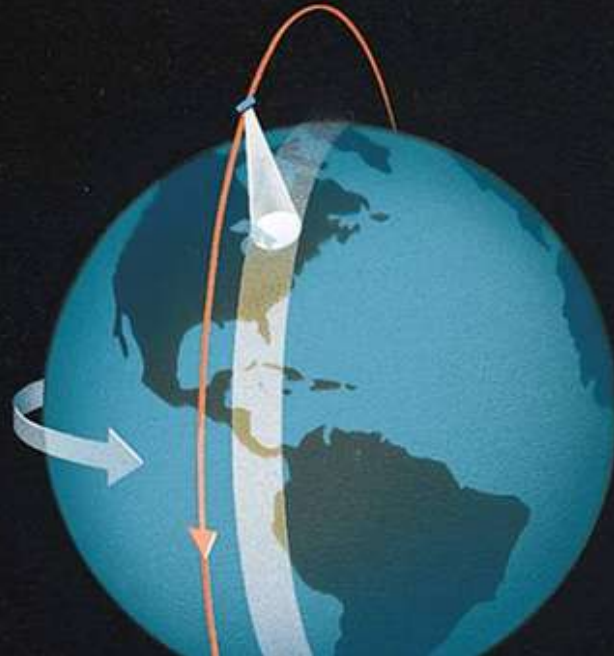




G4AW

Geodata for Agriculture and Water

Images: CIAT & ESA





Food security & satellite based information services



Ruud Grim

Netherlands Space Office (NSO)



Netherlands Space Office

- ▶ Space agency of the Netherlands government (established 2009)
- ▶ Reporting to:
 - Ministry of Economic Affairs
 - Ministry of Infrastructure and Environment
 - Ministry of Education, Culture and Science
 - Netherlands Organisation for Scientific Research (NWO)
- ▶ Task: **develop the Netherlands space policy and bring that into action**
- ▶ Outcome: **space useful for society**

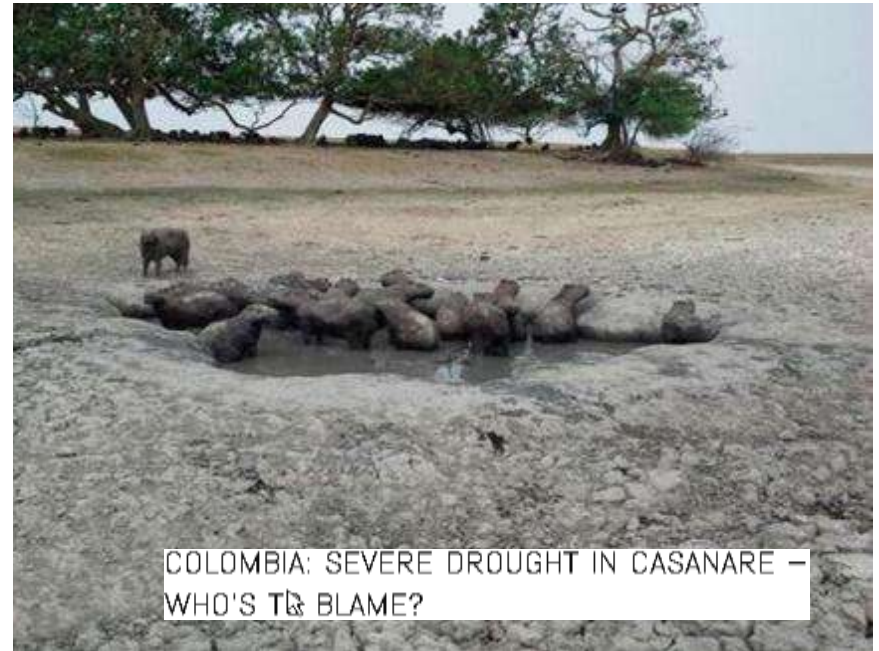
Netherlands
Space
Office



Climate change



Region La Mojana
Puerta Nuevo (2012)



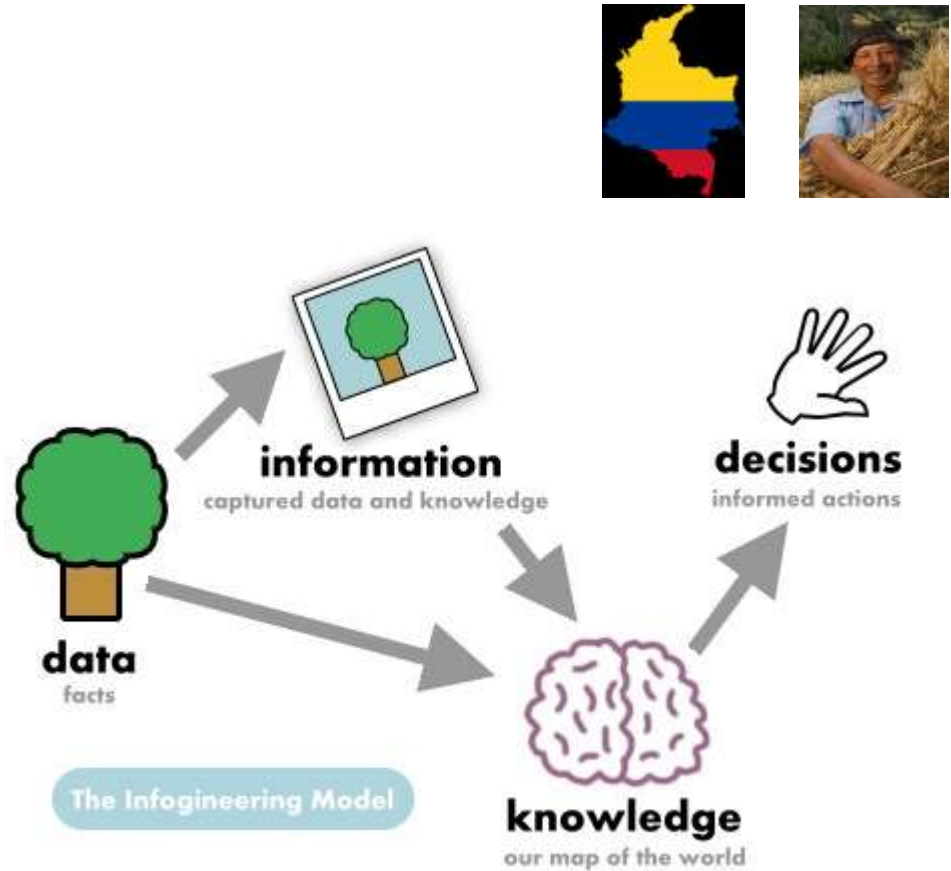
COLOMBIA: SEVERE DROUGHT IN CASANARE –
WHO'S TO BLAME?

Effects of climate change on
food & water security, e.g.

- Extensive rainfall
- El Nino (drought)



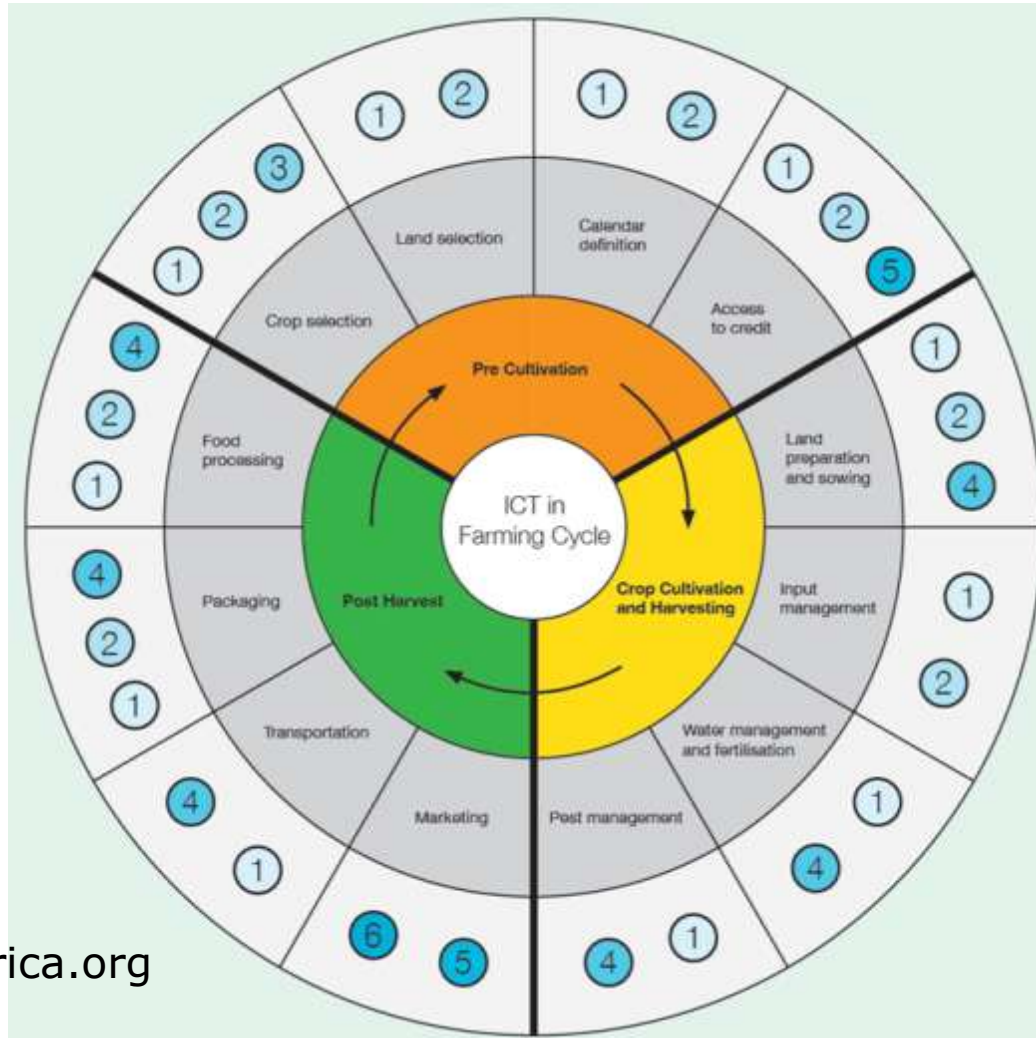
From data to decision



Agricultural cycle



- ① Information systems including DSS/MISS/GIS etc
- ② ICT-enabled learning and knowledge exchange
- ③ Modelling solutions
- ④ Sensory and proximity devices
- ⑤ ICT-enabled networking solutions
- ⑥ Online commerce tools (eCommerce/mCommerce)



www.eTransformAfrica.org

Pre Cultivation

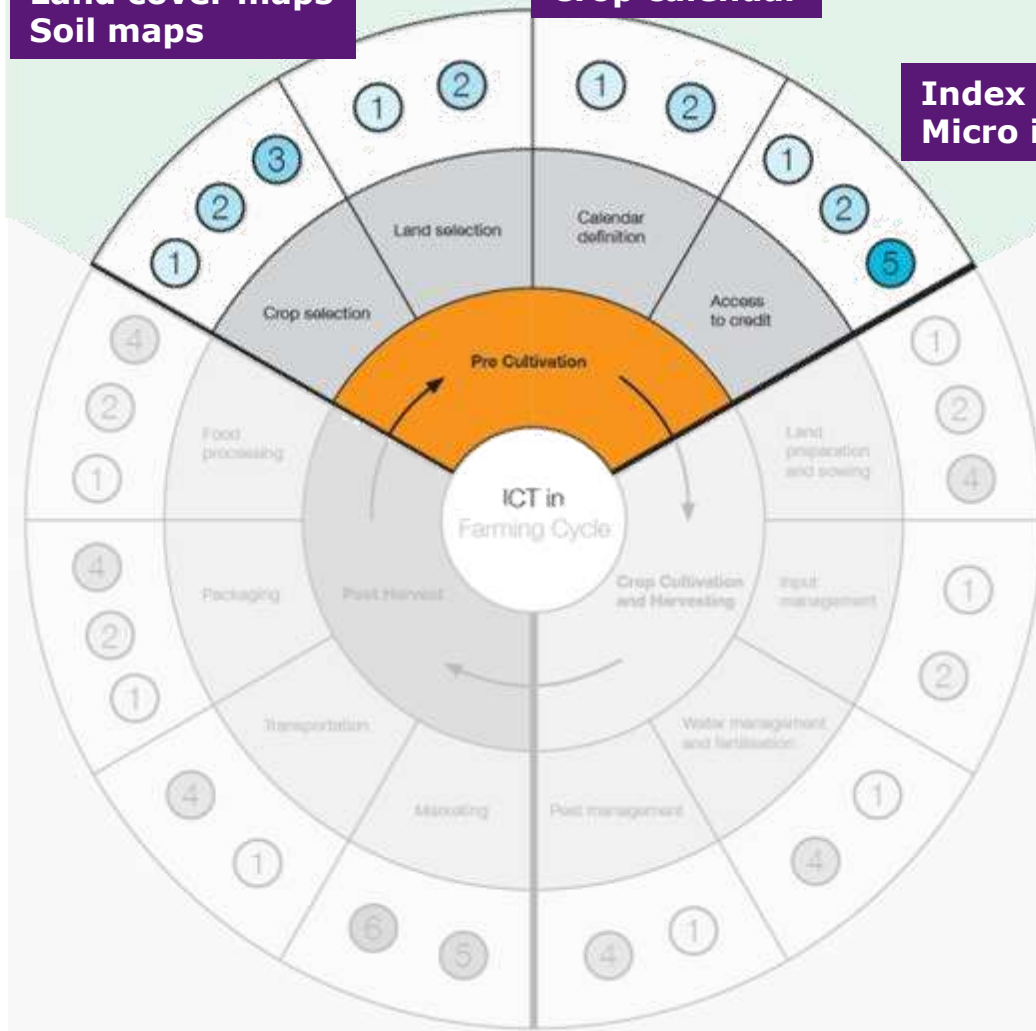


Land cover maps
Soil maps

Crop calendar

Index based
Micro insurance

- 1 Information systems including DSS/MISS/GIS etc
- 2 ICT-enabled learning and knowledge exchange
- 3 Modelling solutions
- 4 Sensory and proximity devices
- 5 ICT-enabled networking solutions
- 6 Online commerce tools (eCommerce/mCommerce)



Land cover map

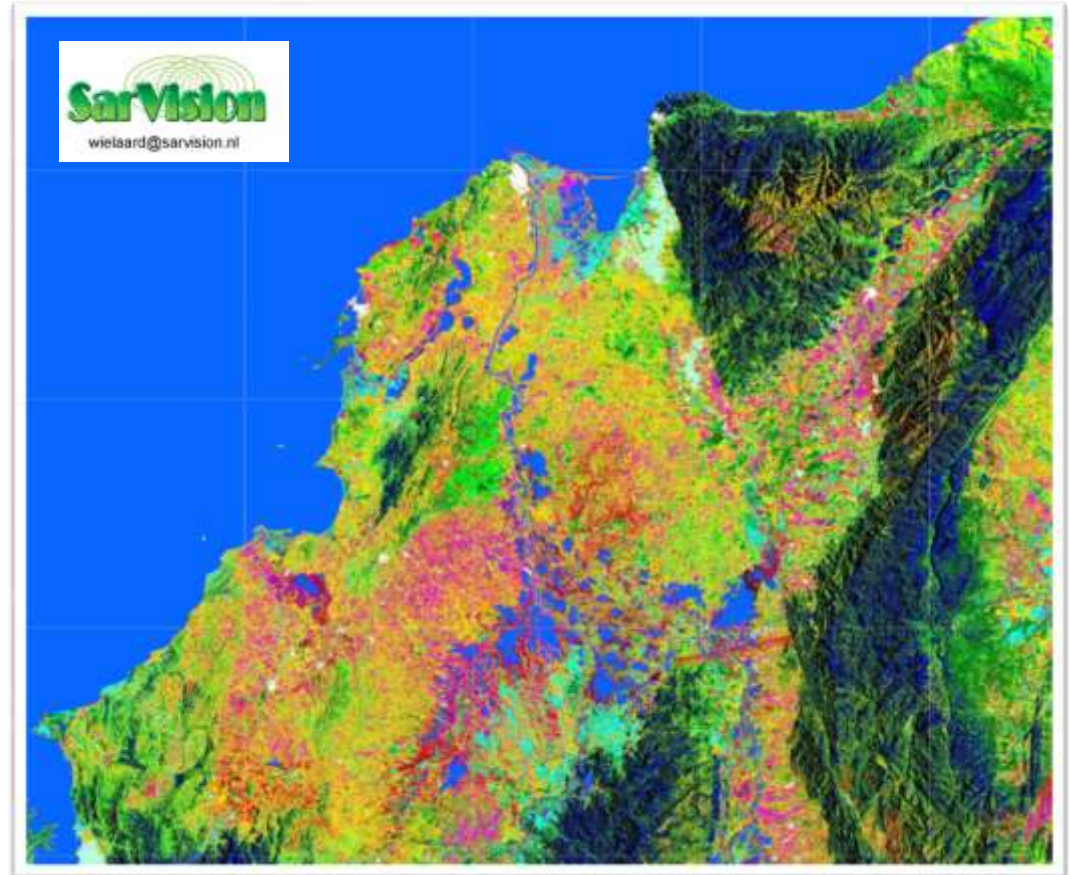


Colombia (radar)

High
resolution
(20-30m)

Cloud free

Timely and
reliable



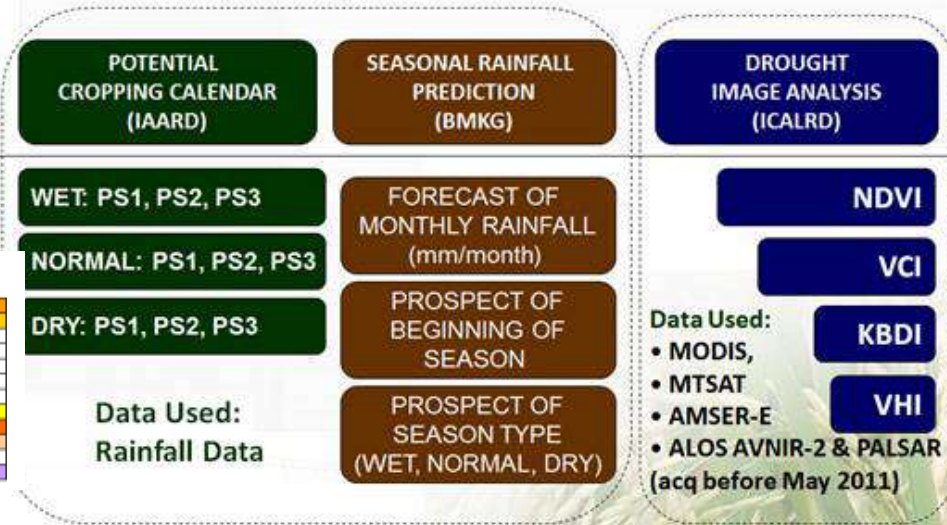
**Example: subset of 2010 land cover Colombia
using ALOS PALSAR**

©Cooperation SEI, TNC, USAID

Crop calendar



INTEGRATION OF CROPPING PATTERNS, SEASONAL RAINFALL AND SATELLITE IMAGE ANALYSIS



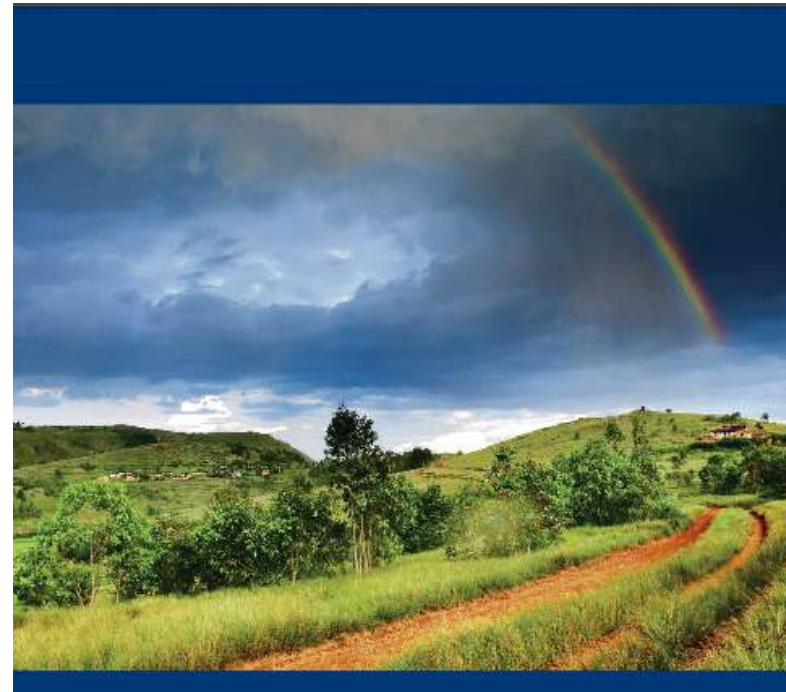
Crop Calendar - Colombia - Carmen Cubita

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Customer Indication Needed												
Land Preparation												
Seed Beds												
Transplanting												
Rearing												
Curing												
Drying												
Fermentation												
Optimum Visit Time												
Packing												

Micro insurance



- Many pilot projects
- Examples:
 - Kilimo Salama
 - Planet Guarantee (EARS FESA project)
 - Micro Insure
 - and others
- Technically feasible
- Increased mobile use → reach farmers



Weather Index-based Insurance
in Agricultural Development
A Technical Guide

→ Time for Up-scaling



World Food
Programme

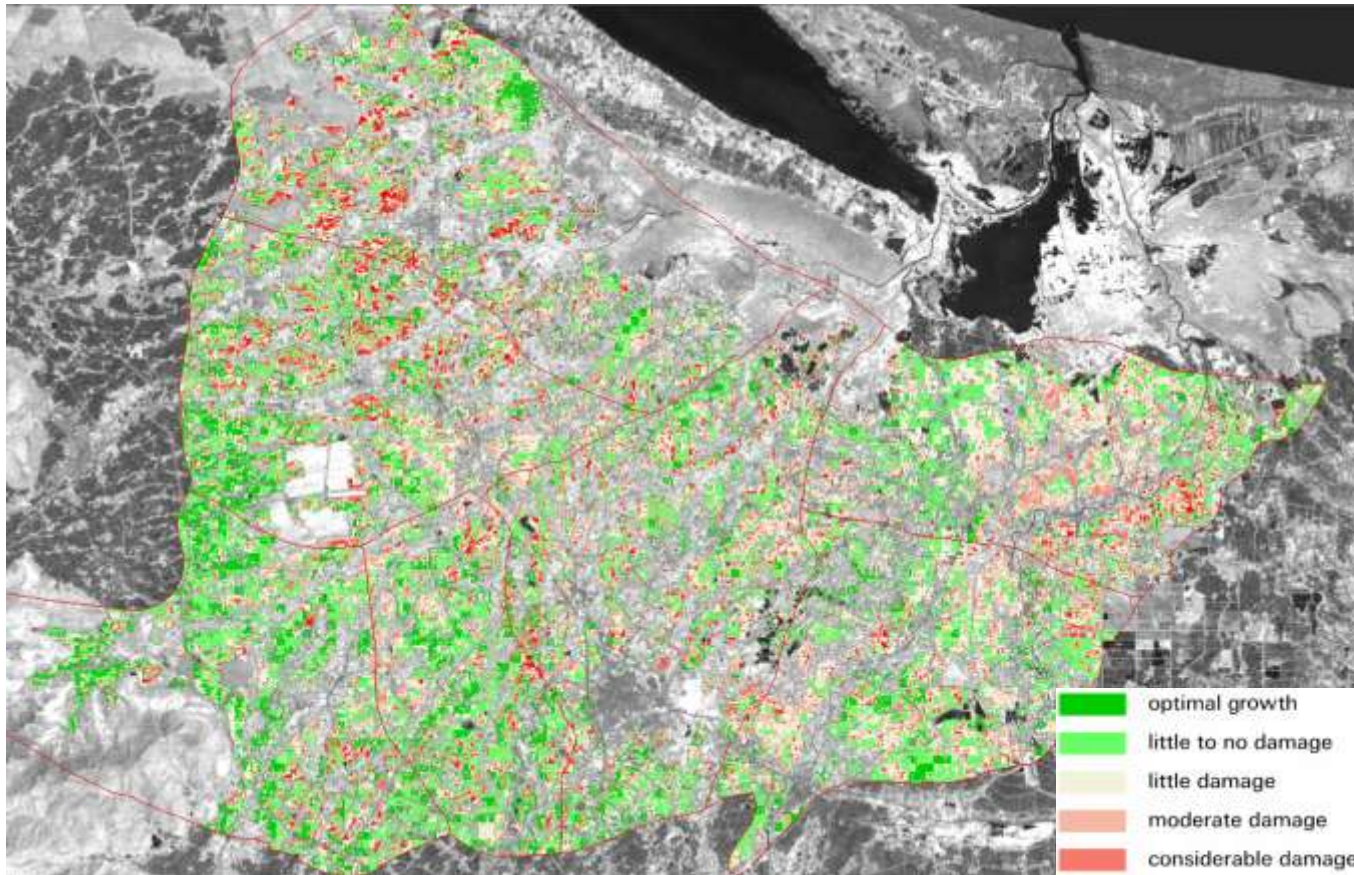


Enabling poor rural people
to overcome poverty

http://www.ifad.org/ruralfinance/pub/WII_tech_guide.pdf



Weather insurance in rice crops

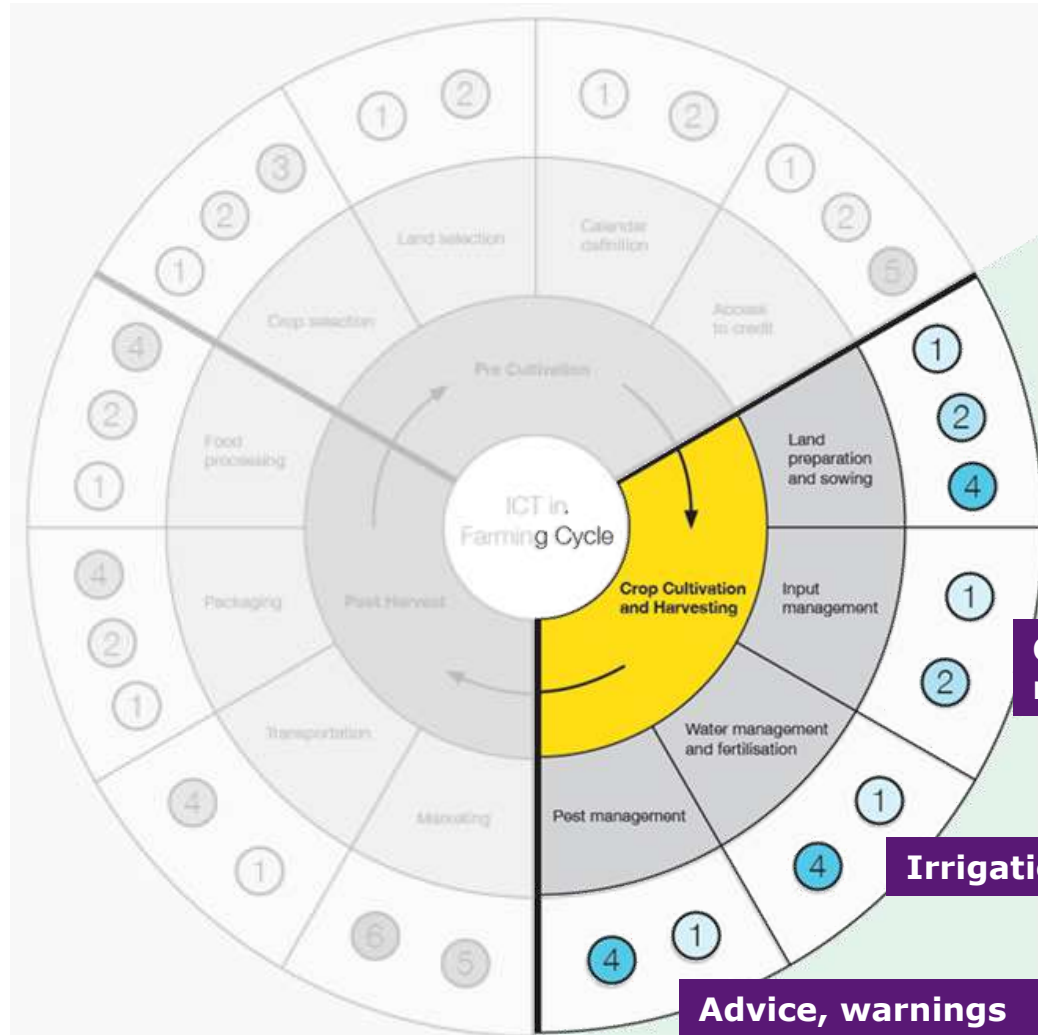


Crop cultivation &



harvesting

- 1 Information systems including DSS/MISS/GIS etc
- 2 ICT-enabled learning and knowledge exchange
- 3 Modelling solutions
- 4 Sensory and proximity devices
- 5 ICT-enabled networking solutions
- 6 Online commerce tools (eCommerce/mCommerce)

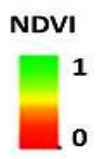
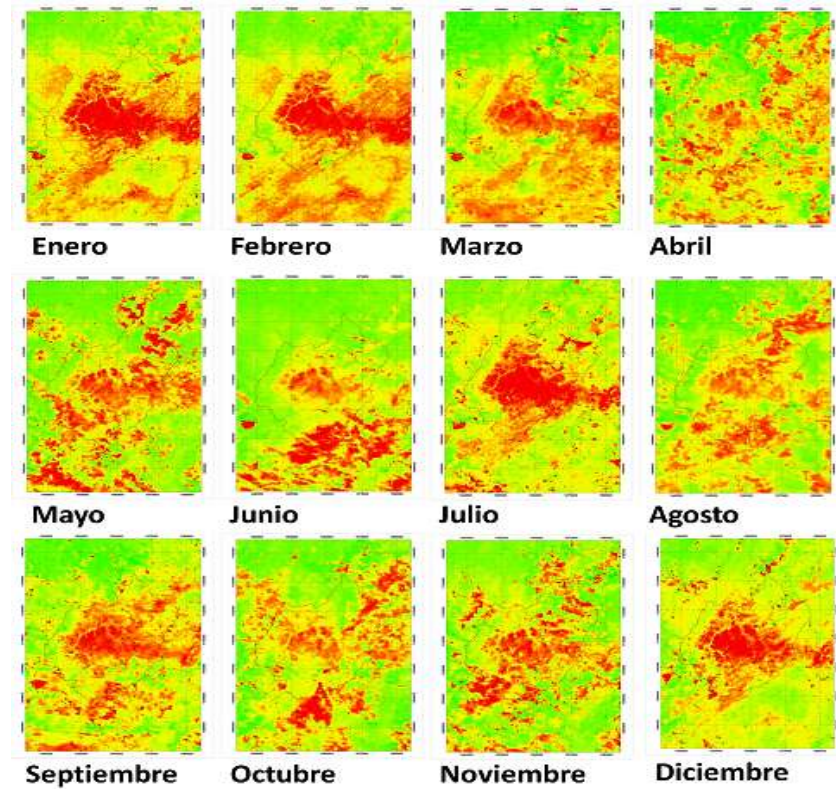
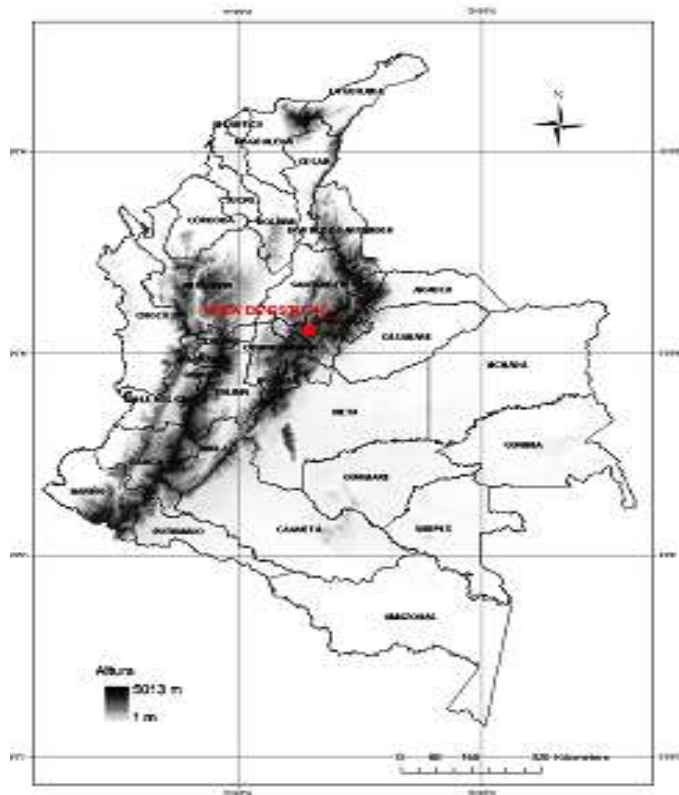


Land cover maps
Soil maps

Crop growth
monitoring

Irrigation advice

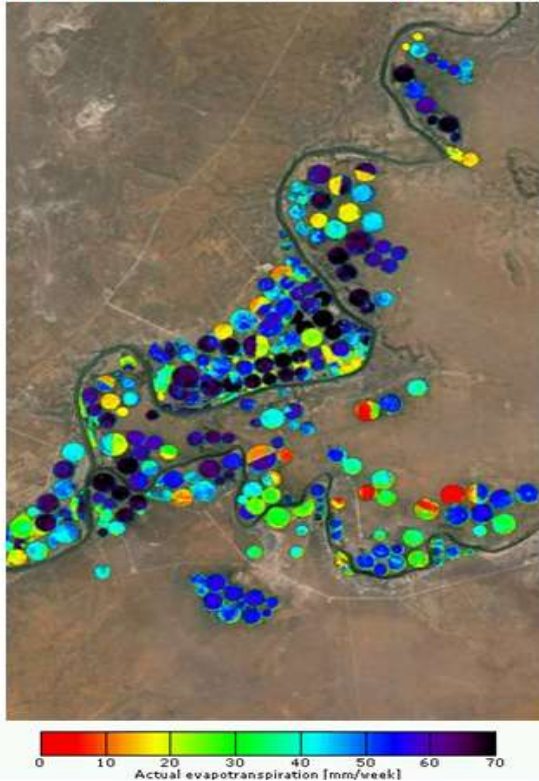
Advice, warnings



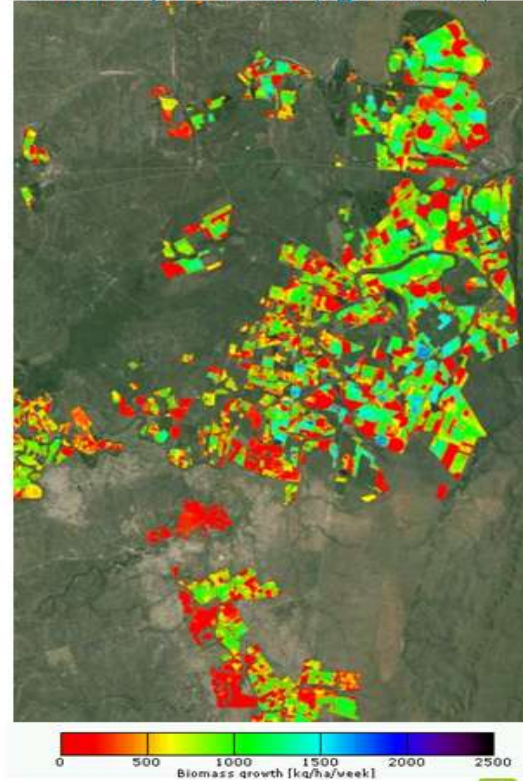
NDVI = Relative index for vegetation



GrainLook – Douglas
Actual Evapotranspiration (mm/week)



SugarcaneLook – Mpumalanga
Biomass production (kg/ha/week)



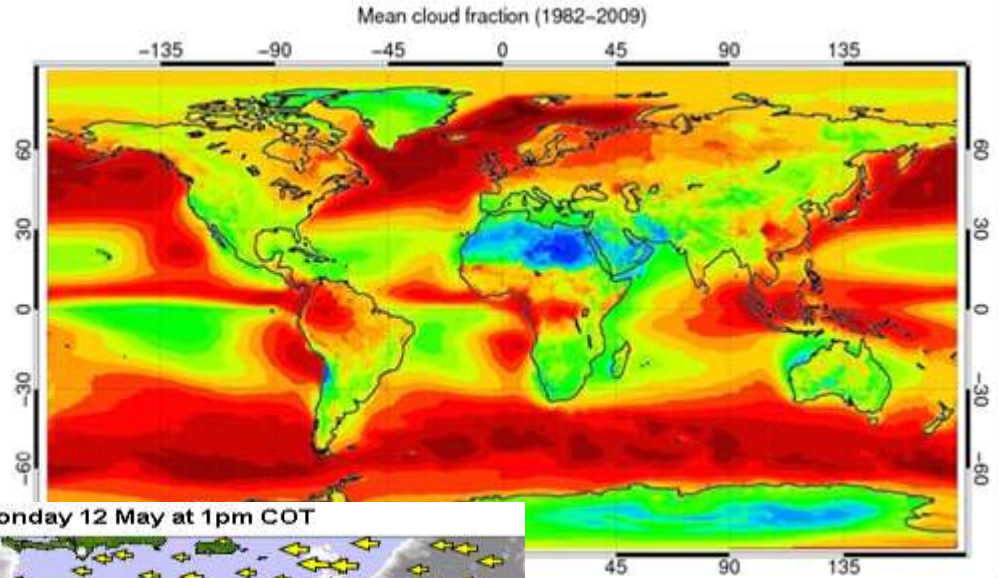
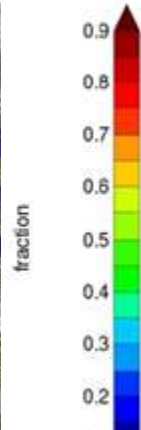
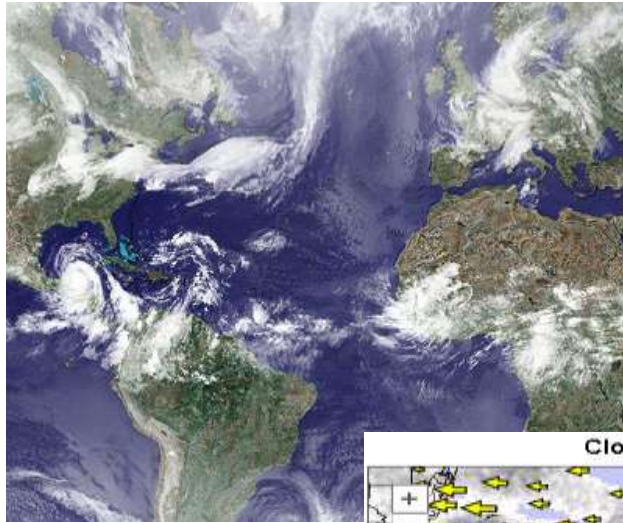
e.g.

kg / ha
mm / wk

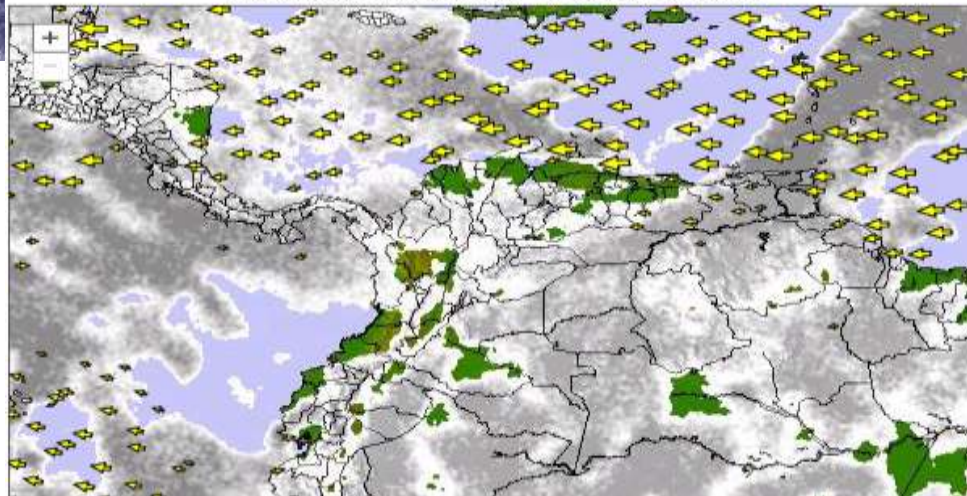


Quantitative information from SEBAL model

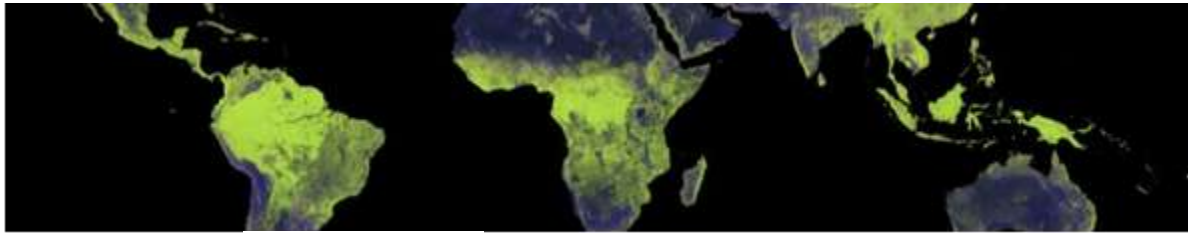
Cloud cover



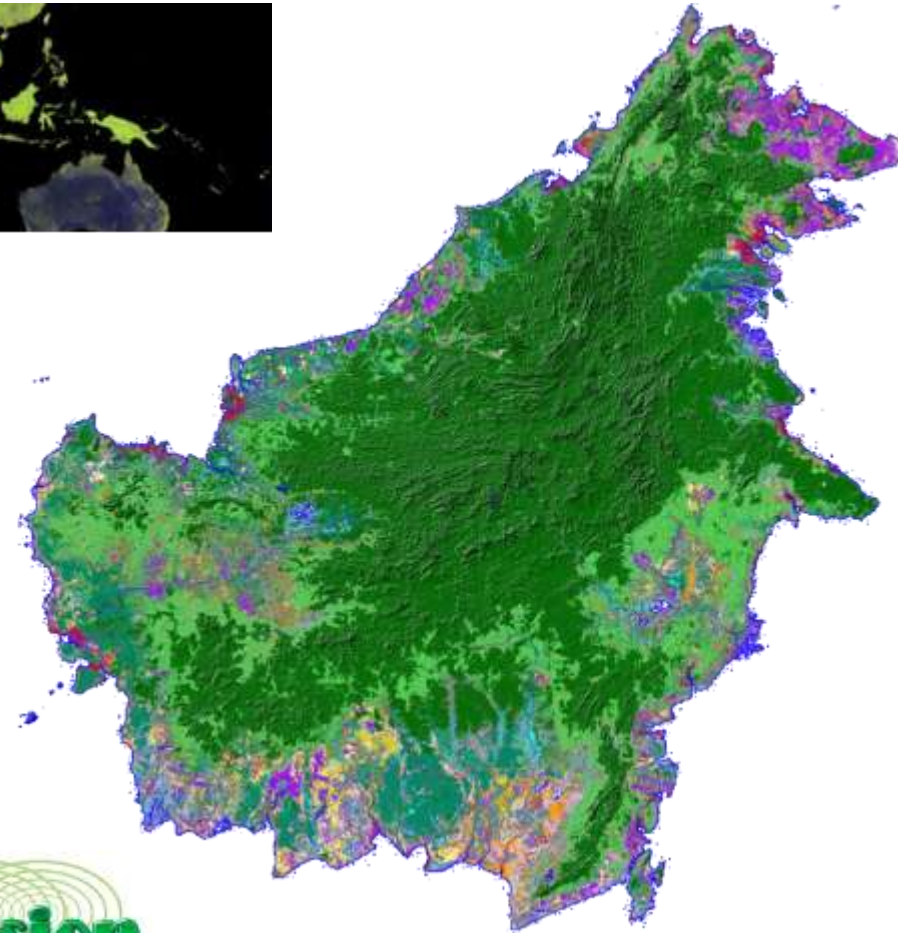
Cloud Cover on Monday 12 May at 1pm COT



Looking through clouds



	Lowland forest
	Riverine forest
	Swamp forest
	Mangrove forest
	<i>Nipah</i> mangrove forest
	Peat swamp forest (pole)
	Peat swamp/riverine shrub
	Forest mosaics/degraded
	High shrub
	Medium shrub
	Ferns / grass
	Grassland
	Cropland (upland)
	Cropland (irrigated)
	Plantations (oil palm)
	Tree cover, burnt
	Water bodies
	Layover /Shadow
	No strip coverage
	Mountain forest



**Kalimantan
Land cover
map (radar)**



Crop growth monitoring



**Cloud
free
radar
image**



©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

22/04/2012



Radar analysis

Bare soil



©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

16/05/2012



Radar analysis

Bare soil
Emergence



©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

09/06/2012



Radar analysis

Bare soil
Emergence
Increment



©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

03/07/2012



Radar analysis

Bare soil
Emergence
Increment
Closure



©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

07/10/2012



Radar analysis

Bare soil
Emergence
Increment
Closure
Harvest



©2012

Rice monitoring

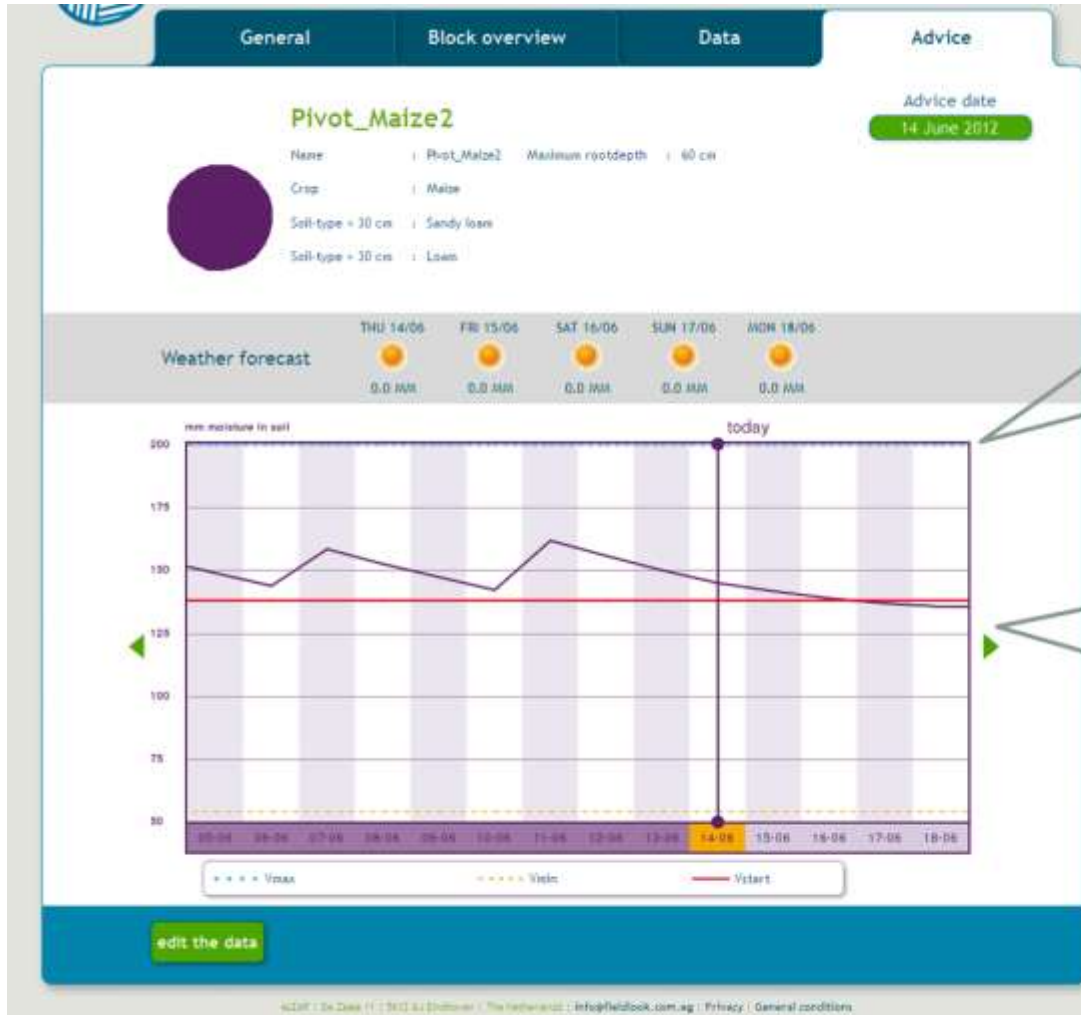


Sharp results: Multi-temporal filtering

5m detail suitable for monitoring of small farms (every 5-11 days)



Irrigation advice



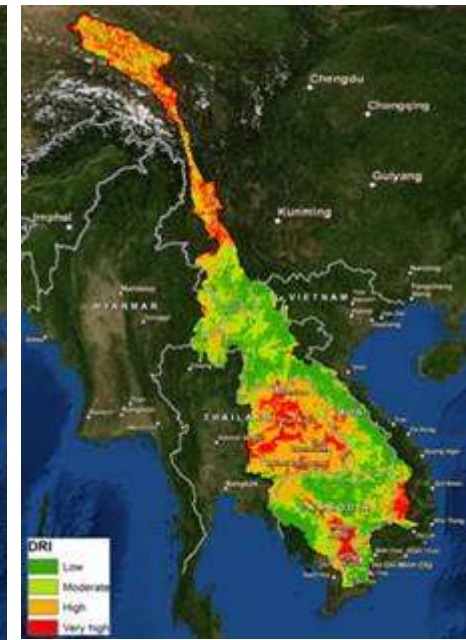
The crop has no water stress when the soil moisture is above the critical level and below the field capacity

When the soil moisture drops below the critical line, irrigation is advised

Advice and warning



Hazard & Risk Analysis



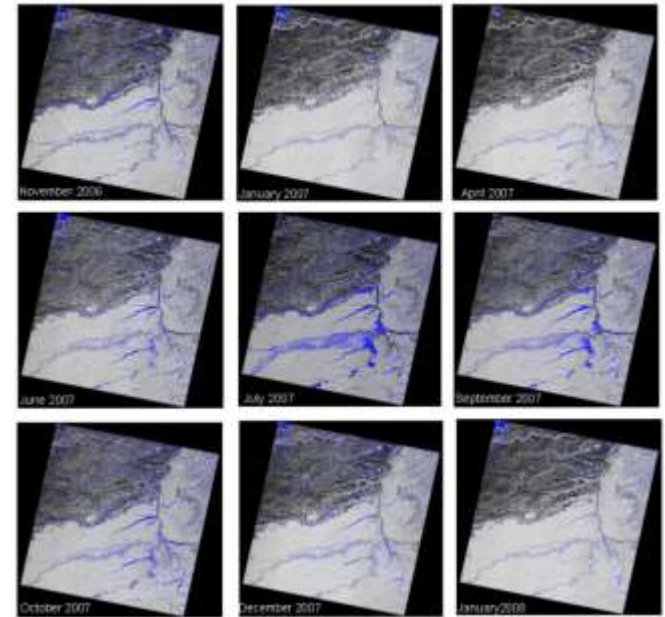
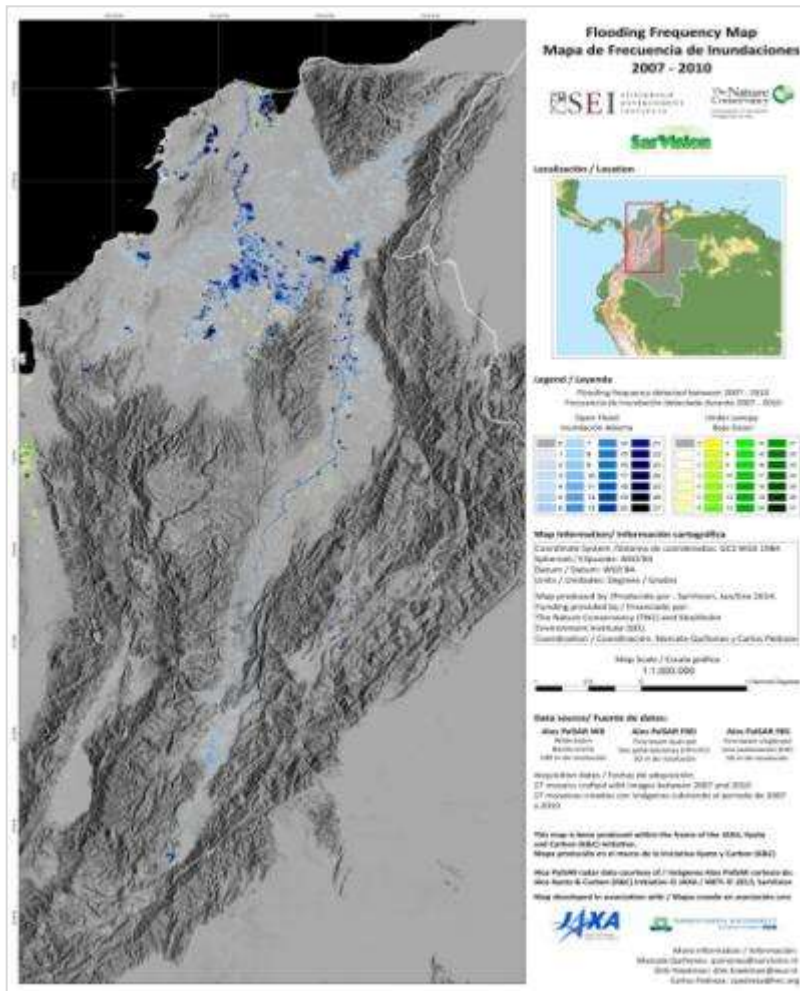
Vulnerability Index
Distance
to river

Vulnerability Index
Population density

Vulnerability Index
Precipitation

Drought
Risk Map





Flooding under closed canopy
High resolution (20-150m)



Example: subset of 2007-2011 flood Colombia using ALOS PALSAR
©Cooperation SEI, TNC, USAID



Volver al Mapa

Haga clic sobre el departamento para ver el nivel de las precipitaciones.

Región Andina



Gilat Awarded \$99-Million Project from Colombia's MINTIC

Dec 19, 2013

Ministry of Information, Technology and Communications to expand Internet kiosk (Kioscos Digitales) deployment and connectivity to schools and communities in rural areas



Development by MARD:

- Mobile app
- Province
- Department

Validation by IDEAM

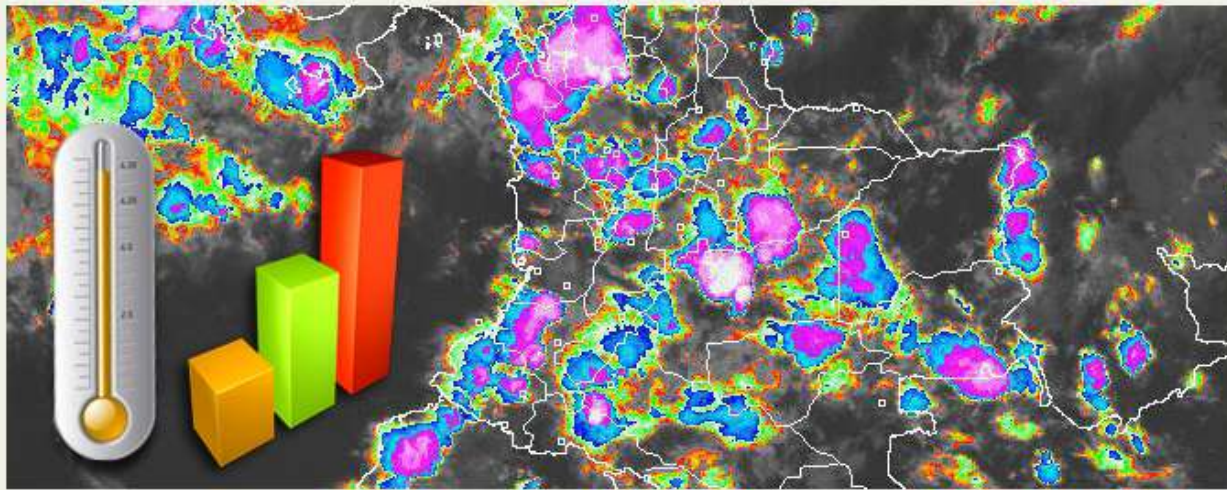


Ministerio de Agricultura y
Desarrollo Rural

Inicio

Entidades

Mas Informacio



MA
En este
informa
satelital
grandes



Meso-escala

Informacion
Sectorial



Micro-escala

Informacion
de Cultivos



Macro-escala

Informacion
climatica

Development for
MARD by:

Universidad del Cauca

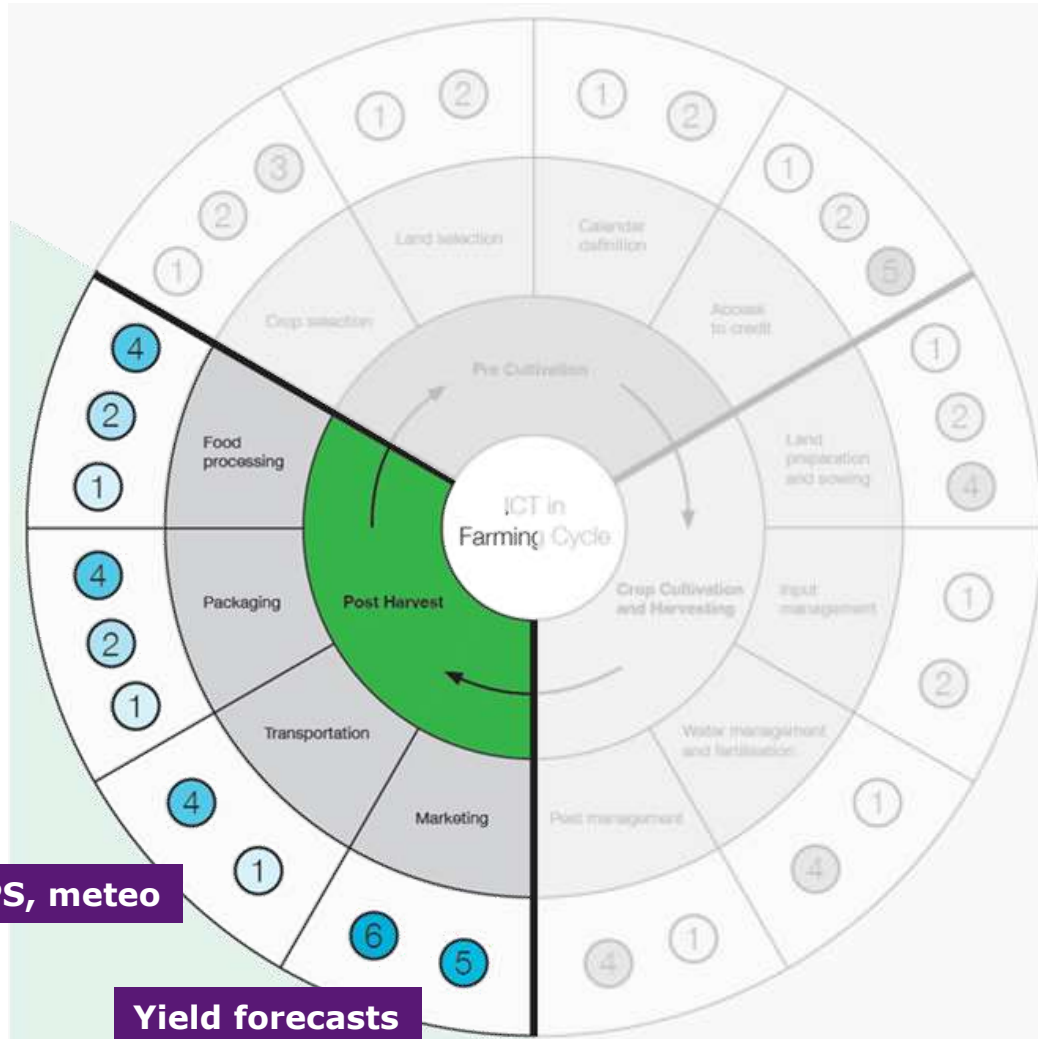
GEA - Grupo de Estudios Ambientales.
GIT - Grupo de Ingeniería Telemática
Carrera 2 # 1A-25 - Popayán (Cauca).





Post Harvest

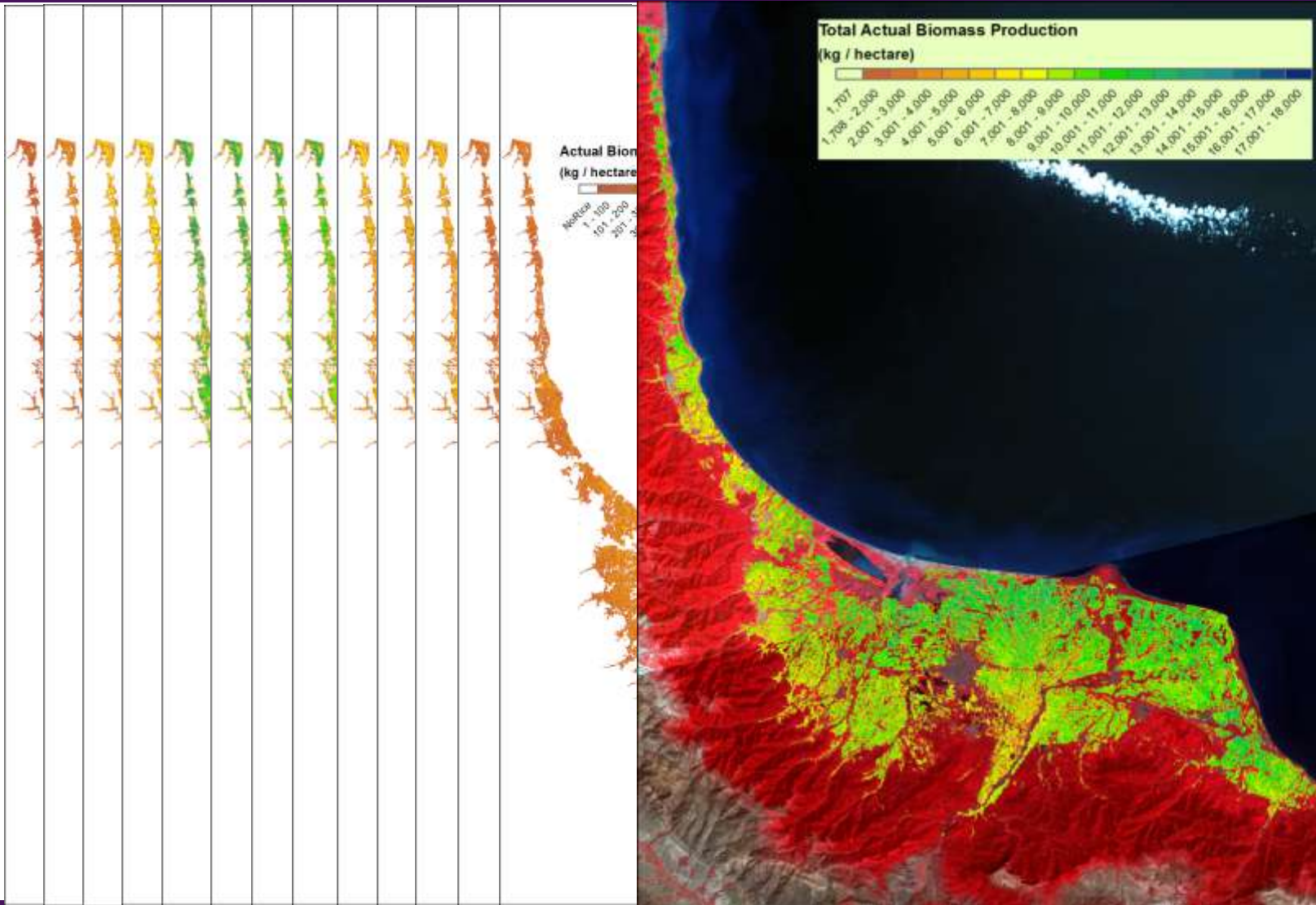
- 1 Information systems including DSS/MISS/GIS etc
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Yield forecast

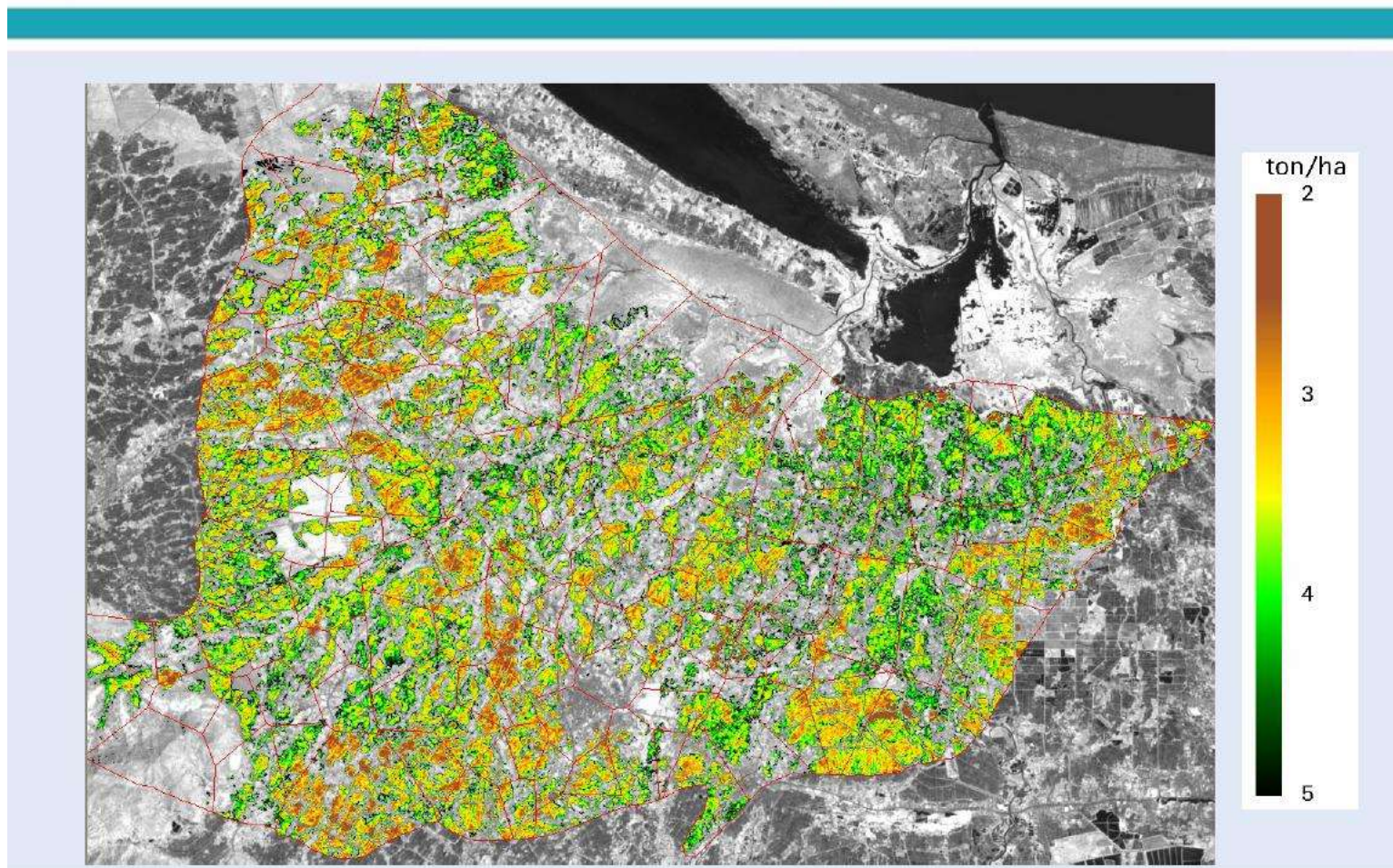


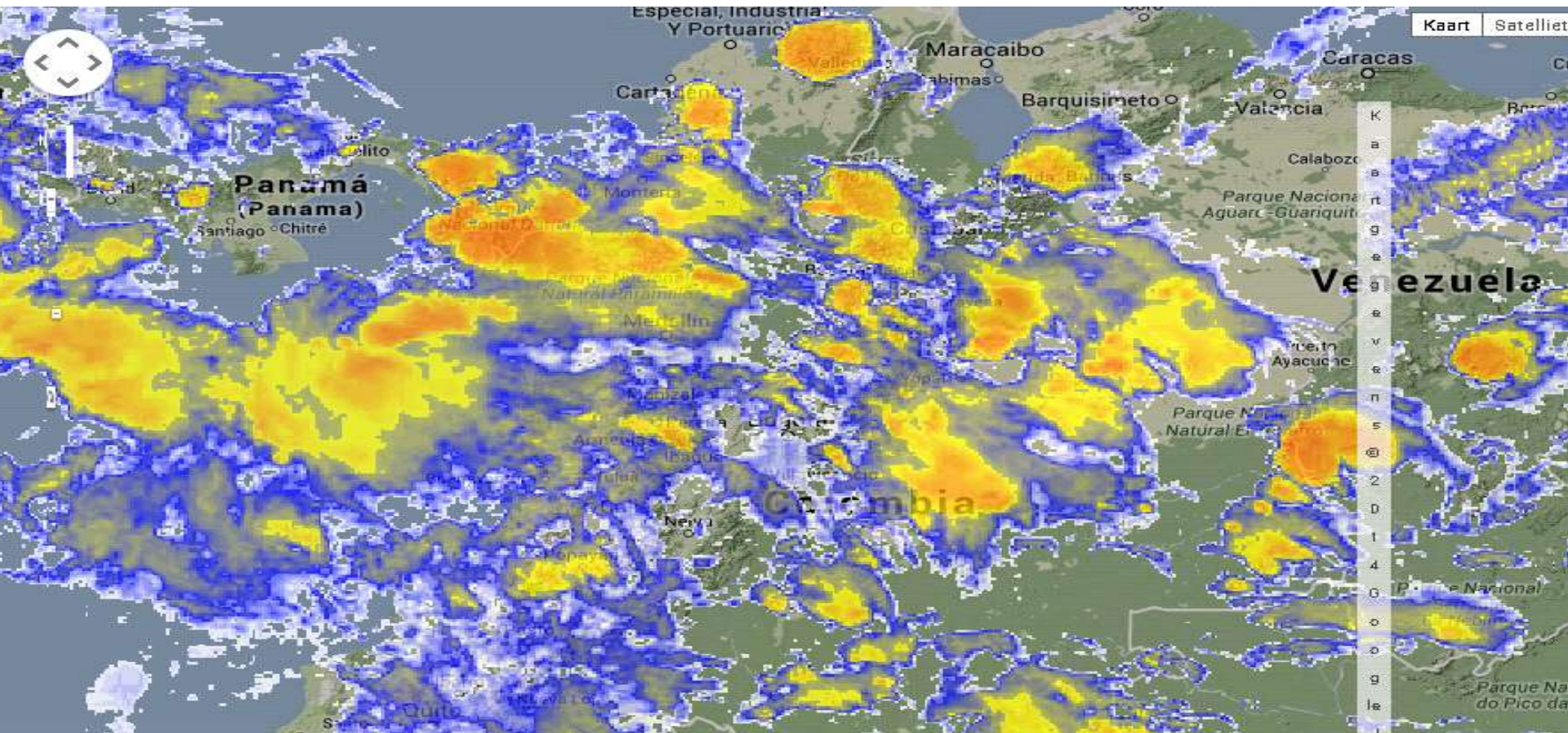
Actual Biomass Production





Rice Yield maps

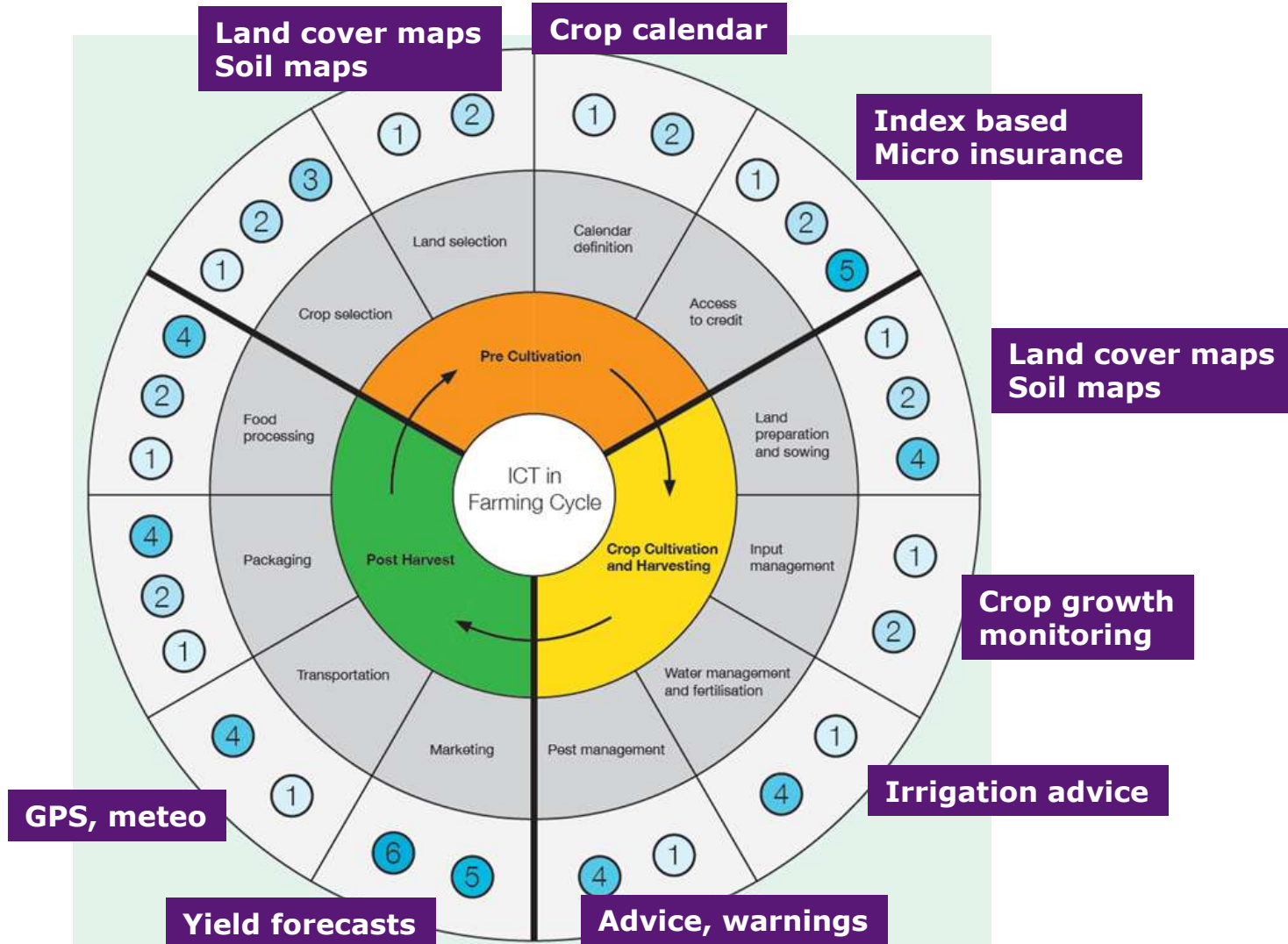




Agricultural Cycle



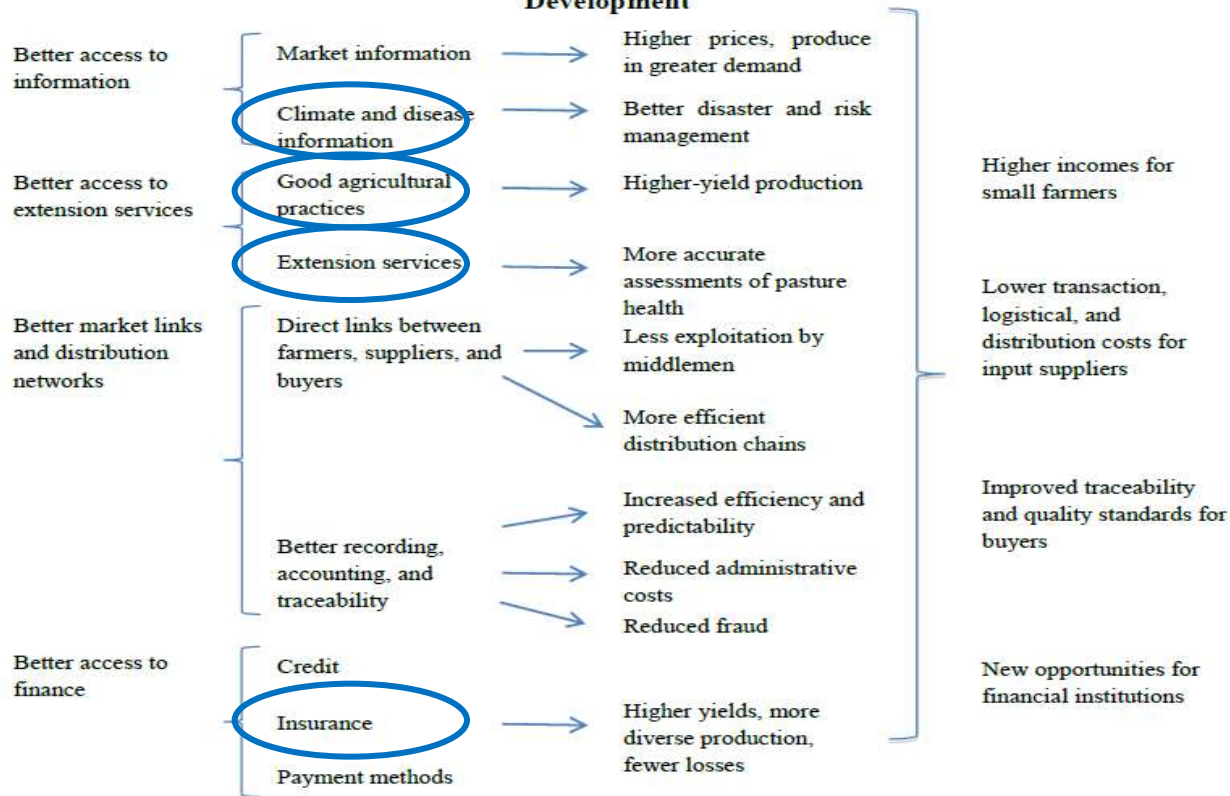
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Mobile/ICT applications

Figure 1. Results Generated by Mobile Applications for Agricultural and Rural Development



Mobile Applications for Agriculture and Rural Development

Christine Zhenwei Qiang, Siou Chew Kuek*, Andrew Dymond and Steve Esselaar

ICT Sector Unit
World Bank

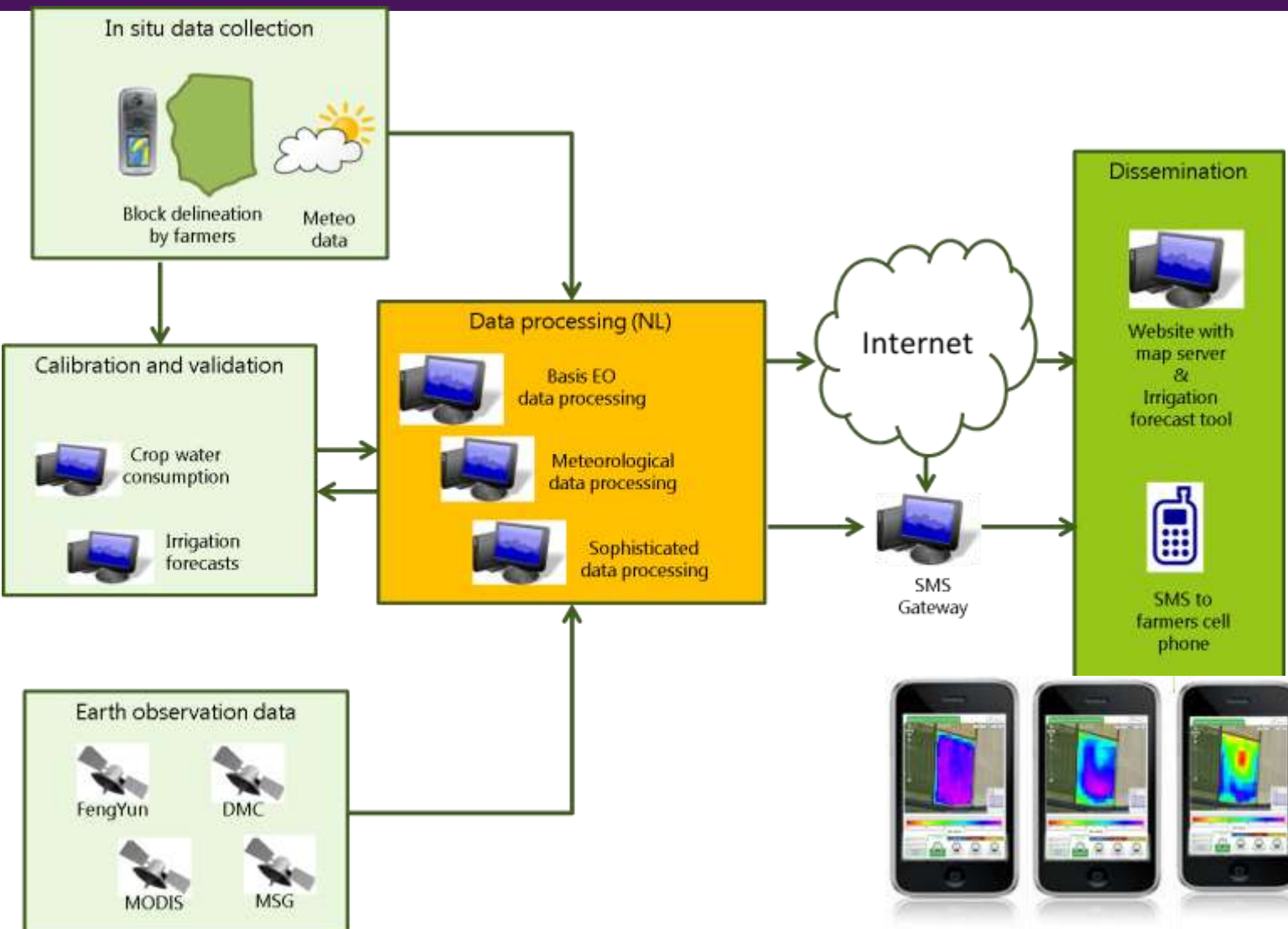
December 2011

Advisory

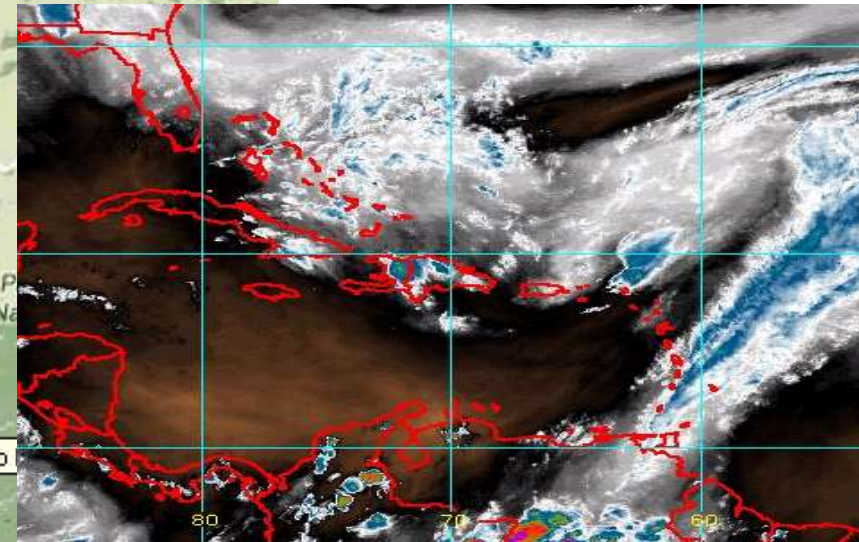


Insurance/finance





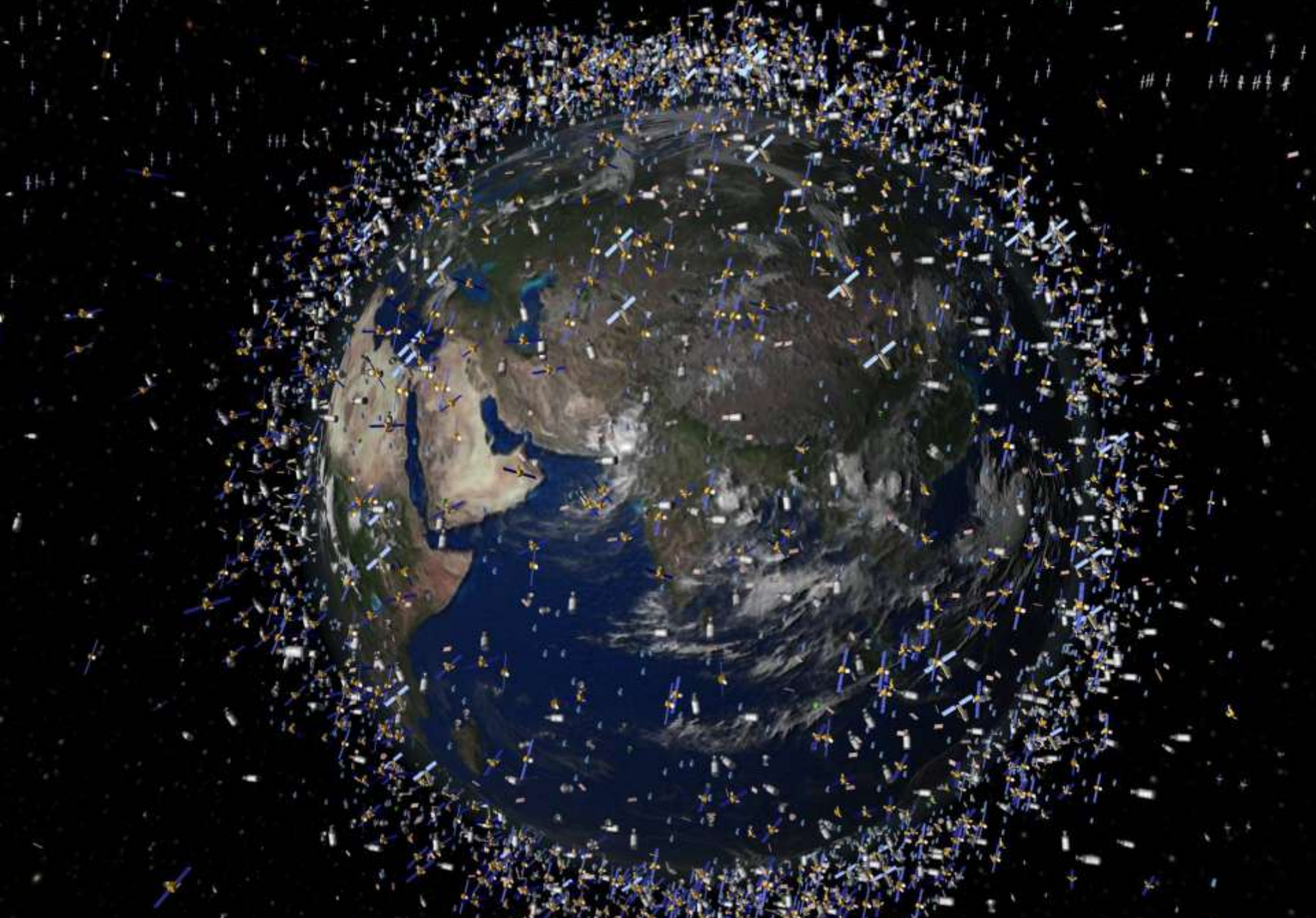
Monitoring





Why also satellite data?

- Objective, consistent, cross border
- No or few (local) monitoring infrastructure
- 25+ years time series (geostationary satellite, Landsat)
- Many new satellites (to be) launched, no or low cost



Landsat 8 (US, 2013)
No cost

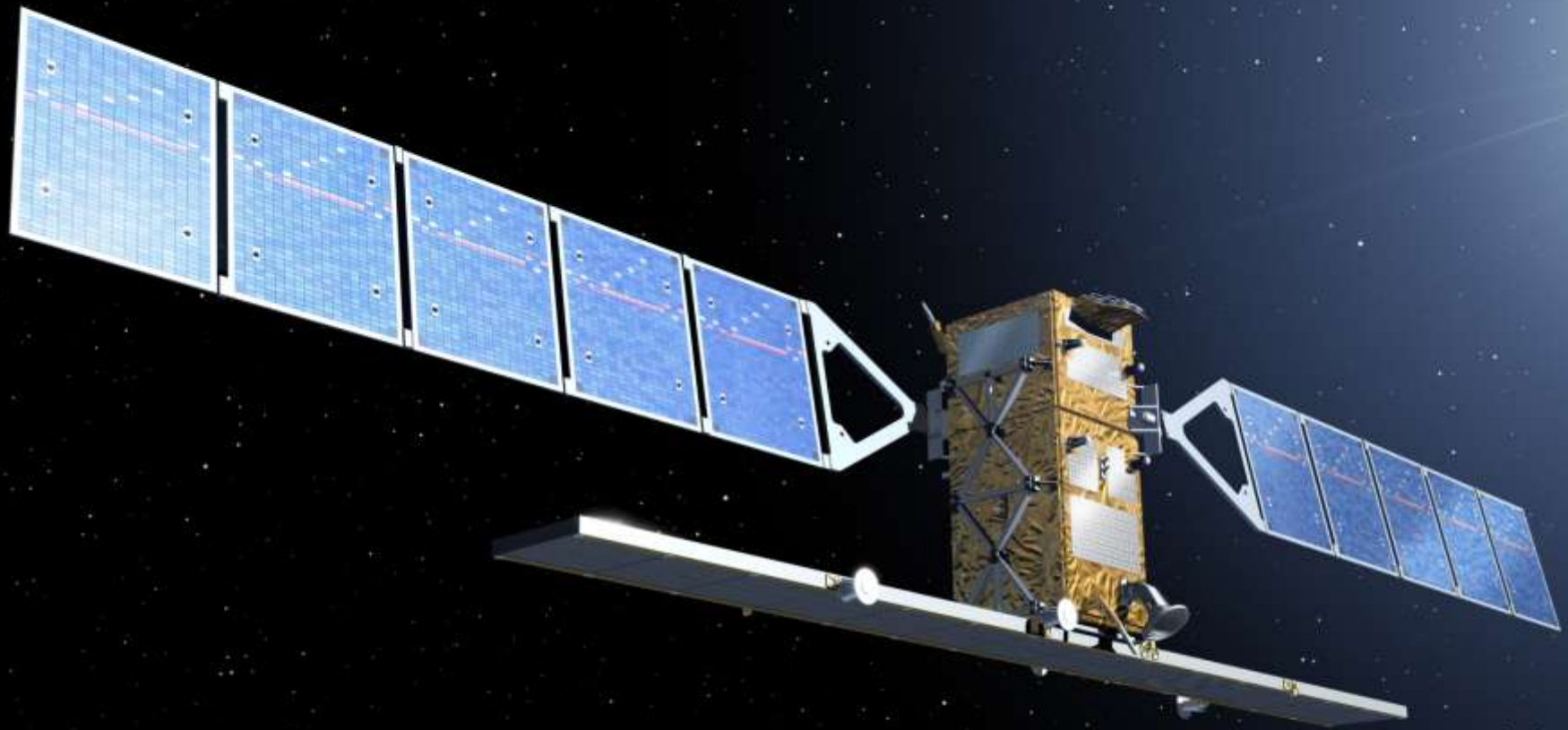




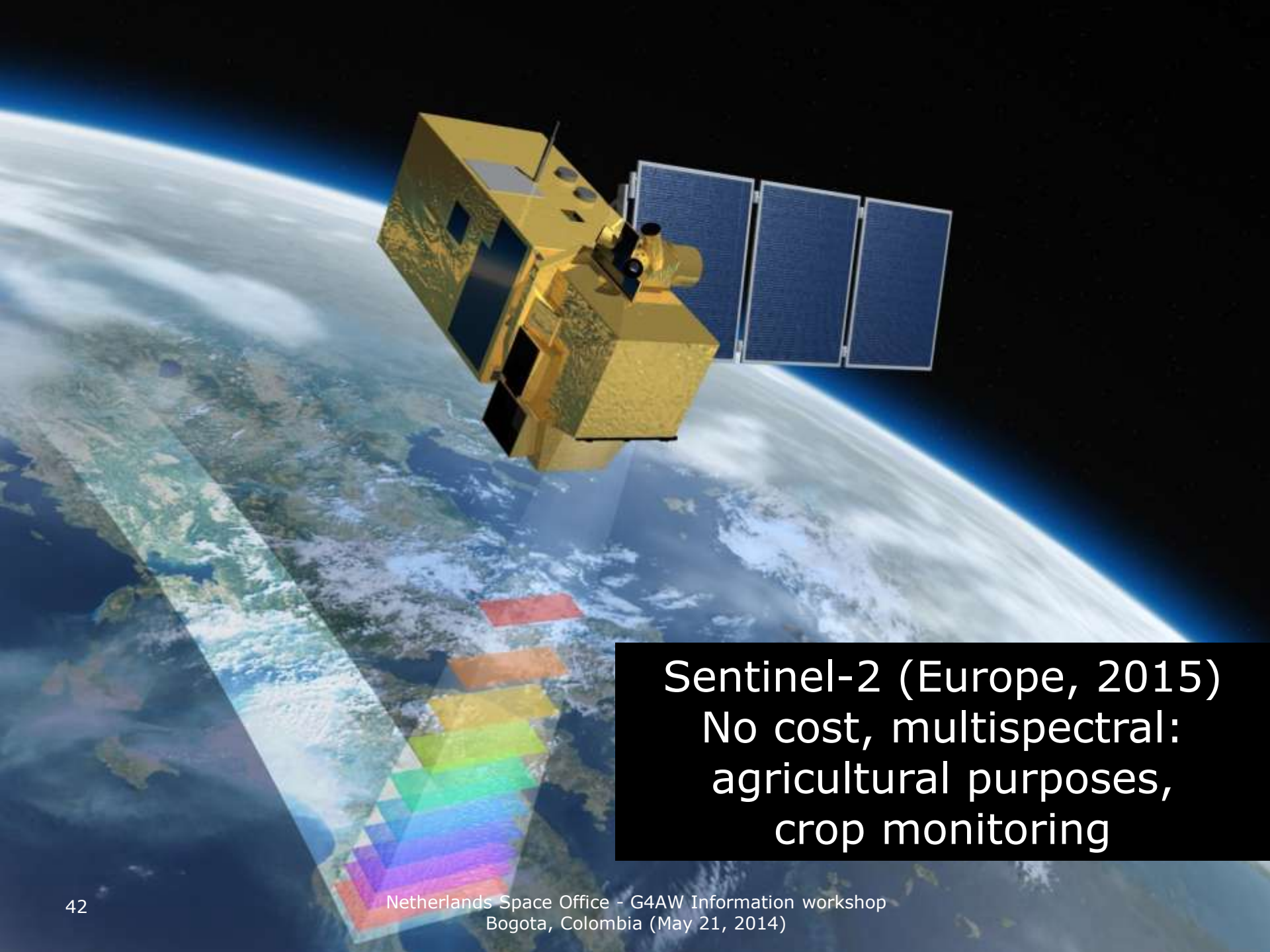
Planet Labs (2014)

Skybox (2014)

Constellation
High revisit time
Commercial
Low cost



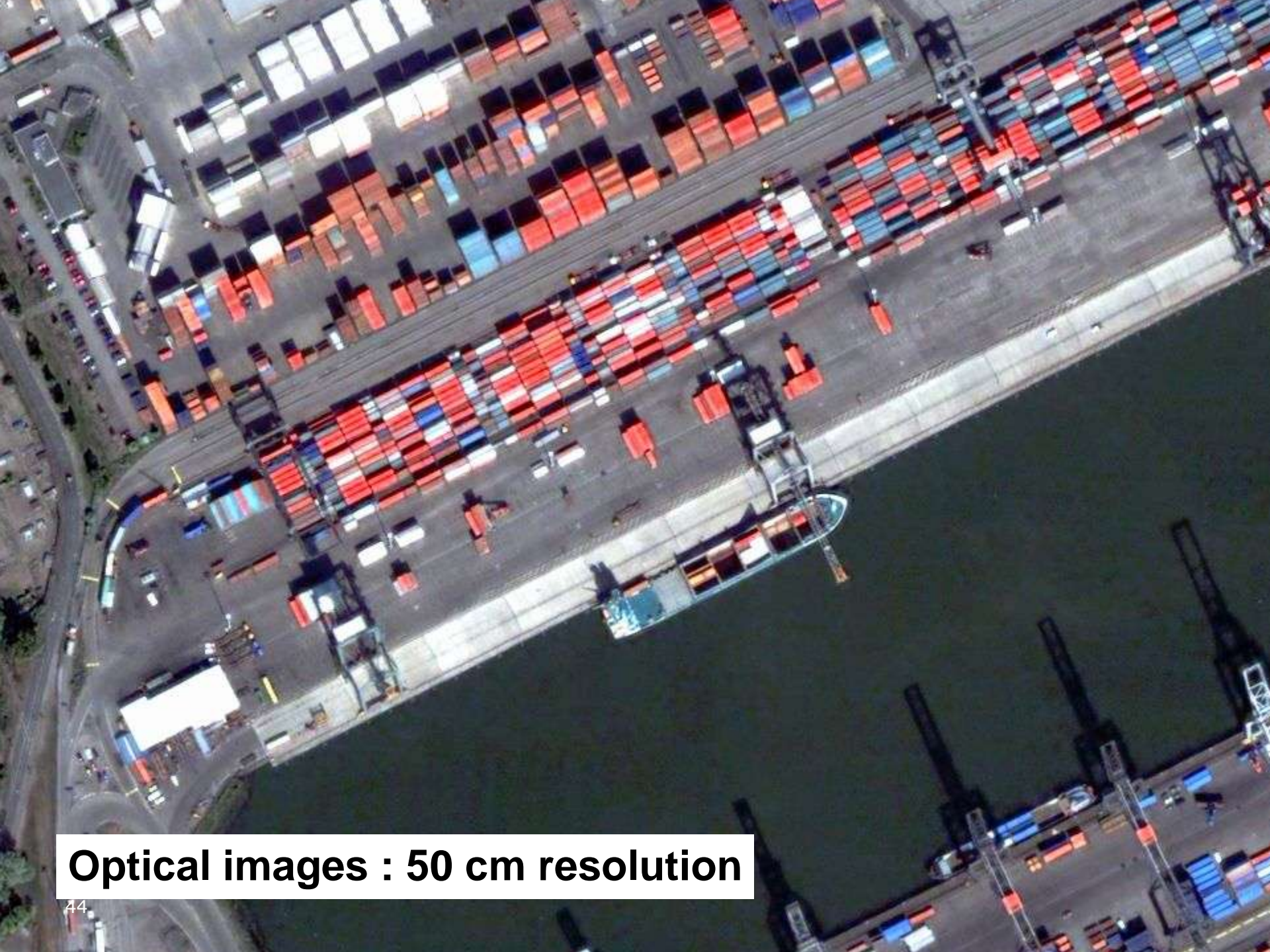
Sentinel-1 (Europe, 2014)
No cost
Looking through clouds, day & night



Sentinel-2 (Europe, 2015)
No cost, multispectral:
agricultural purposes,
crop monitoring

High resolution satellites

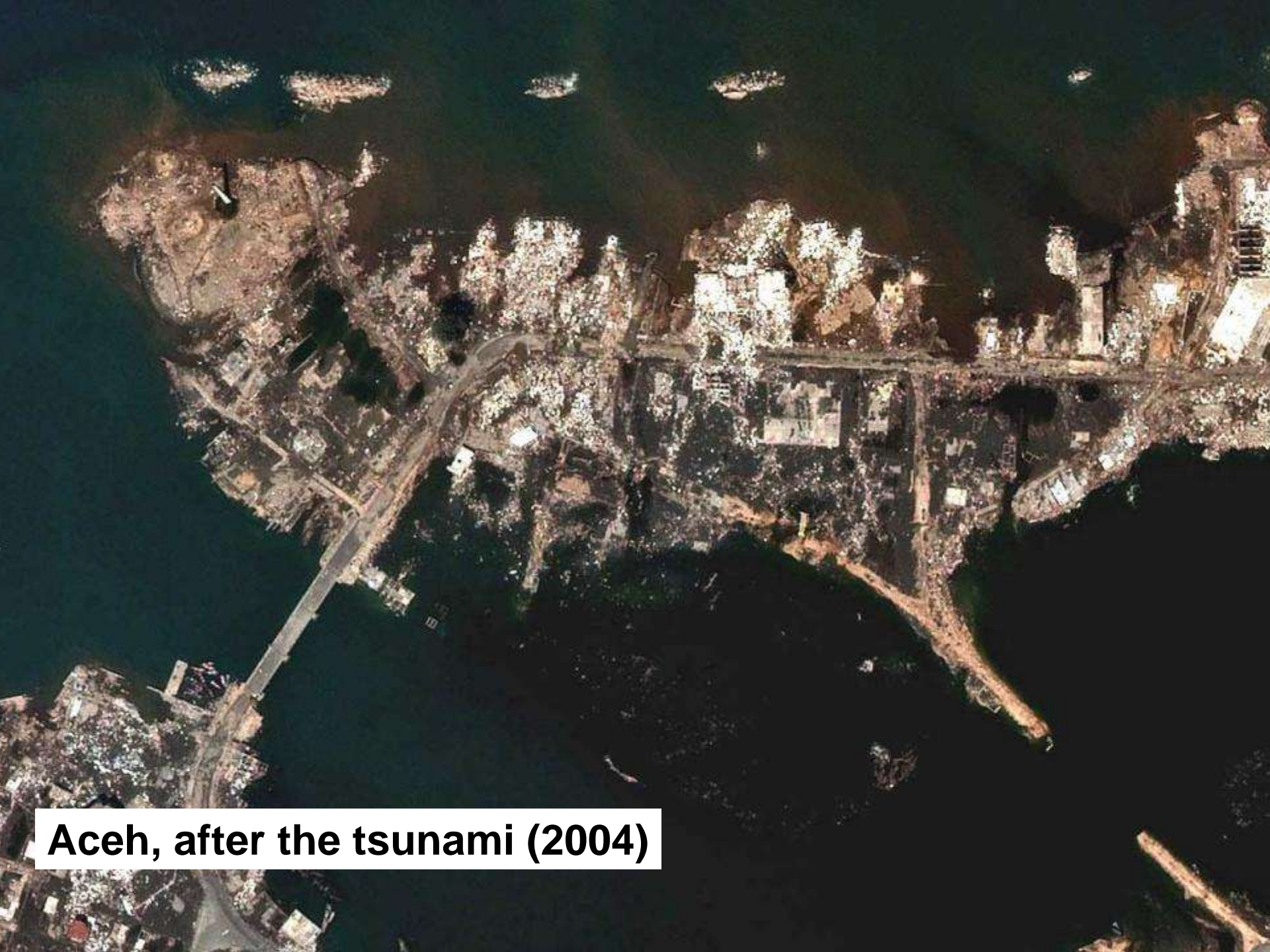
Worldview-2



Optical images : 50 cm resolution



Aceh, before the tsunami (2004)



Aceh, after the tsunami (2004)



Gracias por
su atención

Netherlands
Space
Office