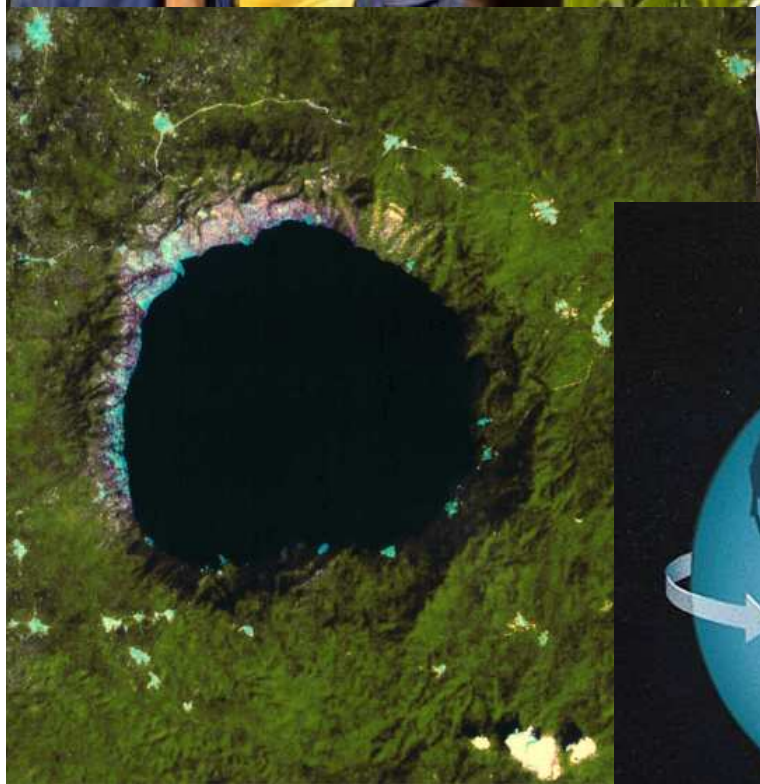




G4AW

Geodata for Agriculture and Water

Images: CIAT & ESA





Food security &
satellite based information services

Ivo Walsmit

Netherlands Space Office (NSO)

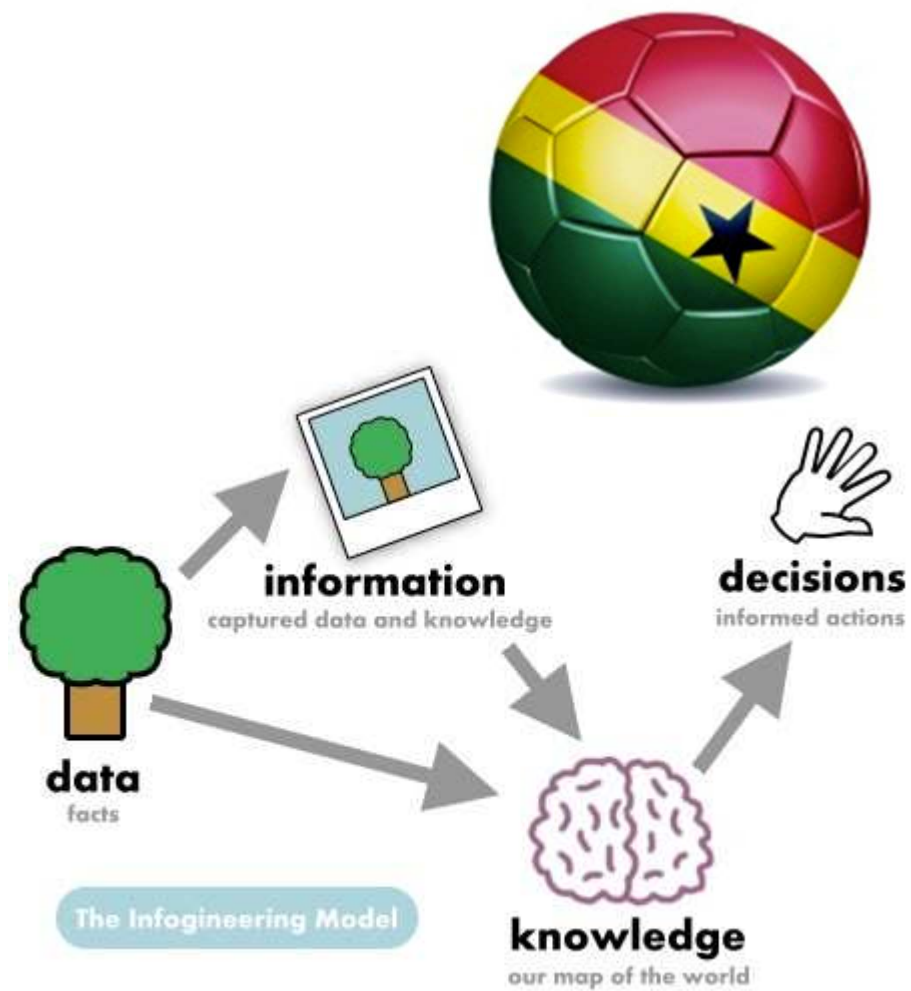


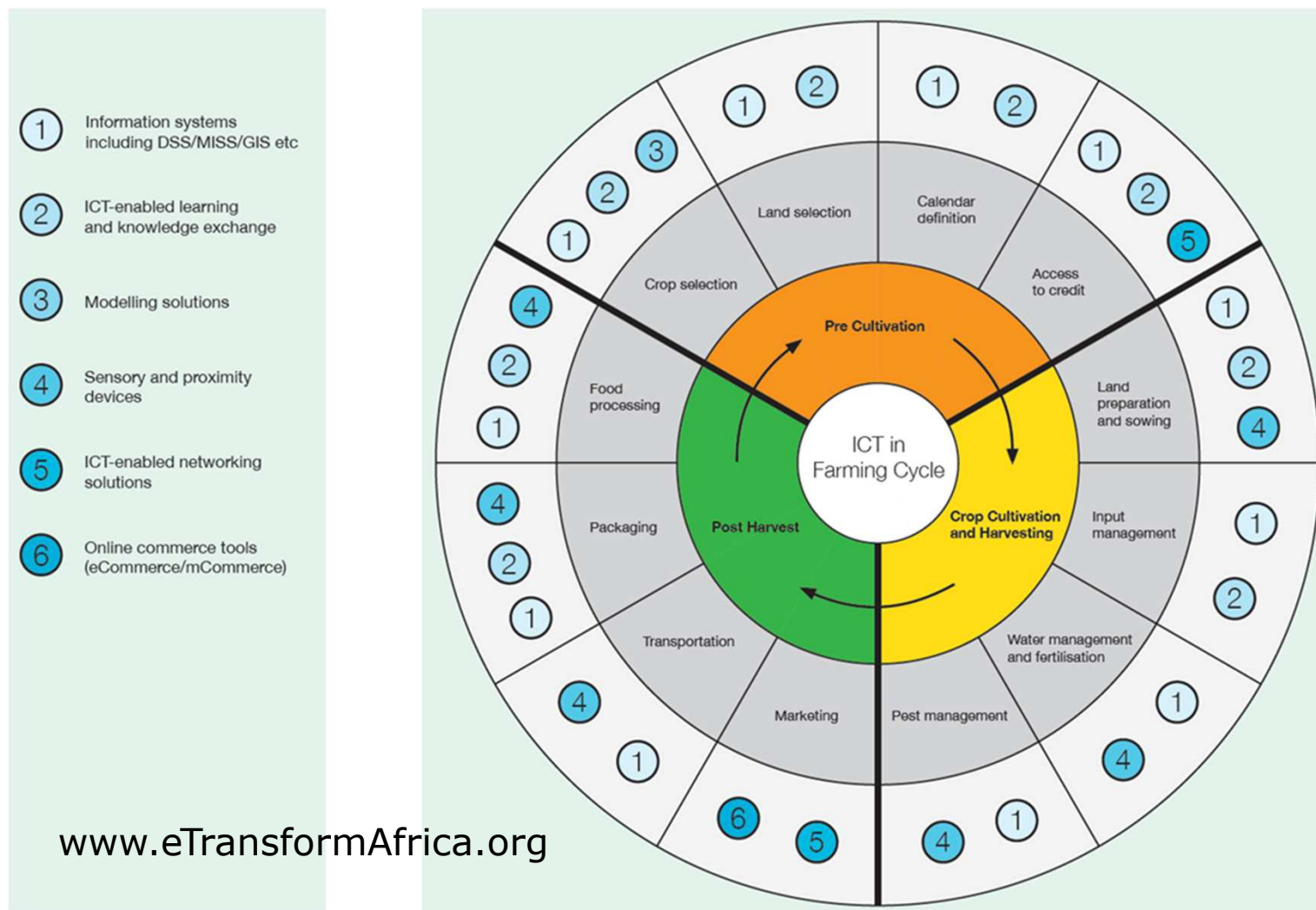


Effects of climate change on food & water security, e.g.

- Extensive rainfall
- Drought







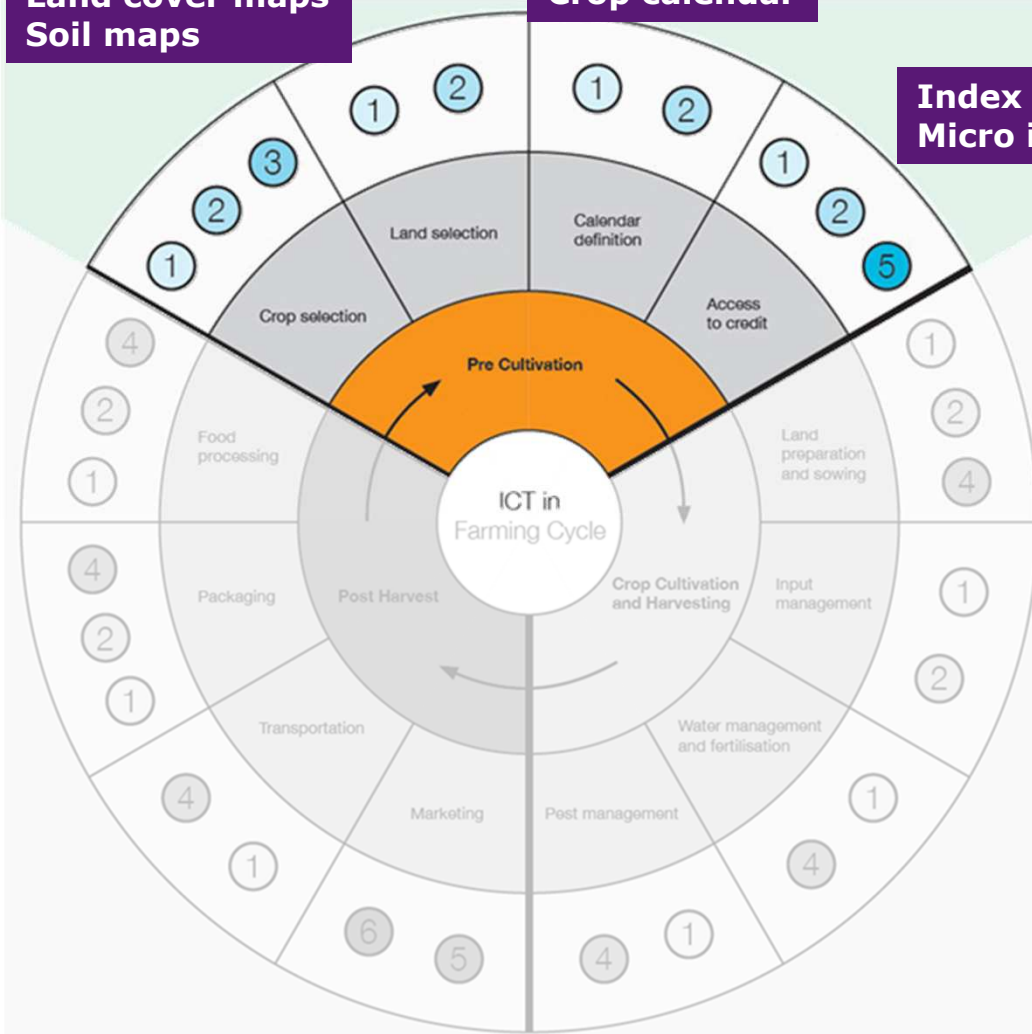


- ① Information systems including DSS/MISS/GIS etc
- ② ICT-enabled learning and knowledge exchange
- ③ Modelling solutions
- ④ Sensory and proximity devices
- ⑤ ICT-enabled networking solutions
- ⑥ Online commerce tools (eCommerce/mCommerce)

Land cover maps Soil maps

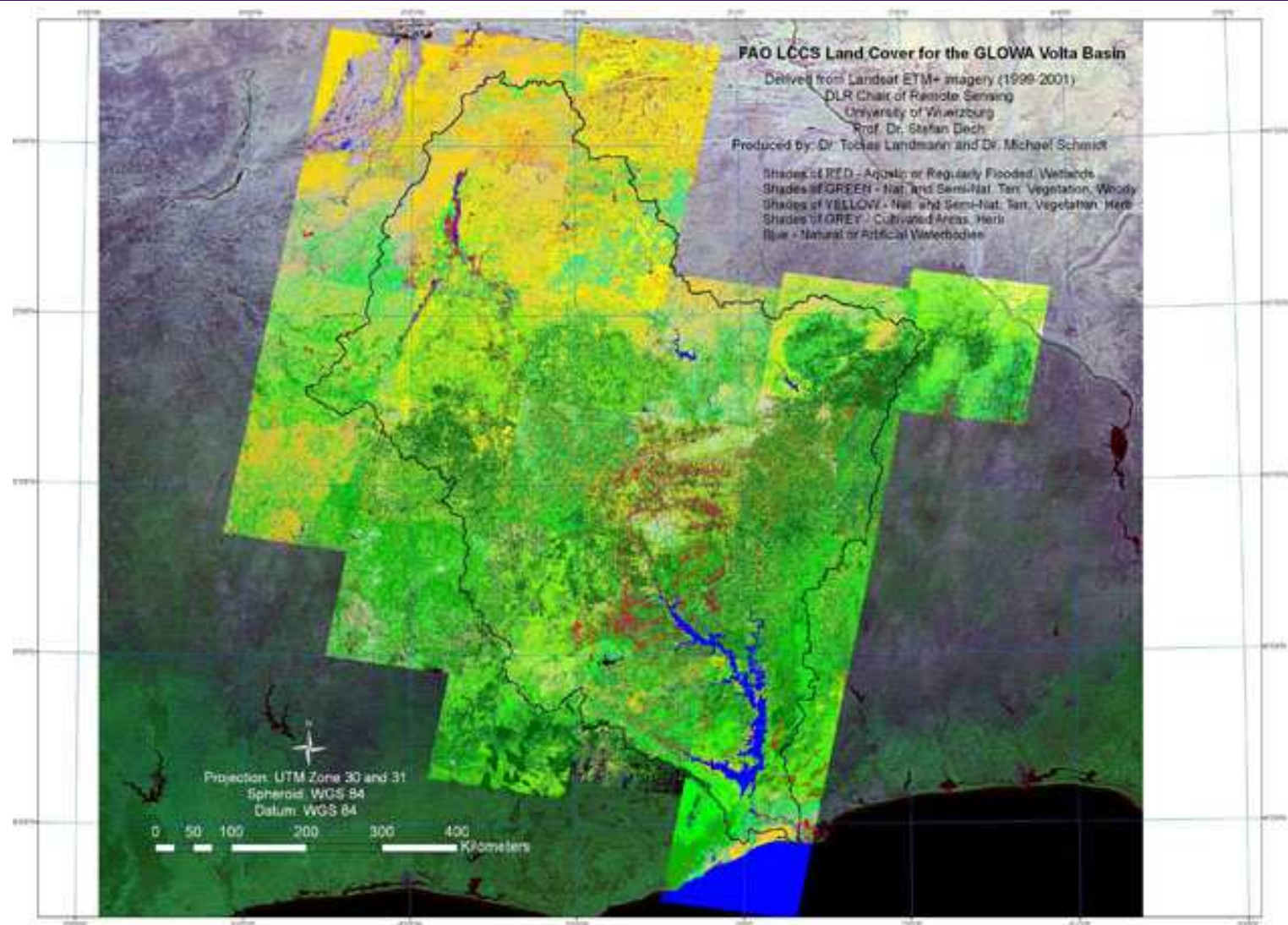
Crop calendar

Index based Micro insurance





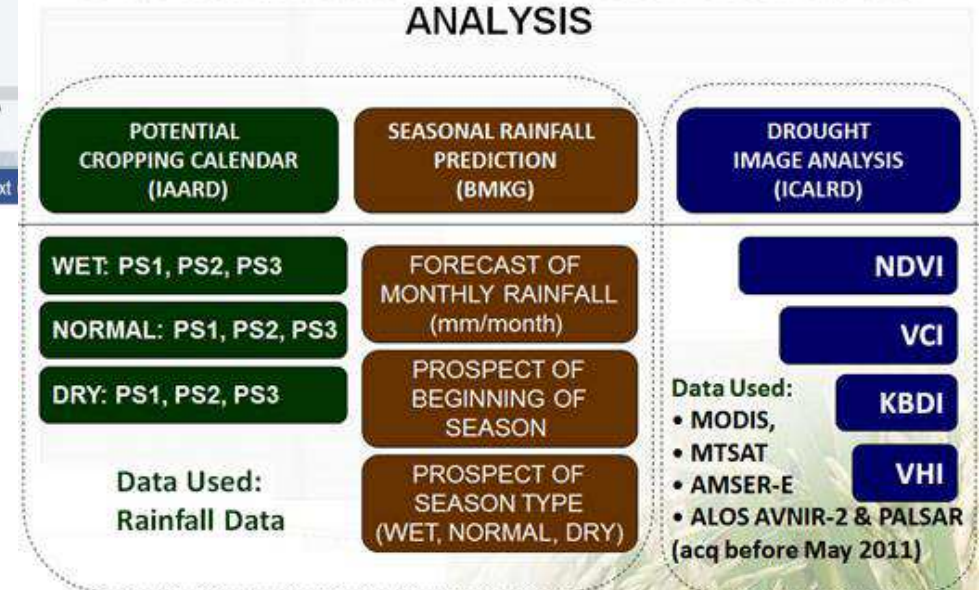
Land Cover Map



Crop calendar



INTEGRATION OF CROPPING PATTERNS, SEASONAL RAINFALL AND SATELLITE IMAGE ANALYSIS

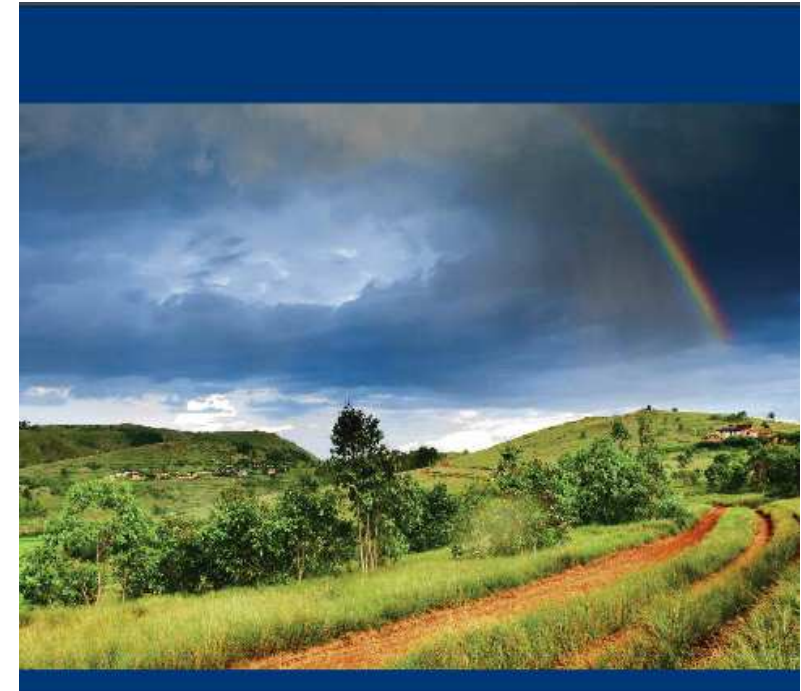


Micro insurance



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

→ Time for Up-scaling



Weather Index-based Insurance
in Agricultural Development
A Technical Guide



World Food
Programme



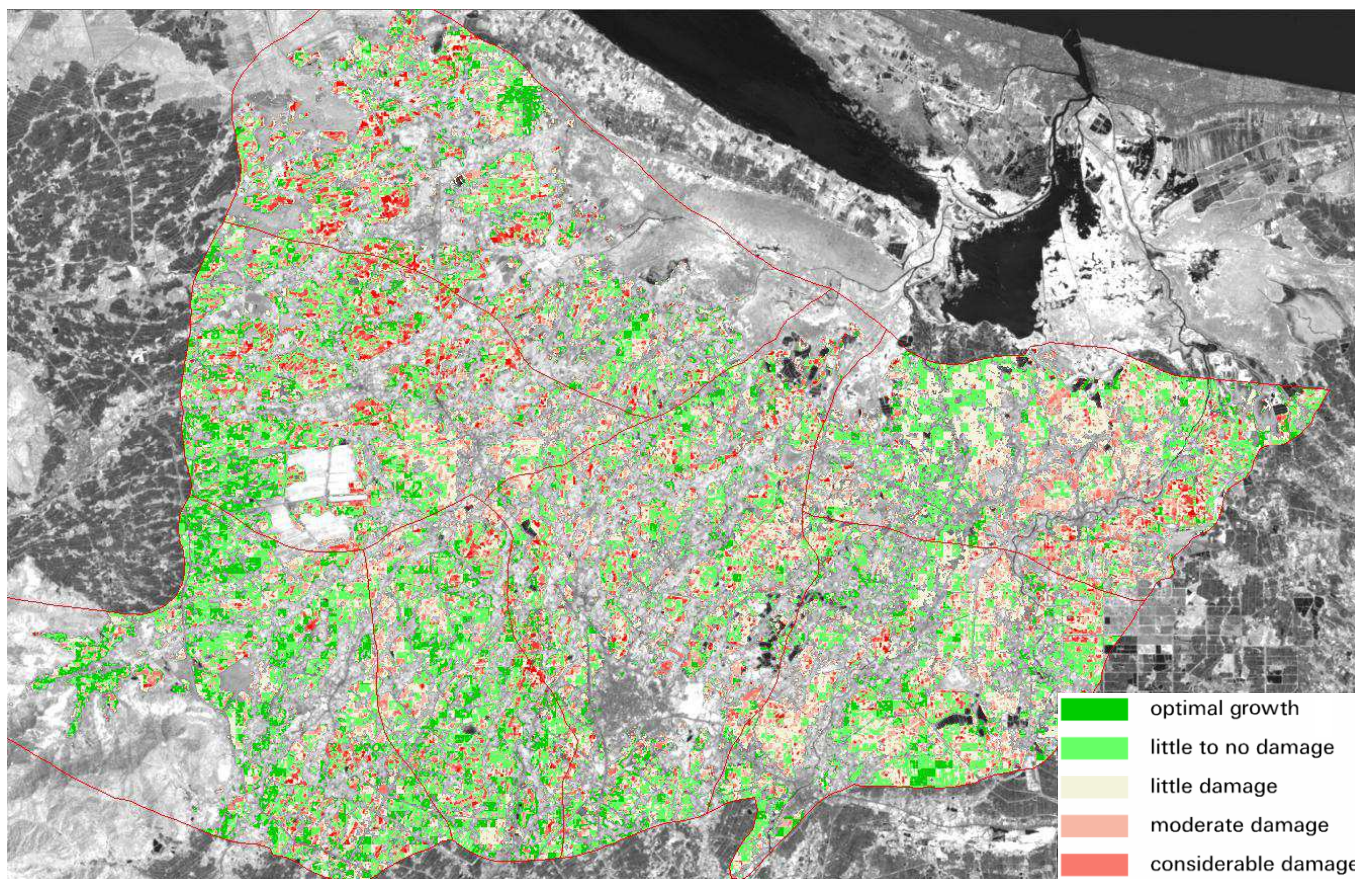
Enabling poor rural people
to overcome poverty

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

Micro insurance

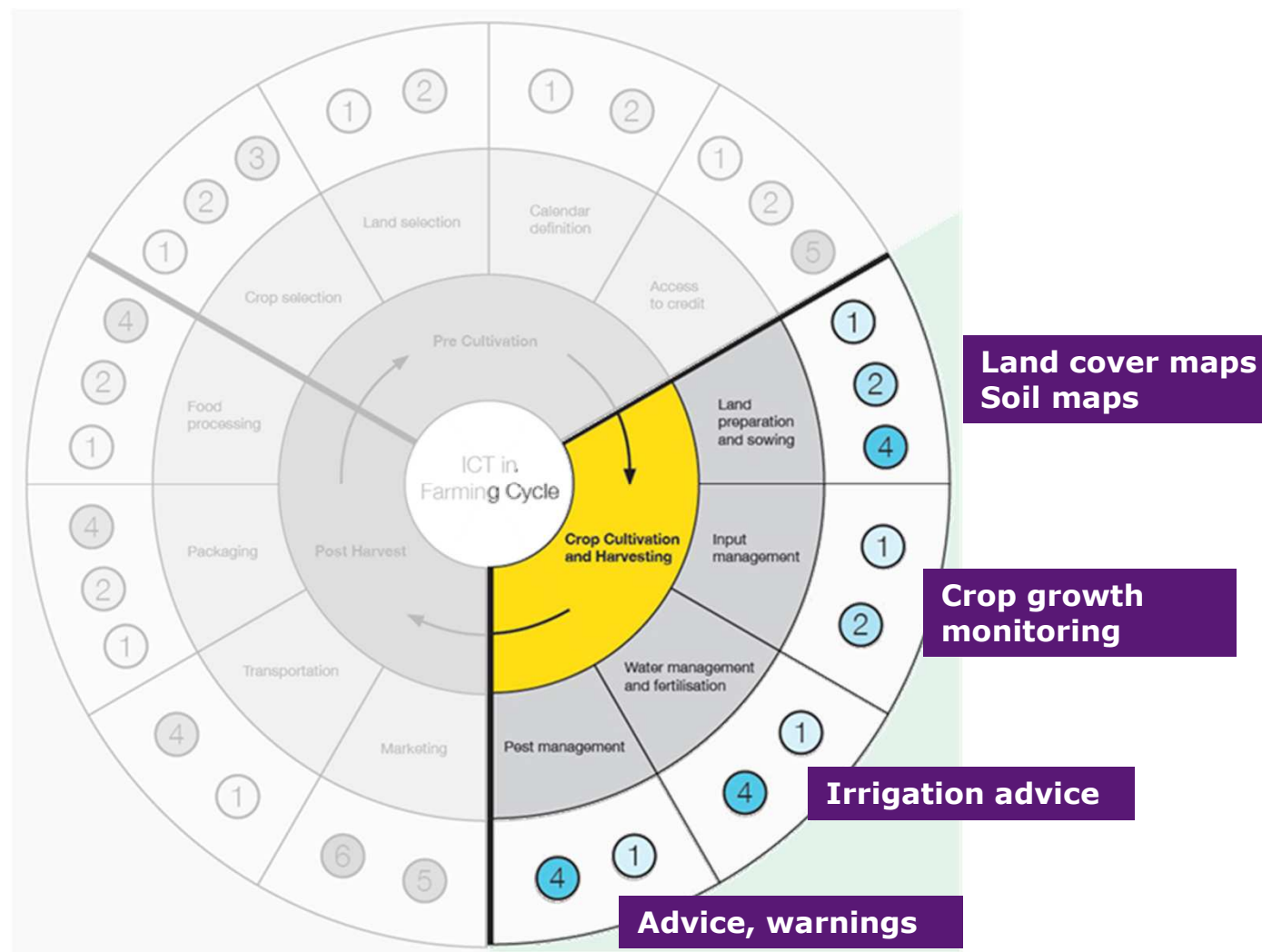


Weather insurance in rice crops





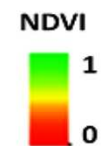
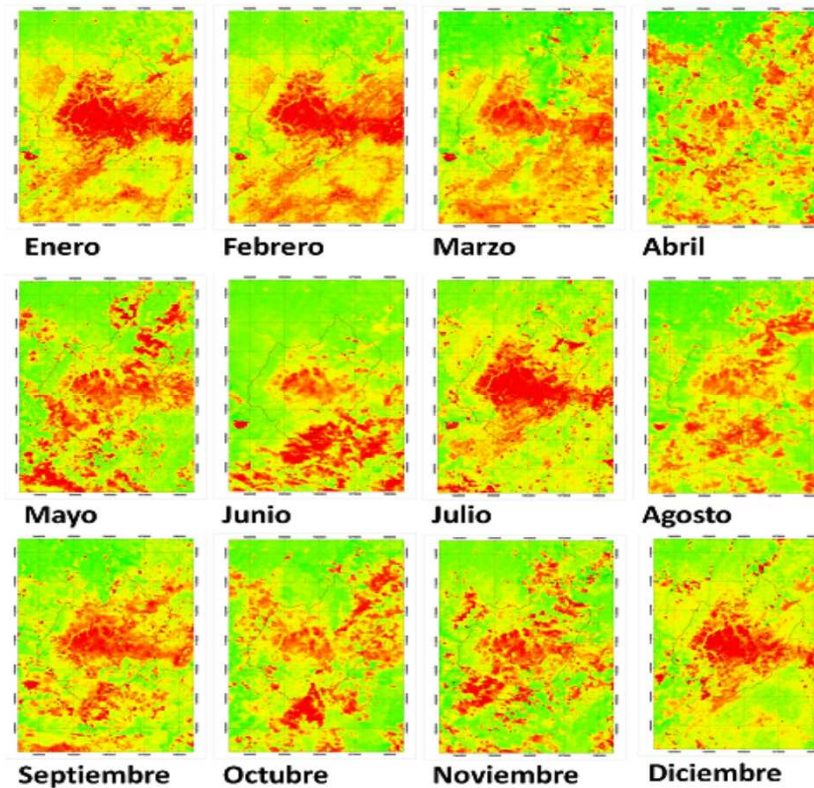
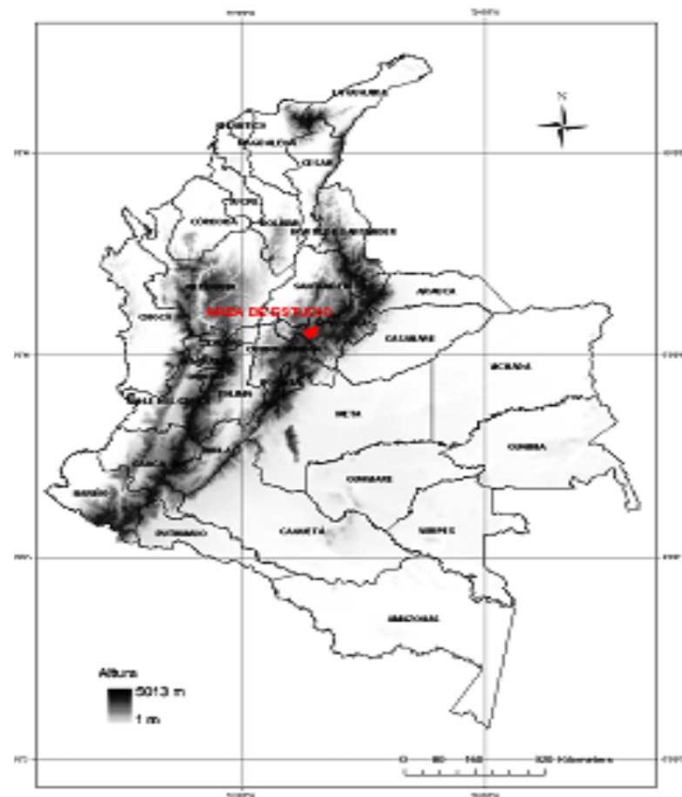
- ① Information systems including DSS/MISS/GIS etc
- ② ICT-enabled learning and knowledge exchange
- ③ Modelling solutions
- ④ Sensory and proximity devices
- ⑤ ICT-enabled networking solutions
- ⑥ Online commerce tools (eCommerce/mCommerce)



Crop growth monitoring



Villa de Leiva (2008)

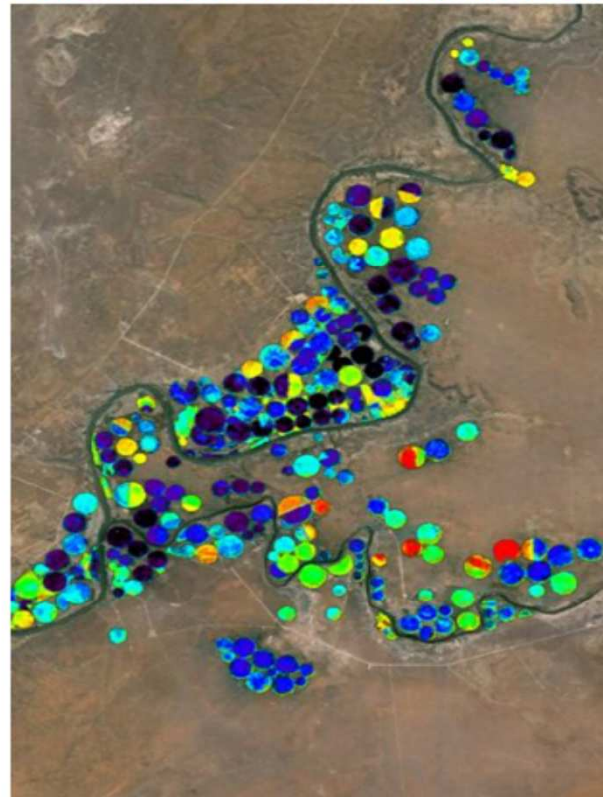


Crop growth monitoring

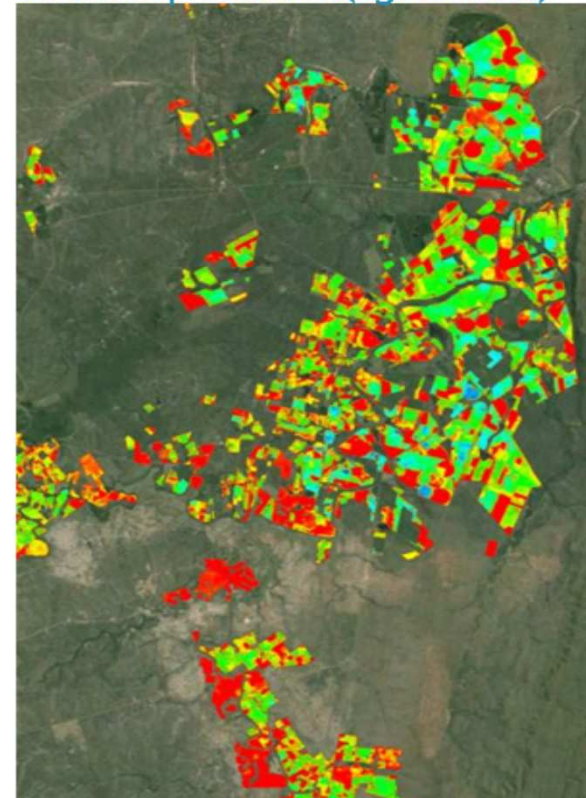


South Africa

GrainLook – Douglas
Actual Evapotranspiration (mm/week)

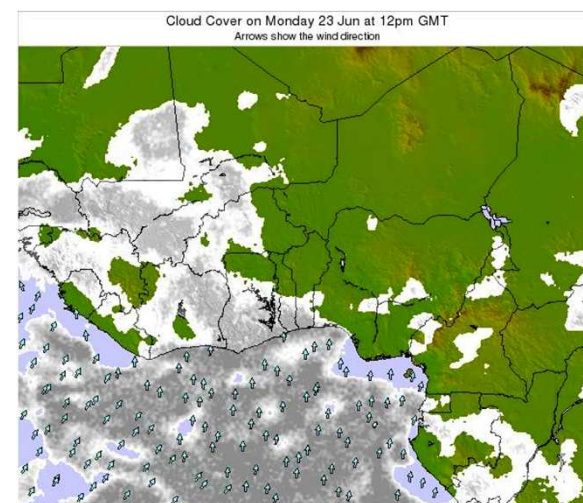
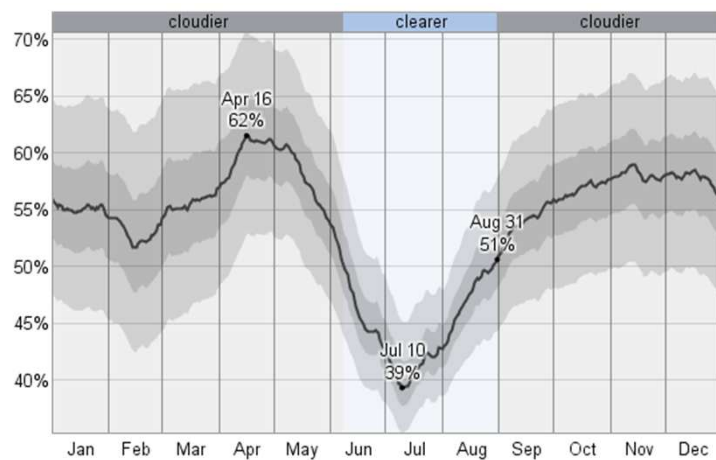
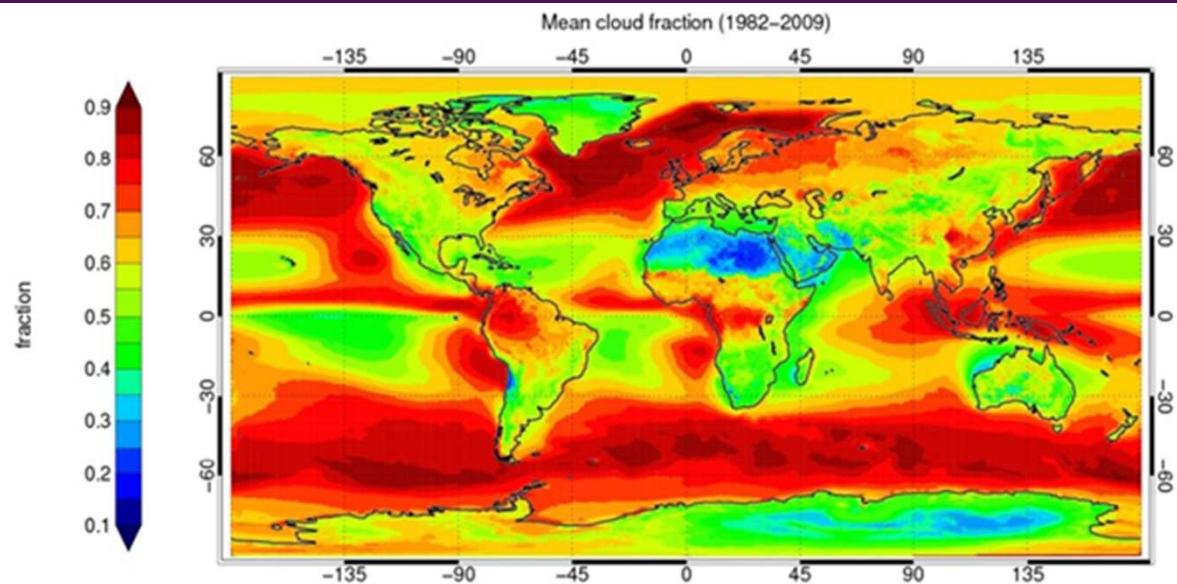
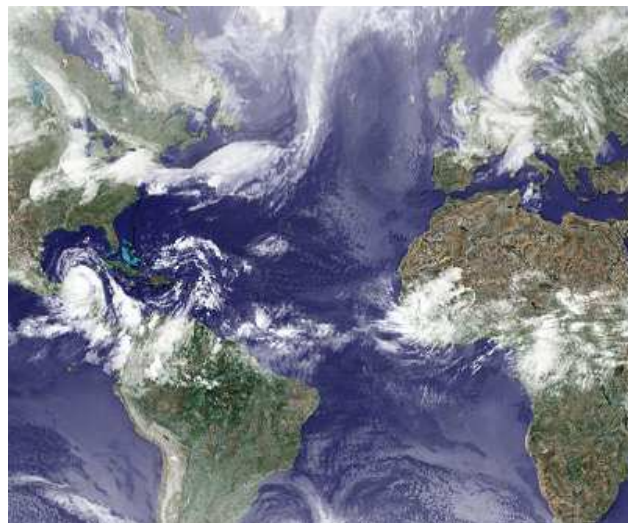


SugarcaneLook – Mpumalanga
Biomass production (kg/ha/week)

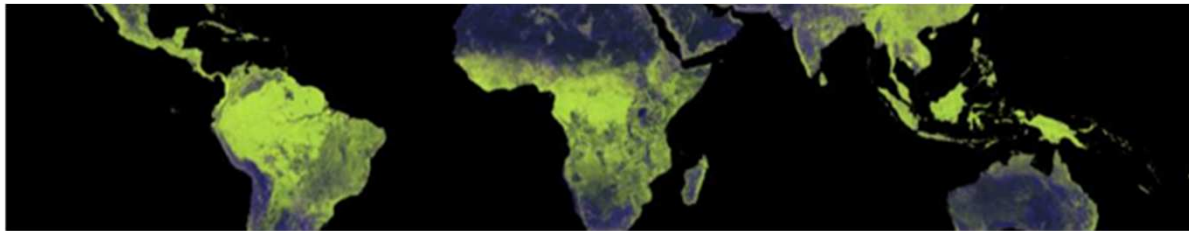




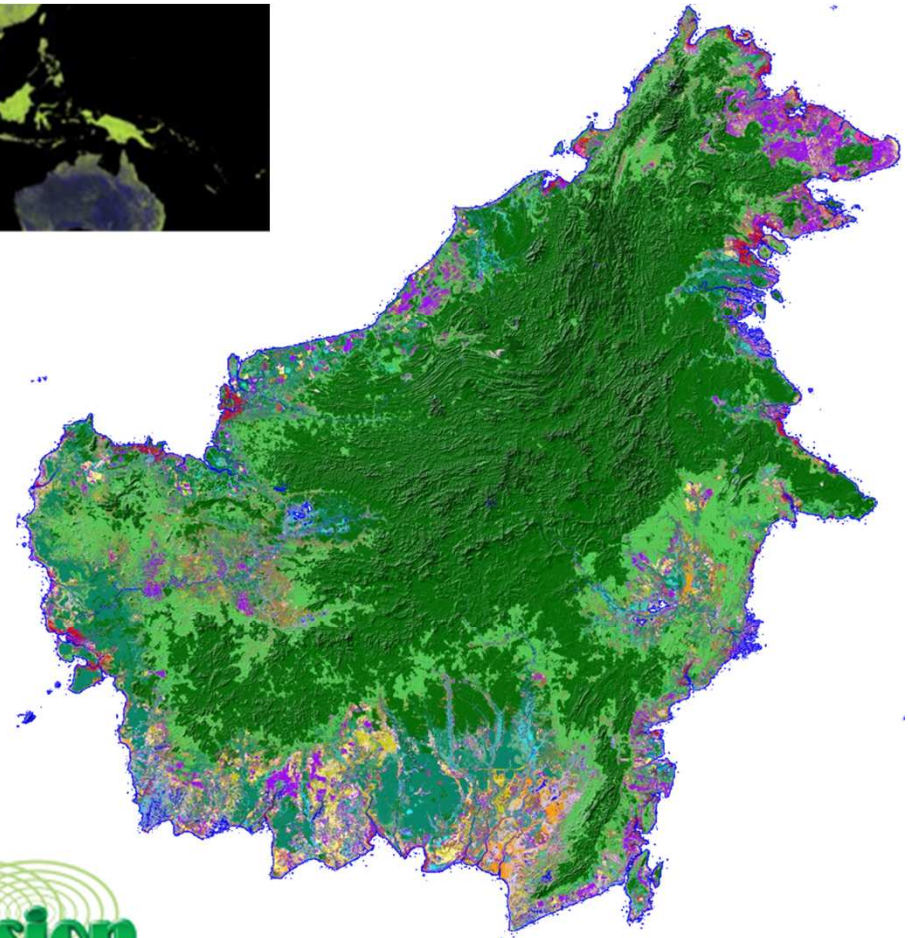
Cloud cover



Radar looks under clouds



	Lowland forest
	Riverine forest
	Swamp forest
	Mangrove forest
	Nipah 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



wielaard@sarvision.nl

©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

22/04/2012



**Radar
analysis**

Bare soil

SarVision
wielaard@sarvision.nl

©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

16/05/2012



**Radar
analysis**

Bare soil
Emergence

SarVision
wielaard@sarvision.nl

©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

09/06/2012



**Radar
analysis**

Bare soil
Emergence
Increment

SarVision
wielaard@sarvision.nl

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Crop growth monitoring



Sugar beet at 25m resolution every
24 days

03/07/2012



**Radar
analysis**

Bare soil
Emergence
Increment
Closure

SarVision
wielaard@sarvision.nl

©2012

Crop growth monitoring



Sugar beet at 25m resolution every
24 days

07/10/2012



Radar analysis

Bare soil
Emergence
Increment
Closure
Harvest

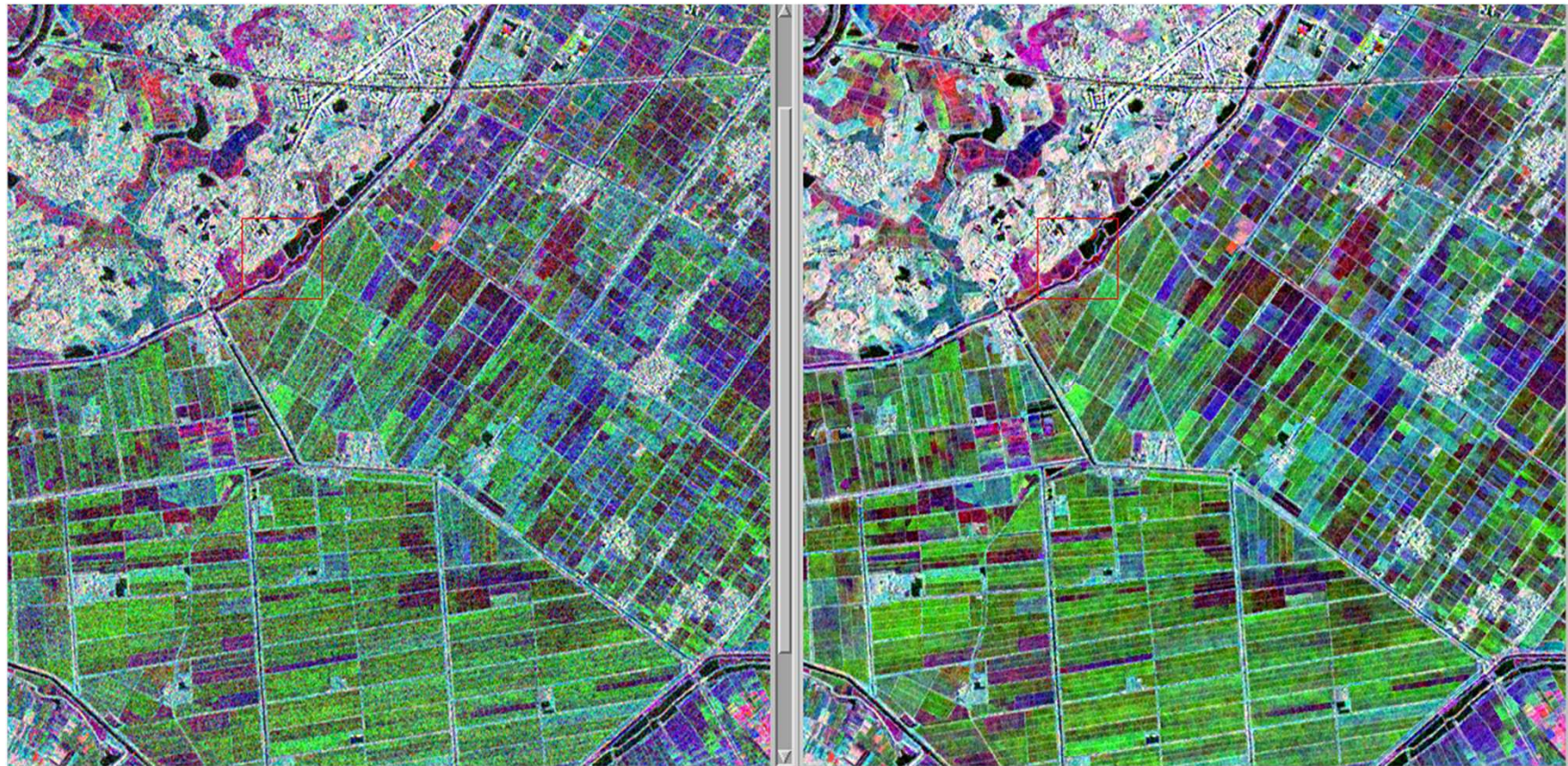


©2012

Crop growth monitoring



Rice at 5m resolution every 5-11 days



Sharp results: Multi-temporal filtering

5m detail suitable for monitoring of small farms



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



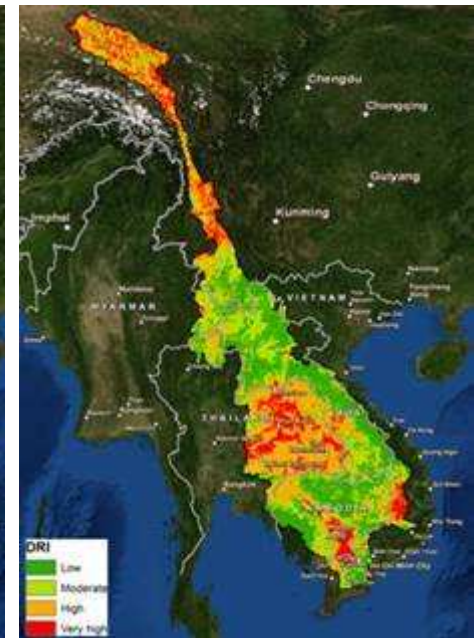
Vulnerability Index
Distance
to river



Vulnerability Index
Population density



Vulnerability Index
Precipitation



Drought
Risk Map

 FutureWater

Advice and warning

Early warning

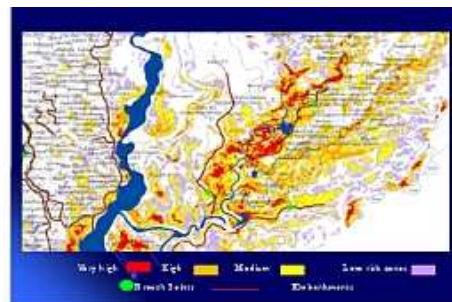
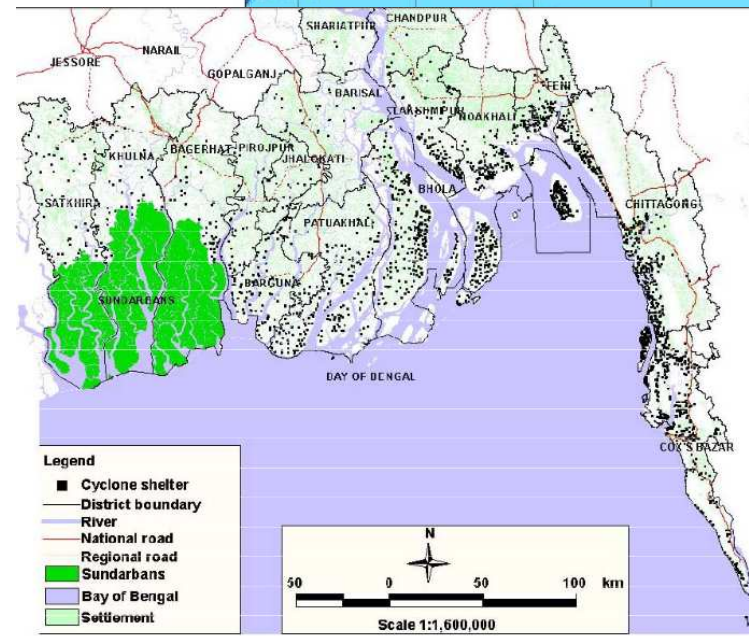
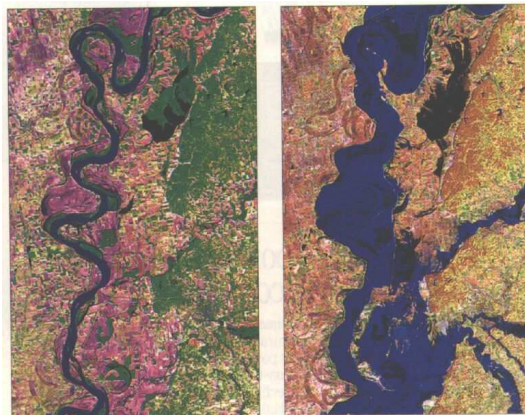
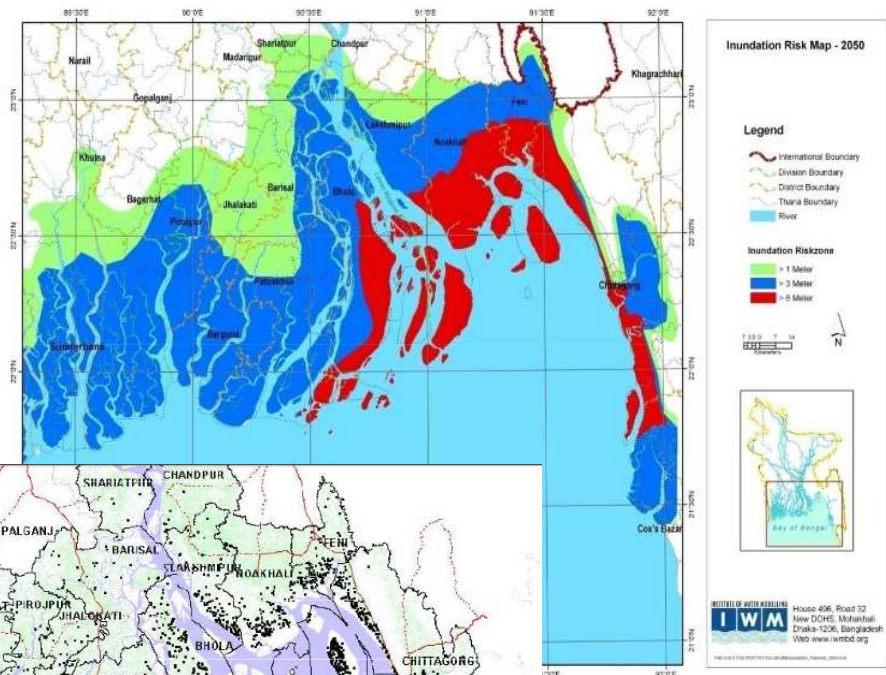
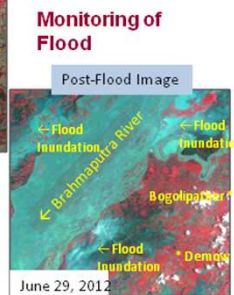
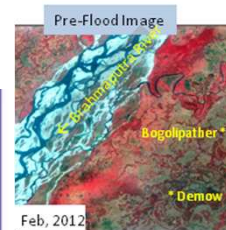
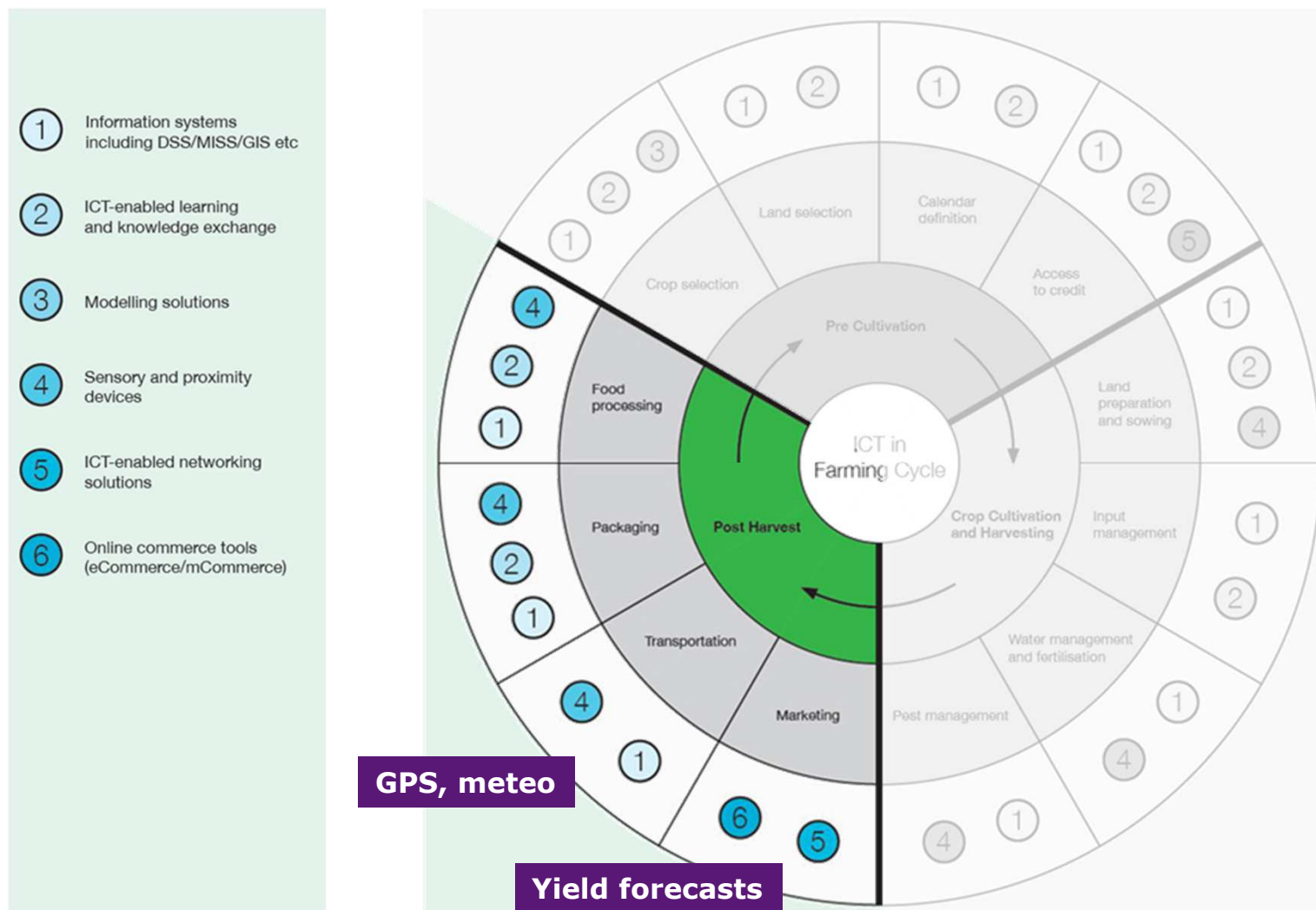


Fig: Flood hazard maps corresponding to various flood discharge and levels

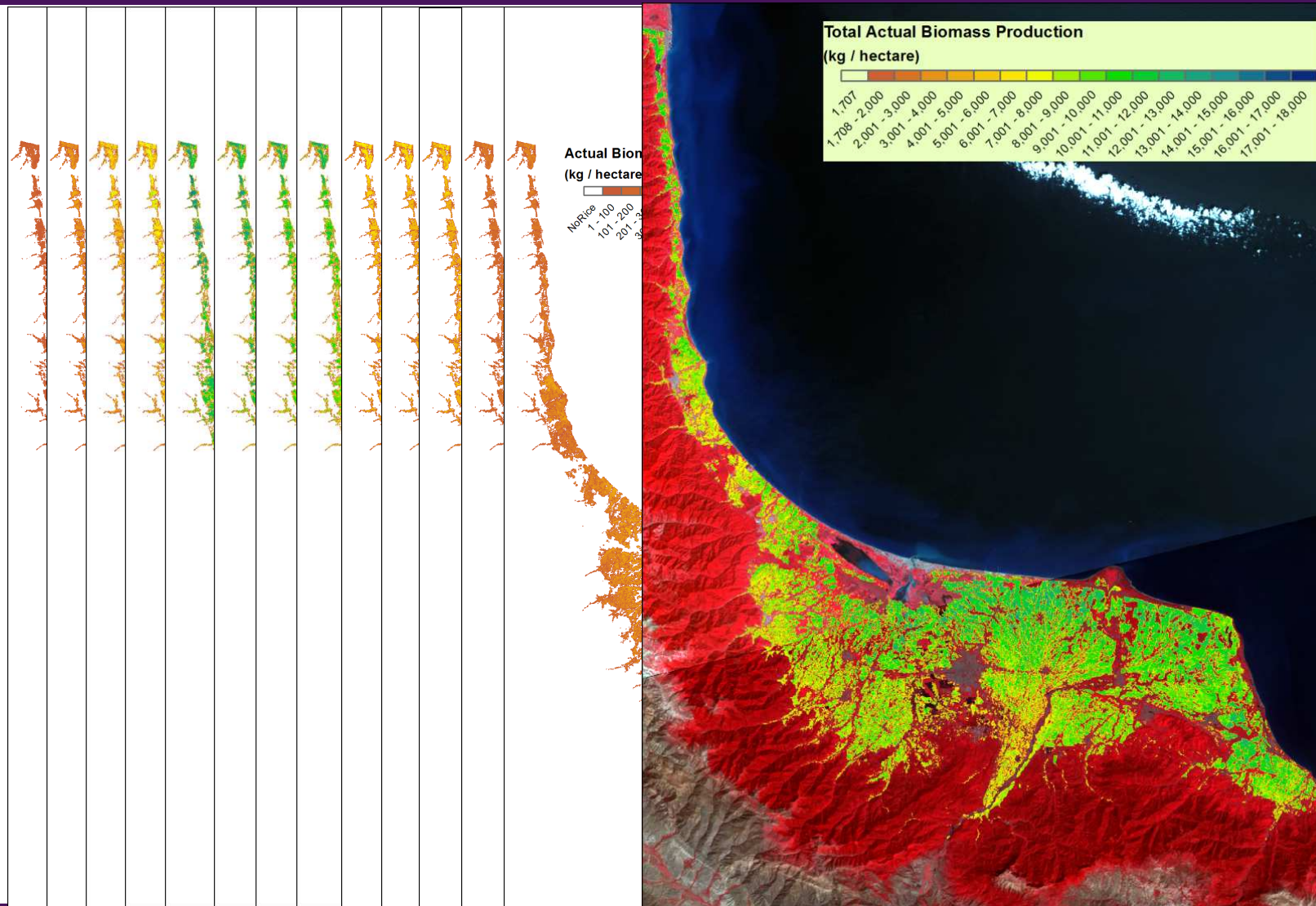




Yield forecast

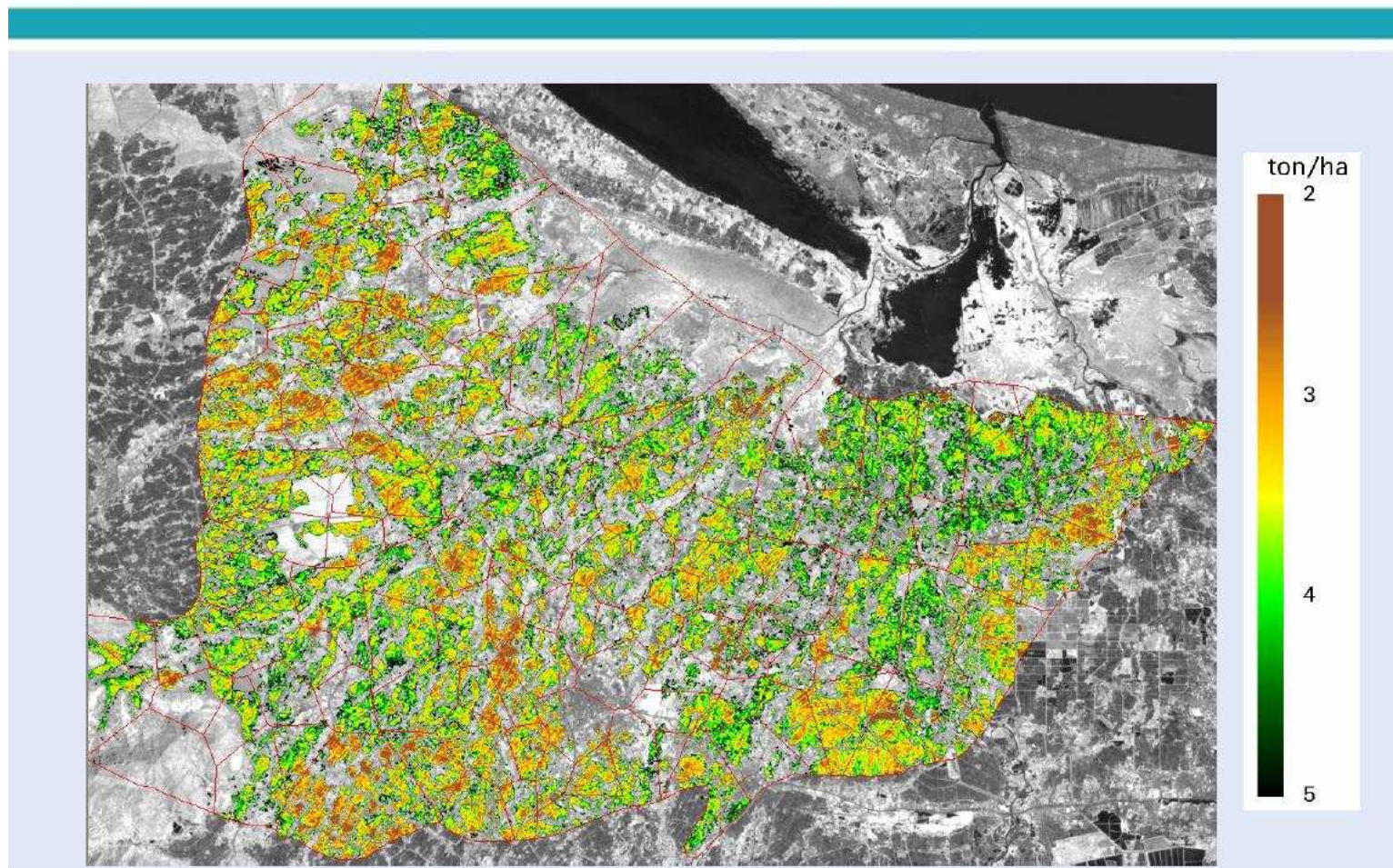


Actual Biomass Production





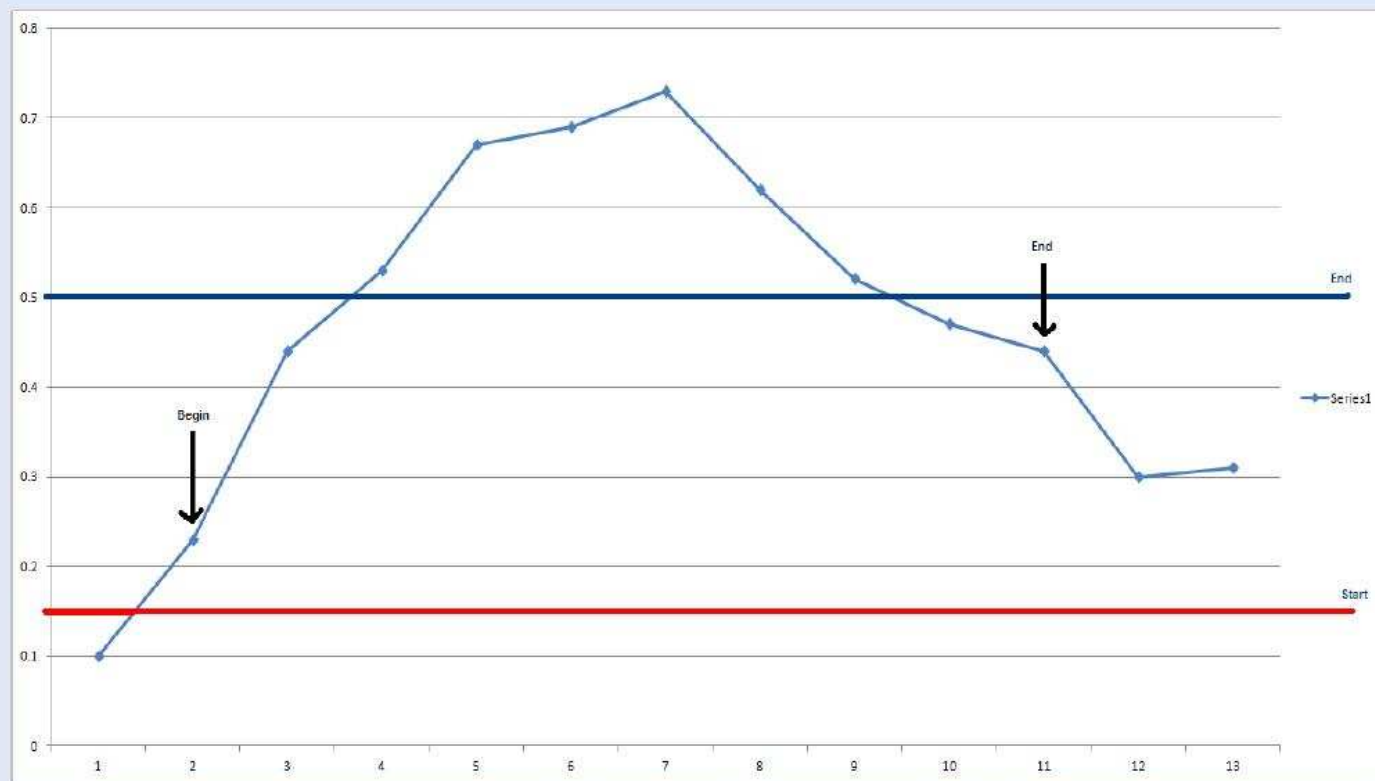
Rice Yield maps

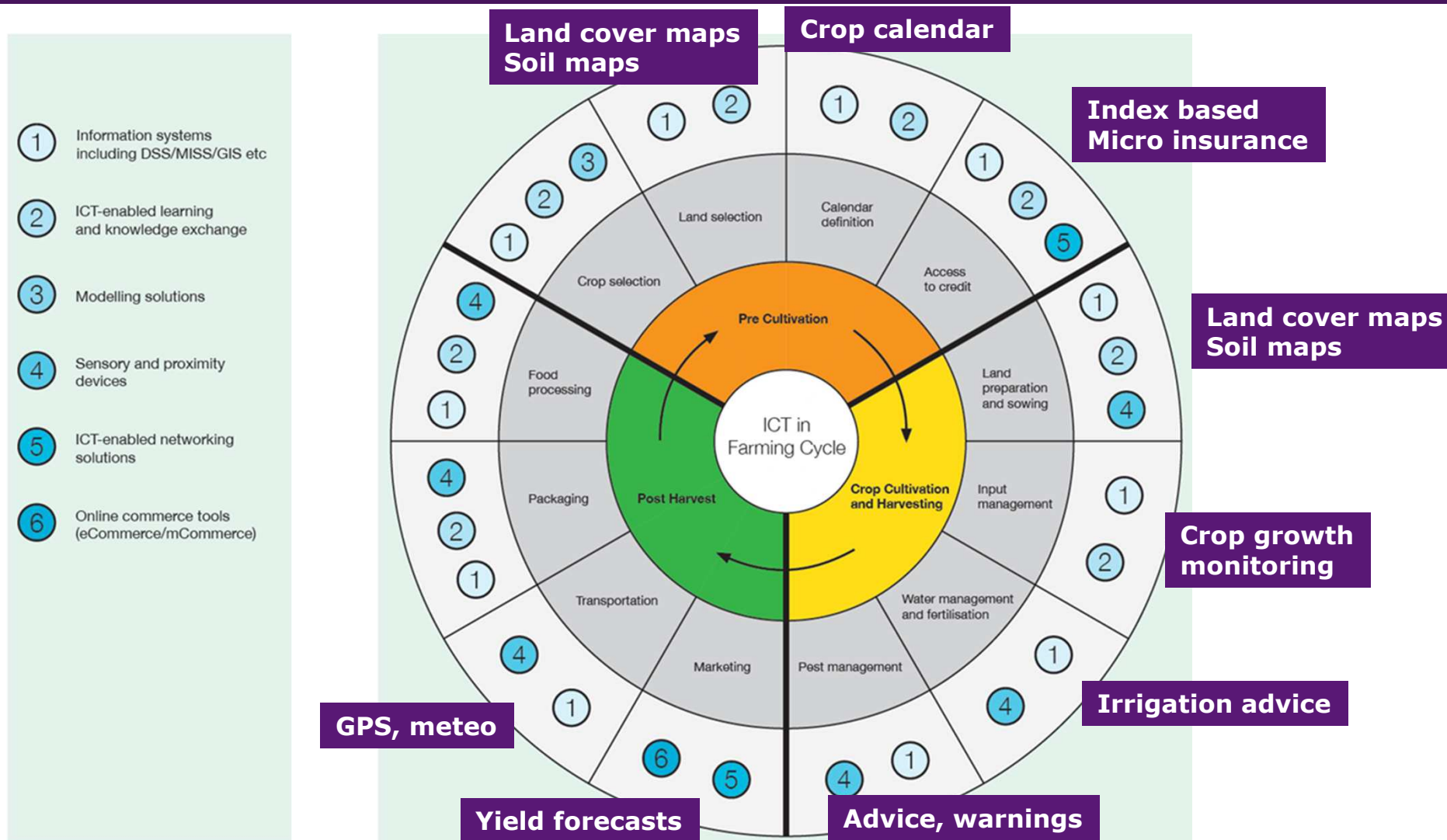


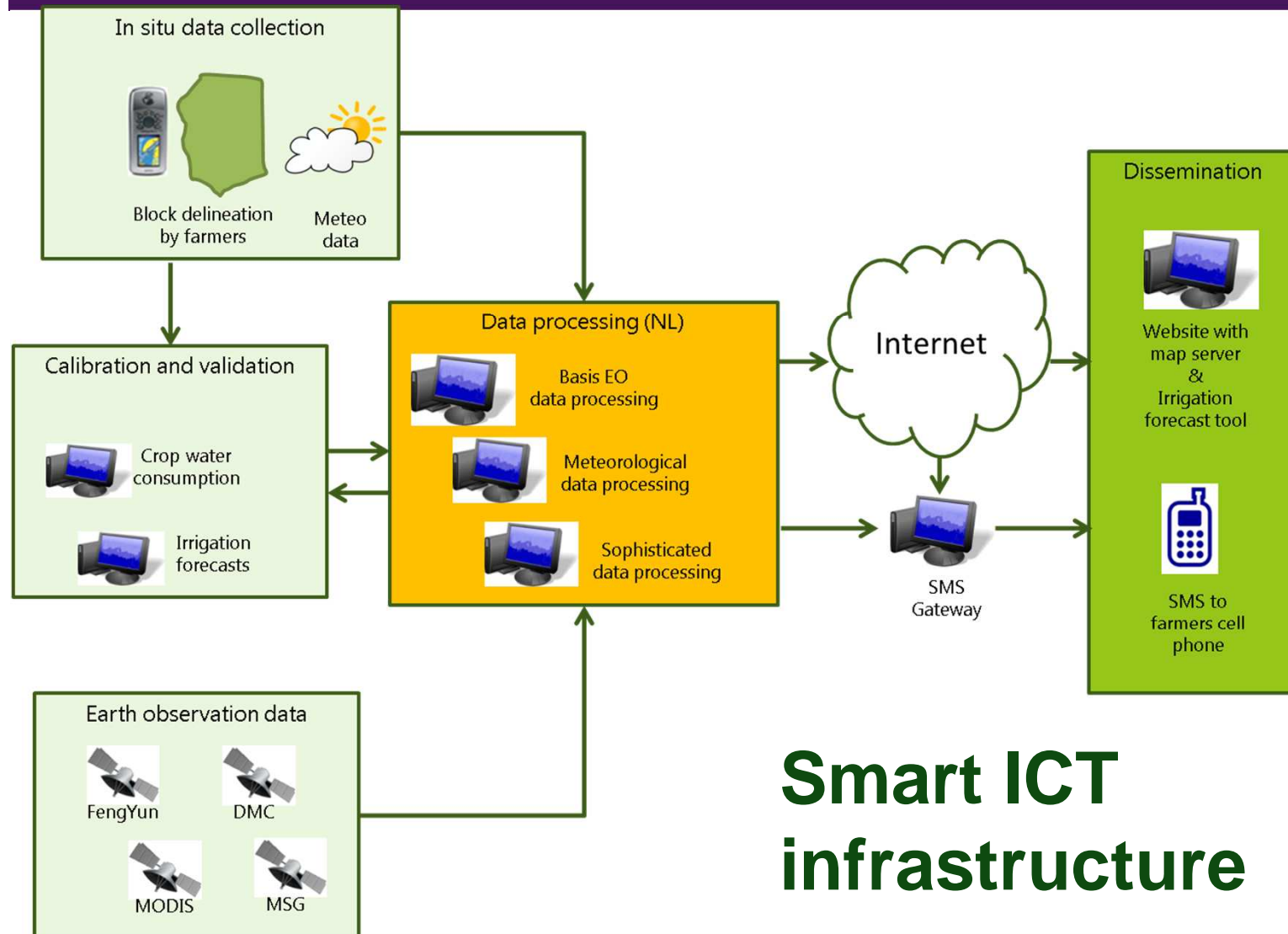
Yield forecast



Rice yield monitoring example using remote sensing





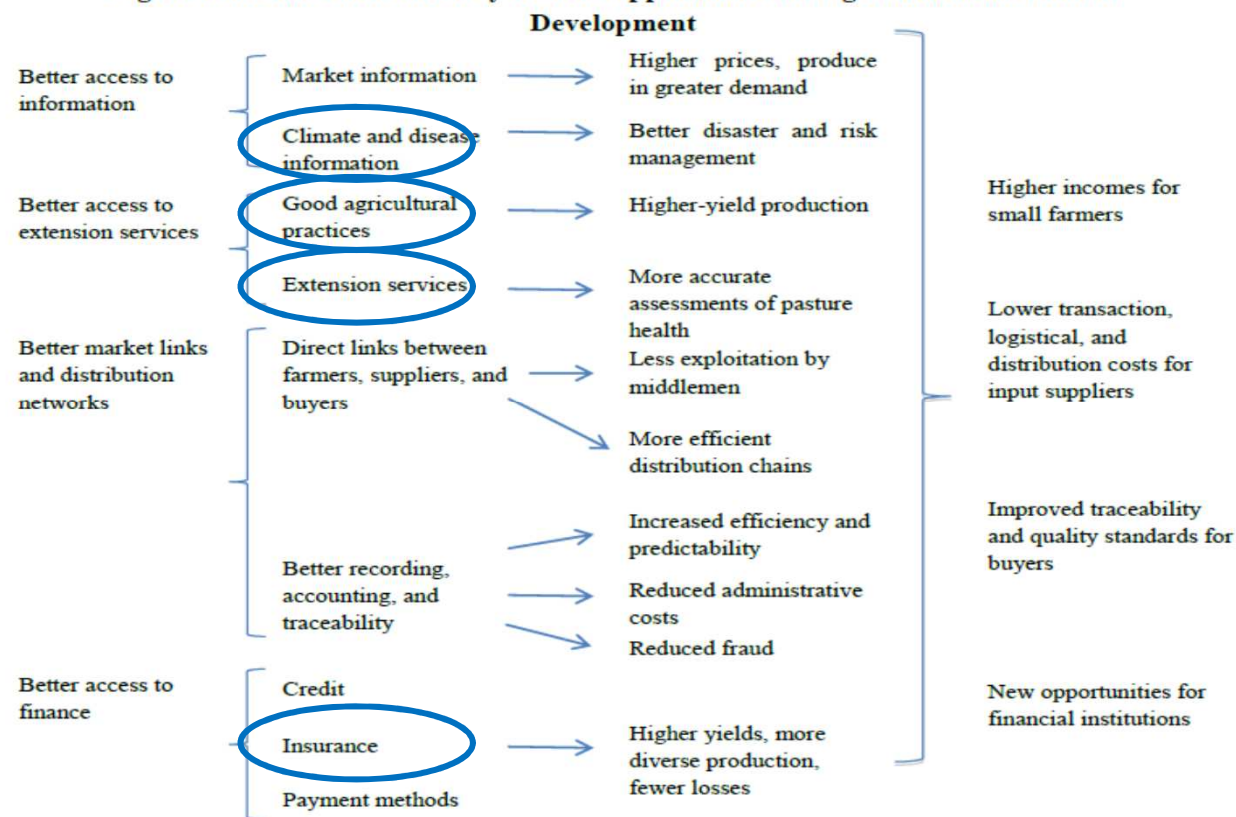


Smart ICT infrastructure



Mobile/ICT applications

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



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



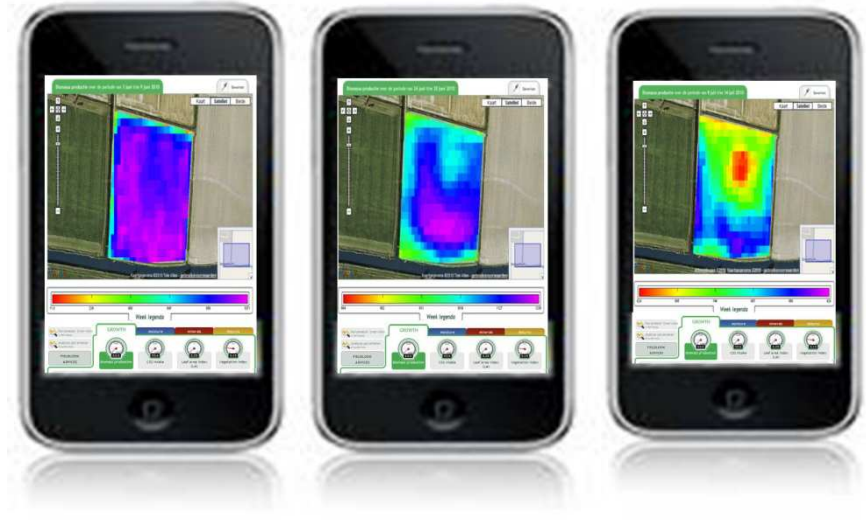
Insurance/finance



Possible service provision



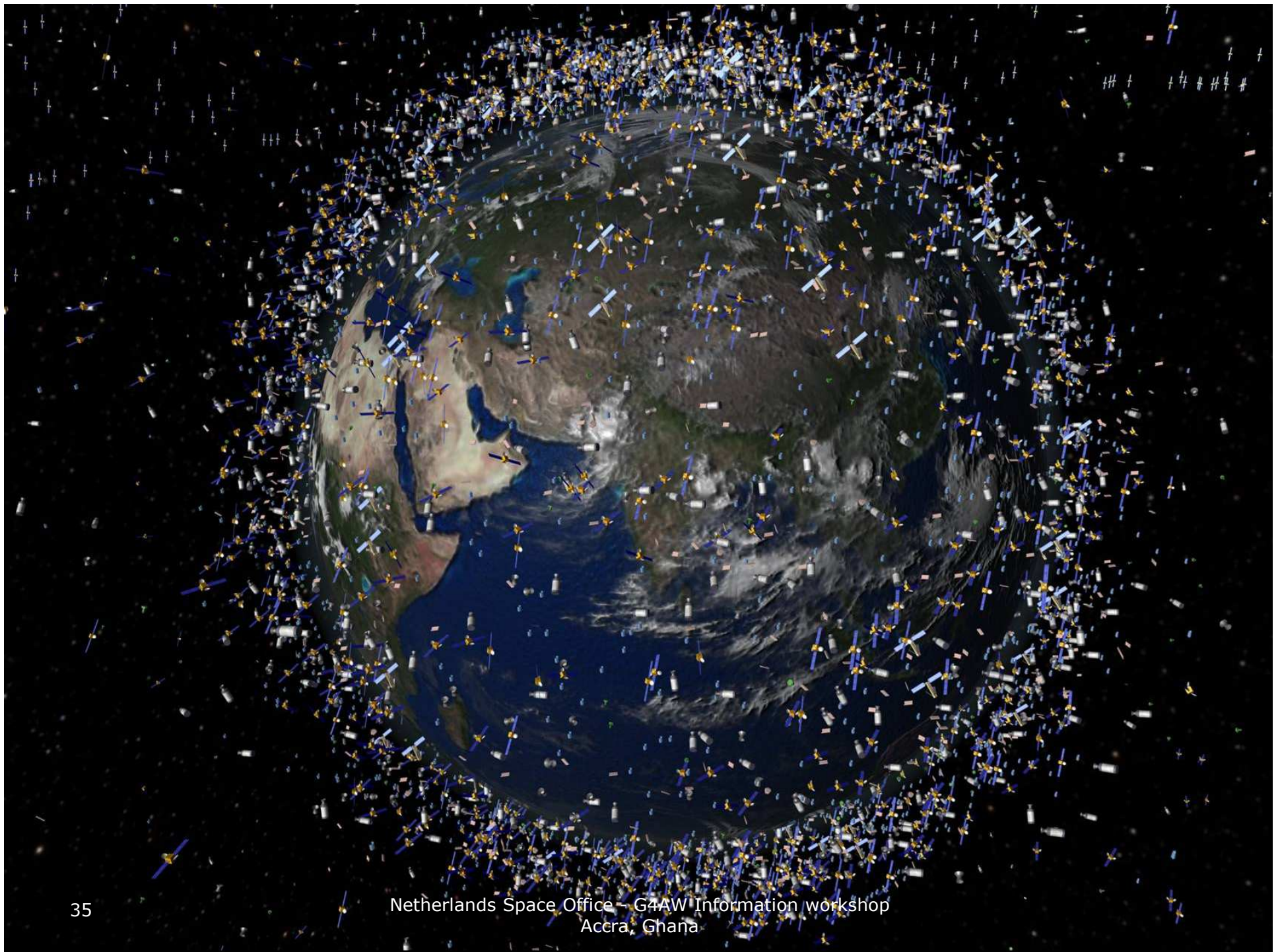
- Crop calendars
 - Weather information
 - Mapping
 - Monitoring (e.g. vegetation growth)
 - Irrigation / nutrient supply advices
-
- Stand alone
 - Integrated in value chain services
 - Complementary to micro-insurance

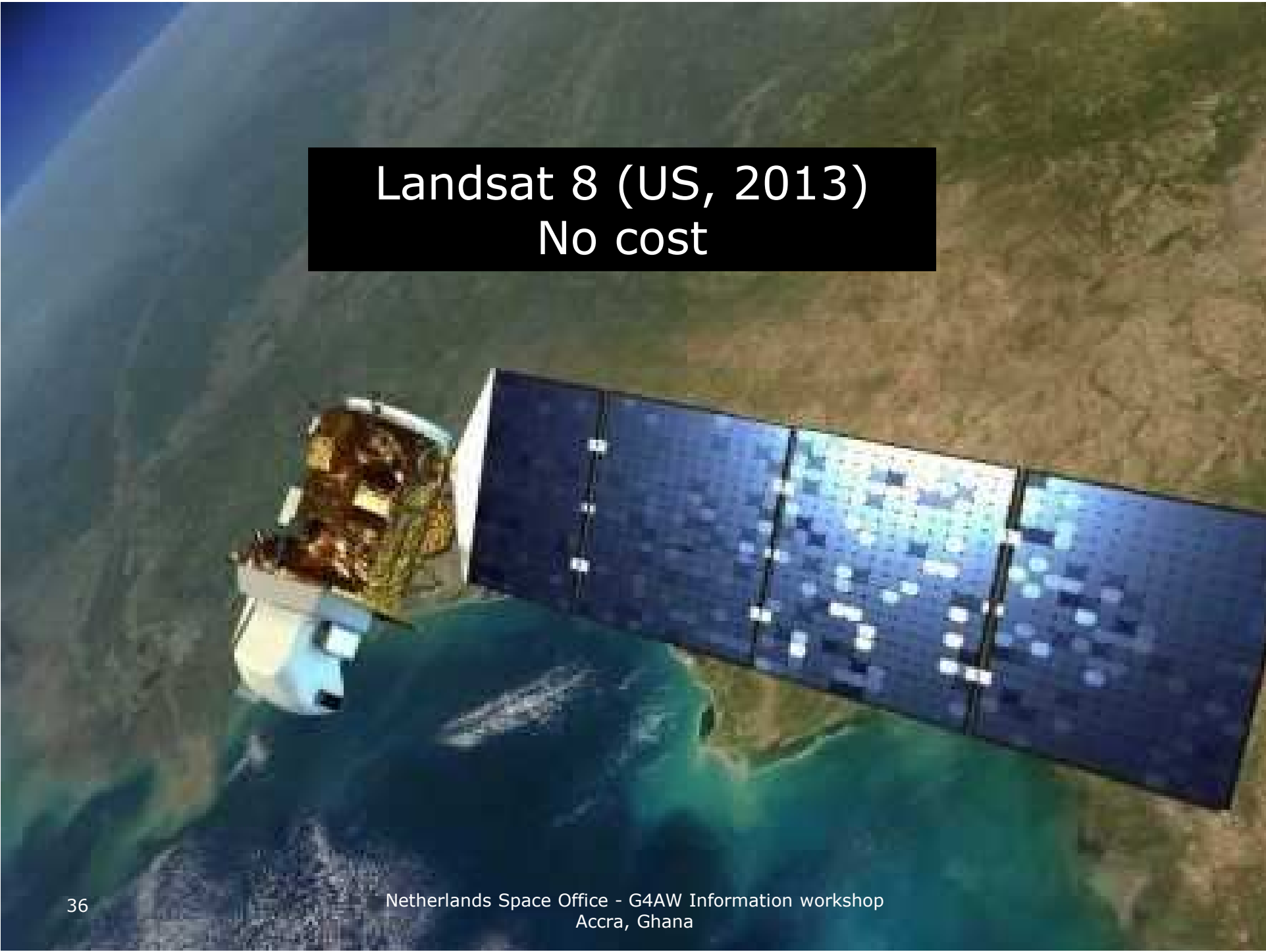




Why based on satellite data?

- 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



A 3D rendering of the Landsat 8 satellite in orbit above Earth. The satellite is shown from a side-on perspective, revealing its complex structure including a central body and two large, rectangular solar panel arrays extended outwards. The solar panels are dark blue with a grid of white rectangular cells. The satellite is positioned over a view of the Earth's surface, which shows a mix of green land and blue water. A black rectangular box with white text is overlaid on the upper part of the image.

Landsat 8 (US, 2013) No cost



Planet Labs (2014)

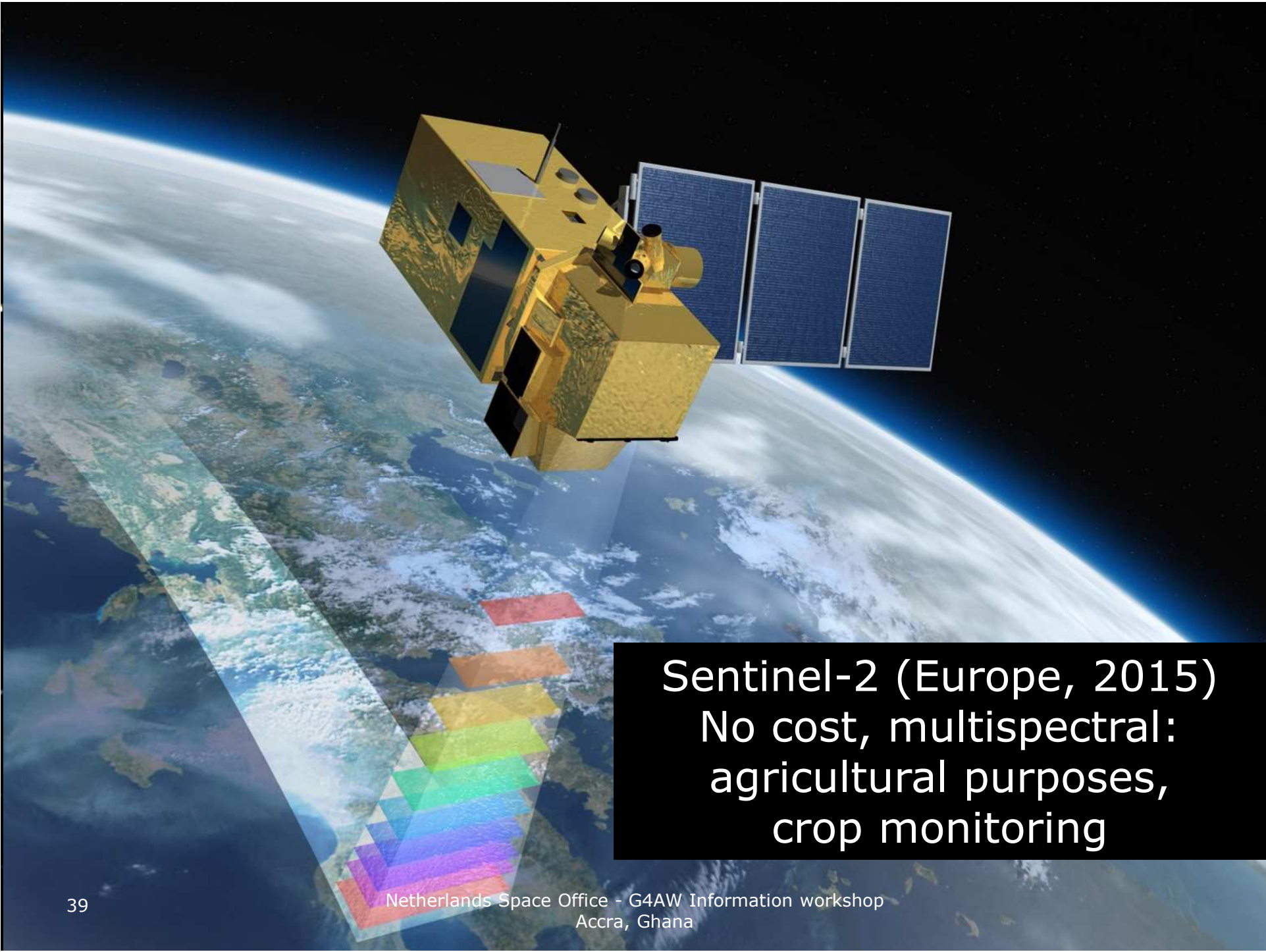


Skybox (2014)

Constellation
High revisit time
Commercial
Low cost



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

A 3D rendering of the Sentinel-2 satellite in orbit above Earth. The satellite is a gold-colored rectangular box with three large blue solar panel arrays extending from its side. Below the satellite, a wide, diagonal strip of the Earth's surface is shown, covered with a grid of colorful rectangular patches in shades of red, orange, yellow, green, blue, and purple, representing multispectral data. The Earth's horizon is visible with a blue atmosphere and white clouds.

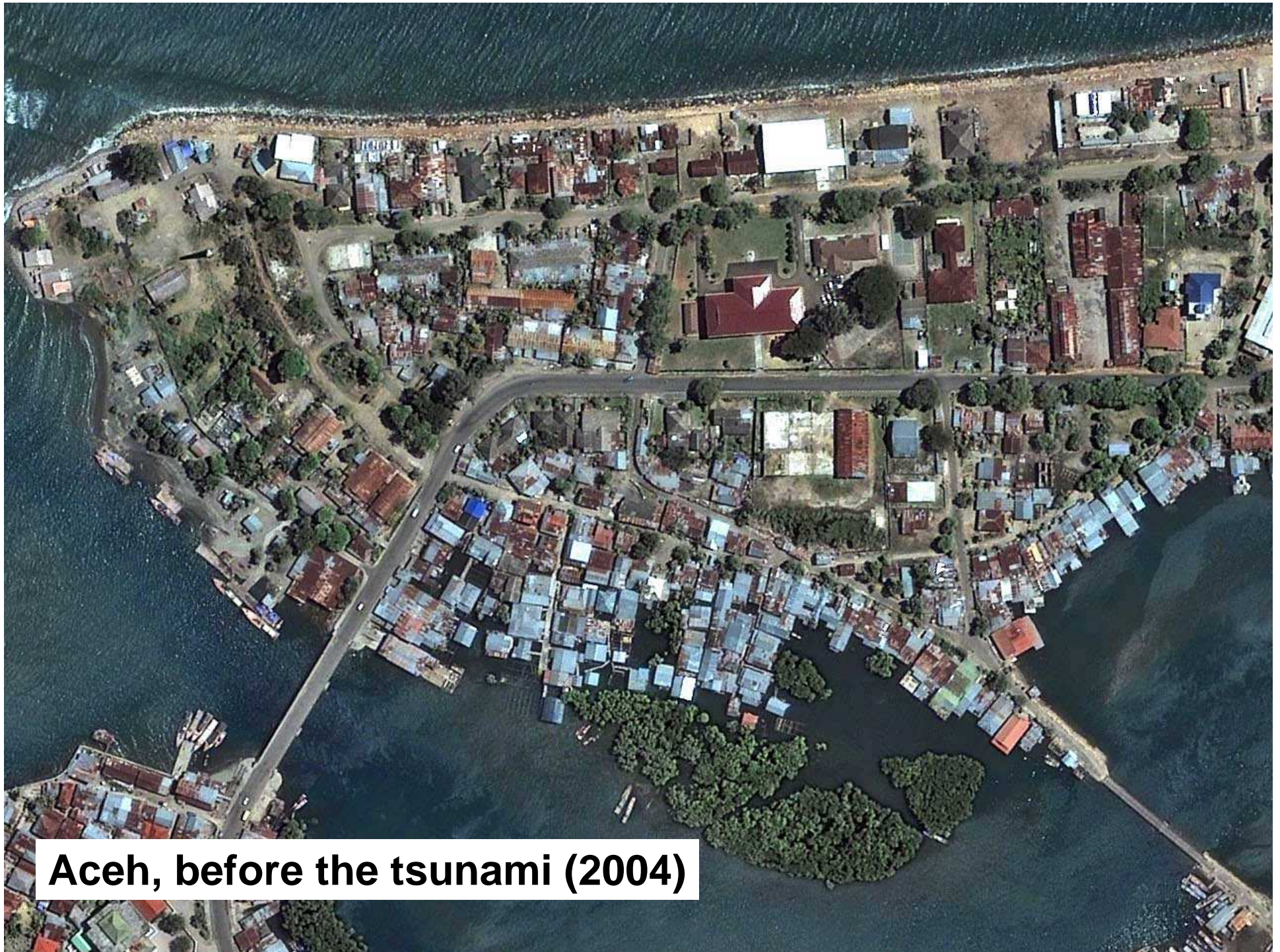
Sentinel-2 (Europe, 2015)
No cost, multispectral:
agricultural purposes,
crop monitoring

High resolution VNIR satellites

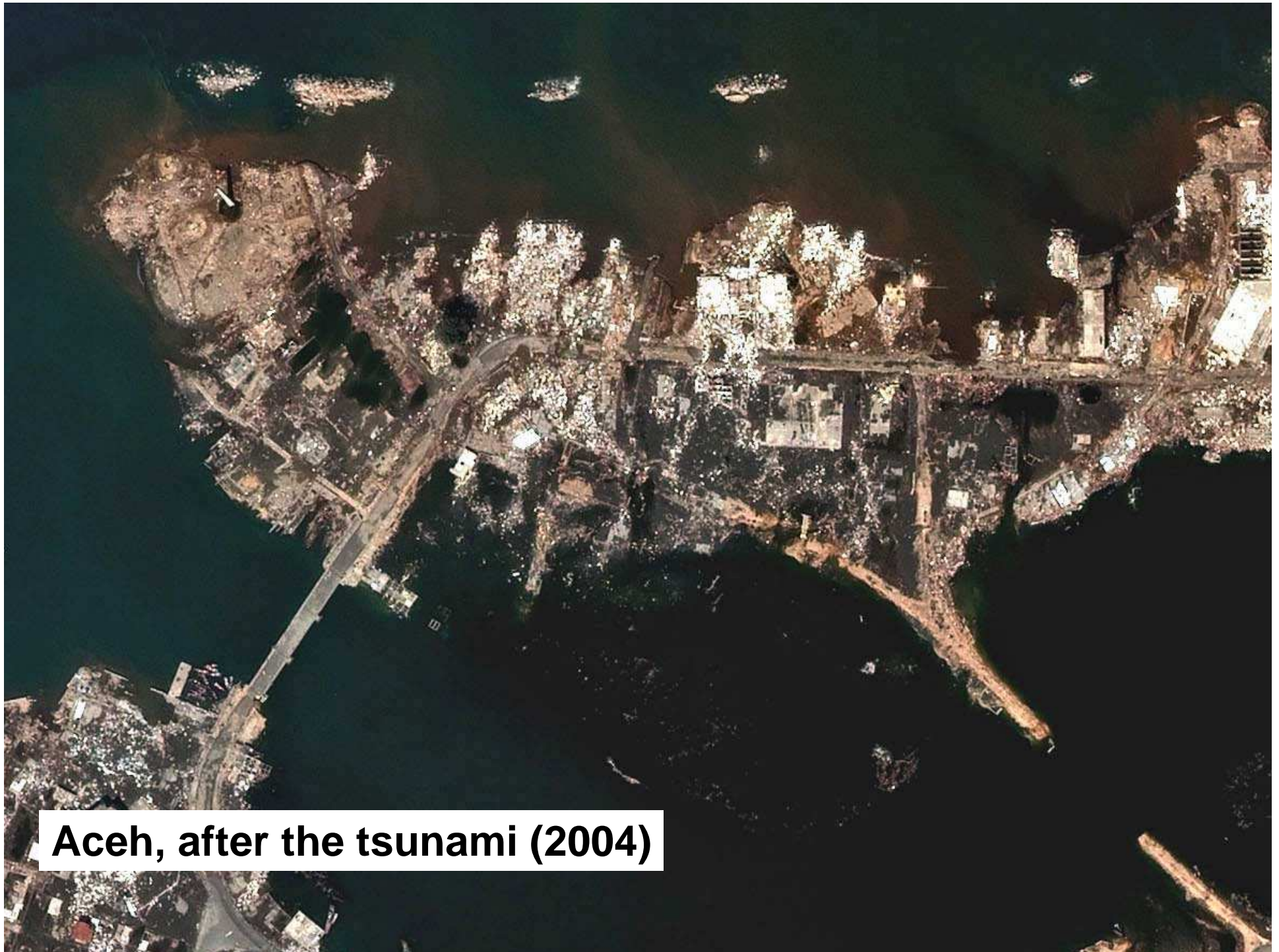
Worldview-2



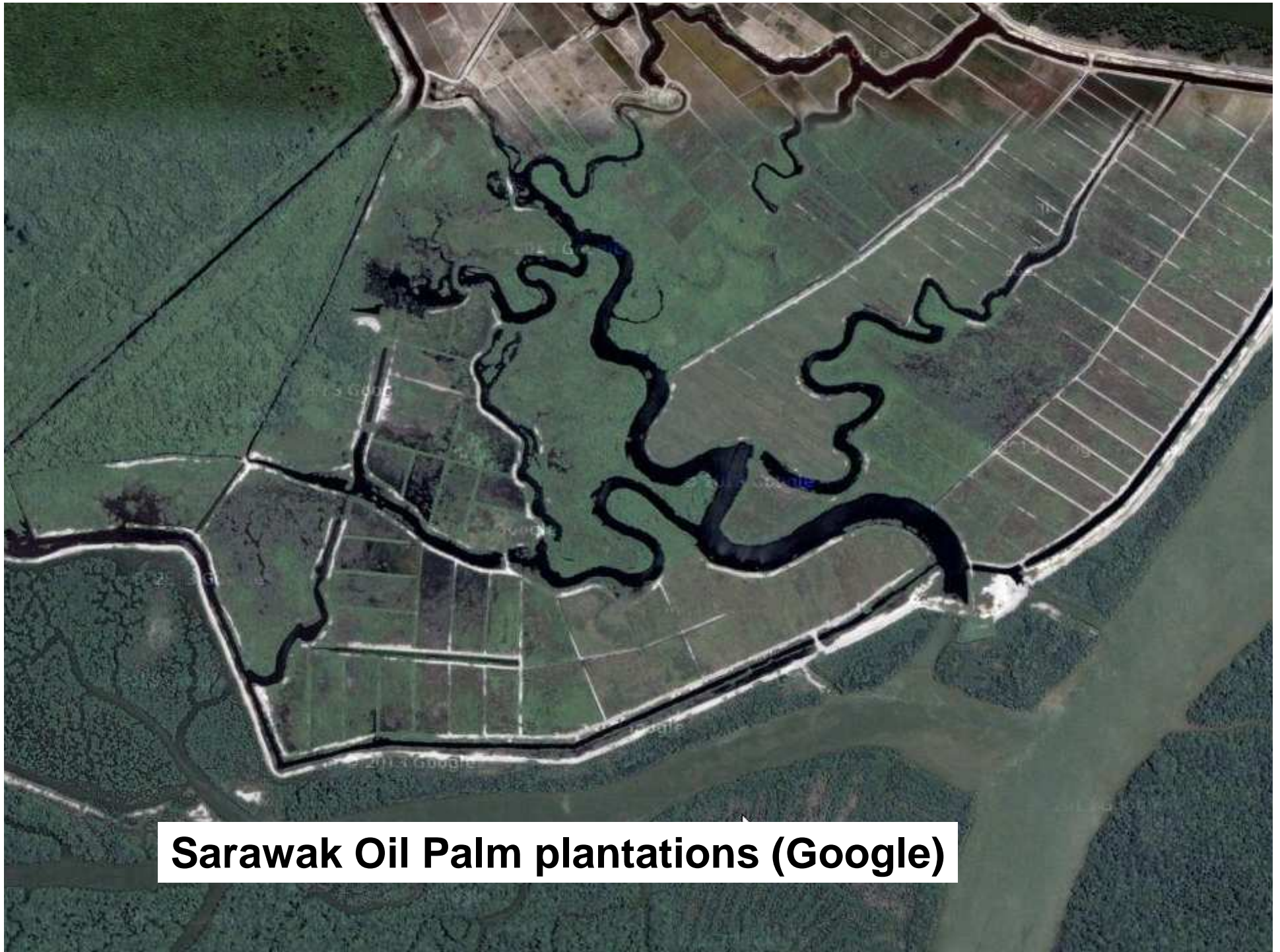
Optical images : 50 cm resolution



Aceh, before the tsunami (2004)



Aceh, after the tsunami (2004)



Sarawak Oil Palm plantations (Google)



Thank you