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Summary Report of the 2009 CwRS Image Acquisition Campaign

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Report

Summary Report of the 2009 CwRS Image Acquisition Campaign

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Executive Summary

In 2009, the number of farm applications received by MS administrations totalled just over 7,1 M for the 25 MS that use the possibility of EU-financed satellite imagery (all MS except FI & LU). This is a decrease of 11,25 % compared to 2008 (8,0 M applications). The total number of On the Spot controls (OTS) in 2009 was 690,000 (cf. 629,000 in 2008 & 598,000 in 2007), 420.000 applications (61% of OTS) were controlled using Remote Sensing (cf. 55% in 2008).

The number of zones requested by the Member States continued to increase, 249 HR zones planned (cf. 244 in 2008). 285 VHR zones planned (cf. 264 in 2008).The 2009 Campaign totalled **247** High Resolution (HR) control zones and **285** Very High Resolution (VHR) control zones. Almost **175.758** km^2 were programmed for the prime VHR sensors Ikonos, Quickbird and GeoEye1 [174.706 km2 acquired]; **23.946** km^2 planned for back-up [22.268 km2 acquired]. **655** HR images were acquired. VHR success rate was **99%** [on area] (283 zones acquired) and the HR success rate was **95 %** (3% windows closed at contractors' request as imagery not needed]. Bad weather over Europe in late July had an impact principally on HR acquisitions (HR+2) - 5 DE windows failed

The number of HR images per control zone decreased from 3,9 in 2005 to 2,3 in 2008, but increased in this Campaign 2009 to 2,7 - due to the larger budget available to satisfy MS requests (use of remaining 2008 budget for bulk orders).

The total expenditure for the 2009 Campaign was **6,03** M Euro divided into **3,9** M Euro for VHR imagery and **2,13** M Euro for HR imagery.

The budget available for the 2010 Campaign will amount to **8,2** M Euro: 6,5 M Euro from the 2010 budget to be made available by DG AGRI and the remaining **1,7** M Euro of the 2009 budget. In order to make efficient use this remaining budget, two bulk orders from the remaining 2009 budget will be prepared for the image providers e-GEOS (1.011.800 Euro) and SPOTImage (675.000 Euro) for imagery to be acquired in 2010. In total this will be enough to cover all MS requests for imagery during the upcoming Campaign.

1 Introduction

1.1.1 The objective of this document is to summarise the results of the image acquisition campaign carried out by the JRC (IPSC, CID Action) within the framework of the Control with Remote Sensing 2009.

1.1.2 The LIODOTNET (Live Image Ordering) system was developed for the 2005 Campaign for image acquisition and ordering and has been further developed during subsequent Campaigns. An example of an improvement made in 2009 is the inclusion of the image providers completing their image return for imagery sent to the JRC via ftp, this link is completed in Lio.Net in real time. The CID Quicklook Browser, linked to LIODOTNET, is still used efficiently and allows the viewing and downloading of georeferenced quicklooks (all VHR data and SPOT HR data).
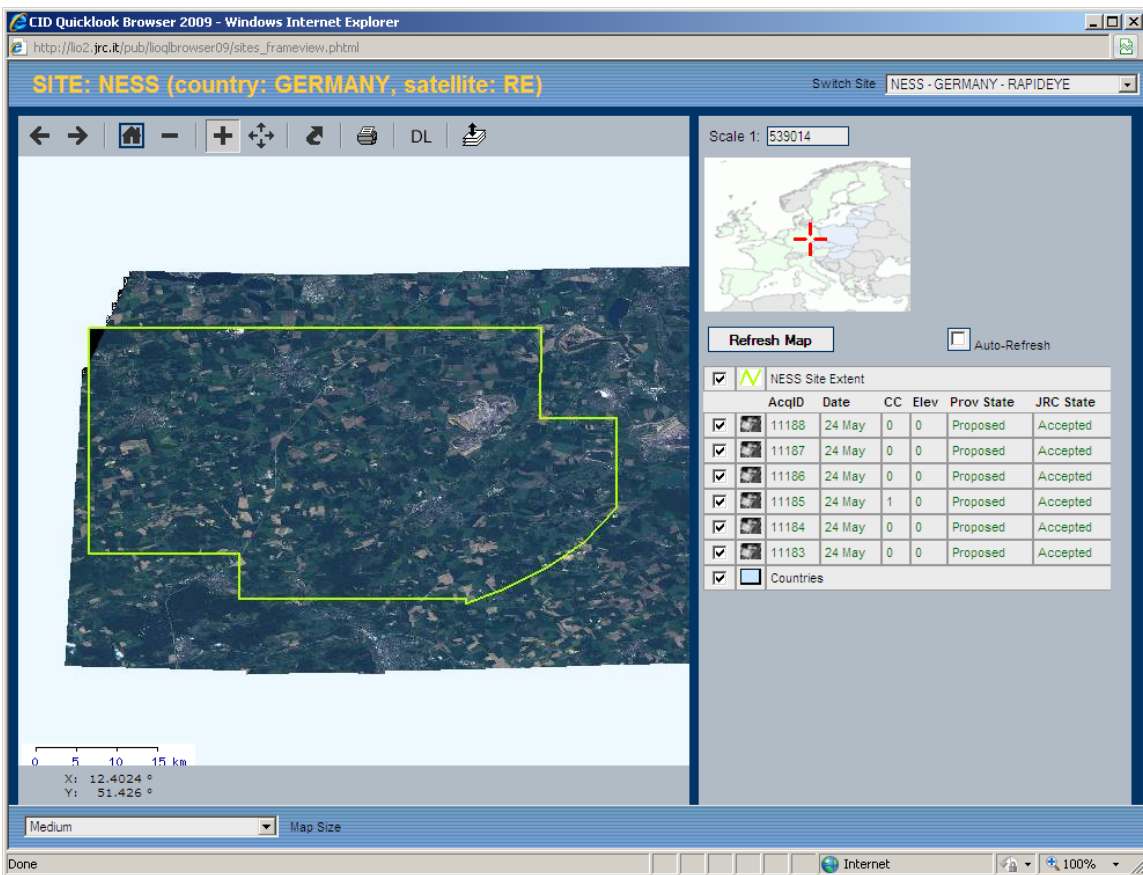
Figure 1 - *RapidEye_DE_NESS_240509*

1.1.3 All orders are prepared 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.

1.1.4 The 14 Framework Contracts (FCs) that were signed in 2006 with image providers were renewed for a last year. They can be renewed up to three times; the maximum validity is 4 years. The FCs used in the 2009 CwRS campaign are with SPOTImage (SPOT 2, 4 & 5 and Formosat2 sensor data), Eurimage (Quickbird2 and Landsat5 data), Telespazio (GeoEye1 data), Euromap (IRS P6 sensor data), European Space Imaging (EUSI) (Ikonos2 data), ImageSat International (EROS A and B data), DMC International

Imaging (DMC data) and RapidEye (RapidEye data). 16 new FCs are presently being prepared to follow the present ones.

1.1.5   During the year several meetings took place with image providers (mainly VHR). These meetings are essential for the correct functioning of the Campaign and the understanding of the sensors' efficiency.

2   Image acquisition Campaign 2009 - Overview

2.1.1   The total number of farmers applications received by MS administrations totalled 7,1 M for the 25 MS that used the possibility of EU-financed satellite imagery (FI and LU did not participate). This is a decrease of 11,25 % compared to 2008 (when 8,0 M applications were made).

2.1.2   The total number of On the Spot controls (OTS) was 690,000 (cf. 629,000 in 2008 & 598,000 in 2007), 420.000 applications (61% of OTS) were controlled using Remote Sensing (cf. 55% in 2008).

2.1.3   The number of control zones requested by the Member States continued to increase. The 2009 Campaign totalled 249 planned High Resolution (HR) control zones (244 in 2008) and 285 planned Very High Resolution (VHR) control zones (264 in 2008). Almost 175.758 (170.000 in 2008) km2 were programmed for the prime VHR sensors Ikonos, Quickbird and GeoEye-1. In addition 7 (6 in 2008) zones in FR were programmed with SPS (SPS/WV1) as backup to aerial photography.

2.1.4   25 MS participated in the CwRS campaign (one more than in 2008). DK, LV, MT & PL required only VHR data. The remaining MS used both VHR and HR data (including PT with VHR data over 1 zone and AT two zones).

2.1.5   Acquisition of HR imagery had an overall success rate of 95% (cf. 91% in 2008) (bad weather was experienced in early July through August in CZ, DE, UK).

2.1.6   The VHR campaign had a success rate of 99% based on area, where VHR prime data failed over 2 zones in Poland.

2.1.7   The total expenditure for the 2009 Campaign was 6,03 M Euro distributed as follows: 3,55 M Euro for VHR prime imagery, 0,25 M Euro for VHR backup, 2,13 M Euro for HR data. The HR expenditure includes 0,09 M Euro that was spent using the 2008 budget for autumn imagery acquired in 2008. Similarly, the VHR expenditure includes 0,10 M Euro for VHR imagery acquired for ES in December 2008 for the 2009 Campaign. See Table 1.

Type of Image	Expenditure 2009 Campaign (M Euro)	Expenditure 2008 Campaign (M Euro)	Expenditure 2007 Campaign (M Euro)	Expenditure 2006 Campaign (M Euro)
HR optical (incl. bulk)	2,04	1,41	1,91	1,95
SAR	n/a	n/a	0,04	0,15
				3,02
VHR prime	3,55	3,14	3,13	

Type of Image	Expenditure 2009 Campaign (M Euro)	Expenditure 2008 Campaign (M Euro)	Expenditure 2007 Campaign (M Euro)	Expenditure 2006 Campaign (M Euro)
(incl. bulk)				
VHR backup	0,25	0,60	0,3	
HR autumn on previous year's budget	,09	0,18	0,2	0,17
VHR on previous year's budget	0,10	0,07	n/a	n/a
Total Expenditure	**6,03**	**5,4**	**5,58**	**5,29**

Table 1 *- Total expenditure for CwRS Campaigns 2009-2008-2007-2006.*

2.1.8   The administrative performance of all actors involved (JRC, Image Providers, Member States' Administrations, Contractors) has generally been good, with few delays. Some contractors are slow to acknowledge receipt and validate imagery in Lio.Net.

3   The HR data acquisition

3.1.1   The 2009 image acquisition campaign totalled 247 HR zones (cf. 244 in 2008): in 2009 15 MS requested VHR + HR; 9 VHR only; 3 MS mix of the 2; (in 2008 - 196 VHR + HR and 48 HR (in combination with aerial photography acquired and paid for by the MS).

3.1.2   Due to low interest, during the 4 previous campaigns, and the very high price, no backup to HR optical data with SAR was planned.

3.1.3   At the kick-off meeting in April 2009, in total 660 images were planned to be acquired. During the Campaign this number decreased to 655. The increase was due to additional images requested in DE & FR. It is important to note that the EC Services agreed to these increases after careful consideration of the individual requests and that there was enough budget available to allow such an increase.

3.1.4   The number of planned HR images per zone decreased from 3,6 in 2006; 3,0 in 2007; 2,3 in 2008 and increased to 2,7 in the 2009 Campaign.

3.1.5   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 ensure that there is a multispectral component available in addition to the PAN backup. In total 20 HR(VHR) windows were planned, 6 images were acquired & 14 were closed at contractors' request as the imagery was no longer required.

3.1.6   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.

3.1.7   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), DMC (32m, 3 MSP bands) & RapidEye (6.5m GSD, 5 MSP bands).

3.1.8   During this Campaign the MS were asked if they wanted to exclude SPOT2 as it lacks the SWIR band. This was requested by 8 MS (BE, CY, CZ, HU, IT, RO, SE, UK) for 58 zones. This exclusion is accepted by the EC Services and the contractors are made aware that this decreases the available sensors and therefore the acquisition possibilities. SPOT Image announced that commercial programming of the satellite Spot 2 ended on June 30, 2009 and it will be out of orbit soon.
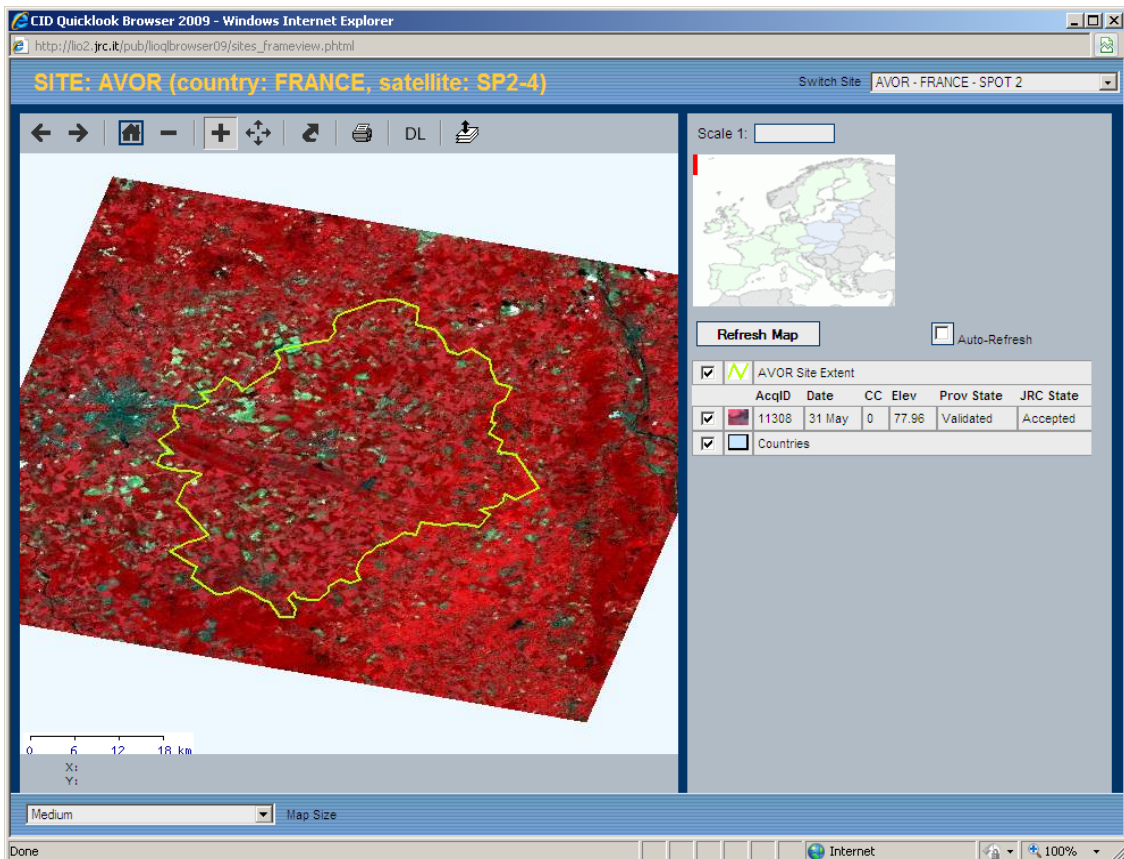
Figure 2 - *FR_AVOR_SPOT2_31052009*

3.1.9   DMC imagery was programmed over 11 BG zones after acceptance by the MS. 10 scenes covering 10 zones were purchased.

3.1.10 During the campaign overlapping windows (VHR-HR) were allowed only upon contractors' request.

3.1.11 691 HR windows were planned and 695 were opened as additional HR+2 windows were requested by DE.

3.1.12 A total of 655 images out of the 660 planned were acquired with a success rate of 95%. In addition, 6 of the 12 SPOT5 scenes in the HR(VHR) window were acquired.

HR status [final]	TOTAL IMAGES	IRS	SPOT2	SPOT4	SPOT5	LS5	DMC	Rapid Eye
HR IMAGES ACQUIRED BY SENSOR								
Autumn	71	3	19	24	25	0	0	0
Winter	44	4	6	13	21	0	0	0
HR-1	172	6	37	65	64	0	0	0
HR(VHR)	6	0	0	0	6	0	0	0
HR+1	220	9	38	79	79	0	10	5
HR+2	139	4	16	64	51	0	0	4
HR+3	3				3			
TOTAL	**655**	**26**	**116**	**245**	**249**	**0**	**10**	**9**
% of TOTAL	100%	4%	18%	37%	38%	0%	2%	1%

Table 2 - *Success rates for the HR campaign per acquisition period*

3.1.13   The SPOT sensors (2, 4, and 5) acquired 93% of the imagery (cf. 90% in 2008 and 90% in 2007). IRS P6 acquired 4% (cf. 9% in 2008 and 5% in 2007), LANDSAT5 0% (cf. 1% in 2008 and 5% in 2007). DMC acquired 10 scenes which covered 10 zones, this corresponds to 2% (cf. 0,4% in 2008 and 0,2% in 2007), and the newcomer RapidEye 1%.
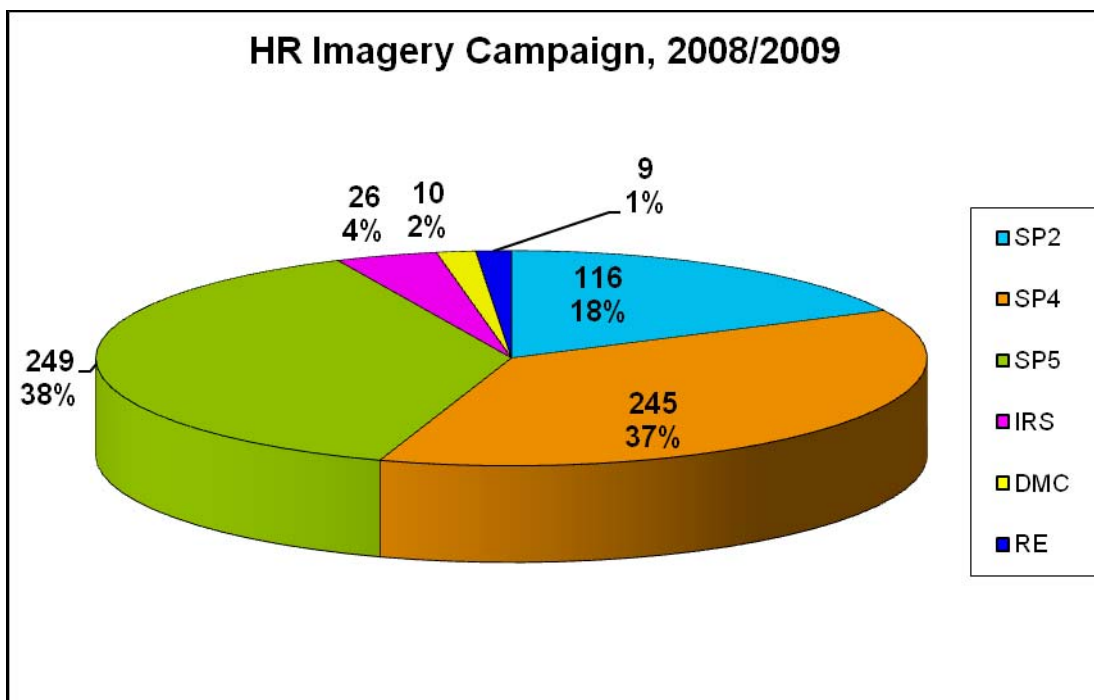
Figure 3 - *The respective shares of the HR sensors*

3.1.14   The total spending on HR imagery amounted to 2,13 M Euro (cf. 1,59 M Euro in 2008), excluding the SPOT5 imagery acquired during the backup window (0,86M - cf. 0,14 M in 2008). The expenditure for SPOT5 imagery acquired as backup has been taken into account as VHR backup expenditure. 0,88M was paid from the 2008 budget for imagery acquired during autumn 2008 (cf. 0.18 in autumn 2007).

3.1.15 The average cost per image, including delivery costs, was 3.252 Euro (cf. 2.962 Euro in 2008).

3.1.16 The average cost for HR data per control zone was 8.623 Euro (cf. 6.531 Euro in 2008; 9.296 Euro in 2007 and 11.003 Euro in 2006).

4 The VHR data acquisition

4.1 Introduction

4.1.1 The 2009 image acquisition campaign totalled 285 VHR control zone. The number of zones has increased by 21 (8%) cf. an 18% increase between 2007 & 2008. In addition, 7 zones were 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); Quickbird (60 cm PAN, 2,4m MSP) and GeoEye1 (0.5m PAN, 2.0m MSP) was 175.758 km^2 (cf. 173.465 km^2 in 2008) divided over 285 zones; 283 zones/174.706 km^2 were acquired.

4.1.3 Backup was planned over 80 zones, in total 47.046 km^2. As in the previous two Campaigns, the backup opened 10 days after prime, and it was closed upon the successful acquisition of the prime sensor. The zones for backup programming were chosen in cooperation with the Image Providers, taking the MS requests into account.

4.1.4 This more efficient way of programming backup allowed the EC Services to programme 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.

4.1.5 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). All backup sensors are PAN only, except Formosat2 which was programmed in the Bundle mode.

4.1.6 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.

4.1.7 The average length of an acquisition window (as requested by the MS) was 62 (cf. 60 in 2008) days, slightly higher than previous campaigns (cf. 53 days in 2005, 2006, 2007). The average time needed to complete a zone from the opening date was on average 16 (cf. 28 in 2008) days. For Ikonos it was 11 days (cf. 27 days in 2008 and 16 days in 2007), Quickbird 24 (30) days (cf. 30 days in 2008 and 29 days in 2007) and GeoEye1 25 days. Here it has to be noted that the average VHR zone area per MS was 617 (645) km^2 (cf. 645 km^2 in 2008, 669 km^2 in 2007 and 764 km^2 in 2006). The average Ikonos zone was 658 km^2 (cf. 738 km^2 in 2008 and 801 km^2 in 2007), the average Quickbird zone was 336 km^2 (cf. 386 km^2 in 2008 and 547 km^2 in 2007) and the average GeoEye1 zone was 671 km^2.

4.2 VHR Prime

4.2.1 Ikonos was originally planned for 179 (cf. 184 in 2008) zones. Part of a zone in BE has been re-tasked due to a high cloud cover in the eastern part of the AOI. One zone in CZ was open as speculative on the request of the national administration. Thereby the final number of Ikonos zones was 181 (cf. 186 in 2008), covering 118.432 (135.782) km^2. 181 (176) zones/ 118.407 (127.322) km^2 were acquired successfully, giving a success rate of 100% (cf. 94% in 2008) based on the area. This is a significant

increase. No extensions. 16 acquisition requests (9%) were extended (cf. 4% in 2007). Detailed information is given in Tables 3 and 4 below.

4.2.2   Quickbird was planned for 35 (78) zones, 11.769 (30.394) km^2. All 35 zones (72 zones/ 11.769 (28.561) km^2 were acquired successfully. The success rate based on area was 100 (cf. 94% in 2008, 93% in 2007 and 100% in 2006). There were no extensions (27% Acquisition Requests (ARs) were extended in 2008 and 26% in 2007). Detailed information is given in Tables 3 and 4 below.

4.2.3   GeoEye1 was planned for 67 zones, 44.925 km^2. Part of a zone in EE has been re-tasked due to a high cloud cover in the southern part of the AOI. In CZ one of the HR images has been exchanged to a VHR Image to control Good Agricultural and Environmental Conditions (GAEC). Thereby the final number of GeoEye1 zones was 69, covering 44.557 km^2. 67 zones /44.530 km^2 were acquired, giving a success rate of 98% (based on area).

Prime sensors	Ikonos	Quickbird	GeoEye1
Planned	117.773	11.769	44.925
Swapped			
Added BE, CZ, EE	659		632
Failed PL			576
Final planned	118.432	11.769	45.557
Acquired	118.407	11.769	44.530
Success rate	**100%**	**100%**	**98%**

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

Prime sensors	Ikonos	Quickbird	GeoEye1
Planned	179	35	67
Swapped			
Added BE, CZ, EE	2		2
Failed			2
Final planned	181	35	69
Acquired	181	35	67
Success rate	**100%**	**100%**	**97%**

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

4.2.4   In total, 2 (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
PL	OB11	GE-1	EROS B
PL	OB19	GE-1	EROS B

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

4.3   VHR Backup

4.3.1   EROS A and B were originally planned for 47 (25) zones, 21.461 (19.223) km^2. The Image Provider was given the freedom to choose where to program EROS A and where to program EROS B. After the final

feasibility 3 zones were given to Eros A and 44 to Eros B. The backup programming was closed for 19 Eros B zones and for all the 3 Eros A zones, in total 22 zones. 25 zones / 8.892 km^2 were acquired with EROS B. 91% (65%) of the area planned for backup was acquired. The division between the two sensors were 6% (22%) EROS A and 94% (78%) EROS B. Detailed information is given in tables 6 and 7 below.

Prime sensors	Eros A	Eros B	SPS	FS2	Total
Planned	3.397	18.064	12.952	5.497	39.910
Closed/ not open	3.397	8.318	8.741	1.698	22.154
Failed					
Final planned	0	9.746	4.211	3.799	17.756
Acquired	0	8.892	4.211	2.975	16.078
Success rate	**0%**	**91%**	**100%**	**78%**	**91%**

Planned backup to aerial	n/a	n/a	7.136	n/a	7.136
Closed			946		
Failed					
Final planned			6.190		6.190
Acquired			6.190		6.190
Success rate			**100%**		**100%**

T

able 6 - *Backup planned and acquired area (in km^2) per sensor*

Prime sensors	Eros A	Eros B	SPS	FS2	Total
Planned	3	44	20	6	73
Closed/ not open	3	19	13	2	37
Failed	0	0	0	0	0
Final opened	0	25	7	4	36
Acquired	0	25	7	4	36
Success rate	**0%**	**100%**	**100%**	**100%**	**100%**
Planned backup to aerial	n/a	n/a	7	n/a	7
Closed			1		1
Failed			0		0
Final opened			6		6
Acquired			6		6
Success rate			**100%**		**100%**

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

4.3.2   SPS was programmed for 20 (14) zones/ 12.952 (16.453) km^2. These figures do not include the backup to aerial photography mentioned in section 4.19. 13 (1) zones/ 8.741 (4.697) km^2 were closed due to acquisition of prime sensor and 6 (10) zones/4.211 (11.756) km^2 were acquired. 100% (71%) of the area planned for backup was acquired. Detailed information is given in tables 6 and 7 above.

4.3.3   Formosat 2 was programmed for 6 (7) zones, 5.497 (7.519) km^2. 2 zones/1.698 km^2 were closed. Four zones /2.975 km^2 were acquired and, 2 of them having partial coverage. 78% (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.

4.3.4   In FR, satellite imagery was requested as backup to aerial photography over 7 (6) zones, 7.136 km^2 (4.703). All 7 (Five zones/3.683 km$^{2)}$ were programmed with SPS. 6 (Six) of the zones were acquired with aerial photography. The backup programming was closed for 1 zone/946 km^2 on request by the FR administration. 6 zones/ 6.190 (742) km^2, were acquired by SPS. Detailed information is given in tables 6 and 7 above.

4.4   VHR Expenditure 2009

4.4.1   The total expenditure on prime VHR imagery for the CwRS2009 campaign was 3.90 M Euro (cf. 3,803 in 2008). 3.657 (cf. 3,207 M Euro in 2008) 94% (cf. 84% in 2008) was spent on the prime sensors Ikonos, GeoEye-1 and Quickbird, and 0,246 M Euro 6% (16%) was spent on backup imagery.

4.4.2   66% (cf. 68% in 2008) of the total VHR expenditure was spent on Ikonos, 27% on GeoEye-1 and 7% (cf. 16% in 2008) on Quickbird. EROS B had the largest share of the backup sensors.

5   Human Resources

5.1.1   The IPSC, CID devotes considerable resources for the near 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
- Near real time image acquisition, validation, ordering, delivery
- Final archiving of the imagery
- Development of the on-line accessible archive (CID Image portal)
- Development and maintenance of LIODOTNET (Live Image Ordering DB)
- Development and maintenance of the CID QUICKLOOK Browser

5.1.2   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; however, with the GAEC requirements from the MS, image acquisition is becoming a year-round activity.

6   Conclusions and Outlook towards the 2010 Campaign

6.1.1   The 2009 CwRS was a demanding Campaign for the IPSC CID Action; still the VHR area for 2010 will increase to reach nearly 200.000 km2 for 2010. The prime sensors will be Ikonos, GeoEye1, Quickbird and the newcomer WorldView2. This will be a challenge for CID to manage.

6.1.2   The budget for the 2010 Campaign will amount to 6,5 M Euro as in 2009. An amendment to the work programme makes it possible (since 2009) to use the remaining budget (approx. 1,7 M Euro) for imagery to be acquired in 2010. Two bulk orders have been prepared for the Image Providers e-Geos and SPOTImage for imagery to be acquired in 2010. In total, this budget (6,5 + 1,7 M euro) will be enough to cover all MS requests for imagery during the 2010 Campaign.

6.1.3   The CID team will take the same approach as in 2009 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. Future also envisages that the VHR prime will close upon VHR backup acquisition if contractors judge that controls can be performed with the VHR backup.

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

6.1.5   Further, new ITTs have been launched for new FCs for the purchase of satellite imagery with starting date in 2010. These new FCs will be used as follower-ups to the presently running FCs.

(end document)

European Commission

Abstract
The objective of this document is to summarise the results of the image acquisition campaign carried out by the JRC (IPSC, CD Action) within the framework of the Control with Remote Sensing 2009.

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