JRC Scientific and Technical Reports

Summary Report on the 2008 Image Acquisition Campaign for CwRS

Maria Erlandsson
Mihaela Fotin
Cherith Aspinall
Yannian Zhu
Pär Johan Åstrand

EUR 23827 EN - 2009

JRC EUROPEAN COMMISSION
ipsc Institute for the Protection and Security of the Citizen
MARS Monitoring Agricultural Resources and Security
id

The mission of the JRC-IPSC is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies.

European Commission
Joint Research Centre
Institute for the Protection and Security of the Citizen

Contact information
Address: Pär-Johan Åstrand
E-mail: par-johan.astrand@jrc.it
Tel.: +39-0332-786215
Fax: +39-0332-786369

http://ipsc.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

JRC 50045

EUR 23827 EN
ISSN 1018-5593

Luxembourg: Office for Official Publications of the European Communities

Printed in Italy

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for the Protection and Security of the Citizen
Agriculture Unit

JRC IPSC/G03/C/PAR/mer D(2008)(9914) /

Report

Summary Report on the 2008 Image Acquisition Campaign for CwRS

Author:	Maria Erlandsson	***Status:***	**v1.1**
Co-author:	Mihaela Fotin, Cherith Aspinall, Yannian Zhu	***Circulation:***	
Approved:	Pär Johan Åstrand		
Date:	22/12/2008 V1.0, 22/01/2009 V1.1	***Int. ref:***	File://S:\FMPArchive\C\9914.doc

Post: Joint Research Centre, IPSC- AGRICULTURE, TP 266, I-21027 Ispra (VA), Italy
Telephone: direct line +39 0332 78 6215
Facsimile: +39 0332 78 6369
E-mail: par-johan.astrand@jrc.it URL: http://mars.jrc.ec.europa.eu/

Contents:

Executive Summary 3

1. Introduction 4

2. The image acquisition campaign 2008 - overview 6

3. The HR data acquisition 8

4. The VHR data acquisition 11

5. Human resources 20

6. Conclusions and Outlook to 2009 Campaign 21

List of Figures:

Figure 1. *Ikonos upload of zone LUNE in FR in CID Quicklook Browser and the modified IDQA structure.* 4

Figure 2. *Overview of the 2008 CwRS Campaign control zones.* 7

Figure 3. *The respective shares of the HR sensors* 10

Figure 4. *CwRS zone HARN in DK, acquired by Ikonos 7 May 2008.* 13

Figure 5. *Worldview 1 over Mausanne test zone, FR. 15/01/2008.* 16

Figure 6. *Schematics of the backup work-flow* 17

Figure 7. *VHR expenditure 2008.* 19

Figure 8. *GeoEye-1, Ljubljana. © Telespazio* 21

List of Tables:

Table 1. *Total expenditure for CwRS Campaigns 2008-2007-2006.* 7

Table 2. *Success rates for the total HR campaign and per acquisition period.*. 9

Table 3. *Area planned and success rates VHR prime.* 12

Table 4. *Number of zones planned and success rates VHR prime.* 12

Table 5. *Zones where the prime sensor failed to acquire imagery, and backup solution* 13

Table 6. *Backup planned and acquired area (in km^2) per sensor.* 14

Table 7. *Backup planned and acquired number of zones per sensor.* 15

Executive Summary

In 2008, the number of farm applications received by MS administrations totalled just over 8,0 M for the 24 MS that use the possibility of EU-financed satellite imagery (all MS except AT, FI, LU). This is a decrease of 6% compared to 2007 (8,5 M applications). The total number of On the Spot controls (OTS) was 612.000, on average 7,6% (c.f. 6,8% in 2007). 338.000 applications (55% of OTS) were controlled using Remote Sensing (c.f. 52% in 2007).

The number of zones requested by the Member States continues to increase. The 2008 Campaign totalled 244 High Resolution (HR) control zones and 264 Very High Resolution (VHR) control zones. Almost 170.000 km^2 were programmed for the prime VHR sensors Ikonos and Quickbird and 535 HR images were acquired. The bad weather over Europe had a significant impact: the VHR success rate was 94% and the HR success rate 91%.

The major changes seen during the Campaign were the following: the number of HR images per control zone continues to decrease from 3,9 in 2005 to 2,3 in 2008. No overlapping windows between HR and VHR were allowed in order to avoid the purchase of duplicate imagery. A change was made during this campaign in that the backup opened 10 days after prime, and like last campaign it was closed in the case of successful acquisition of prime sensor. This more efficient way of programming backup allowed the EC Services to program additional zones, so called “dynamic backup” where the window was coming close to an end without a successful acquisition of the prime sensor. Image providers were requested to “warn” the EC Services concerning the zones in danger of not being acquired. This means an increased efficiency both of the budget use and the backup programming.

The total expenditure for the 2008 Campaign was 5,4 M Euro divided into 3,8 M Euro for VHR imagery and 1,6 M Euro for HR imagery.

The total budget available for the 2009 Campaign shall amount to 7,6 M Euro: 6,5 M Euro from the 2009 budget to be made available by DG AGRI and the remaining 1,1 M Euro of the 2008 budget. Two bulk orders have been prepared for the image providers Eurimage and SPOTImage for imagery to be acquired in 2009. In total this will be enough to cover all MS requests for imagery: in total more than 300 control zones covering 187.000 km^2 and 260 HR zones / 750 HR images.

1. Introduction

1.1. The objective of the document is to summarise the results of the image acquisition campaign carried out by the JRC (IPSC, G03 (Agriculture Unit), CID Action) within the framework of the Control with Remote Sensing 2008.

1.2. The LIODOTNET (Live Image Ordering) system was developed for the 2005 campaign for image acquisition and ordering and has been further developed during the following Campaigns. The main improvement in 2008 was made to the IDQA (Input Data Quality Assessment) structure: instead of filling and uploading an excel file, the IDQA parameters can now be filled in directly. The CID Quicklook Browser, linked to LIODOTNET, allows the viewing and downloading of georeferenced quicklooks (all VHR data and SPOT HR data).

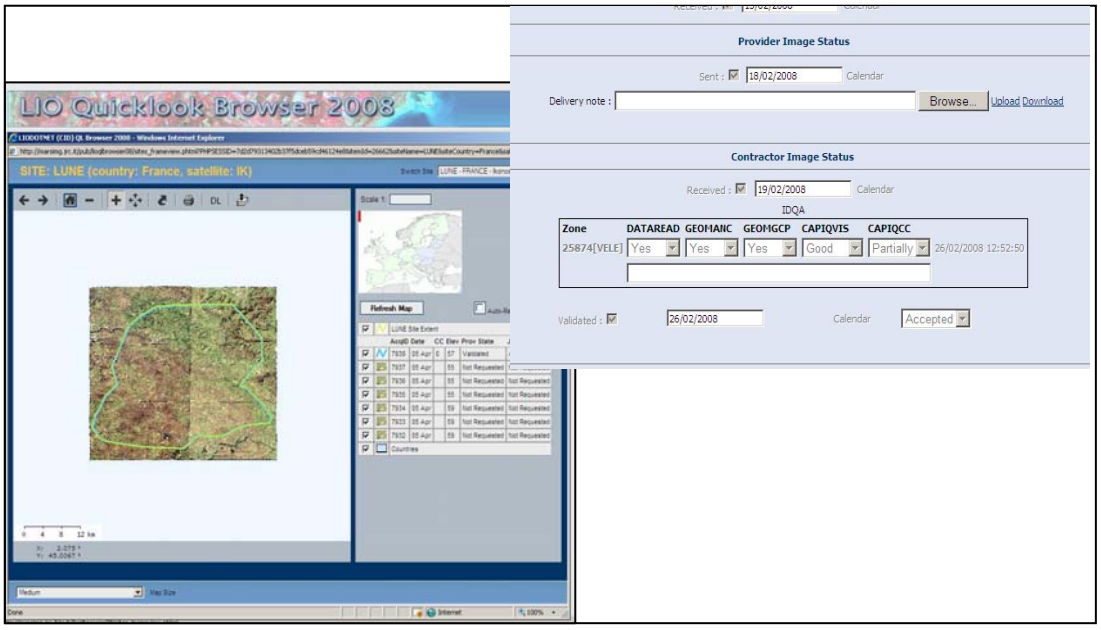

Figure 1. *Ikonos upload of zone LUNE in FR in CID Quicklook Browser and the modified IDQA structure.*

1.3. All orders have been made using JIPSY, the JRC financial software which interfaces to ABAC. The LIODOTNET/JIPSY interface automatically retrieves the JIPSY order number and transfers technical and pricing information from LIODOTNET to the financial database of JIPSY.

1.4. The 14 Framework contracts (FCs) that were signed in 2006 with concerned image providers were renewed for another year. They can be renewed up to three times i.e. the maximum validity is 4 years. The FCs used in the CwRS campaign are with SPOTImage (SPOT and Formosat2 sensor data), Eurimage (Quickbird and Landsat5 data), Euromap

(IRS sensor data), European Space Imaging (EUSI) (Ikonos sensor data), ImageSat International (EROS A and EROS B sensor data), DMC International Imaging (DMC sensor data), Infoterra (TerraSAR-X sensor data).

1.5. During the year several meetings have taken place with (mainly the VHR) image providers. In February a meeting was held in Ispra with Eurimage and EUSI during the feasibility study. In March a meeting was held in Ispra with the VHR backup providers: SPOTImage and ImageSat. In June, SPOTImage visited Ispra. In October Action Leader P.Åstrand participated at the Eurimage annual conference. In November a meeting was held with Infoterra in Ispra. During the GEOCAP annual conference in Ljubljana bilateral meetings with Eurimage and EUSI took place as well as a meeting with all image providers. These meetings are considered essential for the well functioning of the Campaign and the understanding of the sensors' efficiency.

2. The image acquisition campaign 2008 - overview

2.1. The total number of farmers applications received by MS administrations totalled just over 8,0 M for the 24 MS that use the possibility of EU-financed satellite imagery (all except AT, FI, LU). This is a decrease of 6% compared to 2007 (8,5 M applications).

2.2. The total number of On the Spot controls (OTS) was 612.000, on average 7,6% (c.f. 6,8% in 2007). 338.000 applications (55% of OTS) were controlled using Remote Sensing (c.f. 52% in 2007).

2.3. The number of control zones requested by the Member States continued to increase. The 2008 Campaign totalled 244 High Resolution (HR) control zones and 264 Very High Resolution (VHR) control zones. Almost 170.000 km^2 were programmed for the prime VHR sensors Ikonos and Quickbird. In addition 6 zones in FR were programmed with SPS/WV1 as backup to aerial photography.

2.4. As in 2007, 24 MS participated in the CwRS campaign. DK, LV, MT, PL required only VHR data. PT required only HR data. The remaining 19 used both VHR and HR data.

2.5. Acquisition of HR imagery had an overall success rate of 91% due to the bad weather (c.f. 97% in 2007).

2.6. The VHR campaign had a success rate of 94% based on area. The main reason for this was the bad weather during most of the spring and summer, and to a lesser extent conflicts (congestion and/or internal competition) between zones (BE, NL, DE, and northern FR).

2.7. In total 14 zones were not acquired with VHR prime data. 6 of these were located in IE. Two DE zones were not feasible for either of the 2 prime sensors at Campaign start and were therefore programmed with EROSB/SPS.

2.8. To ensure the overall success of the Campaign, 4 zones in PL were changed from QB to IK during July. This is an example of the close follow-up and careful monitoring necessary during the Campaign to ensure success.

2.9. The total expenditure for the 2008 Campaign was 5,4 M Euro distributed as follows: 3,21 M Euro for VHR prime imagery, 0,6 M Euro for VHR backup, 1,59 M Euro for HR data. The HR expenditure includes 0,18 M Euro that was spent on the 2007 budget for autumn imagery acquired in 2007. Similarly, the VHR expenditure includes 0,07 M Euro for VHR imagery acquired for ES on olive groves in December 2007 for the 2008 Campaign. See Table 1.

Type of Image	Expenditure 2008 Campaign (M Euro)	Expenditure 2007 Campaign (M Euro)	Expenditure 2006 Campaign (M Euro)
HR optical	1,41	1,91	1,95
SAR	n/a	0,04	0,15
VHR prime	3,14	3,13	3,02
VHR backup	0,60	0,3	
HR autumn on previous year's budget	0,18	0,2	0,17
VHR on previous year's budget	0,07	n/a	n/a
Total Expenditure	**5,4**	**5,58**	**5,29**

Table 1. *Total expenditure for CwRS Campaigns 2008-2007-2006.*

2.10. The administrative performance of all actors involved (JRC, Image Providers, Member States Administrations, Contractors) has generally been good, with overall few delays. Many contractors are slow when it comes to acknowledging receipt and validating imagery.

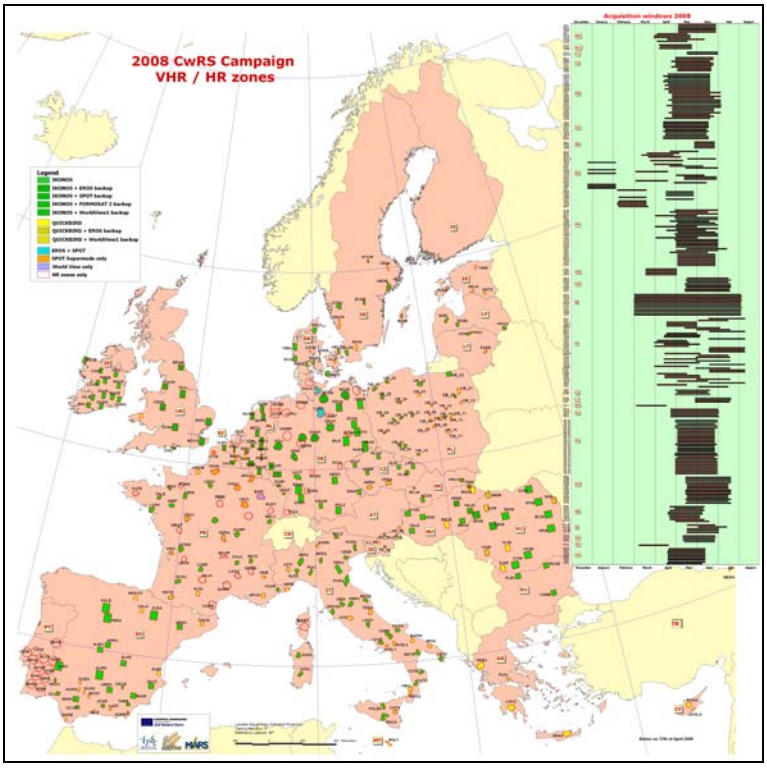

Figure 2. *Overview of the 2008 CwRS Campaign control zones.*

3. The HR data acquisition

3.1. The 2008 image acquisition campaign totalled 244 HR zones (c.f. 227 in 2007): 196 VHR + HR and 48 HR (in combination with aerial photography acquired and paid for by the MS).

3.2. In comparison to 2007, the VHR + HR zones increased by 15% and HR-only zones decreased by 16%. The total number of HR zones increased by 7%.

3.3. Due to the low interest during the two previous campaigns, no backup to HR optical data with SAR was planned. However radar data of very high resolution was used as an emergency backup, see chapter 4.

3.4. The names of the acquisition windows were modified from the “seasons” (winter, spring, summer, etc.) to indicate their relative position to the VHR window. Consequently, an HR window opened before the VHR window was named HR-1, the HR window following the VHR window was named HR+1, etc.

3.5. At the kick-off meeting, in total 568 images were planned to be acquired. During the campaign this number increased to 606. The increase was mainly due to an additional window in PT and additional images requested in FR. However it is important to note that the EC Services agreed to this increase after it was evident that many acquisition requests were failing, and that there was enough budget available to allow such an increase.

3.6. Consequently the number of planned HR images per zone continued to decrease from 3,6 in 2006; 3,0 in 2007; and 2,3 for the 2008 campaign.

3.7. In addition to the “traditional” HR windows, a SPOT5 image was programmed during the VHR window for the zones with B&W (PAN) backup. This is to make sure that there is a multispectral component available in addition to the PAN backup. In total 47 such HR(VHR) windows were planned.

3.8. Since in some cases the VHR image was acquired late, some MS (FR, ES) requested an archive search for HR imagery acquired during the first part of the VHR window. This occurred 5 times.

3.9. As in previous years, the HR acquisition campaign is based on a “first come first served approach”, meaning that the EC Services order the first validated image that is uploaded. If more than one validated image is uploaded during the same day the contractor is asked to make a choice between the images.

3.10. The HR sensors participating in the Campaign were SPOT 2 (20m, 3 MSP bands), SPOT 4 (20m, 4 MSP bands including 1 Short wave infrared (SWIR)), SPOT 5 (10m, 4 MSP bands including SWIR (20m)), Landsat 5 (30m bands 1-5, 60m band 7), IRS P6 (23m, 4 MSP bands including SWIR) and DMC (32m, 3 MSP bands).

3.11. During this Campaign the MS were asked if they wanted to exclude SPOT2 since it lacks the SWIR band. This was requested by 6 MS (CZ, HU, IT, LT, RO, SE) for 50 zones. NL excluded SP2 for the last window, in total 8 zones. Such exclusion is accepted by EC Services although the contractors are made aware of the fact that available sensors and therefore acquisition possibilities decrease upon such choice.

3.12. DMC were programmed over a maximum of one window per site after acceptance of the MS. However, only 2 countries (DE [EFTAS], BG) agreed to program DMC. One scene covering 2 zones was purchased.

3.13. During this campaign no overlapping windows (VHR-HR) were allowed. Consequently there was no need to close the HR acquisition window due to the successful acquisition of a VHR image. The only exception was IE where overlapping windows were allowed due to the very long (6 months) VHR acquisition window.

3.14. In total 594 of the 606 planned windows were finally opened. Due to the bad weather situation which caused many extensions during the HR+1 window, 12 ARs were never published (5 in UK, 7 in DE).

3.15. A total of 538 images out of the 594 planned were acquired with a total success rate of 91%. In addition, 29 of the 47 SPOT5 scenes in the HR(VHR) window were acquired.

Period	Total Zones opened	Closed	Accepted	Failed	Success rate 2008
Autumn	95	2	88	5	**95%**
Winter	39	0	38	1	**97%**
HR-1	170	1	141	28	**84%**
HR+1	200	0	188	12	**94%**
HR+2	85	0	80	5	**94%**
Archive search during VHR window to compensate for late/failed VHR	5	0	3	2	**60%**
Campaign total	**589**	**3**	**535**	**51**	**91%**
HR(VHR) window	47	13	29	5	**89%**

Table 2. *Success rates for the total HR campaign and per acquisition period.*.

3.16. The SPOT constellation of sensors (SPOT2, 4, 5) acquired 90% of the imagery (c.f. 90% in 2007 and 81% in 2006). IRS P6 acquired 9% (c.f. 5% in 2007 and 6% in 2007), LANDSAT5 1% (c.f. 5% in 2007 and 12% in 2006). DMC acquired one scene which covered 2 zones, which corresponds to 0,4% (c.f. 0,2% in 2007 and 1% in 2006).

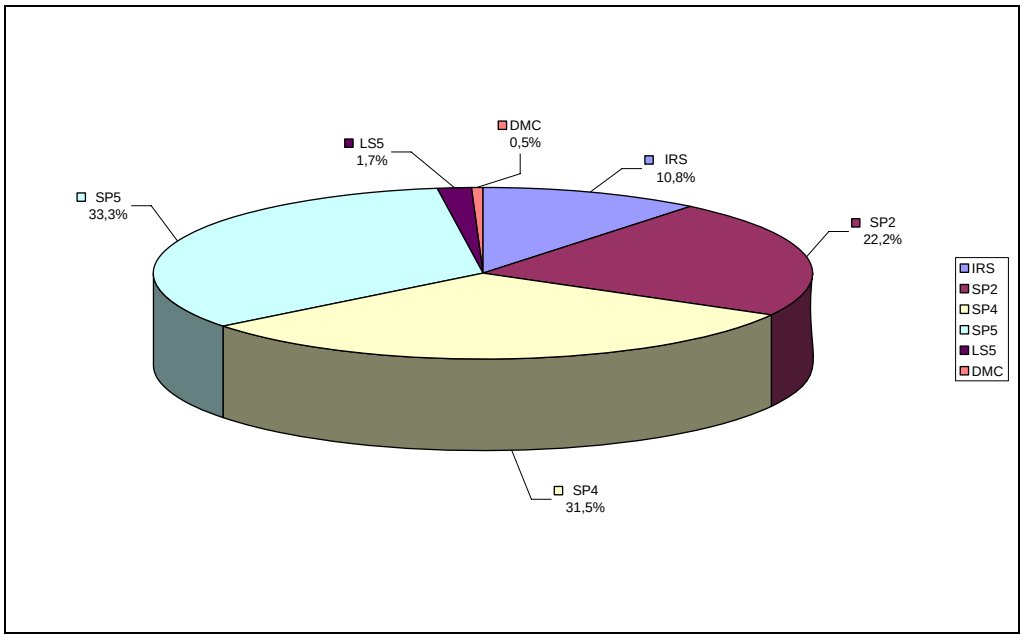

Figure 3. *The respective shares of the HR sensors*

3.17. The total spending on HR imagery amounted to 1,59 M Euro (c.f. 2,11M Euro in 2007), excluding the SPOT5 imagery acquired during the backup window (0,14 M). 0,18M was paid from the 2007 budget for imagery acquired during autumn 2007. The expenditure for SPOT5 imagery acquired as backup (0,14 M) has been taken into account as VHR backup expenditure.

3.18. The expenditure of 1,59 M was divided into 92% (1,46 M Euro) for SPOT imagery (c.f. 93% in 2007); 8% (0,12 M Euro) for IRS P6 (c.f. 5% in 2007), 0,5% (7,6 k Euro) for LANDSAT5 (c.f. 2% in 2007) and 0,2% (2,9 k Euro) for DMC (c.f. 0,04% in 2007).

3.19. The average cost per image, including delivery costs, was 2.962 Euro (c.f. 3.212 Euro in 2007 and 3.048 Euro in 2006).

3.20. The average cost for HR data per control zone was 6.531 Euro (c.f. 9.296 Euro in 2007 and 11.003 Euro in 2006).

4. The VHR data acquisition

4.1. Introduction

4.1.1. The 2008 image acquisition campaign totalled 264 VHR control zones: 196 where the control strategy is a VHR image taken during spring and one or more HR images, and 68 zones where controls are made with a VHR image in combination with a Rapid Field Visit (RFV). The number of zones has increased by 41 c.f. 2007 (18%). In addition, 6 zones where programmed as back-up to aerial photography in FR.

4.1.2. The total area planned for the dedicated sensors Ikonos (1m PAN, 4m MSP) and Quickbird (60 cm PAN, 2,4m MSP) were 167.650 km^2 divided over 262 zones; 248 zones/155.883 km^2 were acquired.

4.1.3. This was the first campaign where 2 zones were considered not feasible by either Ikonos or Quickbird before the campaign start. The 2 zones, both situated in DE, were programmed with EROS B and SPS to increase the chances of acquisition. Total area of the 2 zones 2.719 km^2. The area acquired is taken into account in the success rate of the backup sensors since EROS B and SPS are PAN only.

4.1.4. Backup was planned over 56 zones, in total 47.297 km^2. New this Campaign was that the backup opened 10 days after prime, and like last Campaign it was closed in the case of the successful acquisition of prime sensor. The zones for backup programming were chosen in cooperation with the Image Providers, taking the MS requests into account.

4.1.5. This more efficient way of programming backup allowed the EC Services to program additional zones, so called “dynamic backup” where the window was coming close to an end without a successful acquisition of the prime sensor. Image providers were requested to “warn” the EC Services concerning the zones in danger of not being acquired. In this way 13 additional zones were programmed covering 8.982 km^2.

4.1.6. The backup sensors used were EROS A (1,8m PAN), EROS B (70cm PAN), SPOT 5 Supermode (SPS) (2,5m PAN), Formosat2 (FS2) (2m PAN, 8m MSP) and Worldview1 (WV1) (50cm PAN). WV1 was launched in September 2007, benchmarked by CID and introduced as a new sensor this Campaign. All backup sensors are PAN only, except Formosat2 which was programmed in the Bundle mode.

4.1.7. To ensure a multispectral component in the case of PAN backup, a SPOT5 10m HR image was programmed during the same time window as the backup sensor.

4.1.8. The average length of an acquisition window (as requested by the MS) was 60 days, slightly higher than previous campaigns (c.f. 53 days in 2005, 2006, 2007). The average time needed to complete a zone from the opening date was on average 28 days. For Ikonos it was 27 days (c.f. 16 days in 2007) and Quickbird 30 days (c.f. 29 days in 2007). Here it has to be noted that Ikonos has acquired approx. 82% of the VHR prime volume during the 2008 campaign.

4.1.9. The average VHR zone area per MS was 645 km^2 (c.f. 669 km^2 in 2007 and 764 km^2 in 2006). The average Ikonos zone was 738 km^2 (c.f. 801 in 2007) and the average Quickbird zone was 386 km^2 (c.f. 547 in 2007).

4.2. VHR Prime

4.2.1. Ikonos was originally planned for 184 zones. Out of these, 2 zones in DE were closed on June 30th on the request of the regional administration. One zone in DE planned as VHR prime was swapped with a zone planned for aerial photography due to flight restrictions. 4 zones in PL were re-allocated from QB to IK to ensure the successful acquisition of all PL zones. Thereby the final number of Ikonos zones was 186, covering 135.782 km^2. 176 zones/127.322 km^2 were acquired successfully, giving a success rate of 94% (based on the area). This is a significant decrease compared to 2007 (98%) and 2006 (100%). 16 acquisition requests (9%) were extended (c.f. 4% in 2007). Detailed information is given in Tables 3 and 4 below.

4.2.2. Quickbird was planned for 78 zones, 30.394 km^2. 72 zones/28.561 km^2 were acquired successfully. Part of a zone in IT was re-tasked due to a high cloud cover in the northern part of the AOI. The success rate based on area was 94%, c.f. 93% in 2007 and 100% in 2006. 21 Acquisition Requests (ARs) (27%) were extended (c.f. 26% in 2007). Detailed information is given in Tables 3 and 4 below.

Prime sensors (km2)	Ikonos	Quickbird
Planned	137.256	30.394
Swapped	817	-817
Added DE	1.421	0
Closed DE	3.712	0
Acquired	127.322	28.561
Sucess rate	**94%**	**94%**

Table 3. *Area planned and success rates VHR prime.*

Prime sensors (no of zones)	Ikonos	Quickbird
Planned	184	78
Swapped	4	-4
Added DE	1	0
Closed DE	-3	0
Acquired	176	72
Sucess rate	**95%**	**92%**

Table 4. *Number of zones planned and success rates VHR prime.*

4.2.3. In total, 14 zones did not receive the VHR prime data. The table below shows their location and the backup solution chosen by MS administrations to carry out the controls.

Country	Zone	Prime (failed)	Backup solution
BE	FAUV	IK	SPS + SP5
BE	MAAS	IK	SPS + SP5
DE	DALD	not feasible	EROS B, SPS, SP5
DE	LAUT	IK	TSX test
DE	LUED	not feasible	EROS B, SPS, SP5
DE	SOLI	IK	SPS + SP5
FR	CROM	QB	Aerial photo acquired by MS
IE	BELM	IK	EROS B + TSX StripMap archive data
IE	FERB	IK	TSX SpotLight
IE	KILM	IK	Field inspections
IE	MALL	IK	TSX SpotLight
IE	THUR	IK	Field inspections
IE	VIRG	IK	TSX StripMap archive data
SI	KZ08	QB	Backup prog. declined- Field inspections

Table 5. *Zones where the prime sensor failed to acquire imagery, and backup solution*

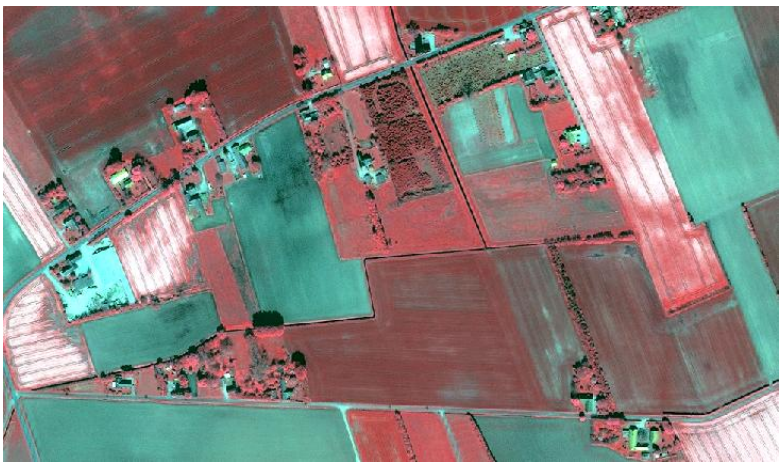

Figure 4. *CwRS zone HARN in DK, acquired by Ikonos 7 May 2008.* © European Space Imaging, EUSI 2008.

4.3. VHR Backup

4.3.1. EROS A and B were originally planned for 25 zones, 19.223 km^2. The Image Provider was given the freedom to choose where to program EROS A and where to program EROS B. However in some cases (CZ, NL, RO and SK) the contractor requested to receive EROS B. 18 zones were acquired and 7 closed. Out of the 18, 4 zones/ 2.820 km^2 were acquired with EROS A. 14 zones/9.755 km^2 were acquired with EROS B. 65% of the area planned for backup was acquired. The division between the two sensors were 22% EROS A and 78% EROS B. Detailed information is given in tables 6 and 7 below.

Backup sensors	**EROS A**	**EROS B**	**SPS**	**FS2**	**WV1**	**TOTAL**
Planned	**19.223**		**16.453**	**7.519**	**4.837**	**48.032**
Closed	6.648		4.697	374	4.665	
Failed	0	0	0	0	0	
Acquired	2.820	9.755	11.756	7.145	172	**31.648**
Dynamic backup	0	5.038	2.145	0	1.799	**8.982**
Closed		1.197	361	n/a	1.421	
Failed		2.397	0	n/a	378	
Acquired dynamic		1.444	1.784	n/a	0	**3.228**
Total acquired	**2.820**	**11.199**	**13.540**	**7.145**	**172**	**34.876**
Planned backup to aerial	n/a	n/a	3.683	n/a	1.020	**4.703**
Closed			2.941		1.020	
Failed			0		0	
Acquired			742		0	**742**

Table 6. *Backup planned and acquired area (in km^2) per sensor.*

Backup sensors	EROS A	EROS B	SPS	FS2	WV1	Total
Planned	25		14	7	4	**50**
Closed	7		4	-	3	**14**
Failed	0		0	-	-	**-**
Acquired	4	14	10	7	1	**36**
Dynamic backup		8	3	-	2	**13**
Closed		2	1	-	1	4
Failed		4	0	-	1	5
Acquired dynamic		2	2	-	-	**4**
Total acquired	4	16	12	7	1	**40**
Planned backup to aerial	n/a	n/a	5	n/a	1	**6**
Closed			4		1	**5**
Failed			-			-
Acquired			1			**1**

Table 7. *Backup planned and acquired number of zones per sensor.*

4.3.2. 8 additional dynamic backup zones covering 5.038 km^2 were programmed with EROS B. 2 zones/1.197 km^2 closed due to acquisition of prime, 4 zones/ 2.397 km^2 failed (IE) and 2 zones/ 1.444 km^2 were acquired. 29% of the area planned for dynamic backup was acquired.

4.3.3. SPS was programmed for 14 zones/ 16.453 km^2. These figures do not include the backup to aerial photography mentioned in section 4.19. 4 zones/ 4.697 km^2 closed due to acquisition of prime sensor and 10 zones/11.756 km^2 were acquired. 71% of the area planned for backup was acquired. Detailed information is given in tables 6 and 7 above.

4.3.4. 3 additional dynamic backup zones/ 2.145 km^2 for SPS were added. 1 zone/ 361 km^2 was closed and 2 zones/1.784 km^2 were acquired. 83% of the area planned for dynamic backup was acquired.

4.3.5. Formosat 2 was programmed for 7 zones, 7.519 km^2. All zones were acquired, 3 of which partial coverage only, in total 7.145 km^2. 95% of the area planned for backup was acquired. No additional dynamic FS2 backup was programmed. Detailed information is given in tables 6 and 7 above.

4.3.6. The newcomer Worldview 1 was programmed for 4 zones, 4.837 km^2. Only 1 partial zone with as little as 172 km^2 was acquired, corresponding to 4%. It is evident that the availability of WV1 for future Campaigns remains to be proven. Detailed information is given in tables 6 and 7 above.

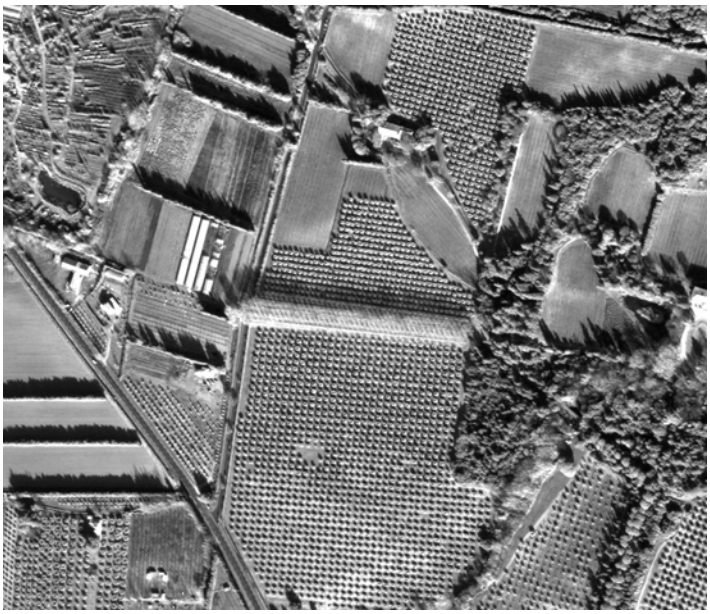

Figure 5. *Worldview 1 over Mausanne test zone, FR. 15/01/2008.*

4.3.7. 2 additional dynamic backup zones/ 1.799 km^2 were programmed with WV1. 1 zone/ 1.421 km^2 was closed and 1 zone/ 378 km^2 failed.

4.3.8. In FR, satellite imagery was requested as backup to aerial photography over 6 zones, 4.703 km^2. Five zones/3.683 km^2 were programmed with SPS and 1 zone/1.020 km^2 was programmed with Wv1. Five of the zones were acquired with aerial photography and the backup programming was closed on request by the FR administration. One zone, 742 km^2, was acquired by SPS. Detailed information is given in tables 6 and 7 above.

4.3.9. TerraSAR-X (TSX) was programmed free of charge for 5 test zones in CZ, DE, ES, FR, NL. At the end of the Campaign, during the second half of August, TSX was also programmed as emergency backup over 2 zones in IE where the situation was critical. For 2 other zones archive data was purchased.

4.4. Survey on usage of VHR Backup imagery

4.4.1. After campaign end a survey was made on the usage of backup. The schematics of the backup work-flow are shown in the figure below. In total 41 zones covering approx. 35.000 km^2 was acquired with VHR data.

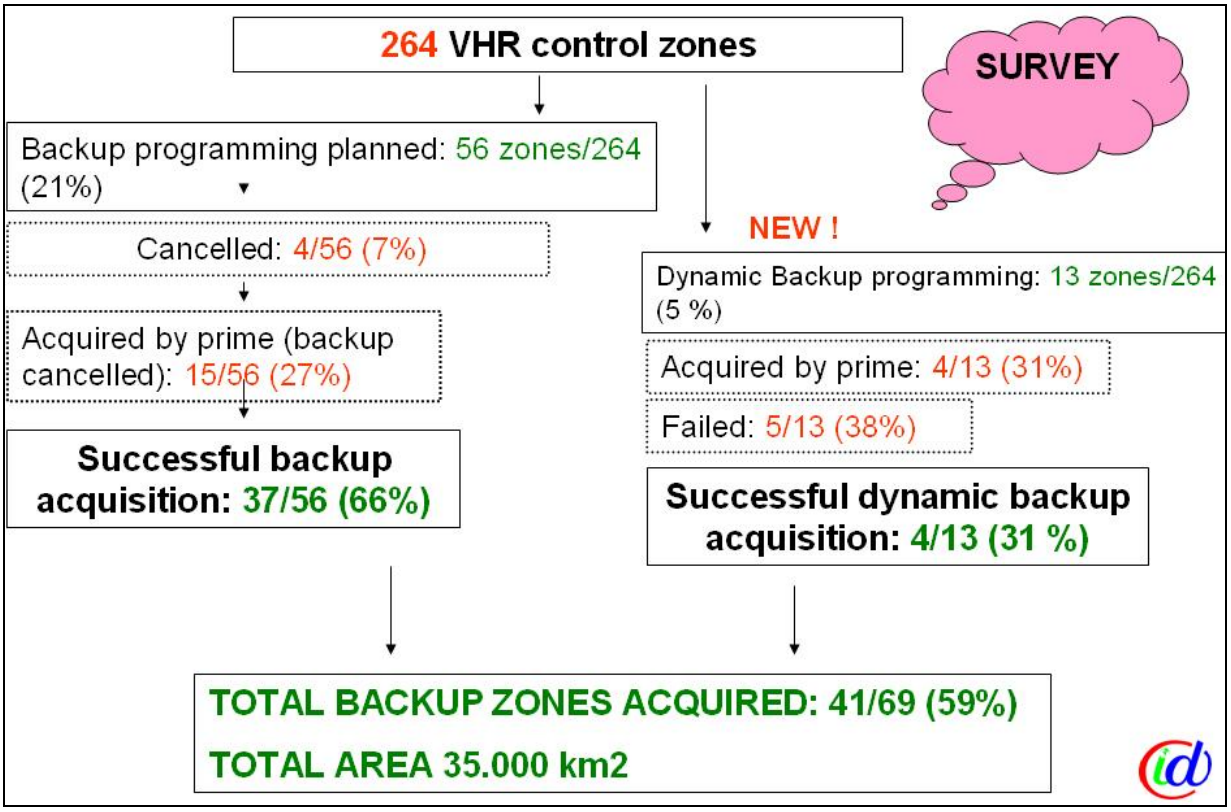

Figure 6. *Schematics of the backup work-flow*

4.4.2. The backup imagery for 23 of the 41 zones (56%) was considered redundant by the contractors. Out of these, 15 were not used at all due to full coverage by the prime sensor, 5 were orthorectified and thereafter not used, and 3 were used for area measurements as a complement to the VHR prime.

4.4.3. The backup imagery for 18 of the 41 zones (44%) was considered necessary by the contractors. 2 were found useful since there was a long time lag between the partial acquisitions of the VHR prime, 15 out of the 18 were used for area measurements and for one zone the contractor did not specify why the backup was “necessary”.

4.4.4. The 15 zones used for area measurements were useful because: the prime sensor failed, or only partial acquisition (9 zones), the prime was cloudy (1 zone), no answer (5 zones).

4.4.5. 36 of the 41 backup zones also received the multispectral component. For 12 zones, the contractors found the multispectral component useful. 9 of the 12 were used for area measurements together with the VHR prime, and 3 were used as a complementary image for a time period when no other data was available.

4.4.6. For 24 zones out of the 36 zones that received the multispectral component, the contractor considered the multispectral component redundant. 6 zones were zones where the programming of VHR backup had been cancelled, 15 were not useful because of full coverage of the prime sensor, and 3 were not used due to problems to create a pansharp image (merging the SPOT 5 with VHR pan data).

4.4.7. Other conclusions drawn from the backup survey are: orthorectification problems are reported for 11 of the 41 zones, mainly for EROS A/B. Further, the methodology used during 2008 campaign is appreciated and will be used also in 2009, the organization of the dynamic backup works well and feedback from the image providers is vital, the success rates of the dynamic backup window are lower since the window is very short (1-2 weeks).

4.4.8. Concerning the orthorectification problems, it was concluded that it is essential to use DEMs with good quality. Also, good GCPs and good check points need to be used (ref: JRC guidelines in WikiCAP (http://marswiki.jrc.ec.europa.eu/wikicap/index.php).

4.5. VHR Expenditure

4.5.1. The total expenditure on VHR imagery for the CwRS 2008 campaign was 3,803 M Euro. 70k Euro was taken from the 2007 budget for the ES zones acquired during December 2007 for the 2008 campaign. 3,207 M Euro (84%) was spent on the prime sensors Ikonos and Quickbird and 0,596 M Euro (16%) was spent on backup imagery.

4.5.2. 68% of the total VHR expenditure was spent on Ikonos, 16% Quickbird. EROS A and B have the largest share of the backup sensors: 5 %. 4% of the expenditure was SPOT5, 3% was spent on TerraSAR-X, 2 % for SPS, 1% for FS2 and 0,1% was spent on WV1.

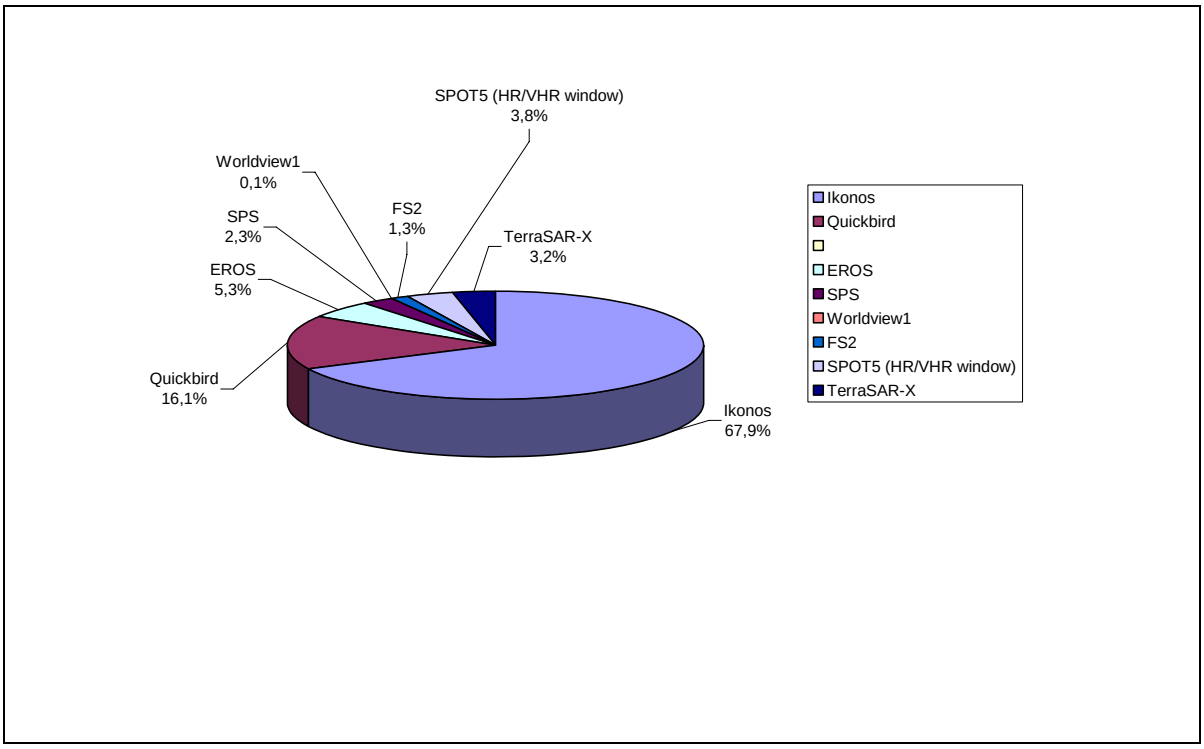

Figure 7. *VHR expenditure 2008.*

5. Human resources

5.1. The IPSC, G03 (Agriculture Unit) devotes considerable resources for the real time management of the image acquisition of the DG AGRI budget line, including:

- Preparation of the Campaign: interface with MS and National contractors, technical feasibility assessment with Image Providers
- Real time image acquisition, validation, ordering, delivery
- Final archiving of the imagery
- Development of an on-line accessible archive (CID Image portal)
- Development and maintenance of LIODOTNET (Live Image Ordering DB)
- Development and maintenance of the CID QUICKLOOK Browser

5.2. 3,5 - 4 person-years are dedicated to image acquisition related activities. With the present number of zones and imagery, this task remains a very intensive one especially during the crop growing season April - September. With the new GAEC requirements from the MS, image acquisition is starting to become a year-round activity.

6. Conclusions and Outlook to 2009 Campaign

6.1. The 2008 CwRS was a demanding campaign, the number of zones and the area was close to the capacity of the 2 prime VHR sensors. The bad weather during most of the spring and summer caused low success rates. For the first time 2 zones were considered not feasible and were programmed with VHR pan only.

6.2. For 2009 the MS requests are more than 300 VHR control zones/187.000 km^2 to be covered. The 2 prime sensors will be Ikonos and Quickbird like previous years. GeoEye-1 will be benchmarked by CID and included as prime sensor if orthorectification results are satisfactory. MS requests for HR data total approx. 260 HR zones/ 750 HR images. Also RapidEye will be benchmarked and possibly included as HR sensor.

Figure 8. *GeoEye-1, Ljubljana. © 2008 GeoEye Inc. All Rights Reserved, distributed by Telespazio S.p.A*

6.3. The budget for the 2009 Campaign amounts to 6,5M Euro like in 2008. However an amendment to the work programme makes it possible to use the remaining budget (approx. 1,1M Euro) for imagery to be acquired in 2009. Two bulk orders have been prepared for the image providers Eurimage and SPOTImage for imagery to be acquired in 2009.

6.4. The CID team will take the same approach as in 2008 for the backup programming (opening 10 days after prime, cancelled when acquired by prime, prime not extended if backup available, always ensuring a MSP component in the case of VHR pan only, dynamic backup). In this way the budget is used in a most efficient way.

6.5. There will be a closer link between LIODOTNET and the CID portal concerning image return/archiving.

6.6. Further, a new ITT will be launched for new FCs for the purchase of satellite imagery with preliminary starting date in January 2010.

(end document)

European Commission

EUR 23827 EN – Joint Research Centre – Institute for the Protection and Security of the Citizen
Title: Summary report on the 2008 Image Acquisition campaign for CwRS
Author(s): Maria Erlandsson, Mihaela Fotin, Cherith Aspinall, Yannian Zhu, Pär Johan Åstrand

Luxembourg: Office for Official Publications of the European Communities
2009 – 26 pp. – 21 x 29.7 cm
EUR – Scientific and Technical Research series – ISSN 1018-5593

Abstract

The objective of the document is to summarise the results of the image acquisition campaign carried out by the JRC (IPSC, (IPSC, G03 (Agriculture Unit), CID Action) within the framework of the Control with Remote Sensing 2008.

The mission of the IPSC is to provide research results and to support EU policy-makers in their effort towards global security and towards protection of European citizens from accidents, deliberate attacks, fraud and illegal actions against EU policies