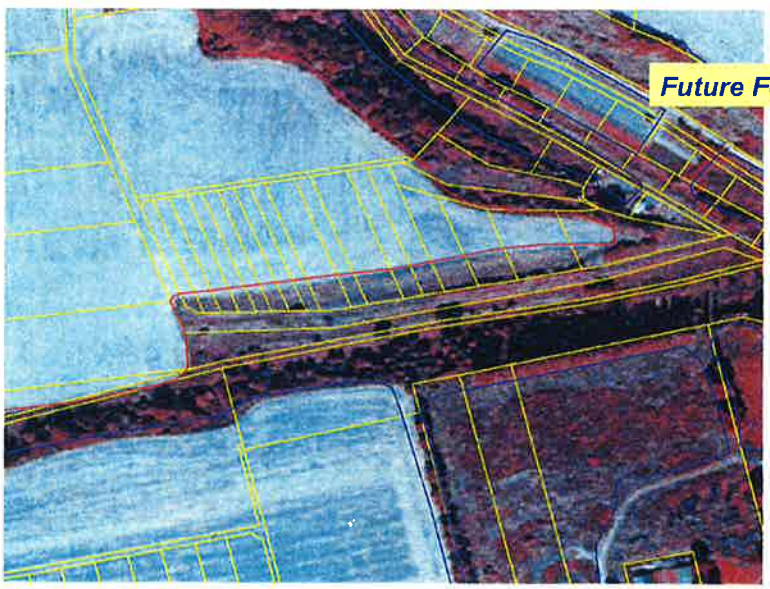
LPIS in DEUTSCHLAND



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LPIS in DEUTSCHLAND

A number of interesting approaches

- Integration of RD & other AEM zones ("KULISSE" concept)
- Multi-functional GIS
- Strategy to include CwRS
- Field assistant GIS / GPS

Courtesy of Baden Wurttemberg

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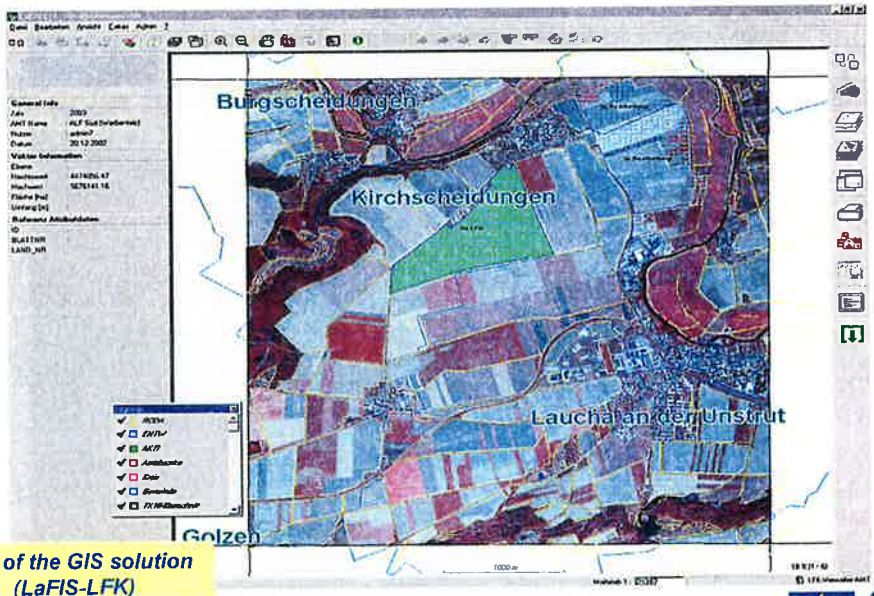
IACS GIS in DEUTSCHLAND



One of the GIS solution (LaFIS-LFK)

Courtesy of A HAGEN, Sachsen Anhalt

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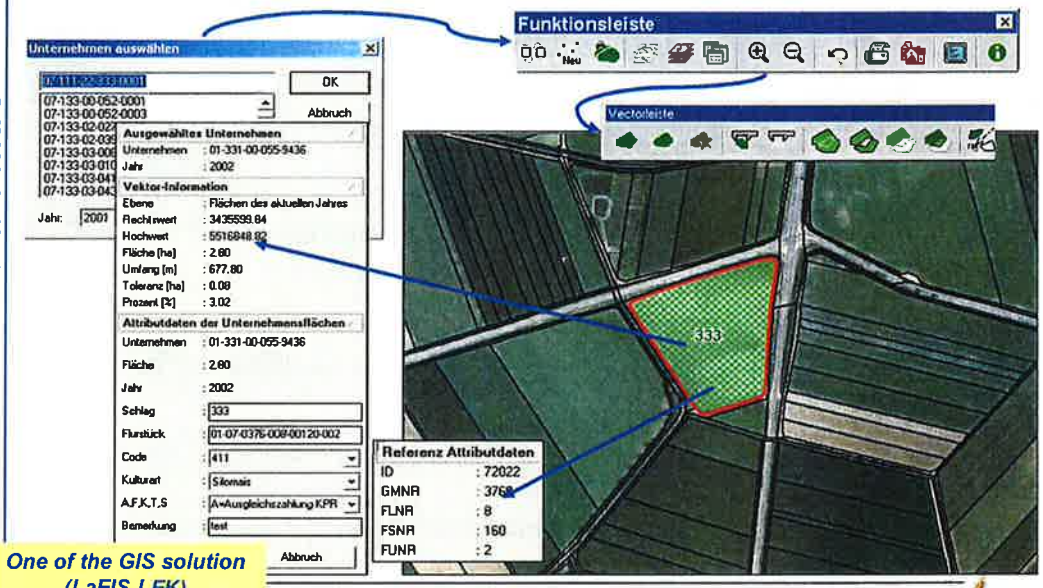
IACS GIS in DEUTSCHLAND



One of the GIS solution (LaFIS-LFK)

Courtesy of Rheinland Pfalz

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From LPIS to IACS GIS

- **LPIS is the IACS graphical reference**
  - Completely digital in January 2005
  - Important investments
    - **for digitization,**
    - **production of ortho-imagery,**
    - **And or migration to new systems**
- **The purpose is not to modernize paper map production**
  - But to use this digital information in synergy with IACS databases
  - in all IACS procedures: Declaration, Administrative cross checks, risk analysis, on the Spot checks…

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From LPIS to IACS GIS

- **MARS has issued some working documents on this issues**
  - Recommendations for LPIS implementation
  - Functionalities of IACS GIS
  - Presented and discussed in several IACS Expert Group organized by DG Agriculture
- **Most of the MS having already a digital LPIS are involved in**
  - **Deploying intranet /extranet application to disseminate IACS GIS information**
  - **developing field assistant systems combining GPS and GIS**

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IACS GIS in ITALY

- **an European pioneer in the domain of integration of Geographic information within IACS**
- **A reliable and easy to use multifunctional working instrument,**
  - **designed for on the field use**
  - **by operators not necessarily competent in IT.**
- **product able to guarantee**
  - **a certified management of activities carried out**
  - **a constant update of data information in support of the national agricultural network.**

Courtesy of AGEA & SIAN

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IACS GIS in ITALY

- An ergonomic and compact portable personal computer,
- allowing to execute mission-critical applications,
- that integrate handheld applications
  - with wireless capabilities for real-time communications with IACS server
  - GPS location information
  - and image capture.

Cf Workshop in Umbria
MARS web site

Courtesy of AGEA & SIAN

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IACS GIS in ITALY

- The other part of the system : a complete ICT infrastructure

Courtesy of AGEA & SIAN

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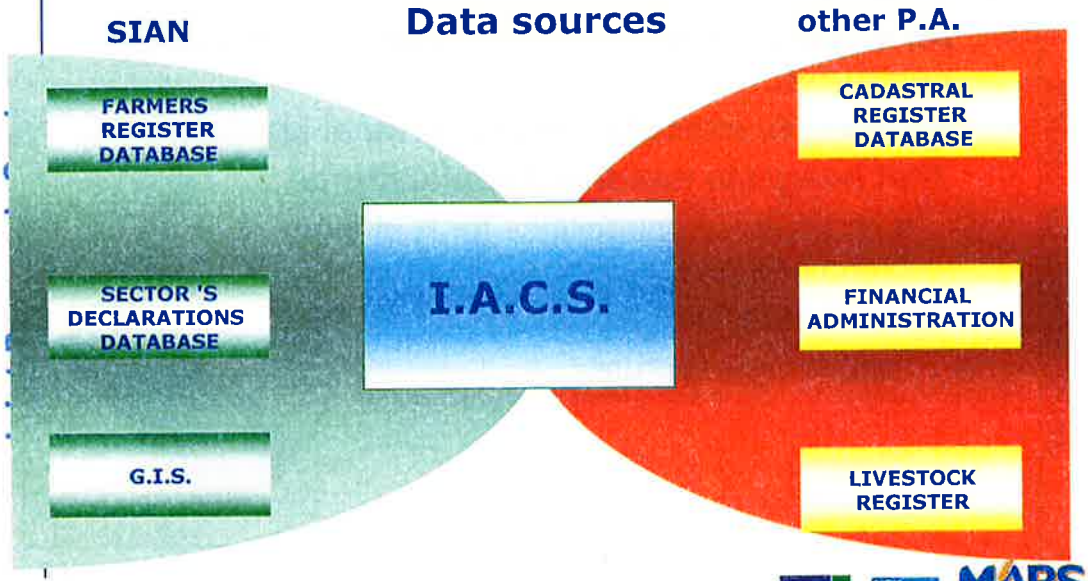
IACS GIS in ITALY



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IACS GIS in ITALY

An integrated design of the architecture

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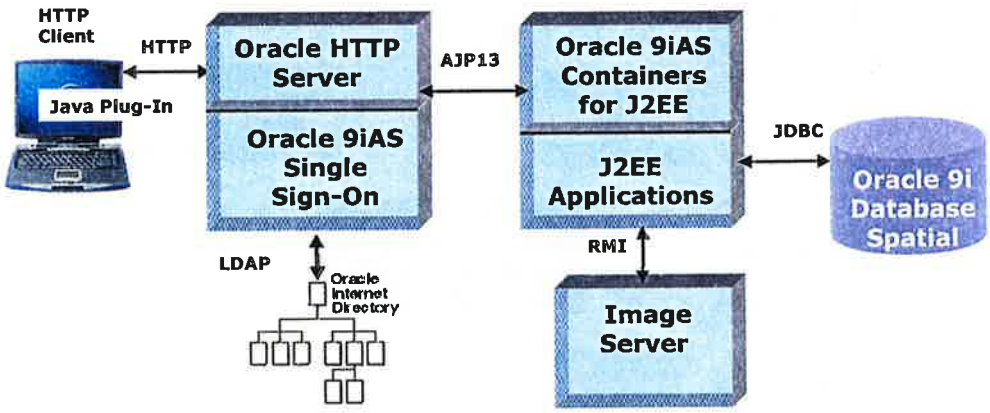

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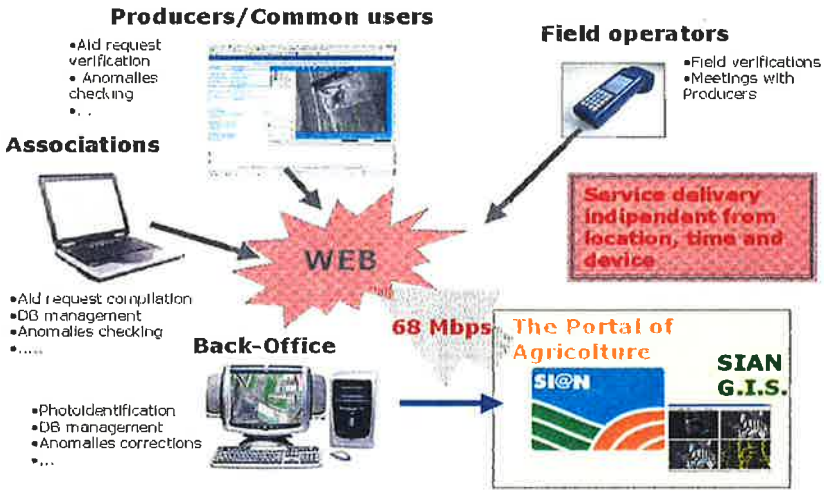
IACS GIS in ITALY

A web oriented integrated solution



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Vielen Dank
für Ihre Aufmerksamkeit !

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Session 3 – Posters session and software demonstrations

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Session 4 – New VHR satellite data processing and geometry

Chairman: Simon Kay - JRC/ IPSC/ MARS Unit

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Presentation 1 – Overview of the VHR systems and testing – Spaceborne VHR validation, 2003

Simon KAY

JRC/IPSC /MARS Unit

Abstracts

The presentation summarised the two goals of the project:

- to validate the orthocorrection potential, of state of the art digital spaceborne sensors, for CAP applications,
- identification of potential areas of application (LPIS creation, permanent crops, RDP, CwRS)

A high-level schedule to complete validation in 2003, parallel to airborne sensor studies and 2003 CwRS campaign, was established for the project. Two approaches were used for the evaluation of orthorectification.

- *Validation testing*, i.e. in-house processing, using off-the-shelf software, was carried out using appropriate ancillary data delivered from Member States;
- *Proficiency testing*, i.e. assessment of imagery orthorectified elsewhere. This entailed a QC test to evaluate the success of the third-party rectification, in other words a closer estimate of "Real-world" performance in operational circumstances.

Both results supported decisions on the generalisation of use of these VHR images in the EU CAP activities. This large scale validation programme, with 37 sites across EU and Accession Countries, offers many important characteristics: different countries, a wide range of conditions, with diverse terrain characteristics and operational/production. The analysis includes: the method/software used (physical model, RPC), the producer (contractor, JRC) the sensor, the view angle and the site conditions.

Keywords: IACS, LPIS, CwRS, Orthophotos, Orthorectification, VHR images,

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Spaceborne VHR validation, 2003

Simon Kay,
Jerzy Chmiel, Peter Spruyt

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Project Goals

- Ultimate goal of project
  - To validate the use of state of art digital spaceborne sensors for PAC use
    - across-team effort
- Relationship to other projects
  - LPIS creation, Permanent crops, RDP, CwRS – any area where VHR desirable
- High-level schedule
  - Complete validation thro' 2003, parallel to airborne studies and 2003 CwRS campaign

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Project Description

- We understand most aspects of analogue (film) airborne data collection
- Exciting times?
  - At least four systems are now commercially available as (potential) replacements
    - Ikonos, QuickBird, EROS, Spot 5 super mode
  - We need to assess their potential to replace the current paradigm of:
    - 2nd generation HR systems (Spot 10m, etc.)
    - airborne (analogue) data collection

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Why VHR testing in 2003?

- VHR geometry testing is "hitching a ride" on the image acquisitions made for other testing purposes.
  - Our image management **needs** to give some consideration to orthoimage production requirements
- Analysis objectives
  - Highlight any differences from regular (HR) products
  - Determine practical geometry specification
  - Determine acquisition constraints
  - Determine operational benefits of this new generation of satellite sensors

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Testing

- We intend to undertake two evaluations:
- For imagery where we manage to get the appropriate ancillary data;
  - undertake the orthorectification for our own purposes (a ***validation*** test).
  - Result: the validated performance of a particular method under standardised conditions
- For imagery orthorectified elsewhere;
  - undertake a QA test to evaluate the success of the third party rectification (a ***proficiency*** test).
  - "Real-world" estimate of performance in operational circumstances – ***not a competition***!
- Both will results greatly reinforce any decisions on the generalisation of use of these VHR images in our activities.

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Geometric specifications

- Most of the specifications, in terms of data requirements, are not new,
  - can be derived from the 1999 orthoimage QA specification.
  - section 5, which deals with orthocorrection of satellite imagery, is somewhat out of date
    - but it is precisely this testing programme that is designed to give us the data we need to update it.
- Our default geometric target specification is 2.5m RMSE (i.e. compatible with IACS requirements for 1:10,000 scale mapping).
  - We need to determine if we can create this product reliably
- Version 2.2 "Guidelines for Best Practice and Quality Checking of Ortho Imagery"
  - Available from our web site

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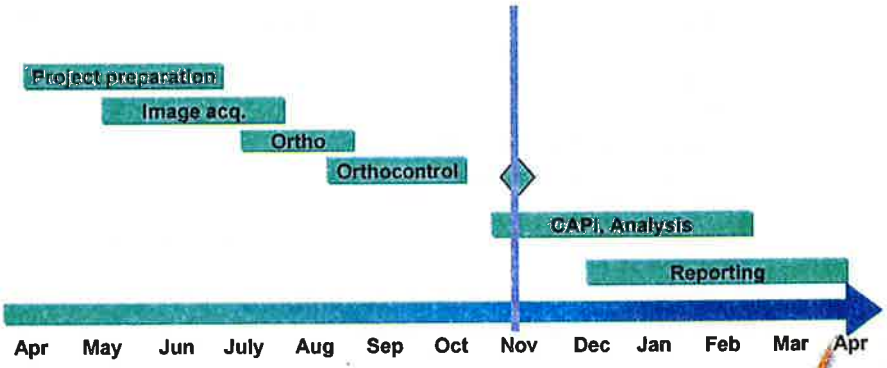
Schedule

- 1st major milestone:
  - Nov 2003 CwRS conference



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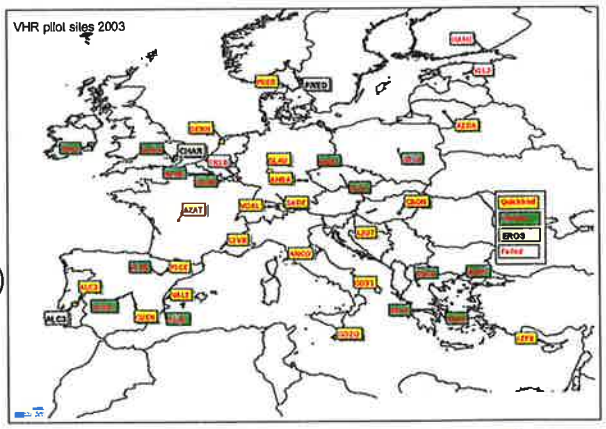
Current work - large scale validation

- 37 sites across EU and Accession Countries
  - *different countries*
  - *wide range of conditions*
  - *diverse terrain characteristics*
  - *operational/production*
- Factorial analysis:
  - Method (physical model, RPC)
  - Producer (contractor, JRC)
  - Sensor
  - View angle
  - Site conditions



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Sources of geometric distortion in VHR imagery

(from Toutin, Int. Journal of RS, 2003)

CATEGORY	SUB-CATEGORY	DESCRIPTION OF ERROR SOURCES
The Observer or The Acquisition System	Platform (spaceborne or airborne)	Variation of the movement Variation in platform attitude (low to high frequencies)
	Sensor (VIR. SAR or HR)	Variation in sensor mechanics (scan rate, scanning velocity. etc.) Viewing/look angles Panoramic effect with field of view
	Measuring instruments	Time-variations or drift Clock synchronicity
The Observed	Atmosphere	Refraction and turbulence
	Earth	Curvature, rotation, topographic effect
	Map	Geoid to ellipsoid Ellipsoid to map

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Orthorectification, Solutions

- Basically two approaches:
  - Empirical or "non-parametric" approaches, that require no a priori information on the total system
    - 3D Rational Functions
      - Applicable where no physical instrument information available
      - Coefficients provided by image suppliers
    - *Standard 2D polynomial approaches – unsuitable for VHR*
  - Physical model or "Parametric" approaches, that model the instruments and external system
    - Analogous to classical photogrammetry

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Theory, difficulties of Rational Function 3D models

- inability to model local distortions;
  - difficult terrain, problematic instrument configuration, unstable orbit paths
- limitation of image extent;
  - large area coverage in doubt
- difficulty in the interpretation of the parameters due to the lack of physical meaning;
- potential failure due to zero denominator; and
- potential correlation between the terms of polynomial functions.

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Problems with physical models

- Since some time, applied to push-broom sensors such as SPOT
  - Reconstructs ray for each pixel and intersects with geodetic model of the system (sensor, atmosphere, Earth model, DEM)
- Instrument information not always public domain
  - DigitalGlobe (Quickbird), Ikonos
  - Generalised models not supported by image providers
- Generally speaking, require large amounts of ground control
  - Usually minimum of 9 points for a single 10x10km image
- Are more sophisticated; require more "photogrammetric" experience

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Pit-falls? Sure...

- Short timetable!
- International collaboration
- Overlap with operational programme

- Summary: big challenge!

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Session 4: New VHR satellite data: Processing and geometry

- Objective: prove appropriate methodology for CAP implementation – aid application control
- Presentations this session
  - Preliminary results QuickBird, Ikonos, Eros 1A (JRC)
  - Detailed ortho processing (CZ)
  - Accession country example using QuickBird (CY)
  - VHR for LPIS work (PL)
  - Summary of results (JRC)

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Presentation 2 – VHR satellite data processing and geometry. Results of the geometric tests – Eros, Quickbird, Ikonos

Jerzy CHMIEL

JRC/IPSC /MARS Unit

Abstracts

In the framework of an operational VHR testing programme part of sites (36) for the checking of farmers' aid applications under the Common Agricultural Policy (CAP) in 2003 campaign were imaged with very high resolution (VHR) sensors (Ikonos, QuickBird, Eros). Determining the performance of VHR imagery orthorectification, and geometric quality assessment of the results in relation to the different factors, was one of the important goals of the programme.
Two sources of results and experiences – one delivered by contractors and a second one from internal reprocessing of orthorectification done at the JRC – were compared and evaluated. Quantitative and qualitative evaluations of orthorectified imagery were carried out using independent check points, according to a standardized protocol.
The presentation includes the basic characteristics of factors which affect the geometry of registered VHR imagery, describes the main stages of pre-processing and orthorectification, and finally shows the achieved results of orthorectification and geometric accuracy checking for the sites. VHR orthoimage products are considered as generally meet the geometric specification of 2.5m (1D) RMSE (EU technical legislative requirements). Concluding remarks underline existing limits of geometric accuracy under certain circumstances and describe the main factors which influence the geometric accuracy of orthorectified products.

Keywords: IKONOS, QuickBird, EROS, geometry, orthorectification, errors, quality

(*) The posters thematically related to this presentation are attached to the poster session.

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9th Annual Conference on Control with Remote Sensing of Area-based Subsidies
27-28th of Nov. 2003 - Maritim Hotel, Köln, Germany

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VHR satellite data processing and geometry.
Results of the geometric tests – Eros, Quickbird, Ikonos

Jerzy CHMIEL

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Outline of this presentation

- **Basic characteristics of VHR satellite sensors.**
- **VHR geometric accuracy test, assumptions.**
- **Review of the results. Factors influenced on the achieved geometric accuracy**
- **Conclusions *(I part, II part by S. Kay).***

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Orthorectification – typical processing steps

- Acquisition of image and necessary metadata.
- Ancilliary data collection:
  - selection of GCP's and check points (preparing of screen shoots/image coordinates of points), and GPS measurements; or alternatively - points based on ortho/vector map,
  - DEM
- Selection of geometric correction model and computation of its parameters.
- Orthorectification of the image.
- Quality control.

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Terrain not surface correction in orthorectification

- Terrain correction (in orthorectification) removes distortions in the imagery due to topography and varying Earth surface heights, but it doesn't remove height variation due to features standing on the surface, such as bridges, trees and buildings.

  Importance for a proper ground points (GCP's, check) selection procedure.

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Main factors influenced on the geometric accuracy of orthorectified product

- Image features:
  - radiometric, geometric quality,
  - adequate product level
  - a proper acquisition parameters (viewing angle!)
- Quality of GCP's set (accuracy, amount, distribution).
- Grid resolution and vertical/positional accuracy of DEM
- *Geometric correction model*
- *Georeferencing*

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view angle / Revisit time / geometric accuracy / success of the Project

Revisit time *of the certain system depends on:*

- the latitude of area of interest
- maximum off-nadir angle which is allowed for the Project

importance:

- The revisit time directly affects the amount of time required to collect imagery for given project.
- The higher off-nadir angle the higher likelihood to cover area of interest in shorter time (clouds/weather limitation).

To which extent off-nadir angle can be accepted (15 °/18° or more?) allowing on successful orthorectification?

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Basic characteristics of applied VHR sensors

Features / sensors	IKONOS	QUICKBIRD	EROS A
Launch Date	24 Sept. 1999	18 Oct. 2001	5 Dec. 2000
Satellite Altitude	681 km	450 km	480 km
Image Bands	Pan; blue, green, red, near infrared	Pan; blue, green, red, near infrared	Pan
Resolution *GSD in nadir*	0.82 m pan 3.28 m multisp.	0.61 m pan 2.44 m multisp.	1.8 m pan
Image Swath */ in nadir*	11.3 km	16.5 km	13.5 km
Revisit Time ~ *(40° lat., 15° off-nadir)*	6 days	8 days	7 days
Dynamic Range	11-bits per pixel	11-bits per pixel	11-bits per pixel

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IKONOS: elevation angle – view angle – GSD

(sample)

IKONOS imagery		
Elev. angle [°]	View angle [°]	GSD [m]
30.0	51.5	2.05
45.0	39.7	1.32
50.0	35.5	1.18
60.0	26.9	1.00
72.0	16.2	0.88
75.0	13.5	0.86

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VHR imagery product levels *(input to orthorectification)*

- IKONOS:
  - Geo
  - Geo ortho kit *(applied in VHR test)*
- QuickBird:
  - Basic
  - Standard ortho ready *(applied in VHR test)*
- EROS:
  - EROS Level 1A

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IKONOS Geo

- geometrically corrected and rectified to a specified ellipsoid and map projection. The correction process removes image distortions introduced by the collection geometry and re-samples the imagery to a uniform ground sample distance and specified map projection

IKONOS Geo ortho Kit

- provided with Image Geometry Model (*camera information, RPC*), which enables the complete and accurate sensor geometry at the time of the image collection. Useable for orthorectification with elevation models and ground control data

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QuickBird Basic

- Radiometrically corrected and sensor corrected, but not geometrically corrected nor mapped to a cartographic projection and ellipsoid.

QuickBird OrthoReady Standard

- radiometrically corrected, sensor corrected, geometrically corrected, and mapped to a cartographic projection. No topographic corrections applied.

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EROS Level 1A

- Radiometric System Correction - calibrated and gain adjusted to correct for known radiance response characteristics of the camera sensor system
- No Geometric System correction
- Basic scene or vector scene *(13.5 km x up to about 40 km).*

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Status of delivering of VHR test data/results to JRC

(by the contractors, 18 Nov. 2003)

- Number of sites with successful image acquisition - 36
- Expected number of sites in geometric test – 33
  - IKONOS - 12 (3 no ancillary data)
  - QuickBird - 18 (9 no ancillary data)
  - EROS - 3
- *With regard to 'above' statistics the evaluation of VHR geometric test is **not complete yet**.*
- *The presented results in next slides are only related to the part of sites; preliminary results.*

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VHR geometric accuracy test assumptions

- VHR orthoimage products should meet the geometric specification of 2.5m (1D) RMSE (EU technical legislative requirements).
- Comparison and evaluation of two types of results:
  1. delivered by contractors, 2. done at the JRC *(other variants)*
- Uniform procedure for geometric evaluation of orthoimage products (from contractors and JRC) :
  - **common guidelines/recommendations for all ortho producers**
  - **accuracy check by one user in one software environment**
  - **independent check points (not GCP's) used, according to a standardized protocol.**

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GLAU QuickBird P RPC m. based on 5 GCP's ortho check (Text Report)

Image:	Ortho_glau_qb_rpc_5gcp.tif			Operator:	Jerzy Chmiel
Mapping:	GPS			Date:	8 November 2003
Grid (x,y):	0,0	Grid Offset (m) (x,y):	0,0		
Target RMSE (1D):	2.50m	Target RMSE (2D):	3.54m		
Target Discrepancy (1D):	7.50m	Target Discrepancy (2D):	10.61m		

No	Image X	Image Y	Check X	Check Y	Height	Check Point Description	X Dise	Y Dise	XY Dise
1	3495068.84	5587922.71	3495067.48	5587922.60	0.0	147.60	-1.36	-0.11	1.36
5	3509891.08	5583545.32	3509890.31	5583544.97	0.0	293.90	-0.77	-0.35	0.85
7	3500887.02	5584327.28	3500887.02	5584329.09	0.0	189.20	0.00	1.81	1.81
8	3498115.66	5585956.64	3498115.51	5585958.00	0.0	159.40	-0.15	1.36	1.37
10	3497010.14	5581112.15	3497009.99	5581112.00	0.0	151.90	-0.15	-0.15	0.21
12	3507875.81	5576360.07	3507875.51	5576359.47	0.0	170.50	-0.30	-0.60	0.67
13	3504868.98	5575644.00	3504869.74	5575644.00	0.0	150.00	0.76	0.00	0.76
15	3496404.22	5577114.60	3496404.52	5577114.00	0.0	141.50	0.30	-0.60	0.67
16	3493873.04	5575160.93	3493871.98	5575161.99	0.0	154.30	-1.06	1.06	1.50
17	3498648.34	5573076.26	3498649.25	5573075.50	0.0	128.90	0.91	-0.76	1.19
19	3493726.96	5581653.92	3493725.75	5581653.47	0.0	174.20	-1.21	-0.45	1.29
21	3505493.29	5588512.49	3505494.50	5588514.00	0.0	246.40	1.21	1.51	1.93
22	3507194.65	5572757.74	3507194.50	5572758.50	0.0	153.90	-0.15	0.76	0.77

RMSE:	0.79m	0.91m	1.21m
	PASS	PASS	PASS
Max Discrepancy:	-1.36m	1.81m	1.93m
	PASS	PASS	PASS
Overall Result:	PASS		

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Example of text report from checking procedure

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IKONOS - *image sample ('PIGE' site)*

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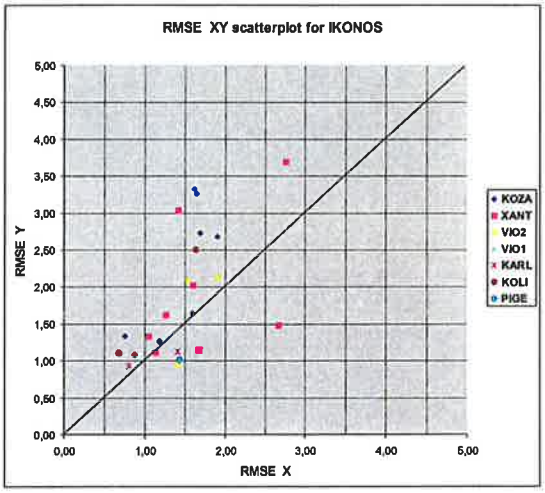
Results. IKONOS - *RMSE XY scatterplot by sites*



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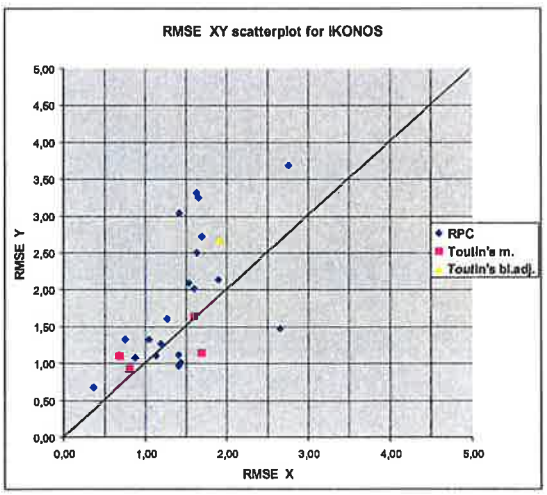
Results. IKONOS - *RMSE XY scatterplot by methods*



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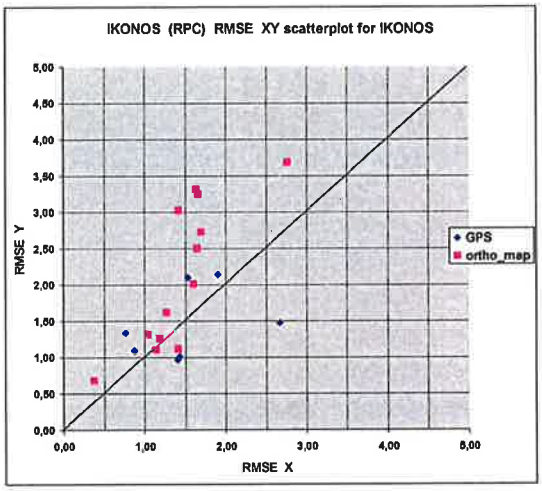
Results. IKONOS - *RMSE XY scatterplot by GCP source.*



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Results. IKONOS – *example: method / no. of GCP / RMSE*

TRIAL c.	Image Id	Ortho m.	No. of GCP	GCP s.	DEM grid	~ΔH	Elevation	Azimuth	RMSE_X	RMSE_Y	RMSE_XY
1019	425	RPC	4	GPS	5	180	76.79	105,5	0,88	1,08	1,39
1020	425	Toutin	10	GPS	5	180	76.79	105,5	0,81	0,93	1,23
1021	426	RPC	4	GPS	5	115	79.46	20,4	0,77	1,33	1,53
1022	426	Toutin	10	GPS	5	115	79.46	20,4	0,69	1,09	1,30
1001	413_0	RPC	28	ortho, 1:5k	40	540	76.17	354,4	1,70	2,73	3,21
1004	413_0	RPC	2	ortho, 1:5k	40	540	76.17	354,4	1,66	3,25	3,65
1003	413_2	RPC	19	ortho, 1:5k	40	144	68.92	2,2	2,77	3,69	4,61
1027	413_2	RPC	9	ortho, 1:5k	40	144	68.92	2,2	1,42	3,03	3,35
1028	413_2	Toutin	9	ortho, 1:5k	40	144	68.92	2,2	1,60	1,64	2,29
1007	496_0_1	RPC	4	GPS	40	230	75.44; 72.73	91,5; 59,6	1,41	0,97	1,71
1036	496_0_1	RPC	8	GPS	40	230	75.44; 72.73	91,5; 59,6	1,54	2,09	2,60
1010	524_1b	RPC	16	ortho, 1:5k	30	670	67.57	27,5	1,14	1,10	1,58
1013	524_1b	RPC	8	ortho, 1:5k	30	670	67.57	27,5	1,27	1,61	2,05
1029	524_1b	Toutin	8	ortho, 1:5k	30	670	67.57	27,5	1,69	1,14	2,04
					[m]	[m]	[deg]	[deg]	[m]	[m]	[m]

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IKONOS 'Koza' site – *sample data.*

TRIAL	Image Id	Ortho m.	No. of GCP	~ΔH	Col. Elevation	Col. Azimuth	RMSE_X	RMSE_Y	RMSE_XY
1001	413_0	RPC	28	540	76.17	354,4	1,70	2,73	3,21
1004	413_0	RPC	2	540	76.17	354,4	1,66	3,25	3,65
1002	413_1	RPC	20	520	82.71	329,7	1,64	2,50	2,99
1003	413_2	RPC	19	144	68.92	2,2	2,77	3,69	4,61
1027	413_2	RPC	9	144	68.92	2,2	1,42	3,03	3,35
1028	413_2	Toutin	9	144	68.92	2,2	1,60	1,64	2,29
1005	413_0_1_2	Toutin, bl.	27	590	68.92; 76.17; 82.71	2,2; 354,4; 329,7	1,91	2,68	3,29
				[m]	[deg]	[deg]	[m]	[m]	[m]

GCP's source: ortho 1:5k
DEM grid: 40m

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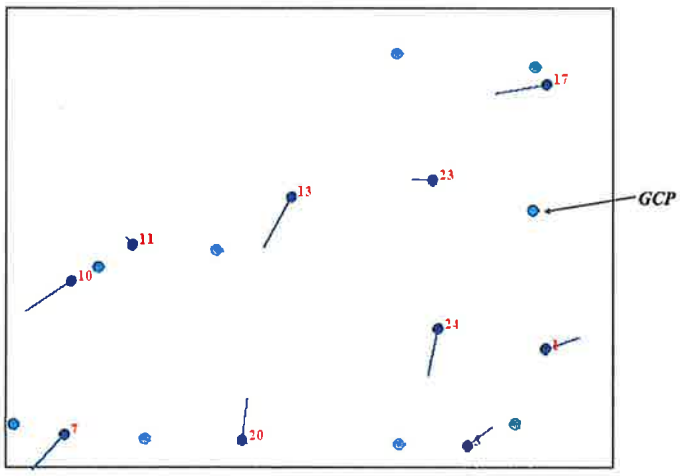
IKONOS 'KOZA' img_2 *Toutin's model 9gcp*
(Report of check point discrepancies).



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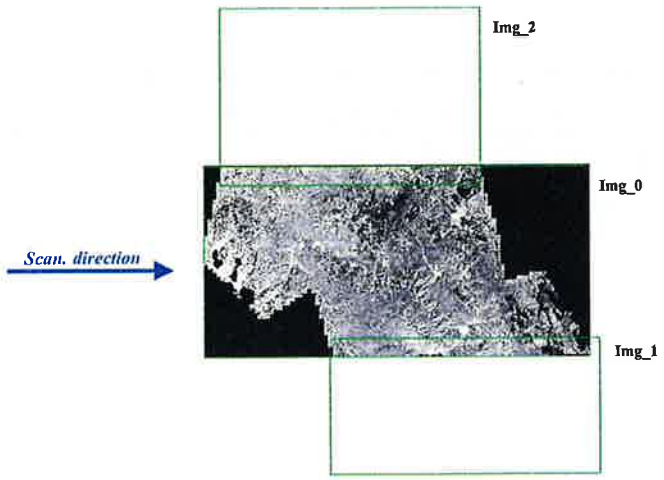
IKONOS 'Koza' site – *image acquisition parameters*



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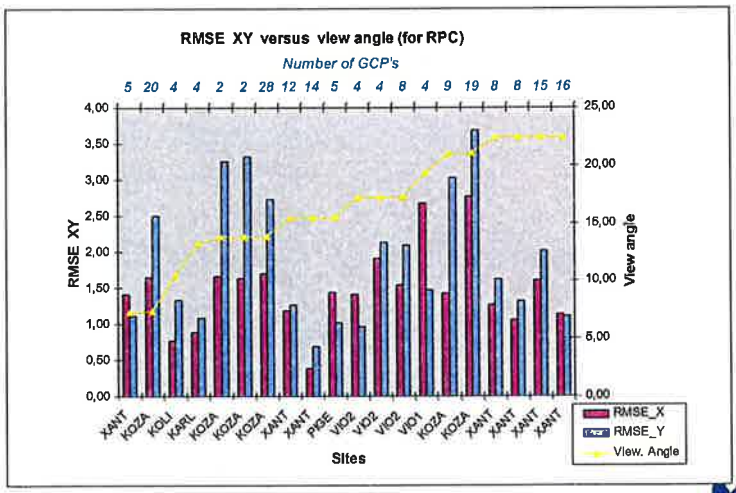
Results. IKONOS – *RMSE XY versus view angle*



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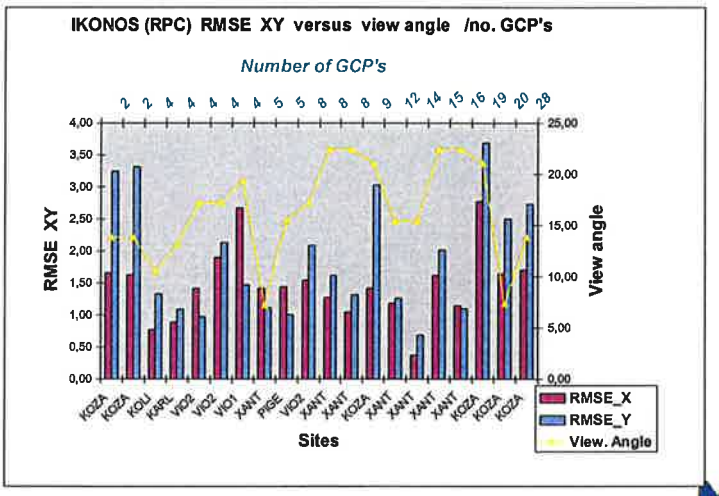
Results. IKONOS – *RMSE XY / view angle / no. GCP's*



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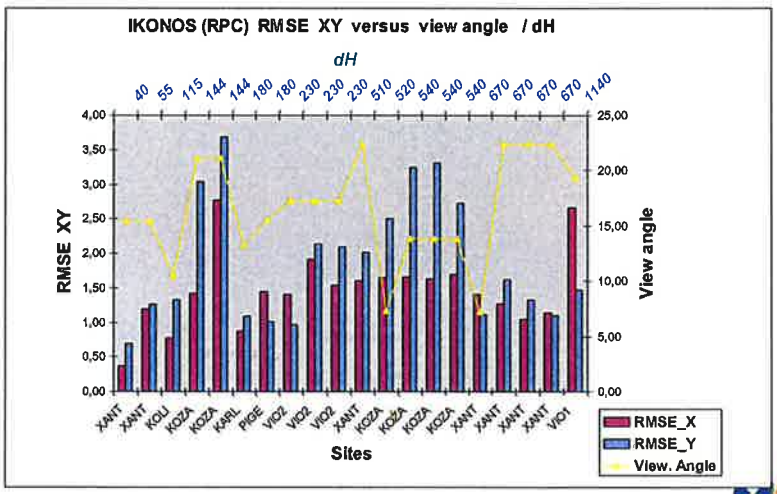
Results. IKONOS – *RMSE XY / view angle / dH*



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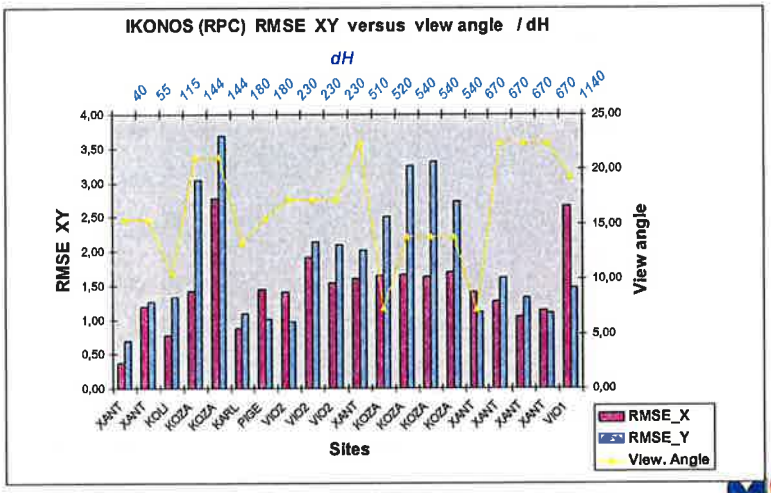
Results. IKONOS – *RMSE XY / view angle / dH*



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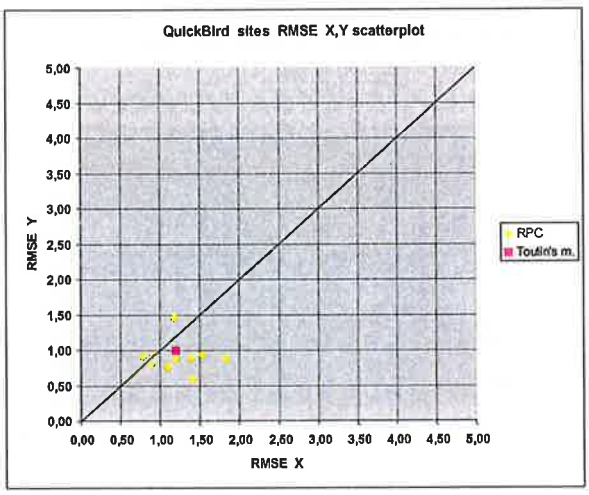
Results. QuickBird - *RMSE XY scatterplot*



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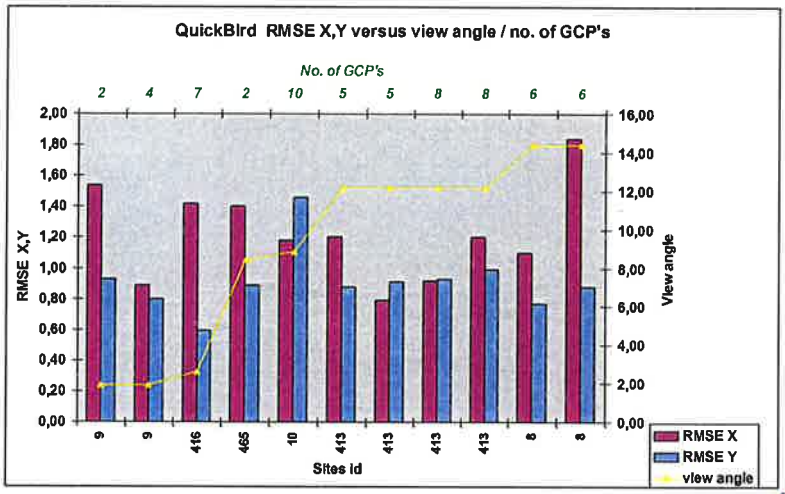
Results. QuickBird – *RMSE XY versus view angle*



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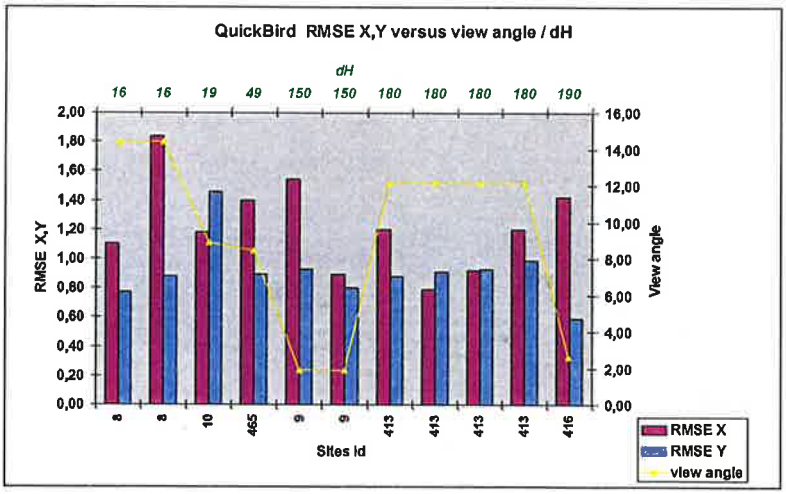
Results. QuickBird – *RMSE XY / view angle /dH*



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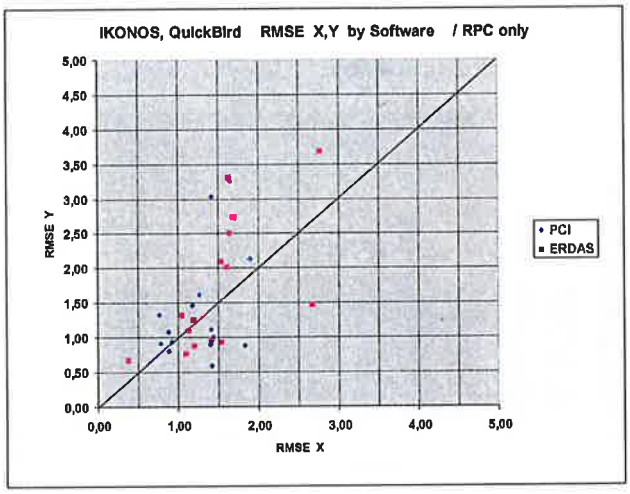
IKONOS, QuickBird - RMSE X,Y by Software /RPC only



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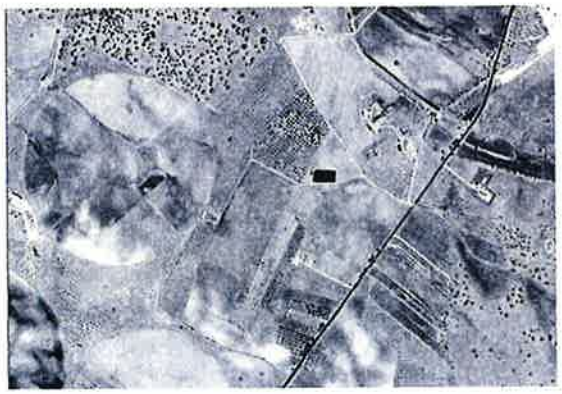
EROS - *image sample ('ALC3' site)*



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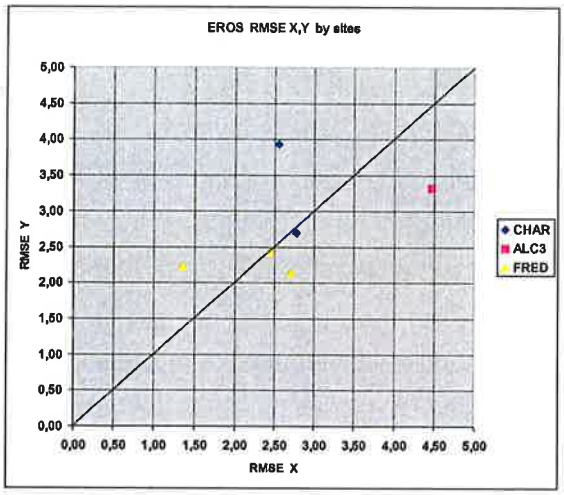
Results. EROS - *RMSE XY scatterplot*



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Results. EROS – *no. of GCP / RMSE/v. angle*

A	B	C	D	E	F	G	H	I	J	K	L
SITE_code	Ortho m.	No. of GCP	GCP source	DEM grid	~ΔH	V. Angle	m.p.a	Collect. Azimuth	RMSE_X	RMSE_Y	RMSE_XY
ALC3	Toutin	21	ortho, 2m pix	20	134	22,80	9.7	107,0	4,47	3,32	5,57
CHAR	Toutin	18	vector m., 1:2	10	180	20,18	8.3	286,0	2,78	2,69	3,87
CHAR	Ph.M.	18	vector m., 1:2	10	180	20,18	8.3	286,0	2,56	3,93	4,69
FRED	Toutin	9	GPS	50	10	14,97	10.7	290,0	2,45	2,43	3,45
FRED	Ph. M.	9	GPS	50	10	14,97	10.7	290,0	2,71	2,13	3,44
FRED	Ph. M.	15	GPS	50	10	14,97	10.7	290,0	1,37	2,23	2,62
				[m]	[m]	[deg]	[deg]	[deg]	[m]	[m]	[m]

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VHR geometric test - *preliminary conclusions* IKONOS:

- **Meets the geometric specification of 2.5m (1D)**
- Results also in acceptable level of accuracy for:
  15°<view angle <20.15° *(*IKONOS; dH=670m, col. Az.: 27.5 °)*
- Visible influence of quality of ancillary data (DEM, GCP's) on the accuracy, partially masking the other factors.
- No significant difference between the RPC and Toutin's models.
- For good quality of ancillary data increase in number of GCP's above recommended level doesn't make the increase of accuracy.
- No difference in software performance *(PCI, ERDAS)*

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VHR geometric test - *preliminary conclusions* QuickBird:

- **Limited number of trials done!**
- Meets the geometric specification of 2.5m (1D)
  - ***(QuickBird current samples: view angle <14.3°).***
- Increase in number of GCP's above the reasonable level doesn't make the increase of accuracy.
- Toutin's model was not tested *(sites with limited no of GCP's, except 1)*

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VHR geometric test - *preliminary conclusions* EROS:

- **Limited number of trials done!**
- Meets the geometric specification of 2.5m (1D) *for standard scene, flat area*
- Worse accuracy for vector scene, *geometry requires a better geometric correction model?*
- Visible influence of quality of ancillary data (DEM, GCP's) on the accuracy, partially masking the other factors.
- No significant difference between the Socet Set and PCI models.

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Presentation 3 – Using VHR satellite imagery in the Czech Republic: testing with Ikonos.

Lubos KUCERA

GISAT, Czech Republic

Abstracts

IKONOS data were provided by JRC for two Czech sites in the frame of the CwRS pilot project in 2003. Detailed analysis related to image geometry and interpretation issues have been elaborated.

Results of the comprehensive orthorectification evaluation are presented. Both physical modelling and RPC method have been tested using dense grid of verification points (measured by GPS) and accurate DEM. Pan-sharpening techniques for fusion of panchromatic and multispectral data was another part of the evaluation. Comparison of IKONOS data with 50cm bw aerial orthophoto (used for LPIS creation in the Czech Republic) has been done with respect to parcel boundaries detection. Value and use of IKONOS data for crop discrimination was the final topic of the study.

The results proved that, if properly treated, IKONOS data can be operationally used during CwRS campaign (data acquisition and cost issues are not referred here). The geometrical properties and information content make these data equivalent substitution of aerial orthophotos for the use during remote sensing control.

Keywords: VHR imagery, IKONOS, orthorectification, pan-sharpening

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Using VHR satellite imagery in the Czech Republic: testing with IKONOS

Lubos Kucera

gisat
www.gisat.cz

CWRS Pilot Project 2003

- **2 sites 10 km x 10 km selected**
- **satellite data delivered by JRC**

Site 1 (KOLI)

- Landsat 7 ETM+ (05.05.2003)
- Ikonos P+MS bundle (07.06.2003)
- SPOT 2 XS (27.07.2003)

Site 2 (KARL)

- Landsat 7 ETM+ (26.04.2003)
- Ikonos P+MS bundle (07.06.2003)
- SPOT 4 XI (11.07.2003)

- **main objectives**
  - VHR data evaluation
  - simulated CWRS

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VHR Imagery Processing

- orthorectification
- pan-sharpening
- comparison with aerial orthophoto
- crop discrimination

- sw Geomatica v.9 (PCI Geomatics)
- RPC vs. physical modeling

Orthorectification of VHR Imagery

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Ikonos Orthorectification

- **Ikonos Geo ortho kit (16-bit GeoTiff)**
- **bundle PAN + MS**

Ikonos scene 1

- flat area (elevation 250 – 300 m)
- 20 GCPs + ICPs
- acquisition date: 07.06.2003
- 10 km x 10 km
- incidence angle: 10.5 deg

Ikonos scene 2

- hilly area (elevation 500 – 700 m)
- 20 GCPs + ICPs
- acquisition date: 07.06.2003
- 10 km x 10 km
- incidence angle: 13.2 deg

DEM and GCP Accuracy

Ground Control Points

- GPS measurements
- positional accuracy < 0.3 m
- vertical accuracy < 0.5 m

Digital Elevation Model

- 1:10 000 topographic maps
- contours with 2m elevation interval
- 5m grid DEM

Satellite scene	Grid		Number of checkpoints	Checkpoint accuracy	Maximum discrepancy	RMSE
	X	Y		Z	Z	Z
	[m]	[m]		[m]	[m]	[m]
IKONOS 1	5	5	20	0.5	3.0	0.8
IKONOS 2	5	5	20	0.5	2.5	1.1

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Location of GCPs and ICPs – Ikonos 1

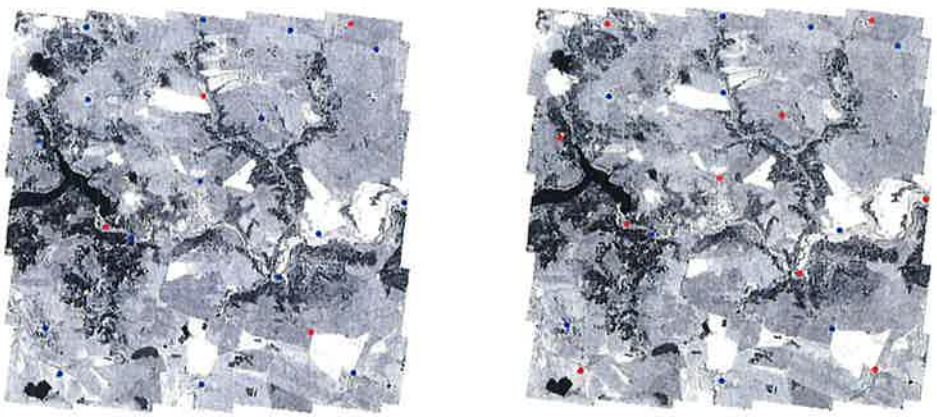
Rational functions modeling
- 4 GCPs
- 16 ICPs

Physical modeling
- 10 GCPs
- 10 ICPs

Location of GCPs and ICPs – Ikonos 2

Rational functions modeling
- 4 GCPs
- 16 ICPs

Physical modeling
- 10 GCPs
- 10 ICPs



Orthorectification Results

Orthorectification method	Satellite scene	Ground Control Points				Independent Check Points					
		Number	RMS			Number	RMS			Maximum Residual	
			X	Y	XY		X	Y	XY	X	Y
			[m]	[m]	[m]		[m]	[m]	[m]	[m]	[m]
RPC	IKONOS1	4	0,33	0,40	0,52	16	0,82	1,01	1,19	1,49	1,48
RPC	IKONOS2	4	0,77	0,81	1,12	16	0,79	1,23	1,46	2,12	1,98
Physical model	IKONOS1	10	0,30	0,30	0,42	10	0,75	1,06	1,30	1,89	1,35
Physical model	IKONOS2	10	0,24	0,50	0,55	10	1,09	1,06	1,52	1,85	2,17

- Ikonos orbital and sensor data not provided by Space Imaging
- Satellite Orbital Math Model (CCRS) used

- GCP requirements for RPC modeling
  - min. of 2 GCPs recommended
- GCP requirements for physical modeling
  - 8 GCPs minimum
  - very sensitive to GCPs distribution

- similar positional accuracy for RPC and physical model

- RPC recommended (except for mountainous regions??)

QuickBird Orthorectification

- **QuickBird Standard ortho ready (16-bit GeoTiff)**
- **bundle PAN + MS (16 bit)**

- hilly area (elevation 350 - 650 m)
- 20 GCPs + ICPs
- acquisition date: 08.09.2003
- 100 km^2
- incidence angle: 14.1 deg

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DEM and GCP Accuracy

Ground Control Points

- GPS measurements
- positional accuracy < 0.3 m
- vertical accuracy < 0.5 m

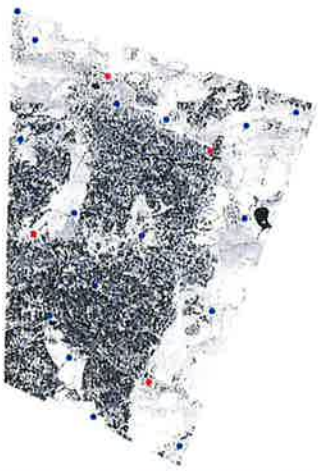
Digital Elevation Model

- 1:10 000 topographic maps
- contours with 2m elevation interval
- 5m grid DEM

Location of GCPs and ICPs

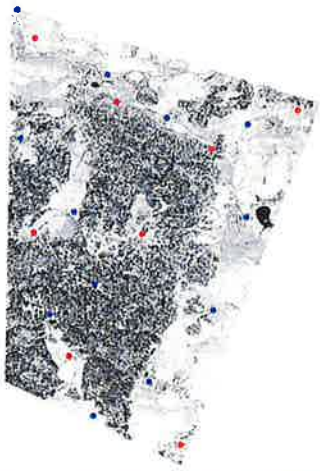
Rational functions modeling

- 4 GCPs
- 16 ICPs



Physical modeling

- 8 GCPs
- 12 ICPs



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Orthorectification Results

Orthorectification method	Satellite scene	Ground Control Points				Independent Check Points					
		Number	RMS			Number	RMS			Maximum Residual	
			X [m]	Y [m]	XY [m]		X [m]	Y [m]	XY [m]	X [m]	Y [m]
RPC	QuickBird	4	1,13	0,42	1,21	16	0,96	0,53	1,10	1,68	1,53
Physical model	QuickBird	8	0,17	0,10	0,20	12	0,51	0,74	0,90	1,30	0,99

- QuickBird orbital and sensor data provided by DigitalGlobe
- GCP requirements

RPC modeling
- min. of 2 GCPs recommended

physical modeling
- 6(8) GCPs minimum
- less sensitive to GCPs distribution

- better positional accuracy for physical model
- RPC modeling recommended
  - if only a few GCPs available
- physical modeling recommended
  - if highest accuracy is required and GCPs are not a problem
  - accuracy of RPC modeling in mountainous regions??

EROS Orthorectification

- **EROS 1A (16-bit raw data)**
- **PAN data**

- flat area (elevation 200 - 350 m)
- 33 GCPs + ICPs
- acquisition date: 31.07.2001
- 12 x 12 km

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DEM and GCP Accuracy

Ground Control Points

- based b&w aerial orthophoto (0.5m resolution)
  - used for orthophoto creation
  - RMSxy ~ 1m (external QC, 30 orthophotos, 270 checkpoints)
- elevation extracted from DEM

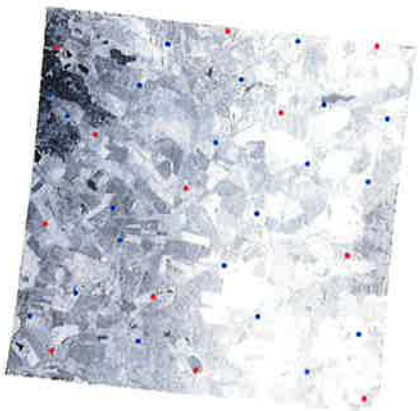
Digital Elevation Model

- 1:10 000 topographic maps
- contours with 2m elevation interval
- 5m grid DEM

Location of GCPs and ICPs

Physical modeling

- 12 GCPs
- 21 ICPs



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Orthorectification Results

Orthorectification method	Satellite scene	Ground Control Points				Independent Check Points					
		Number	RMS			Number	RMS			Maximum Residual	
			X	Y	XY		X	Y	XY	X	Y
			[m]	[m]	[m]		[m]	[m]	[m]	[m]	[m]
Physical model	EROS	12	2,00	1,73	2,64	21	2,86	2,50	3,80	4,97	4,78

- no RPC data available
- GCP requirements for physical modeling
  - 8 GCPs minimum
  - very sensitive to GCPs distribution
- RMS ~ 2.5 m
- GCPs and ICPs accuracy
- high number of GCPs required

Pan-sharpening

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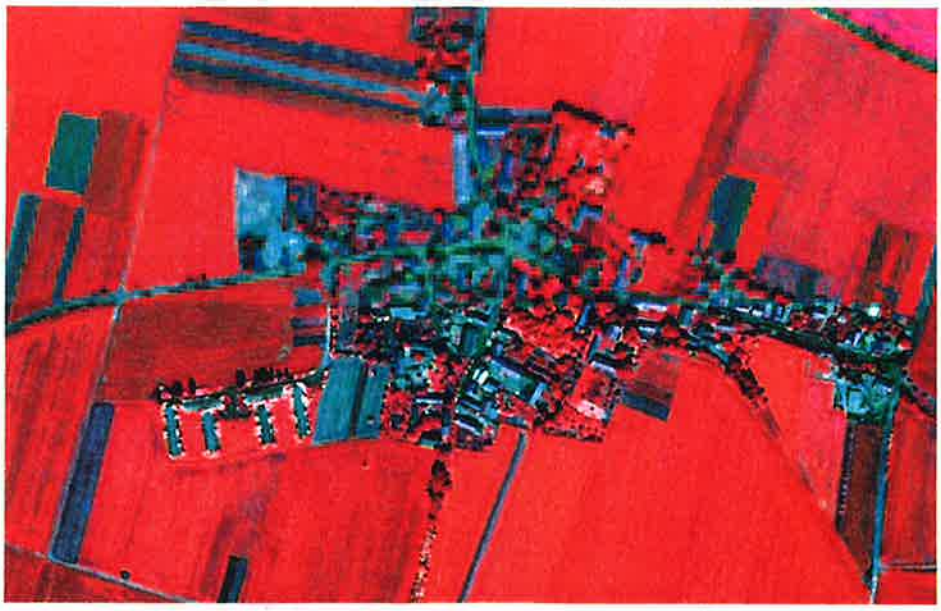
Pan-sharpening methods

- new techniques available
  - no limitations in number of input MS bands
  - preserve original radiometry of input MS bands
- sw Geomatica
  - algorithm developed by Dr. Yun Zhang, University of New Brunswick
  - any image data (8/16/32-bit)
- accurate co-registration required
- separate orthorectification of PAN and MS data
- size of pan-sharpened files
  - > 800 MB for 1 Ikonos scene, > 2.2 GB for 1 QuickBird scene
  - image scaling and image compression are to be considered

Ikonos example



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Landsat 7 ETM+ example

VHR imagery interpretation

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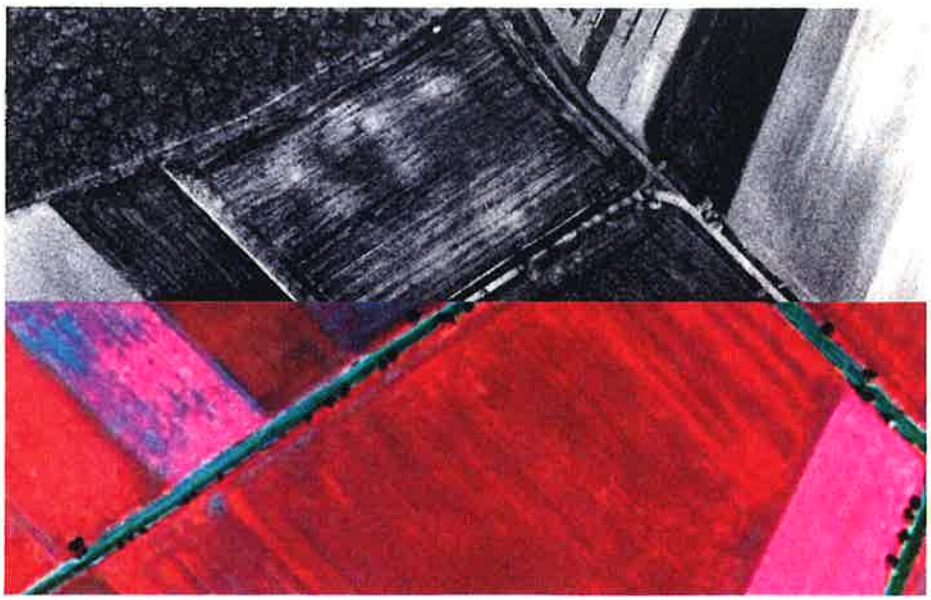
Ikonos and aerial orthophoto

- Ikonos pan-sharpened orthorectified data
- aerial orthophoto (b&w, 0.5m resolution)

- comparison with respect to
  - parcel boundaries detection
  - LPIS requirements

- comparable image products
  - spatial resolution helps to differentiate types of linear features
  - radiometric resolution helps to identify field (crop) boundaries

Ikonos and aerial orthophoto – example 1



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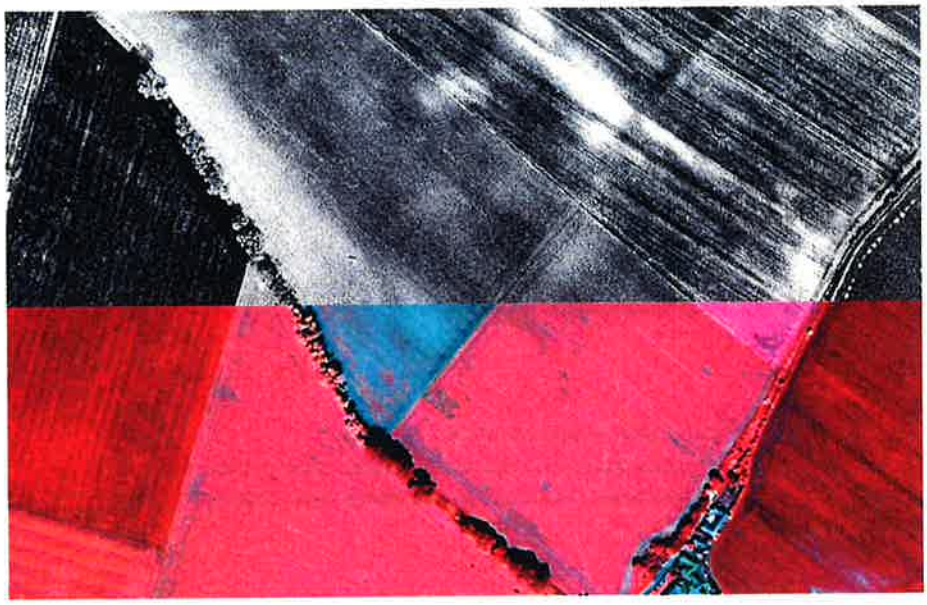
Ikonos and aerial orthophoto – example 2



Ikonos and crop discrimination

- 4 spectral bands
  - 3 in visible, 1 in near-infrared
  - band combination 4-3-2
- interpretation features
  - radiometry (color)
  - texture
- replacement of one HR multispectral image (Landsat/SPOT/IRS)

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Thank you for your attention.

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Presentation 4 – QuickBird Coverage for the Cyprus LPIS

Kyriakos ALEXANDROU

Ministry of Agriculture, Cyprus

Abstracts

The Cyprus Authorities had decided to order VHR satellite images for the creation of Land Parcel Identification System. The Order placed in August 2003 to Eurimage SpA for the delivery 70 Quickbird Images. The decision to use VHR images was based on the constraints faced due to the Turkish occupation and other military reasons (i.e. flight over English Foreign Bases). Lastly, the QuickBird satellite was selected as the best solution, for the Cyprus Case, based on the results derived from the pilot project that had taken place in Aradippou area in the year 2002.

The scenes delivered have an overlapping area of 2 Km both vertically and horizontally. According to the technical specifications, the images must have had less than 15o off Nadir angle and less than 20% cloud coverage. The product delivered was Ortho Ready UTM/WGS84 projected, Bundle Panchromatic and Multispectral (4Bands). The nominal pixel size was 60cm for Pan, and 2.4m for Multispectral channels.

A concrete workflow for the project, established at the early stages ensured the success of the Project. The results obtain up to now indicate that the targeted cartographic accuracy of scale 1:5000 can be achievable.

Keywords: Cyprus, QuickBird, VHR images, LPIS.

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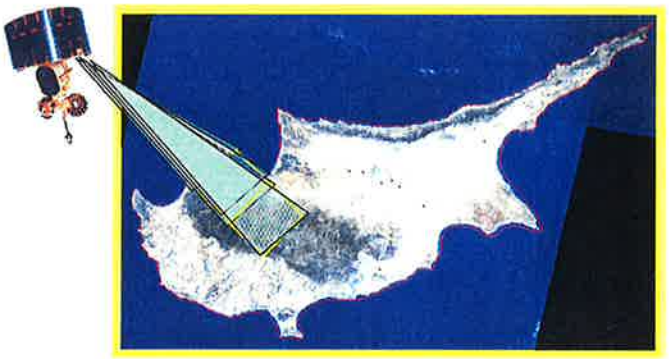
Cyprus Government

"QuickBird coverage for the Cyprus LPIS"



Kyriacos Alexandrou
Ourania Menelaou

Ministry of Agriculture Natural Resources and Environment

Cyprus Government

1. The Project decision background

- *The Cyprus Authorities have decided to use, for a three year period, the cadastral system as the Land Parcel Identification System. In the meantime, a new LPIS, based on block system following natural boundaries, is under development. For this purpose, the decision for the acquisition of Very High Resolution Images was taken in March 2003.*

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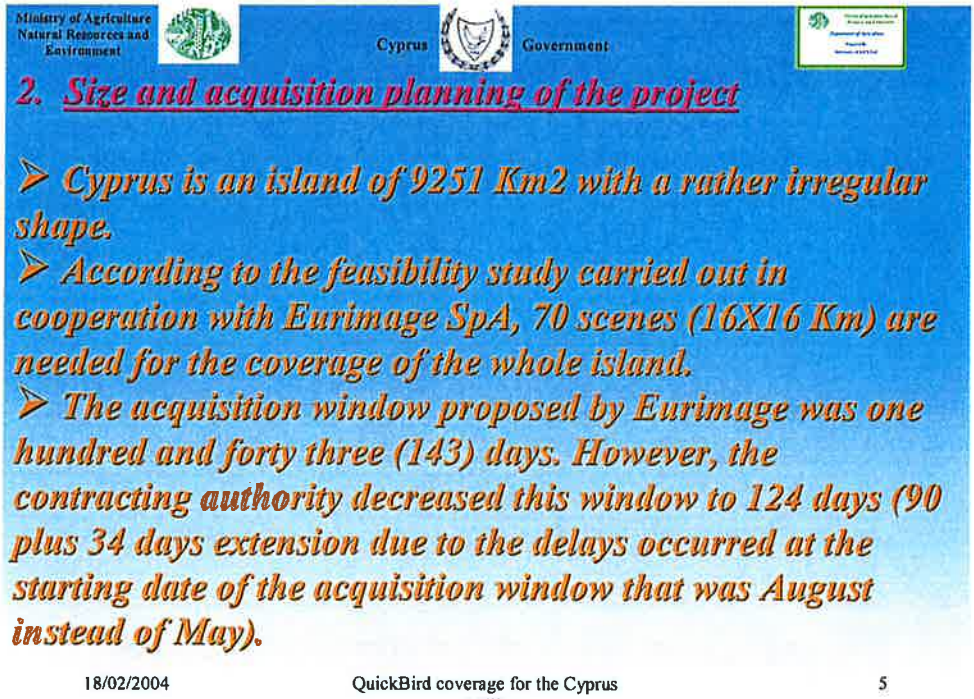
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2. Size and acquisition planning of the project
➢ Cyprus is an island of 9251 Km2 with a rather irregular shape.
➢ According to the feasibility study carried out in cooperation with Eurimage SpA, 70 scenes (16X16 Km) are needed for the coverage of the whole island.
➢ The acquisition window proposed by Eurimage was one hundred and forty three (143) days. However, the contracting authority decreased this window to 124 days (90 plus 34 days extension due to the delays occurred at the starting date of the acquisition window that was August instead of May).
18/02/2004
QuickBird coverage for the Cyprus LPIS
5


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2. Size and acquisition planning of the project
➢ The scenes have an overlapping area of 2 Km both vertically and horizontally.
➢ According to the technical specifications, the images must have less than 15° off Nadir angle and less than 20% cloud coverage.
➢ The product to be delivered is Ortho Ready UTM/WGS84 projected, Bundle Panchromatic and Multispectral (4 Bands). Nominal pixel size 60cm for Pan, 2.4m for Multispectral channels.
➢ The Acquisition was set at priority status.
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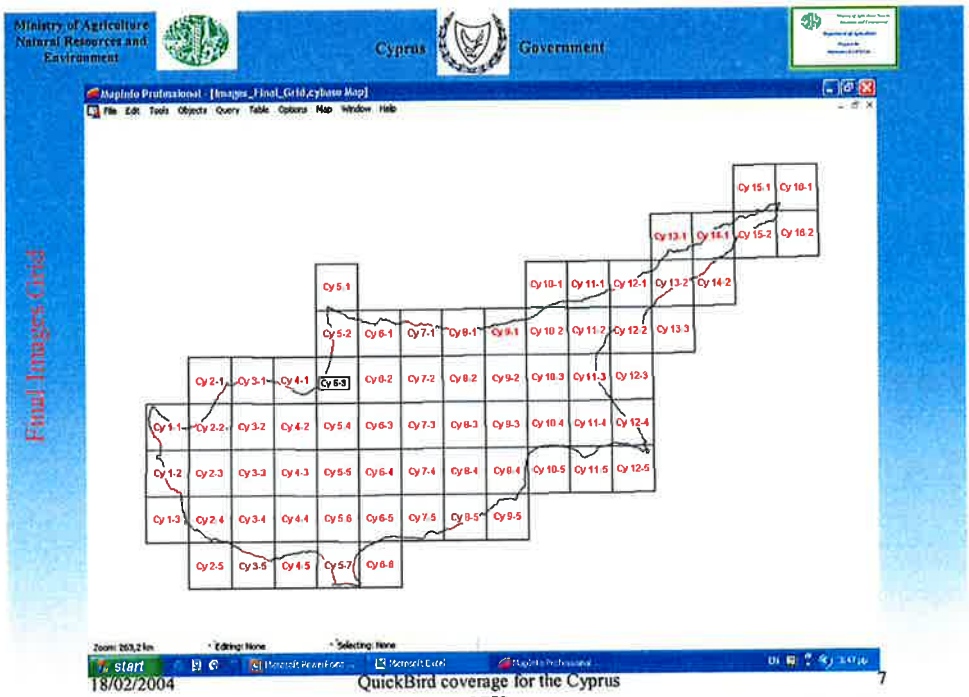

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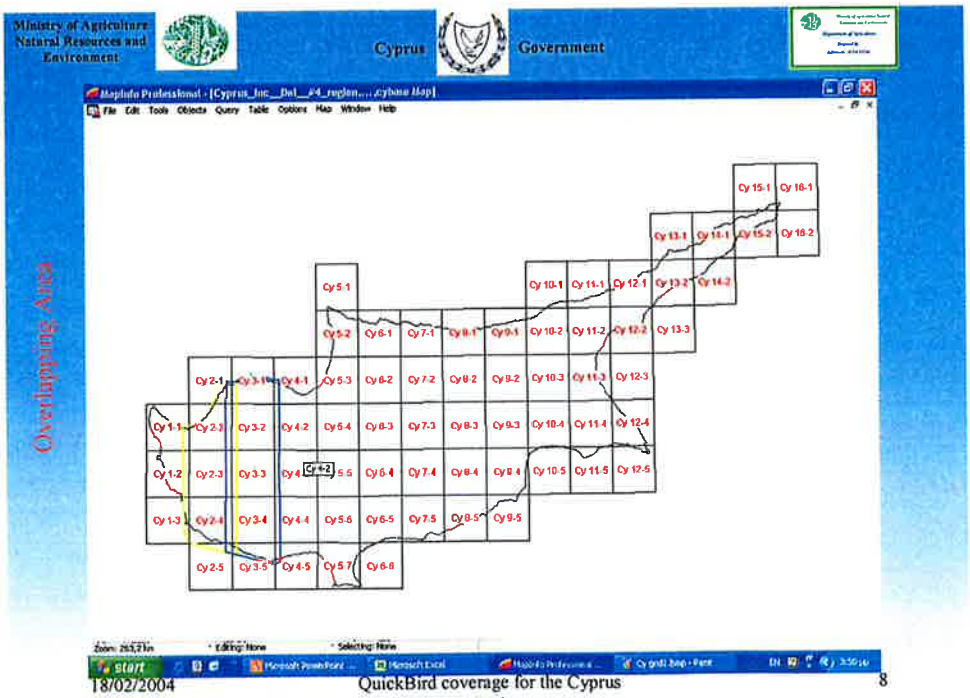

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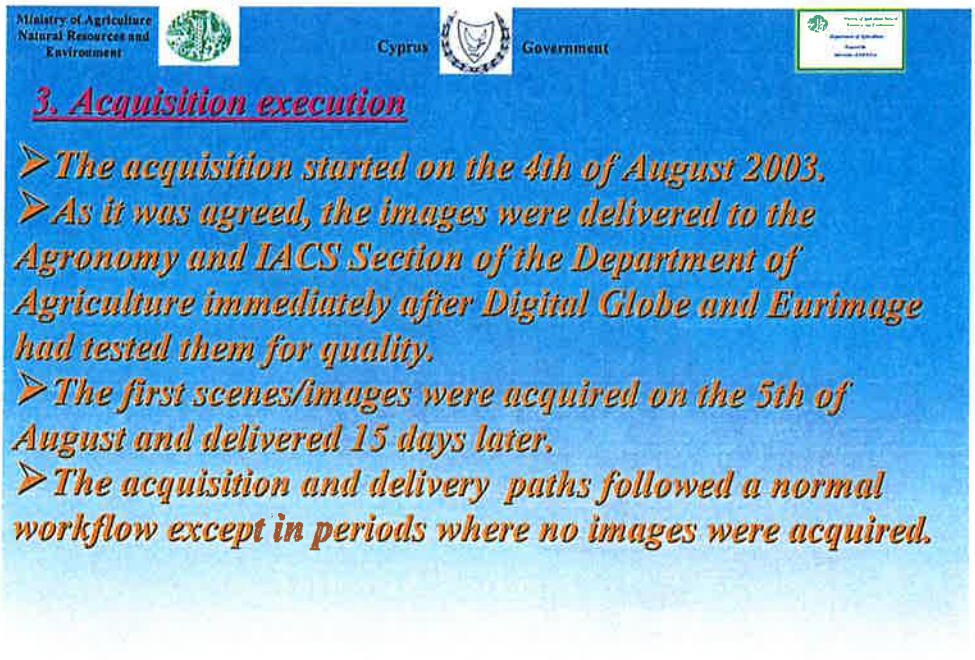

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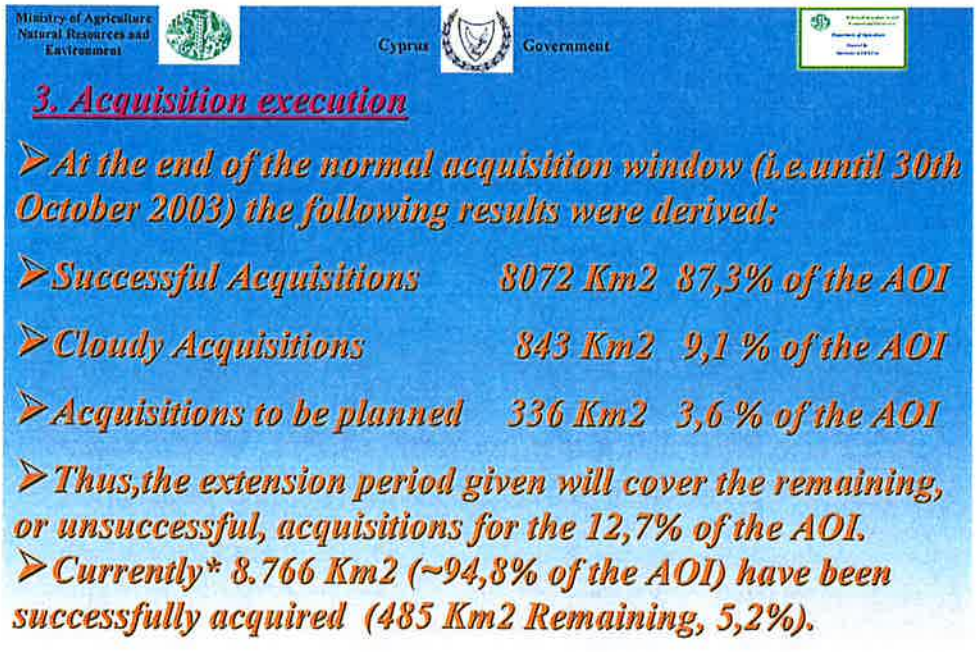

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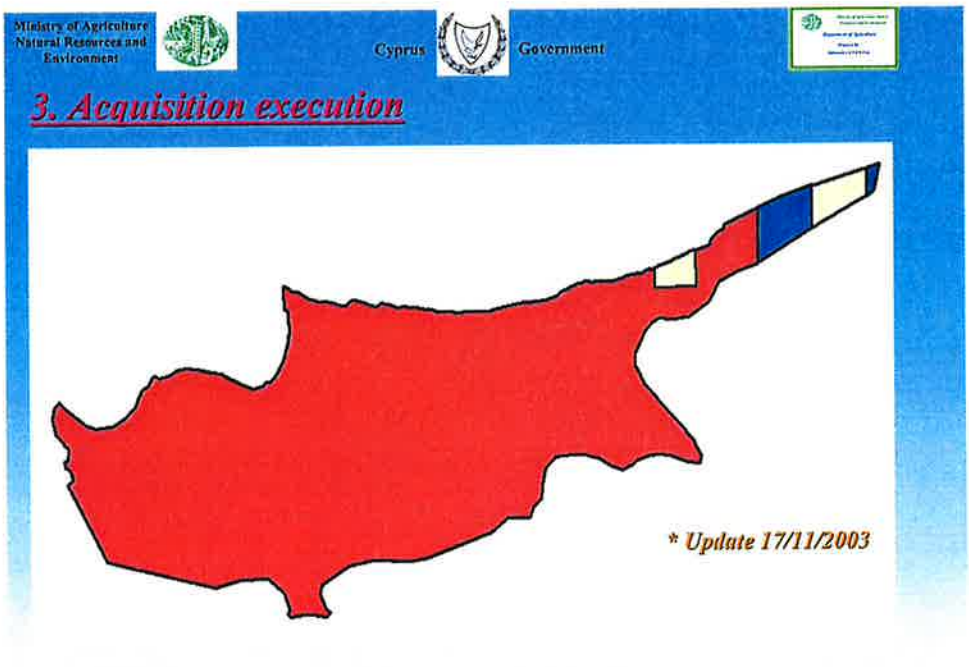

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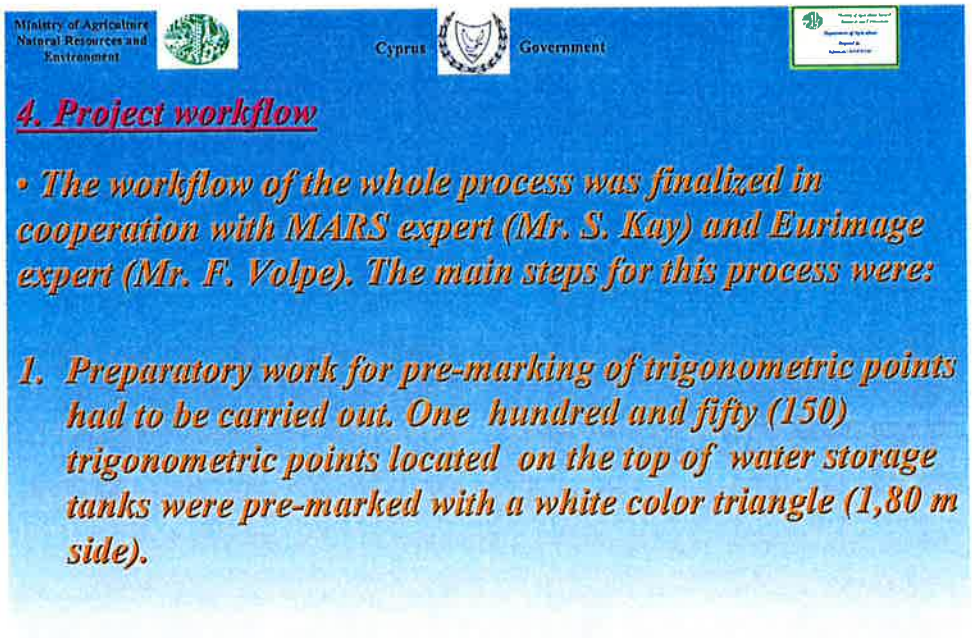

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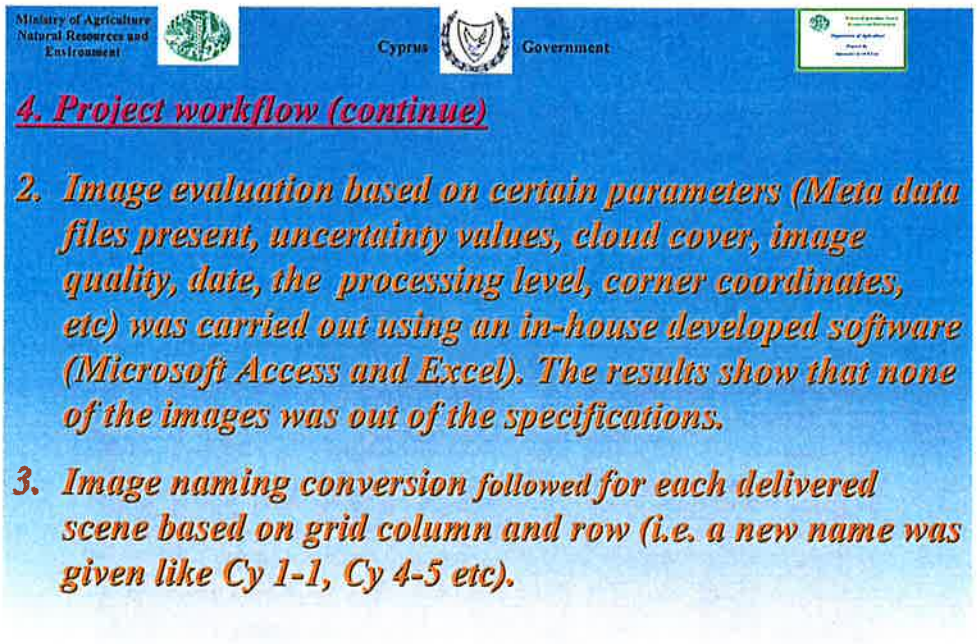

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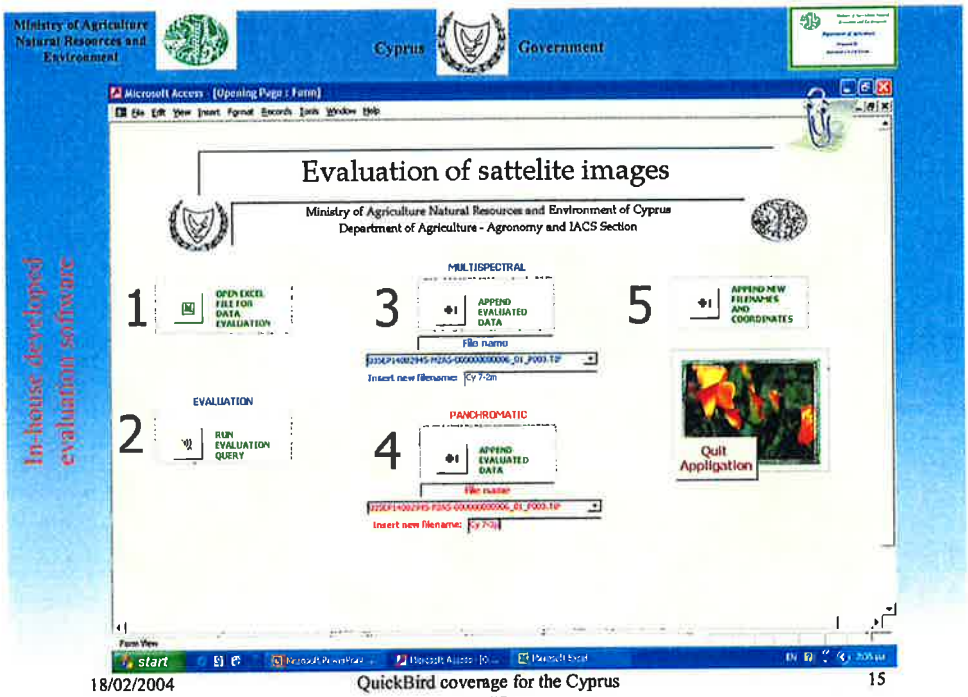

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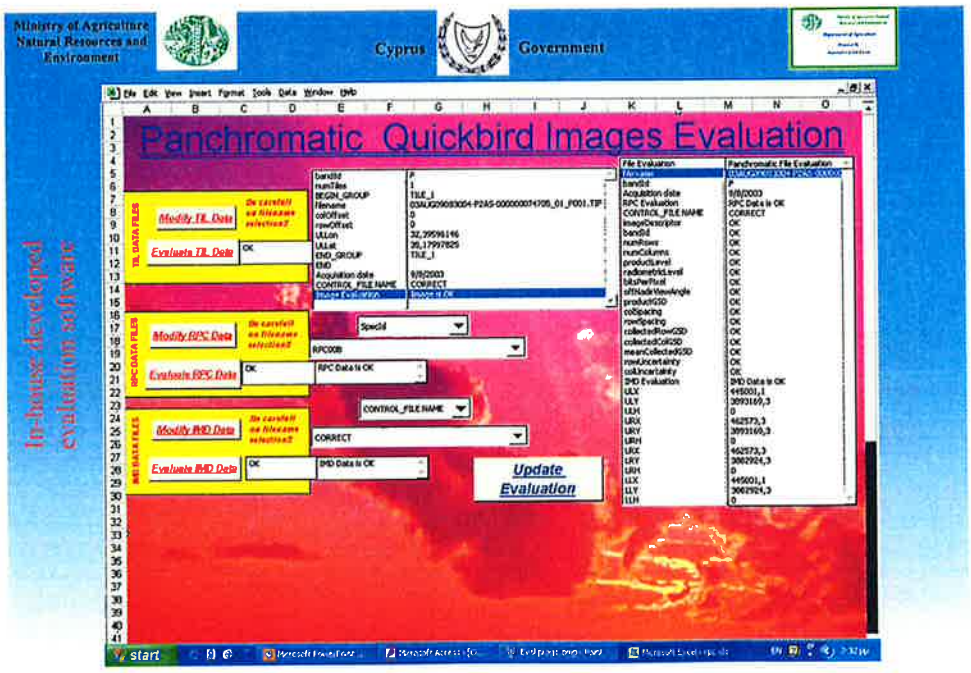

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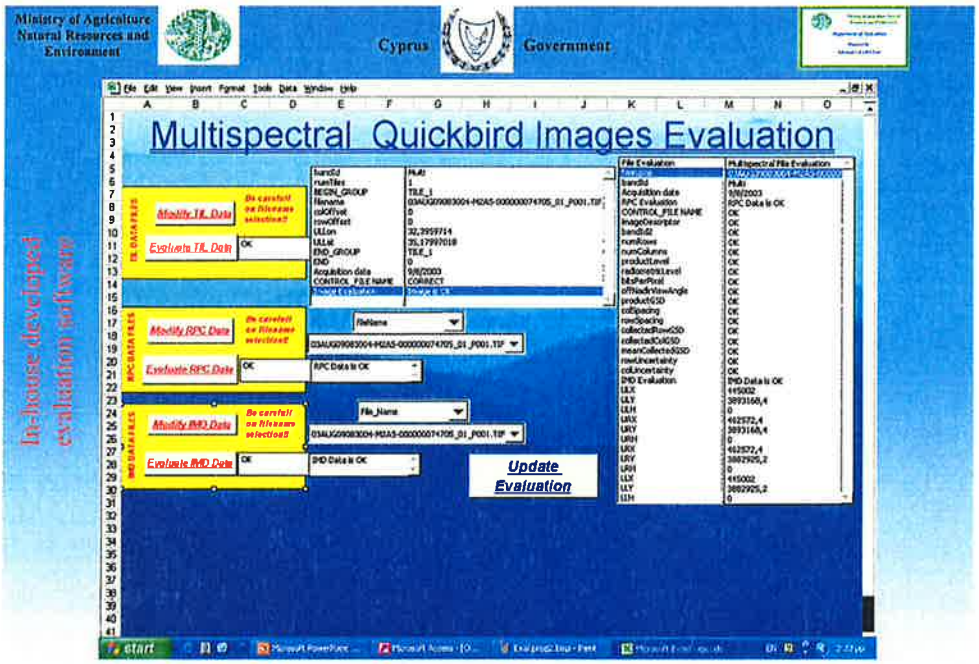

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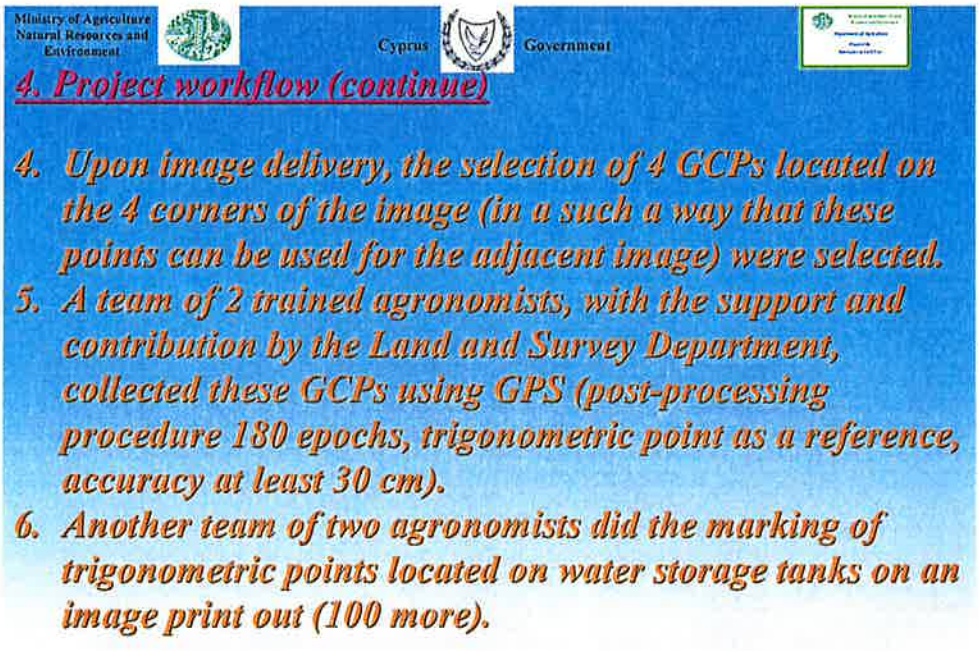

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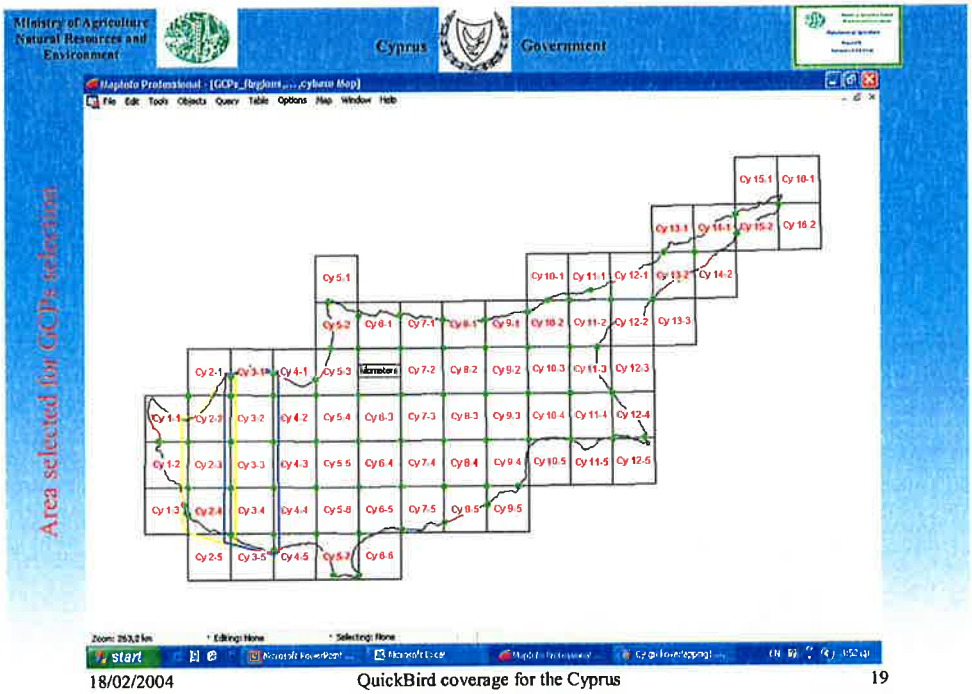

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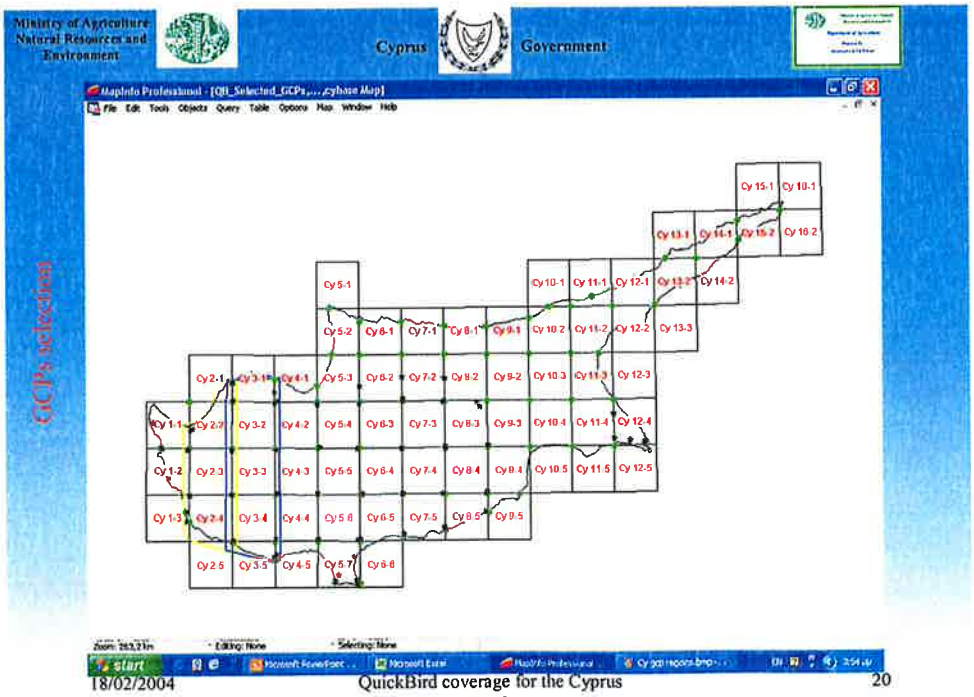

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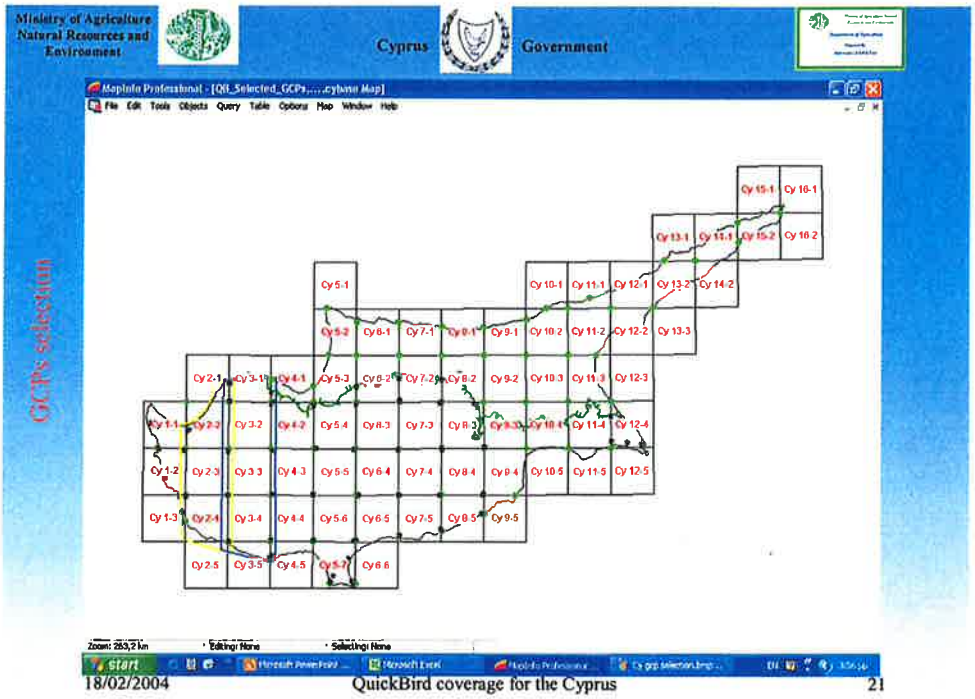

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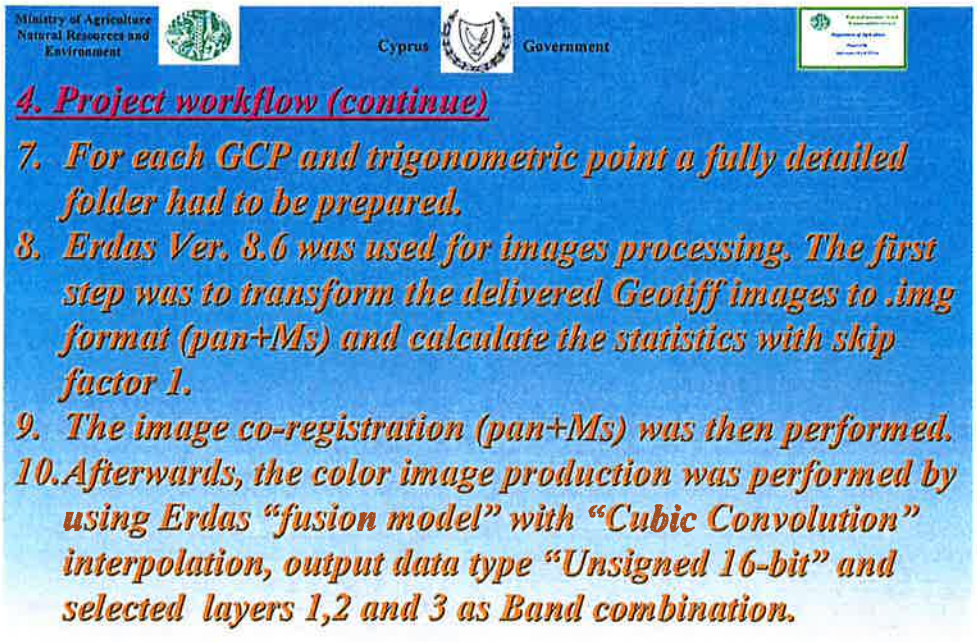

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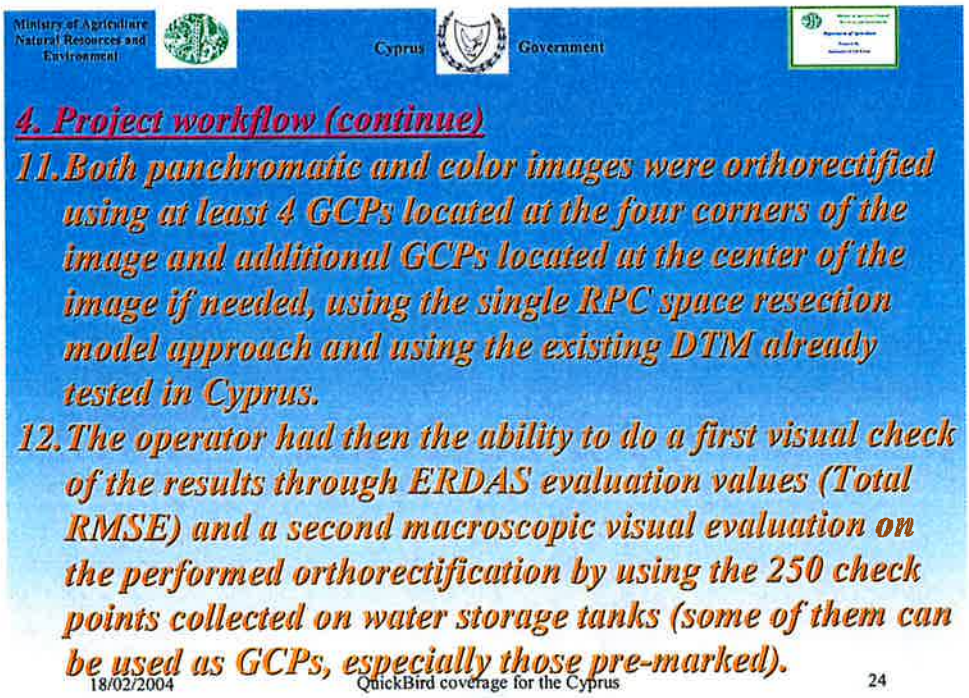
18/02/2004 QuickBird coverage for the Cyprus LPIS 23



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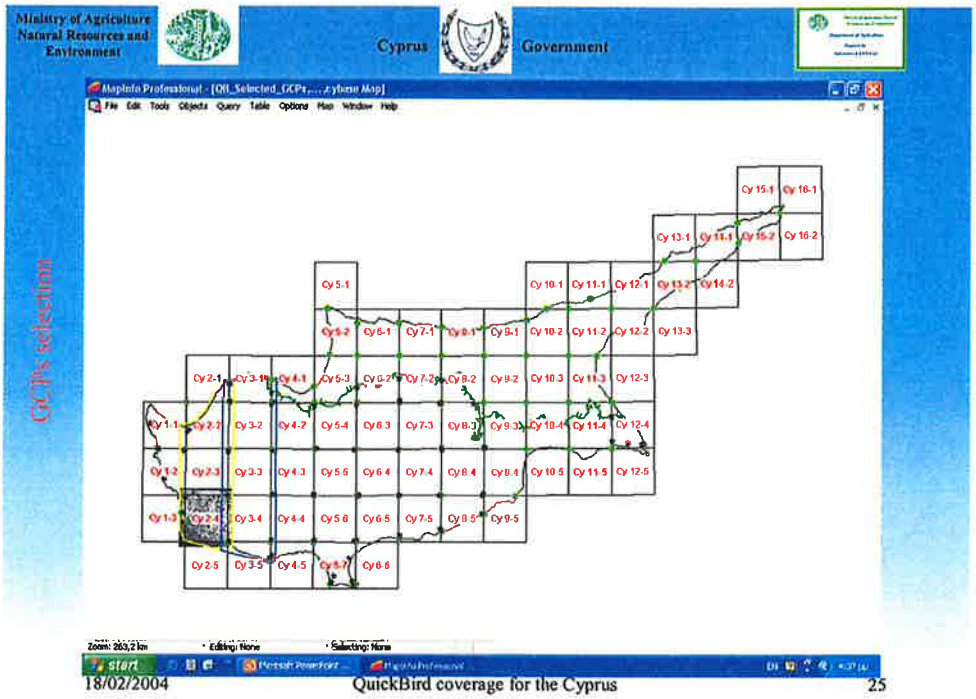

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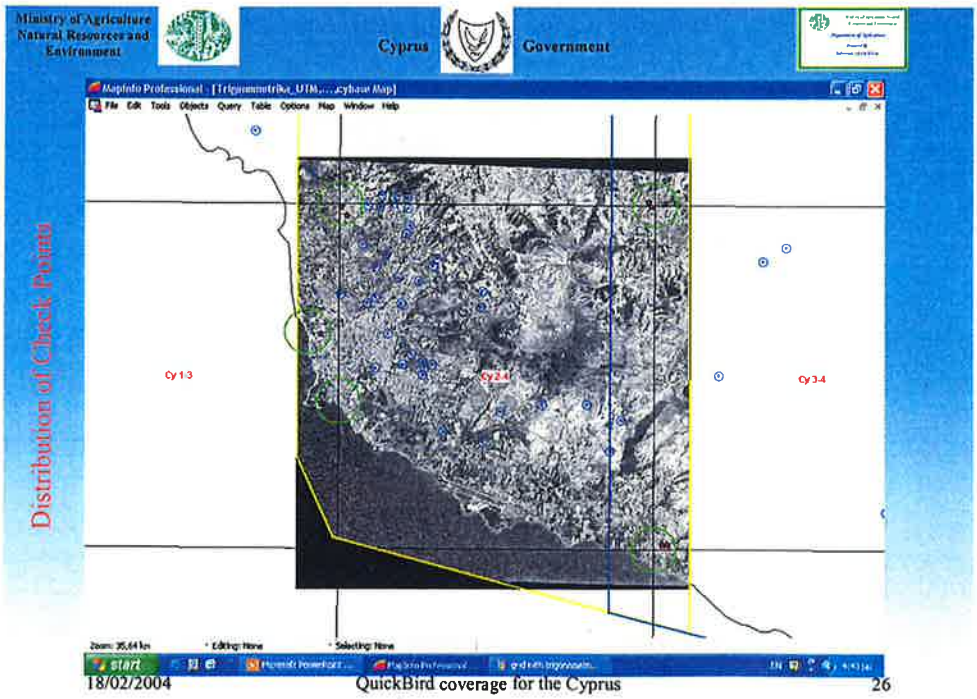

18/02/2004 QuickBird coverage for the Cyprus LPIS 26


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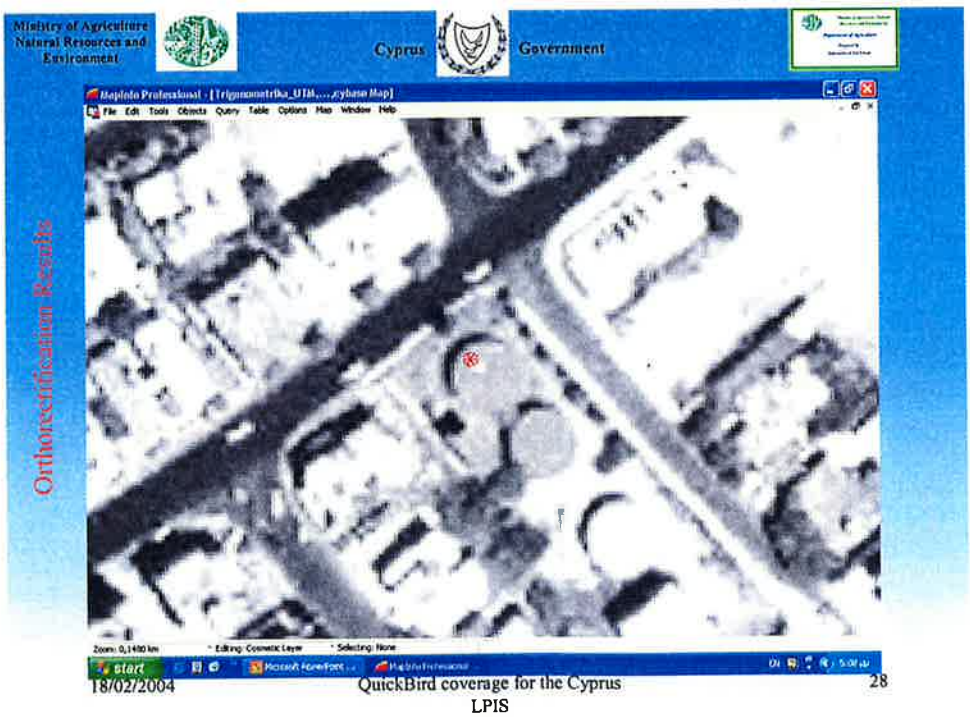
Cyprus
Government
GCPs selection
18/02/2004
QuickBird coverage for the Cyprus
LPIS
27


Ministry of Agriculture Natural Resources and Environment
Cyprus
Government
Orthorectification Results
18/02/2004
QuickBird coverage for the Cyprus
LPIS
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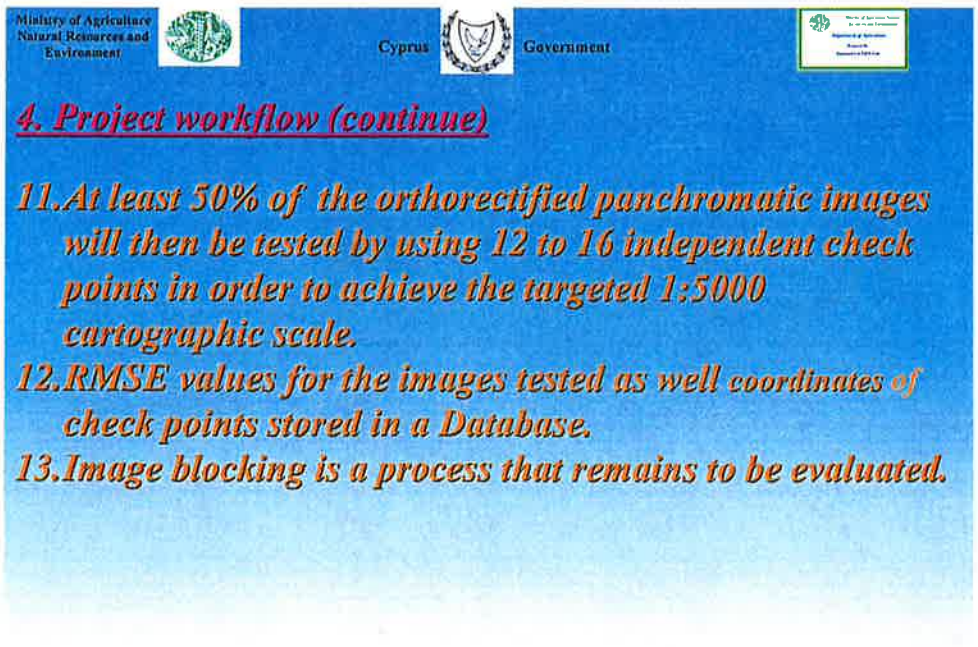
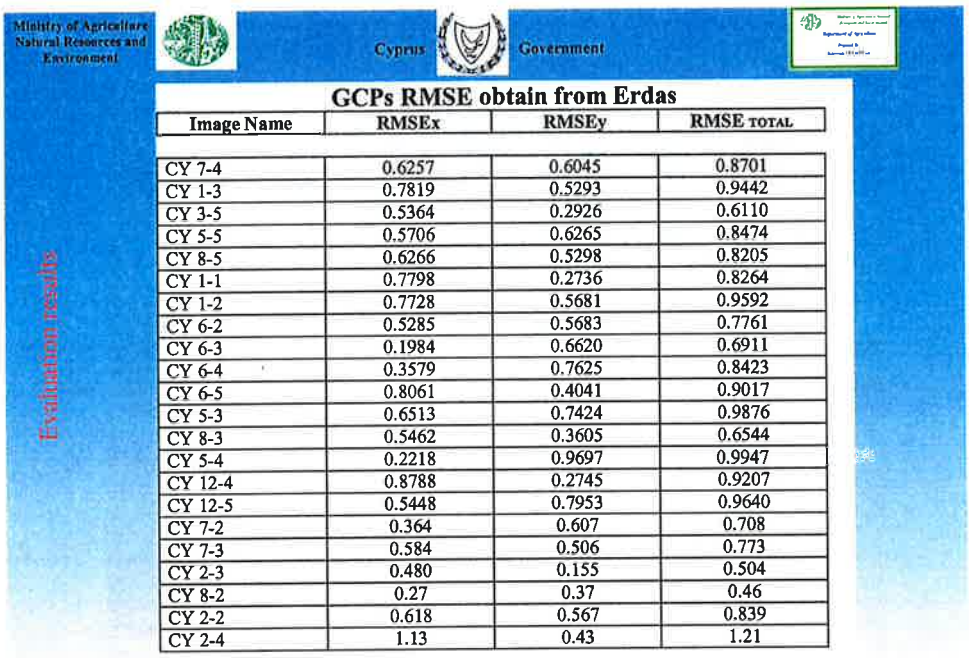
18/02/2004 QuickBird coverage for the Cyprus LPIS 29



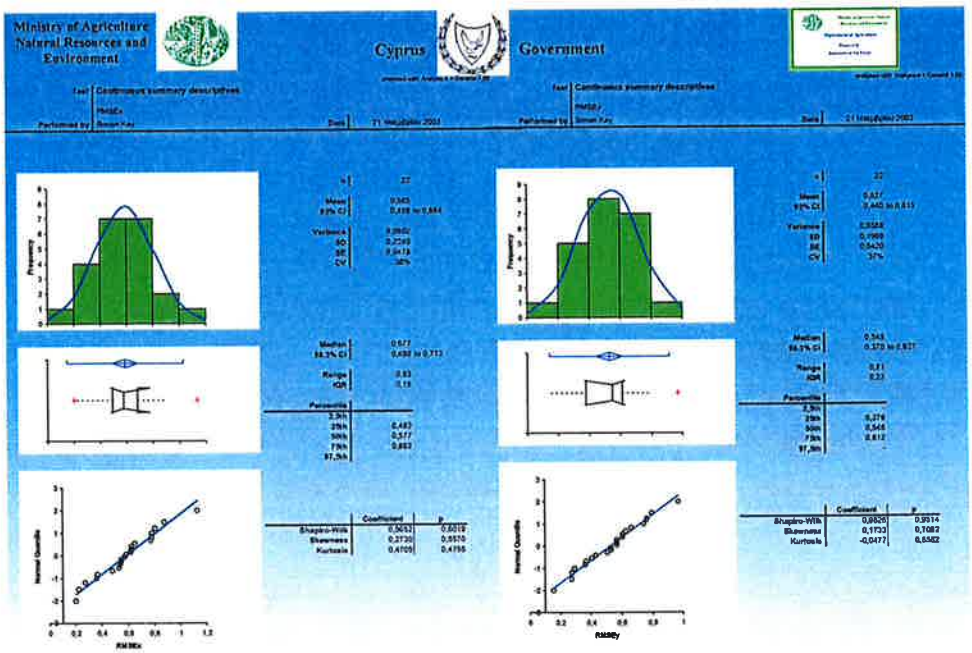
18/02/2004 QuickBird coverage for the Cyprus LPIS 30



GCPs RMSE obtain from Erdas

Image Name	RMSEx	RMSEy	RMSE TOTAL
CY 7-4	0.6257	0.6045	0.8701
CY 1-3	0.7819	0.5293	0.9442
CY 3-5	0.5364	0.2926	0.6110
CY 5-5	0.5706	0.6265	0.8474
CY 8-5	0.6266	0.5298	0.8205
CY 1-1	0.7798	0.2736	0.8264
CY 1-2	0.7728	0.5681	0.9592
CY 6-2	0.5285	0.5683	0.7761
CY 6-3	0.1984	0.6620	0.6911
CY 6-4	0.3579	0.7625	0.8423
CY 6-5	0.8061	0.4041	0.9017
CY 5-3	0.6513	0.7424	0.9876
CY 8-3	0.5462	0.3605	0.6544
CY 5-4	0.2218	0.9697	0.9947
CY 12-4	0.8788	0.2745	0.9207
CY 12-5	0.5448	0.7953	0.9640
CY 7-2	0.364	0.607	0.708
CY 7-3	0.584	0.506	0.773
CY 2-3	0.480	0.155	0.504
CY 8-2	0.27	0.37	0.46
CY 2-2	0.618	0.567	0.839
CY 2-4	1.13	0.43	1.21

18/02/2004 QuickBird coverage for the Cyprus LPIS 31



18/02/2004 QuickBird coverage for the Cyprus LPIS 32

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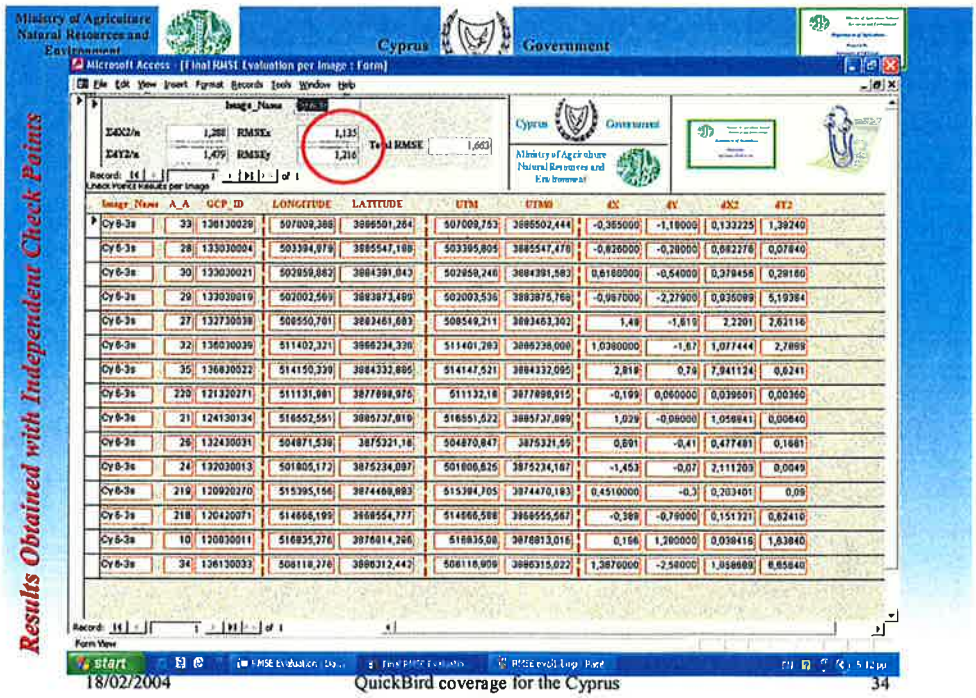
The out comings can be summarized as follows:

- ***the data are very consistent with a final RMSE of around 1:5,000 mapping, 95% of the time.***
- ***they are about the same for RMSEx as RMSEy.***
- ***the upper level of the 95% confidence interval for the mean (average) RMSE is 0.68m for X, and 0.61m for Y.***
- ***Considering that residuals calculated in this way will approximately be half of that of the ones from independent check points (it is written in the Guidelines for Ortho QA document in Table 7), then the probable result on independent check points would be around RMSEx = 1.36m and for RMSEy 1.21m.***

Note: because we are using only a few GCPs with each image, there is a risk that these values are understated. (Simon Kay)



18/02/2004 QuickBird coverage for the Cyprus LPIS 35

18/02/2004 QuickBird coverage for the Cyprus LPIS 36

18/02/2004 QuickBird coverage for the Cyprus LPIS 37

18/02/2004 QuickBird coverage for the Cyprus LPIS 38

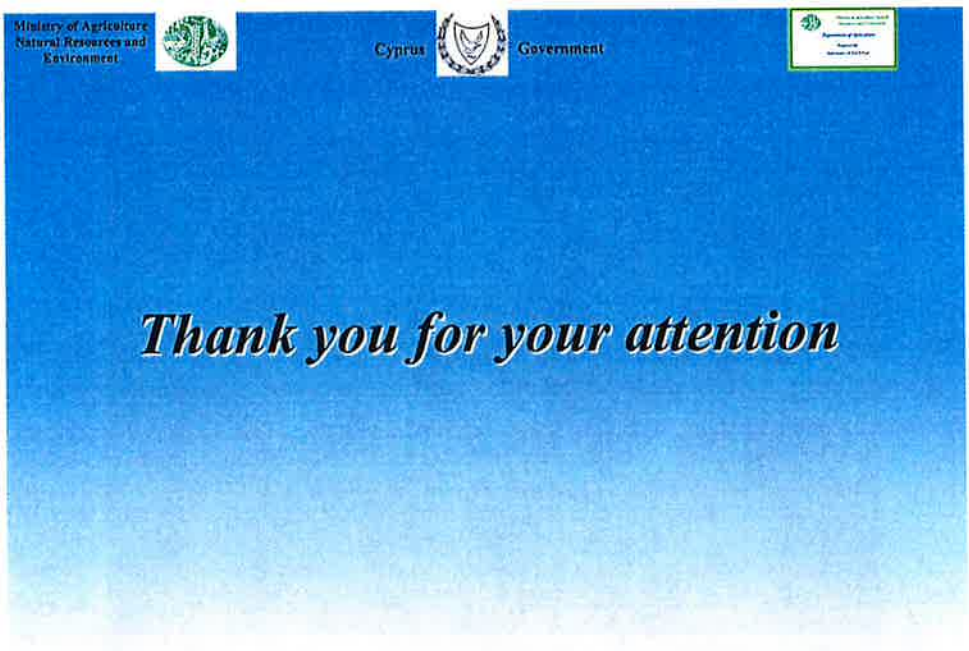
18/02/2004 QuickBird coverage for the Cyprus LPIS 39

18/02/2004 QuickBird coverage for the Cyprus LPIS 40

18/02/2004 QuickBird coverage for the Cyprus LPIS 41

18/02/2004 QuickBird coverage for the Cyprus LPIS 42

18/02/2004 QuickBird coverage for the Cyprus LPIS 43



18/02/2004 QuickBird coverage for the Cyprus LPIS 44

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Presentation 5 – Use of Ikonos for LPIS coverage in Poland

Jacek Jjarzabek
Jolanta Orlinska,
ARiMR, Poland

Abstracts

The main topics of the presentation:

- Specific constrains of use of satellite images (
- Technical conditions of the project implementation ()
- Some aspects of technology employed
- Quality Control procedure and results
- Conclusions

Keywords: VHRS images, LPIS., ortophotos, quality control

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Land and Farm Register Department

USE OF IKONOS FOR LPIS COVERAGE IN POLAND

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Koln, 27-28th November 2003

Content of the presentation

1. Specific constrains of use of satellite images
2. Technical conditions of the project implementation
3. Some aspects of technology employed
4. Quality Control procedure and results
5. Conclusions

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Goals of the project

- to examine accuracy and interpretation potential
- to check the practical availability of satellite imagery in polish condition
- to revise (define) conditions for the effective use of VHRS for the LPIS
- to implement the satellite technology for establishing the LPIS

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Specific constrains for the use of satellite imagery for LPIS

- Agriculture structure *(highly scattered)*
- Average area of cadastral parcel
- Existing and planned coverage of photos
- Additional constraints
  - (e.g. flight permissions, weather conditions..)

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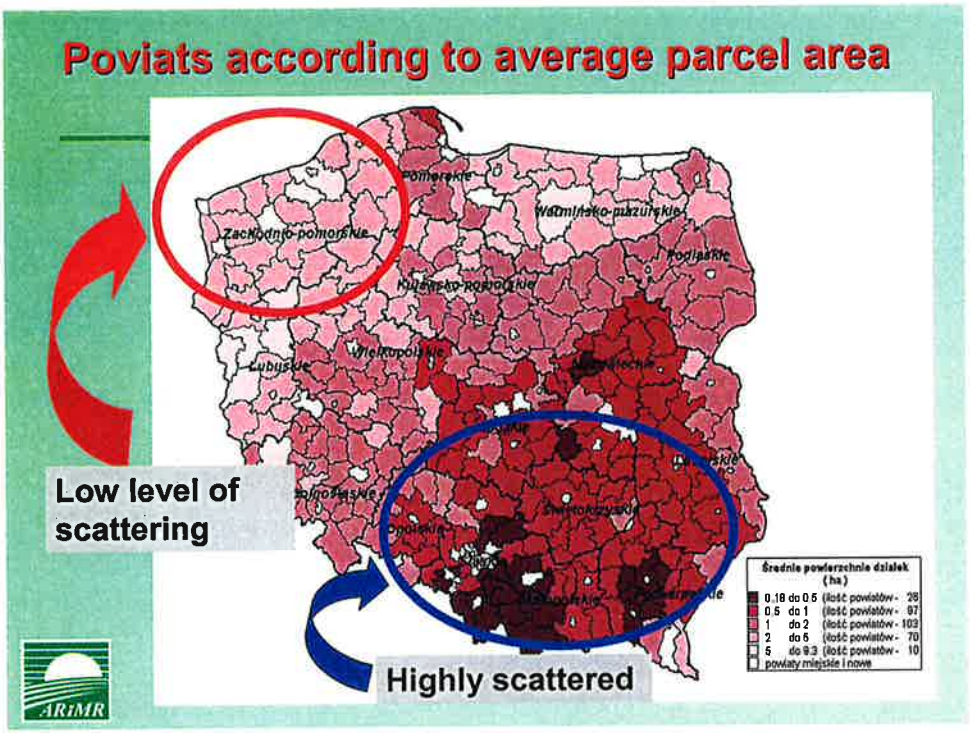

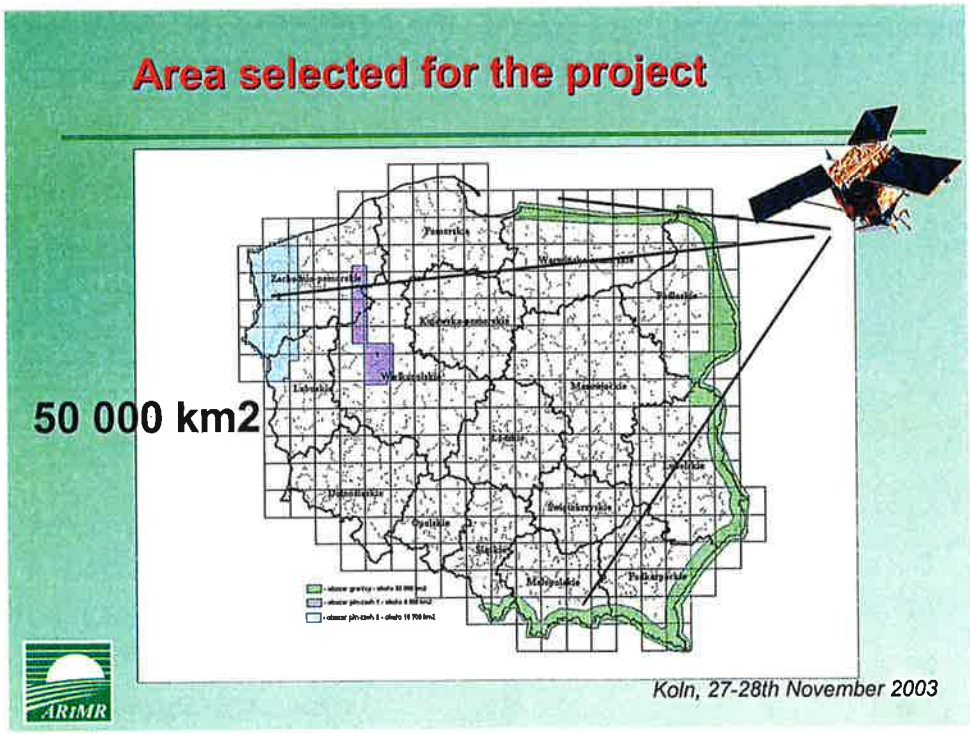

Examples

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Technical condition for data acquisition

- panchromatic <1m + multispectral <4m
  (collected in the same time)
- combined to pan-sharpened -1m resolution
- off nadir angle - ±18°
- sun angle > 25°
- clouds coverage ≤ 10%- *(for total area)*
- without cover of snow

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Technical conditions for ortophoto production

- ground pixel size 1,0m
- RMSE ≤ 1.3 m
- RMSE terrain above 200m ≤ 2.0 m
- GeoTIFF
- radiometric resolution - 8 bit/band

- image homogeneity in radiometry and geometry
- surface continuity

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Technical conditions for ortophoto production

❑ Requirments for GCP's

The accuracy of control and check points
m_{xy}= 0.5m, m_z= 1.0m

❑ Requirments for DTM

m_z= 3.0m
grid space 20m

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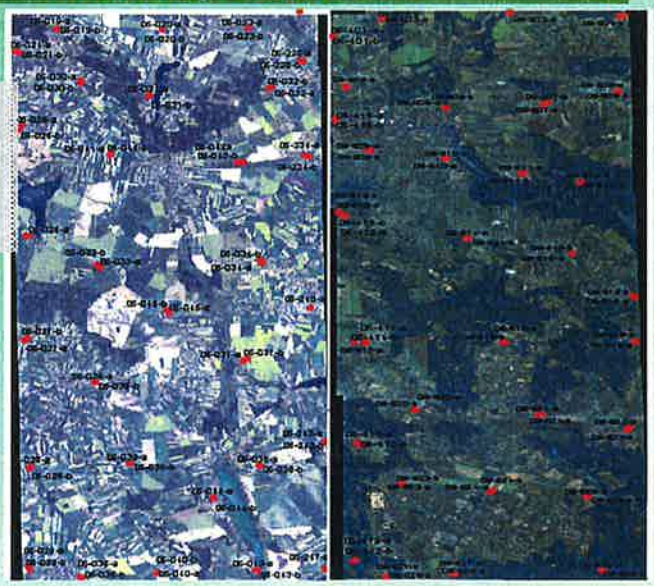
Stages of the project

- Scenes collection
- Preparing pan-sharpened image with 1m pixel in UTM (WGS84), RPC parameteres, and metadata file
- Project and measurement of GCP and check points – *(high quality, expensive, stored)*
- Triangulation with measured GCP
- Ortorectification with mosaicking with usage of DTM from external sources – *(xy accuracy – important in mountain areas)*

All products under internal quality control

Distribution of GCP and checks points on the scenes

- Accuracy of GCP
- Accuracy of final product



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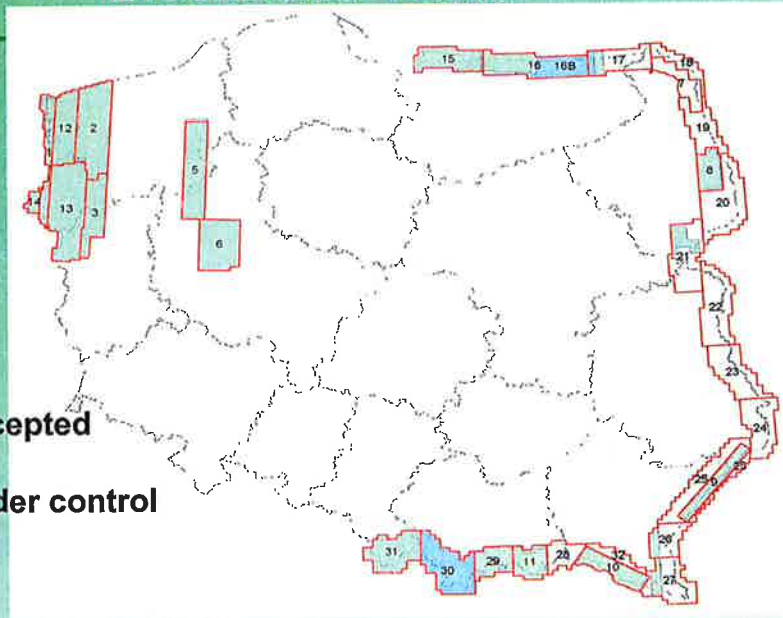
Example of GCP field work documentation

Arkusz mapy	OPIS TOPOGRAFICZNY PUNKTU	Numer punktu
N-33-130-B		06422b

				Odwzorowanie Gaussa		Odwzorowanie UTM	
Układ	B	L	$H_{(ortometr.)}$	X	Y	X	Y
WGS-84	52 ° 39 ' 33.99310 "	16 ° 50 ' 26.62933 "	62.10			5935977.60	3634496.26
PUWG 1992				534824.00	354005.91		
PUWG 2000				5836903.55	6421566.28		

Blocks and status



Accepted

Under control

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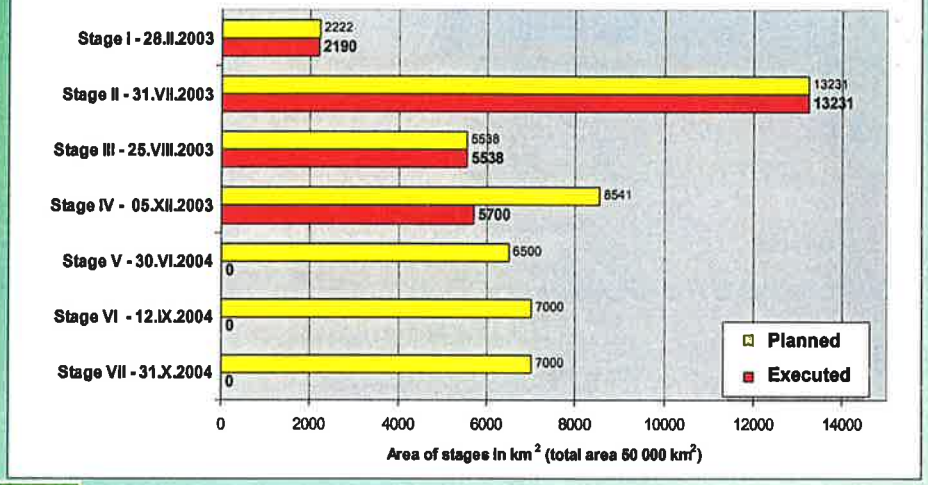
Time schedule and status of realization



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Problems

- Weather condition *(clouds, sun angle, in mountains snow cover)*
- Difficulties in scenes acquisition *(complicated shapes of border area)*
- Difficulties in GCP surveying in mountain and forest areas *(south and east part of Poland)*

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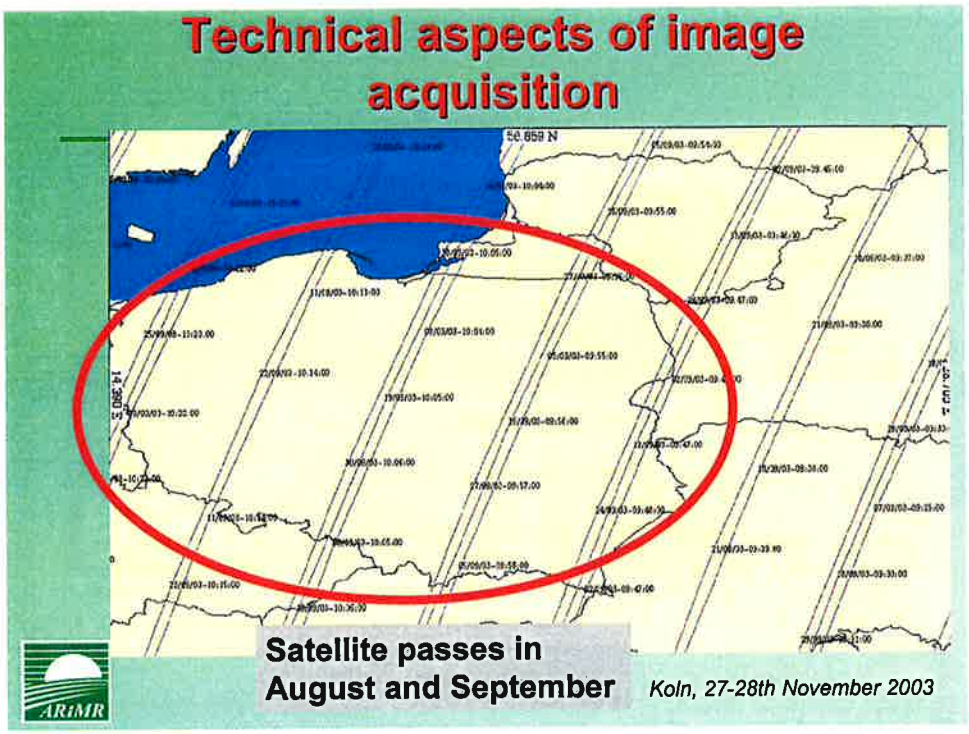

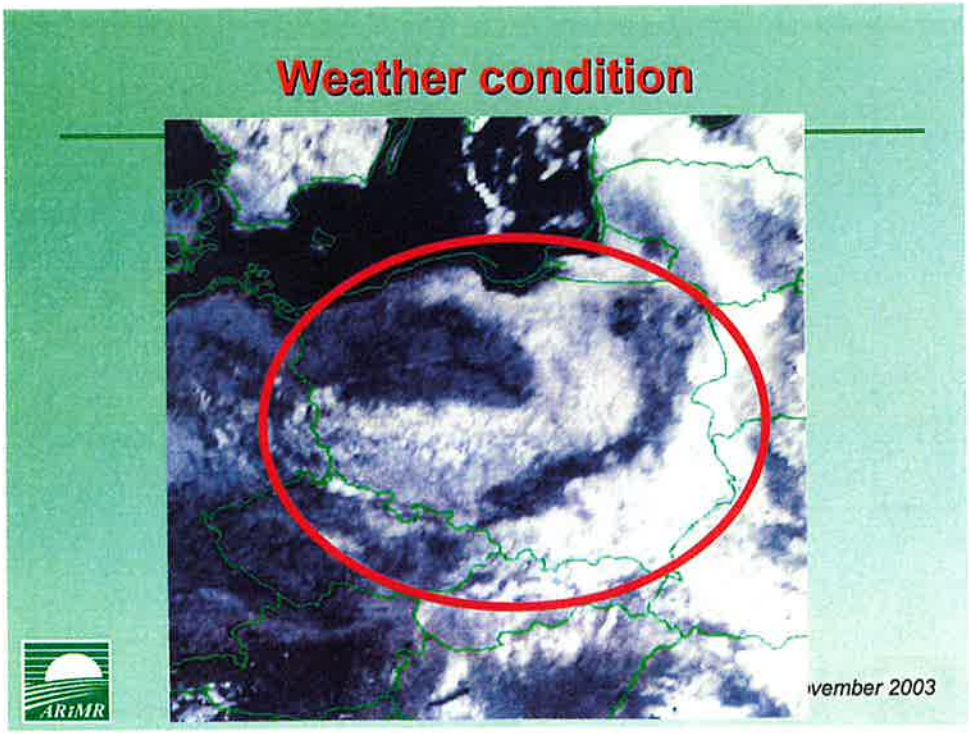

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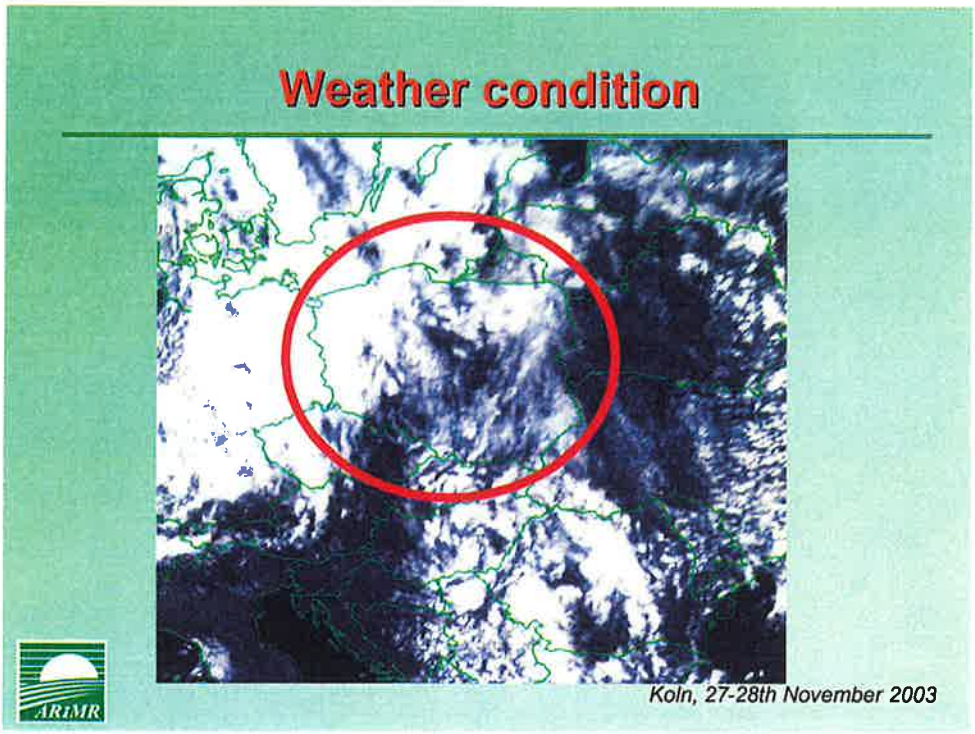

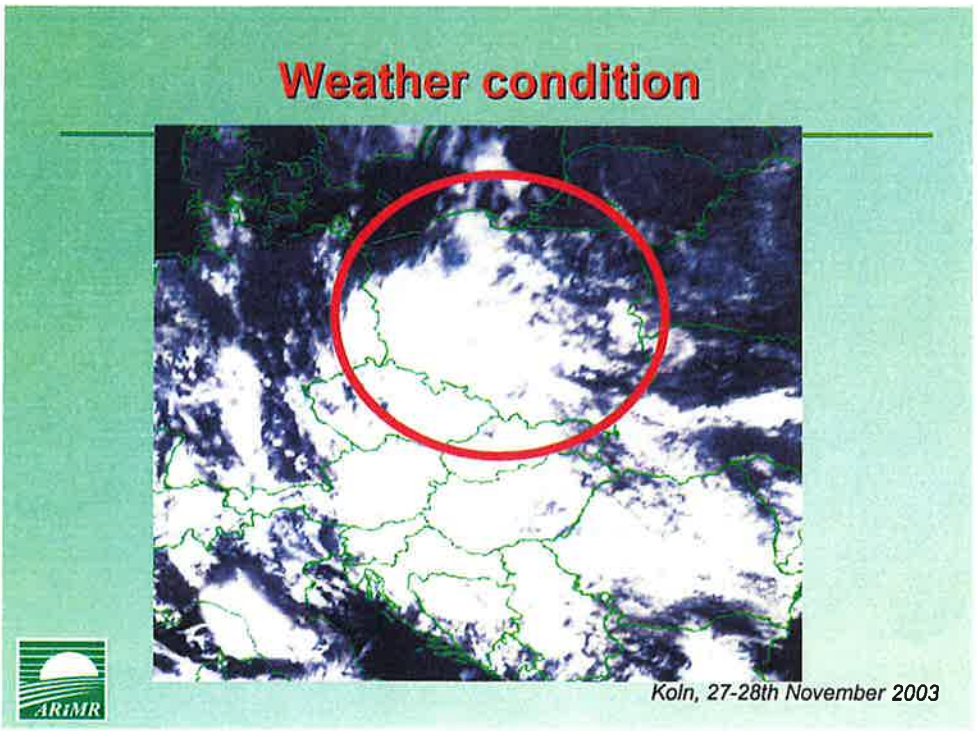

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External Quality Control

Scope of control:

- completeness and accordance of documentation with ToR
- triangulation
  - number and distribution of GCP's
  - accuracy of GCP's and check points
  - results of triangulation - RMSE
- DTM
  - comparison of DTM points to control profiles in the terrain
  - comparison of DTM points to spot heights

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External Quality Control

- geometric quality of ortophoto
  - comparison of GCP coordinates to points from ortophoto
- radiometric quality of ortophoto
  - clouds, shadows, saturation, haze, histogram, homogeneity
- results of ortorectification and mosaicing
  - visual control

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EXAMPLES OF SOME RESULTS OF QUALITY CONTROL

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External Quality Control

Index of results of visual control in blocks

Blocks names	Number of maps	Technical problems eg. CD/DVD		Displacement between mapsheet		Errors in mosaicking		Problem in radiometry on map sheet		Problem in radiometry in block		Errors in georeferences		Clouds and shadows		Errors on histogram (0 or 256 gray level)	
	pcs.	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%	pcs	%	szt	%	szt	%
9_1992	155	0	0,0	2	1,3	0	0,0	0	0,0	0	0,0	0	0,0	3	1,9	24	15,5
10_1992	214	0	0,0	6	2,8	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	16	7,5
14_1992	57	0	0,0	2	3,5	2	3,5	0	0,0	0	0,0	0	0,0	2	3,5	1	1,8
15_1992	310	0	0,0	2	0,6	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	66	21,3
16_1992	234	0	0,0	5	2,1	1	0,4	1	0,4	0	0,0	0	0,0	0	0,0	46	19,7
17_1992	44	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	1	2,3
21_1992	110	0	0,0	2	1,8	0	0,0	0	0,0	0	0,0	0	0,0	2	1,8	27	24,5
9_2000	69	0	0,0	0	0,0	1	1,4	0	0,0	0	0,0	0	0,0	0	0,0	11	15,9
10_2000	121	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
14_2000	28	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	1	3,6	0	0,0
15_2000	122	0	0,0	2	1,6	2	1,6	0	0,0	0	0,0	0	0,0	0	0,0	24	19,7
16_2000	102	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	22	21,6
17_2000	20	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
21_2000	55	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	14	25,5
suma	1641	0		21		6		1		0		0		8		252	

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External Quality Control

Block 16 – comparison of coordinates of control points

point number	GPS			Orthophoto		GCP's			residuals		
	X	Y	Z	X	Y	X	Y	Z	ortho	operat XY	operat Z
1601(16004a)	723393,50	608556,65	102,59	723393,68	608556,71	723393,54	608556,64	102,57	0,18	0,04	0,02
1602(16035b)	712396,10	616872,48	51,66	712396,05	616873,03	712396,09	616872,49	51,40	0,55	0,02	0,26
1603(16138a)	709713,02	635856,58	36,97	709713,23	635855,76	709713,04	635856,62	36,66	0,84	0,05	0,31
1604	721513,71	597841,72	161,20	721513,71	597841,64				0,08		
1605	715848,10	601017,58	120,65	715848,60	601016,58				1,11		
1606	710724,74	598976,97	118,57	710724,90	598976,14				0,85		
1607	711628,70	608379,54	100,90	711628,24	608379,80				0,53		
1608	715872,03	612366,40	110,32	715872,07	612366,50				0,11		
1609	717536,57	637943,92	43,06	717537,49	637943,42				1,05		
1610	719342,84	645949,95	50,01	719343,62	645949,90				0,79		
1611	708985,16	644809,49	41,26	708985,19	644810,00				0,51		
1612	718280,53	621101,63	86,30	718280,75	621101,45				0,29		
1613	716031,12	624532,27	67,05	716030,98	624532,00				0,30		
1614	719753,62	631034,97	48,04	719754,88	631035,20				1,29		
1615	714883,56	621849,31	53,22	714884,32	621848,26				1,30		
1616	714760,65	625089,43	66,30	714760,62	625088,64				0,79		
1617	714837,11	630767,96	46,77	714837,73	630767,58				0,72		
1618	712957,41	621410,58	51,38	712956,37	621409,49				1,45		
1619	710159,52	626625,73	44,54	710159,65	626624,99				0,76		
1620	711126,11	629309,19	39,72	711125,55	629307,97				1,34		

RMSE=0.80

External Quality Control

DTM control – terrain profile

Lp	Block	X	Y	Z	Z - DTM	DZ	Type of point	vv
1	9	814659,12	266643,85	281,20	280,00	1,20	profil	1,44
2	9	814634,81	266666,77	281,18	280,00	1,18	profil	1,39
3	9	814605,97	266692,94	281,68	280,00	1,68	profil	2,82
4	9	814581,55	266715,77	281,77	280,00	1,77	profil	3,13
5	9	814567,51	266728,87	281,24	280,00	1,24	profil	1,54
6	9	814531,99	266761,90	279,52	280,00	-0,48	profil	0,23
7	9	814522,01	266770,91	279,33	280,00	-0,67	profil	0,45
8	9	814493,18	266797,46	278,04	280,00	-1,96	profil	3,84
9	9	814478,76	266810,60	277,90	280,00	-2,10	profil	4,41
10	9	814443,44	266843,48	276,94	280,00	-3,06	profil	9,36
11	9	814426,61	266859,37	276,84	280,00	-3,16	profil	9,99
12	9	814415,74	266869,44	277,10	280,00	-2,90	profil	8,41
13	9	814381,78	266900,91	277,83	280,00	-2,17	profil	4,71
14	9	814366,63	266915,06	278,64	280,00	-1,36	profil	1,85
15	9	814342,44	266937,67	278,42	280,00	-1,58	profil	2,50
16	9	814321,92	266956,27	278,79	280,00	-1,21	profil	1,46
.....								

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External Quality Control

Average errors in blocks

Blocks names	Number of GCP's	RMSE (m)	Max errors	Max errors on GCP's
		PUWG 1992	PUWG 1992	PUWG 1992
9	82	0,56	1,23	0,42
10	47	1,28	1.98	0,56
14	16	0,84	0,87	0,87
15	96	0,73	1,20	1,03
17	18	0,32	0,50	0,24
16	87	0,80	1,45	0,84
21	71	1,43	2,47	0,86

Conclusions

- Quality control proofs that the product meets requirements in terms of geometry and interpretation
- Availability of the satellite imagery even under difficult conditions acceptable (17 000 km2 new scenes during 10 months)
- Overall costs can be significantly reduced for the next campaign by storage of GCP and DTM
- The procedure of building LPIS upon the satellite imagery in due course
- Outsourcing of control tasks guaranty quality and reliability of control

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Presentation 6 – Conclusions - VHR geometric tests and quality control

Simon KAY

JRC/IPSC /MARS Unit

Abstracts

The presentation will summarise the results of the validation campaign carried out in cooperation with Member States and contractors. The results confirm that VHR data are, in general, able to fit inside the geometric requirements of the agricultural policy. However, the level of experience of the organisations and companies responsible is a key factor in terms of the reliability of results.

The main limitation upon image orthorectification quality – in the context of the CwRS checks – is the availability of good ancillary data (DTM, ground control). It would seem that the importance of these elements has been underestimated in a number of projects, and consequently sub-standard orthoimagery has resulted.

Nevertheless, with further training and improved guidelines, it should be expected that the new generation of VHR sensors provides an excellent image resource for the purposes of CwRS checks and the LPIS creation alike.

Keywords: VHR imagery, IKONOS, Quickbird, EROS, orthorectification, validation

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Spaceborne VHR validation, some results

Simon Kay

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Outline

- Image ordering, reception
- Ancillary data: DEM, GCPs
- Another view of results
- The control point hall of fame …

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Image ordering and acceptance

- In general the procedures in the relevant framework contract will apply.
  - order/accept images that meet the suppliers' specification for imagery capable of being successfully orthorectified
- Don't accept an image for which you have been notified by the provider is (or may be) outside of their own QA specification. Give special attention to:
  - remarks concerning image geometry/ephemeris,
  - effects that haze, cloud etc may also have on the usability of data (e.g. GCP identification)
  - usually view angle limited [off-nadir <18degs/incidence angle >72 degs]
    - not a critical part of the VHR test programme
- Few problems reported

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Image ordering and acceptance

- In general, for orthocorrection we today recommend:
  - for Quickbird imagery, default order the "OrthoReady Standard" product.
  - For Ikonos: Geoproduct.
  - Eros: Level 1a.
  - SPOT 5: Level 1a

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DEM

- A DEM is required for all orthorectification work.
  - You should ensure that you are able to locate one, preferably meeting the appropriate specification.
  - In simple terms, this is a model which gives <5m RMSE (vertical) on independent check points
- Typically, this will be derived from the IACS 1:40,000 (or better) flights.
  - DEMs derived from coarser satellite imagery or 1:50,000 mapping, etc., will in general not be appropriate;
  - maps with contours further than 10m apart will usually not be acceptable.
  - If in doubt, the DEM can be tested against GCPs (from GPS survey).
- Warning: The earlier 1999 (v1.5) orthoimage DEM QA guidelines are established for imagery of different geometry and much coarser resolution than our VHR imagery
  - Solution – use v2 of the Guidelines! Now available...

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Ground control and check points

- Our basic premise for GCPs and check points is
  - that they should be of a quality **three times** better than the specification,
    - **i.e. 0.8m RMSE for the 2.5M RMSE specification. (See Chapter 6 of the Orthoimage QA Guidelines).**
- Warning: Chapter 5 of the (satellite) orthoimage recommendations (old version) recommends the use of topographic mapping for GCP generation.
  - This is virtually unfeasible for the 2.5m RMSE specification unless very high quality mapping is available (e.g., 1:2500 OS data in the UK)
  - Solution: Use version 2 of the Guidelines

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Ground control, alternatives

- GPS survey, using appropriate equipment.
  - Standalone, non-differential corrections will not be sufficient; code differential may just meet the requirement but is a risk.
  - Phase (dual or single carrier) differential is the preferred approach.
- LPIS aerial orthophotos primary control (i.e., that surveyed for the aerotriangulation)
- Pass-points, where these are from a reasonable air survey (say, of 1:20,000 scale or larger),
  - where they have been quality controlled, and where their expected RMSE is close to 0.8m, could be used.
- Where really no alternative exists, orthophotos of a final scale of no worse than 1:10,000 could be used

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How many GCPs for rectification + QC?

- While only a few GCPs may be required (normally two to four) to orthocorrect the image, we also need to **check the quality** of the processing.
- Essential to obtain a minimum of 12 points,
  - 15 to 20 points would be a preferred target
  - this is already stated in the Ortho QA Guidelines v2, Chapter 6.
- These points should be spread throughout the image as explained in the Orthoimage QA Guidelines v2, chapter 7
  - basically a 4x4 grid should be used to divide the image space into 16 blocks and a check point acquired inside each one.

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Projections, datums, etc

- Geodetic (centimetre level) precision now required for this work.
- We need to take careful note of the full projection/datum parameters used for the DEM and GCP data.
- Note that some national systems do not accurately convert to GPS compatible systems (e.g. the ETRS89/WGS84 datum used for most image deliveries)
  - Be aware that we will need to obtain this information.

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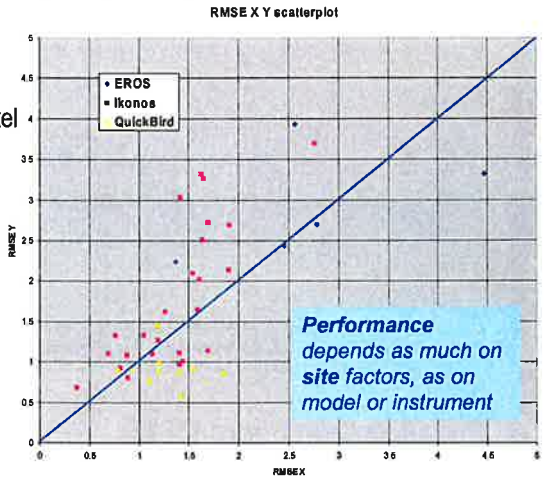
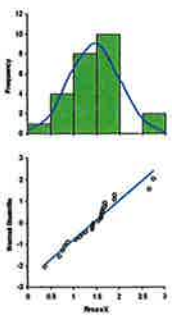
Preliminary results – fit for purpose, LPIS

- Inside regulatory requirements of 2.5m RMSE
- Inside tolerance requirements of 1m pixel size (LPIS requirement)
- Compatibility with GIS management of parcel references



Example:
Normal distribution of results
Upper 95% CI for Ikonos <2m
Ground control requirements
- 2 to 4 GCPs

n	25
Mean	1.447
95% CI	1.221 to 1.673
Variance	0.3007
SD	0.5483
SE	0.1097
CV	38%



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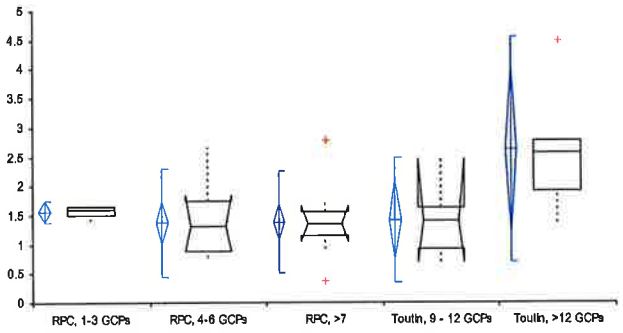
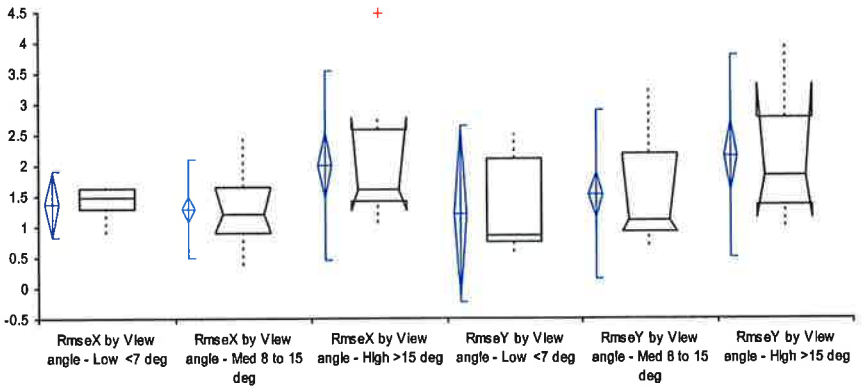
Model comparison...

- Mostly comparable performance, but
  - Statistical comparison yields difference (p = 0.008) (but more analysis required)
  - Statistical comparison identifies Physical model as weakest approach ??
  - **still in course of validation**



View angle: important consideration



- Solution: better DEMs, please.

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Data delivery status 17th Nov

- **On time**
- Agri-Information And Rural Business Center (LT)
- Department Of Agriculture, Agronomy (IACS) (CY)
- DIAS (DK)
- EFTAS (DE)
- Eratosthenes (GR)
- Geoanalysis Sa (GR)
- Geometral (PT)
- Gisat (CZ)
- FÖMI (HU)
- RSAC (UK)
- Tragsatec (ES)

- **Data, but incomplete or not usable**
- GEORAS (NL)
- Ministry for Agriculture, Forestry and Food (SI)
- ICON (IR)
- CTS (BE)
- SCOT (FR)

- **No information**
- AT
- DE
- IT
- MT
- PL
- PT (QuickBird site)

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Control point hall of fame....

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Don't pick 3-D features (DSM vs DTM)

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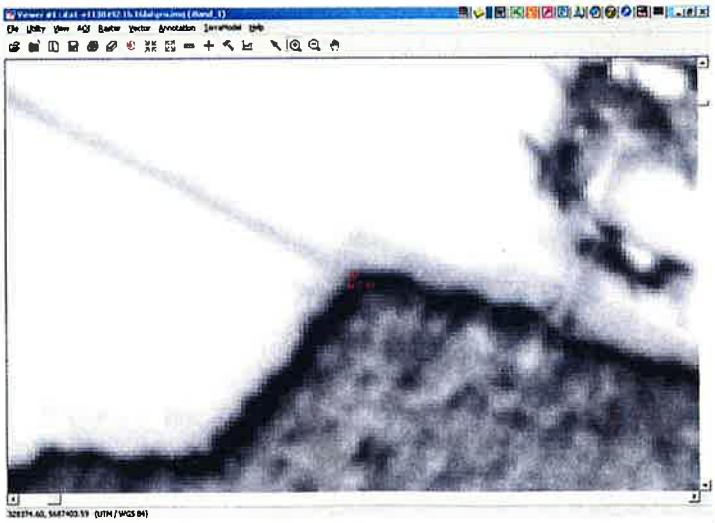
Shaded boundary = feature boundary?



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Er… where?

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Nice start, good overview of distribution…

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Let's zoom in and have a look

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Hmm. A bit strange?

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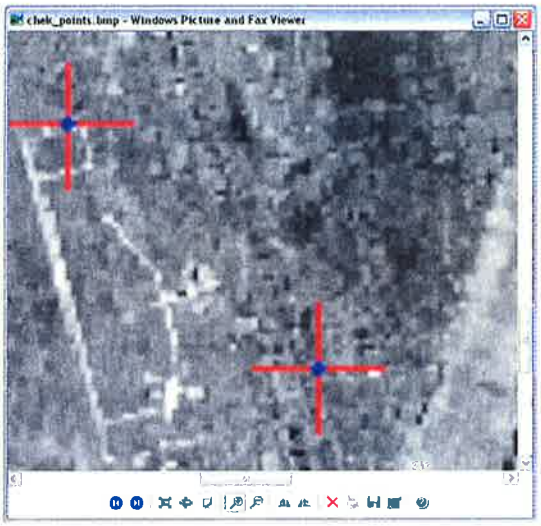
Getting closer…



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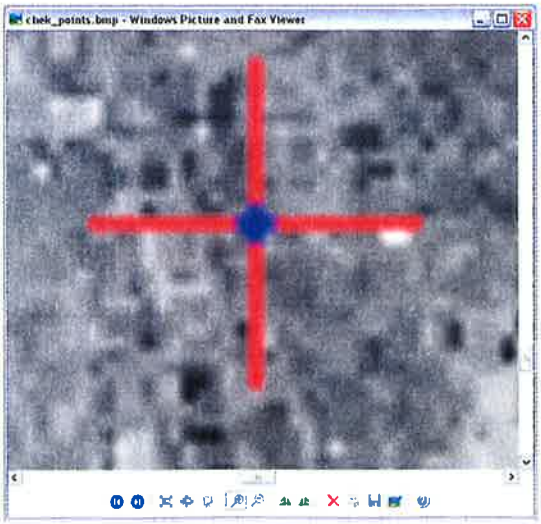
Resolution problem? Was this TM?



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Resolution OK – but where is the point?

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And now – how to do it

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Not bad – white lines (not the trucks…)

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From LPIS?

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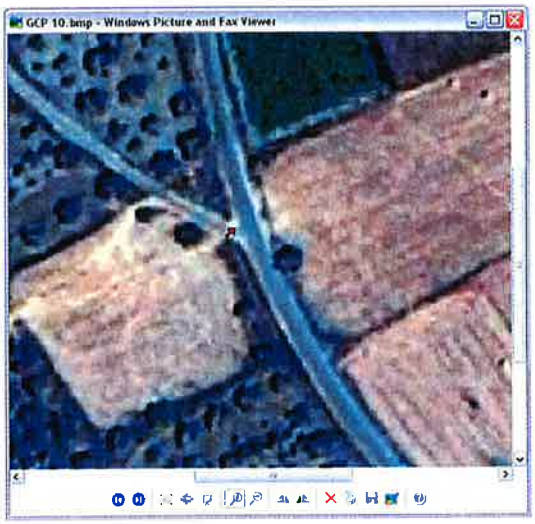
Nicely processed image – a bit short on detail



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Both XS and Pan...

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swe1-e1135293_1b_16bitgeo.img - ERDAS ViewFinder
File Edit View Tools Image Window Help
1:10090
Point #8
618933.20, 6348058.91 (UTM / WGS 84)
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JOINT RESEARCH CENTRE – ISPRA
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Session 5 – CAPI crop identification and parcel measurement with VHR data (+Agri-Environmental AEM issues)

Chairman: Philippe Loudjani - JRC/ IPSC/ MARS Unit