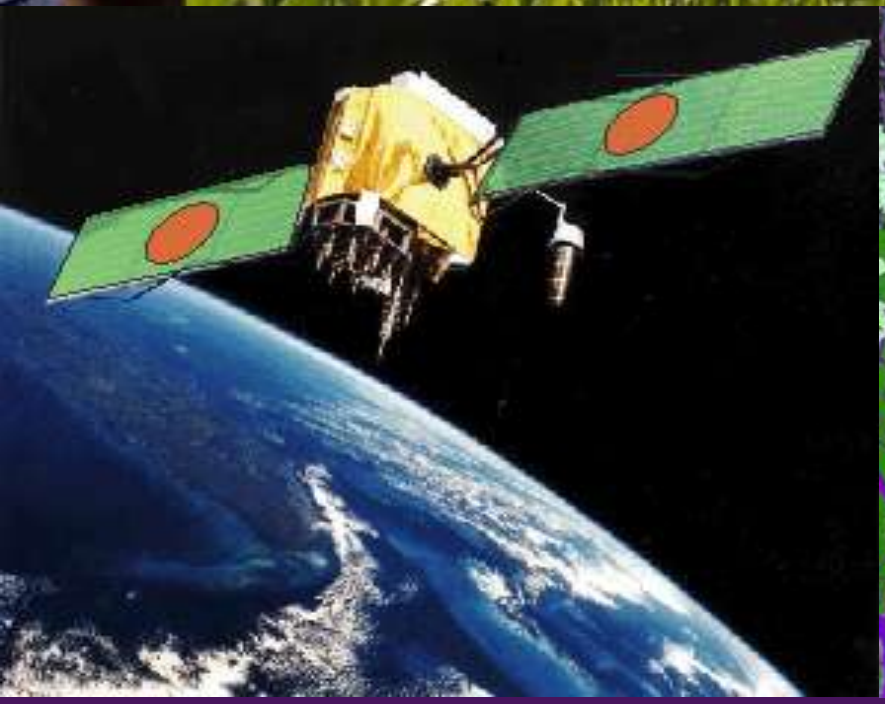


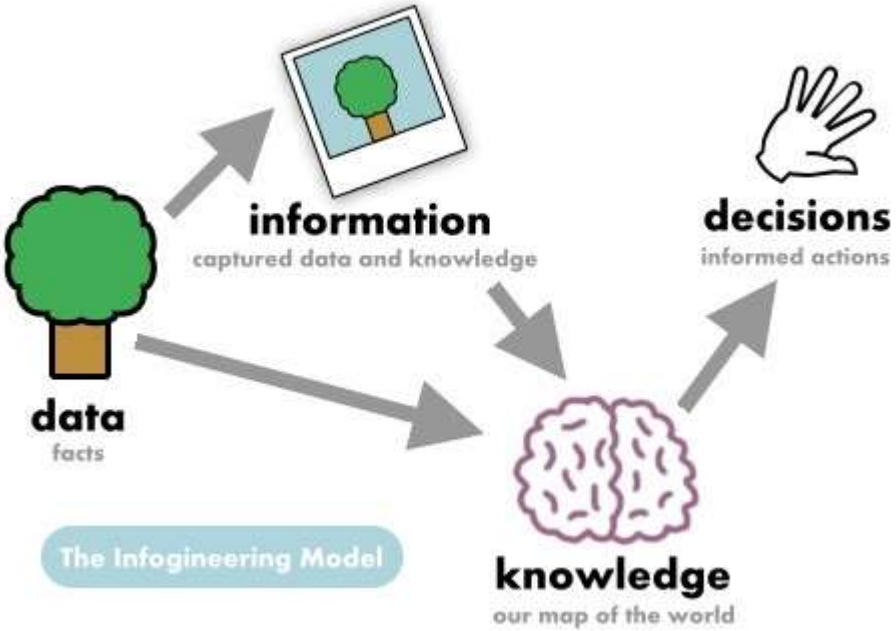
Netherlands Space Office (NSO)

food security & satellite information services

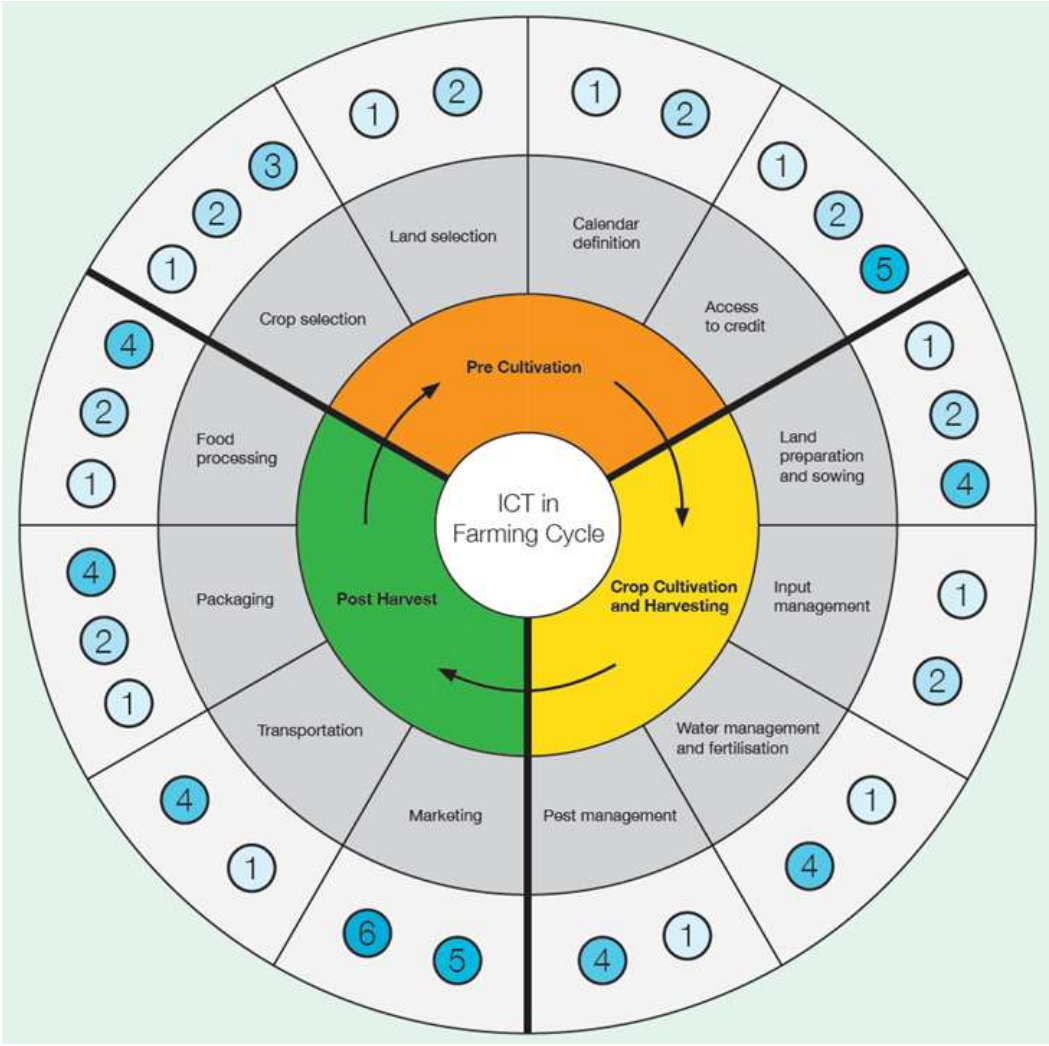
Joost van Uum

Netherlands Space Office (NSO)

Effects of climate change on Food & water security


information
captured data and knowledge
decisions
informed actions
data
facts
The Infogineering Model
knowledge
our map of the world

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)



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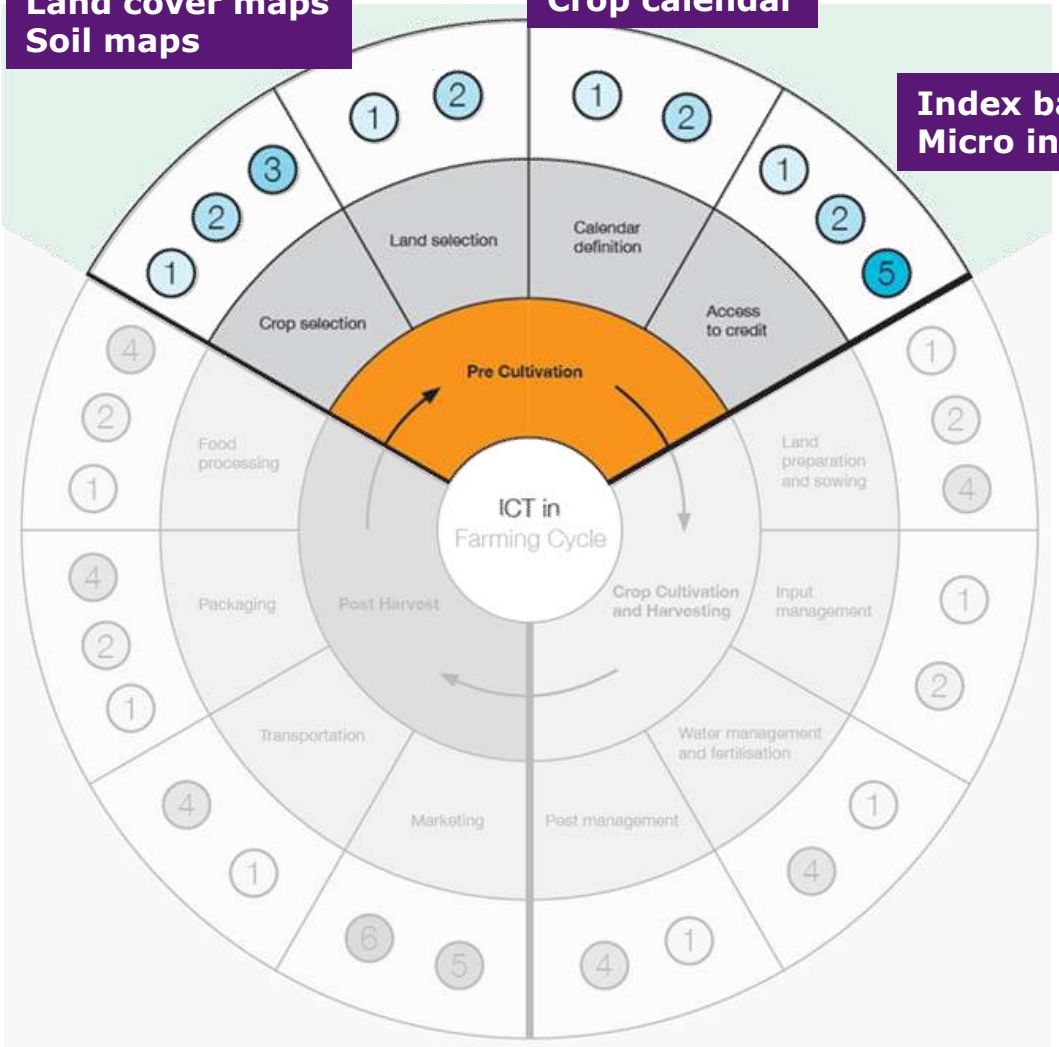
Land cover maps
Soil maps

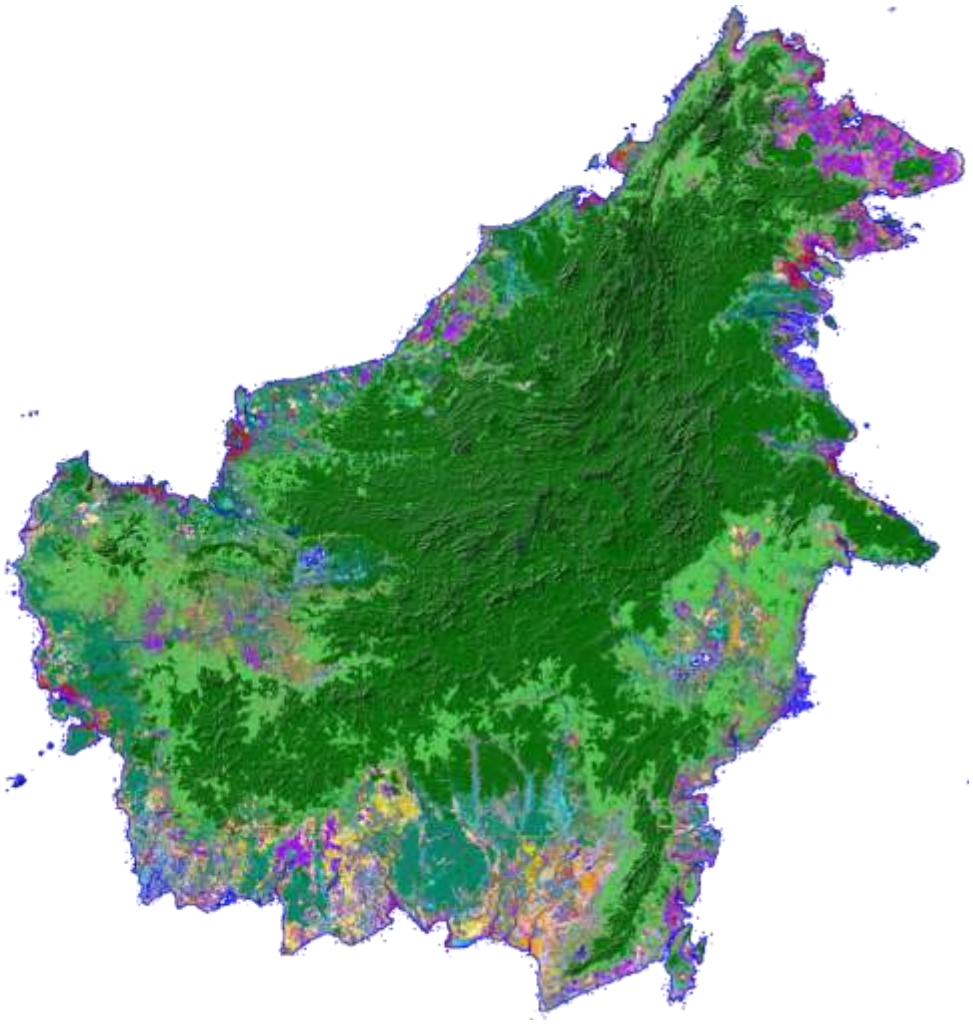
Crop calendar

Index based
Micro insurance

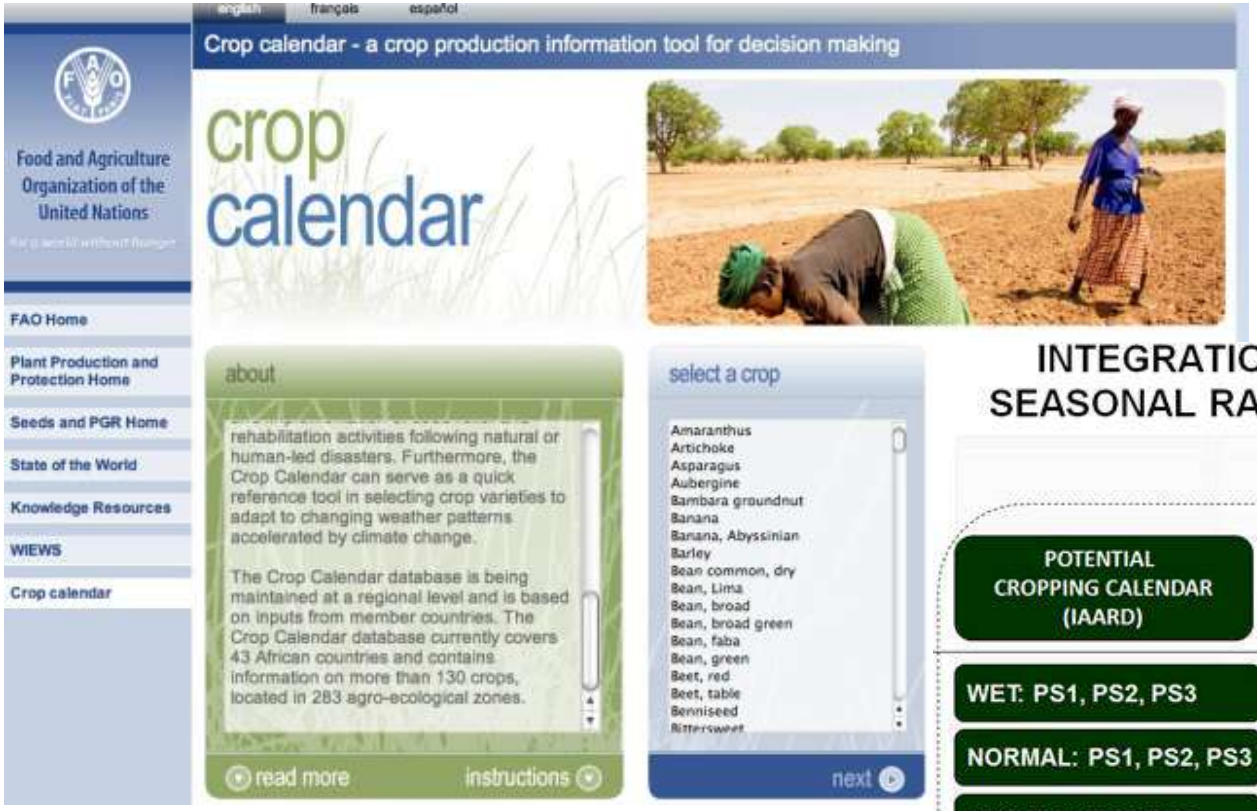


Land cover maps

Kalimantan Land cover map (radar) (SarVision)



Crop calendar



INTEGRATION OF CROPPING PATTERNS, SEASONAL RAINFALL AND SATELLITE IMAGE ANALYSIS

POTENTIAL CROPPING CALENDAR (IAARD)

- WET: PS1, PS2, PS3
- NORMAL: PS1, PS2, PS3
- DRY: PS1, PS2, PS3

Data Used: Rainfall Data

SEASONAL RAINFALL PREDICTION (BMKG)

- FORECAST OF MONTHLY RAINFALL (mm/month)
- PROSPECT OF BEGINNING OF SEASON
- PROSPECT OF SEASON TYPE (WET, NORMAL, DRY)

DROUGHT IMAGE ANALYSIS (ICALRD)

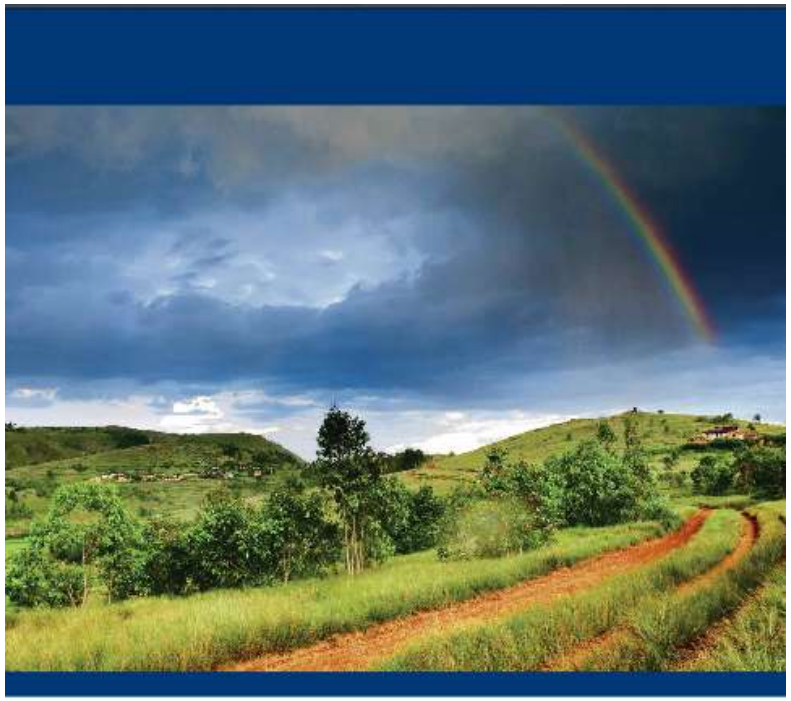
- NDVI
- VCI
- KBDI
- VHI

Data Used:
- MODIS,
- MTSAT
- AMSER-E
- ALOS AVNIR-2 & PALSAR (acq before May 2011)

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



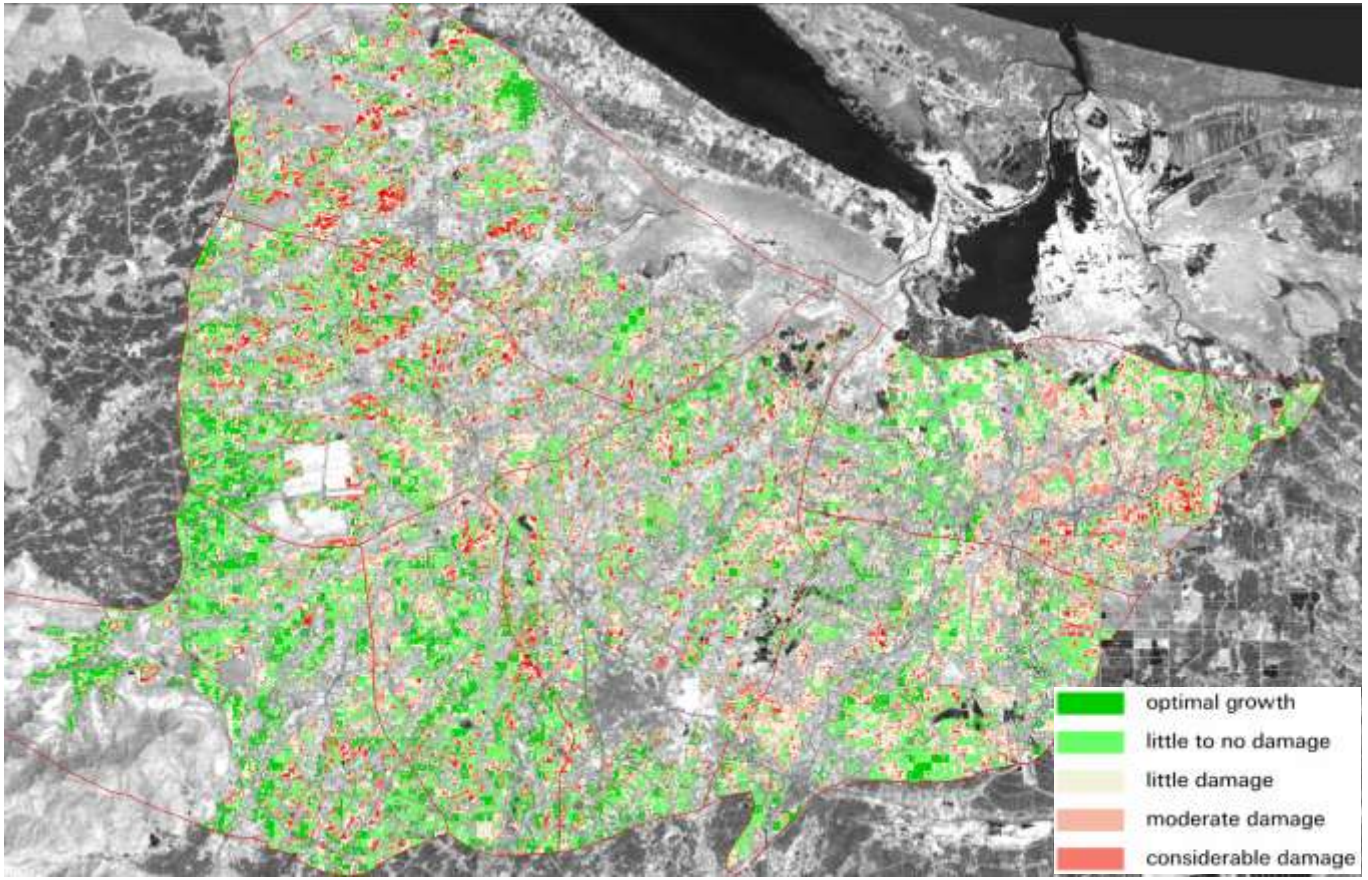
WFP World Food Programme wfp.org

IFAD Enabling poor rural people to overcome poverty

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

Micro insurance

Weather insurance in rice crops



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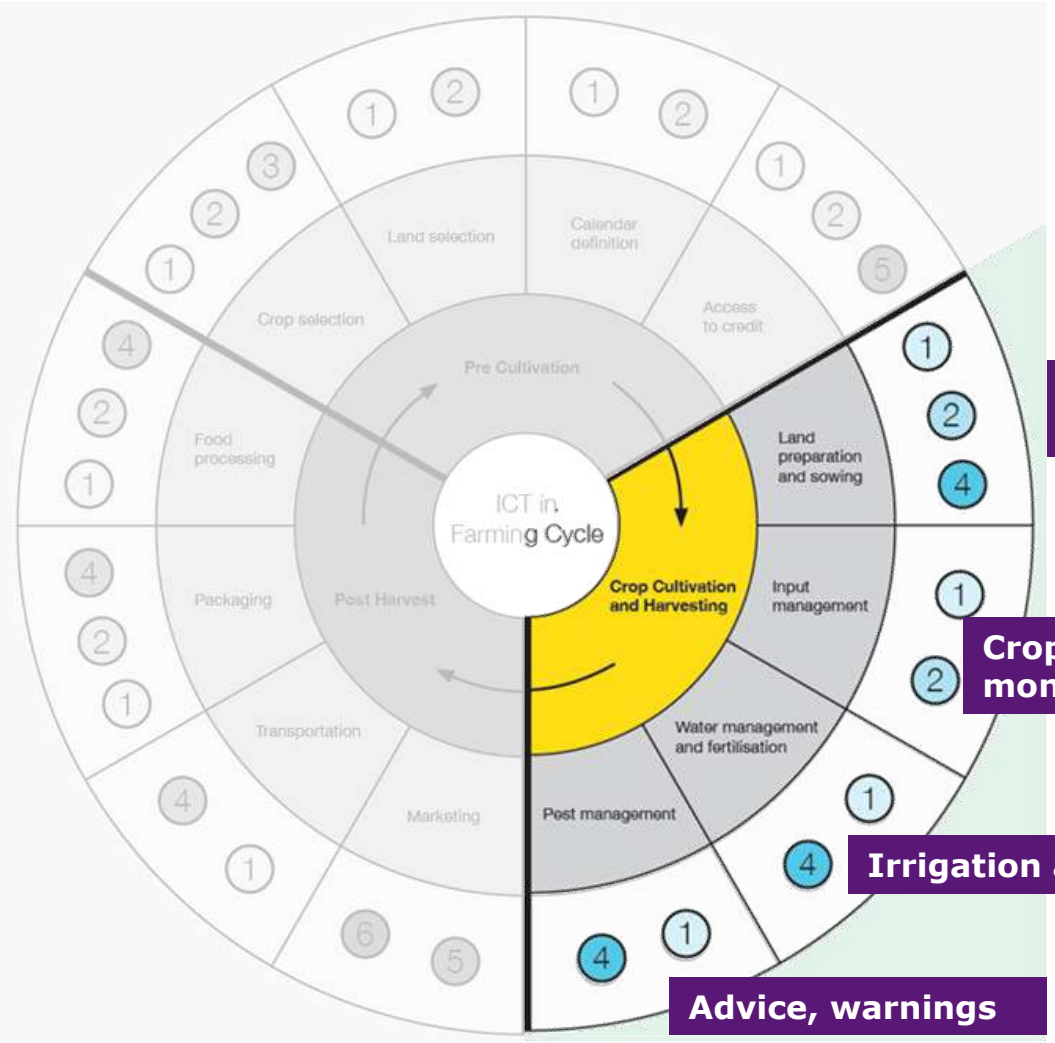


Land cover maps
Soil maps

Crop growth monitoring

Irrigation advice

Advice, warnings

Crop growth monitoring

Cloud free radar image

SarVision
wielsard@sarvision.nl

Crop growth monitoring

Sugar beet at 25m resolution every 24 days

22/04/2012

Radar analysis

Bare soil

SarVision
wielaard@sarvision.nl

Crop growth monitoring

Sugar beet at 25m resolution every 24 days

07/10/2012

Radar analysis

Bare soil
Emergence
Increment
Closure
Harvest

SarVision
wielaard@sarvision.nl
©2012

Crop growth monitoring

Rice at 5m resolution every 5-11 days

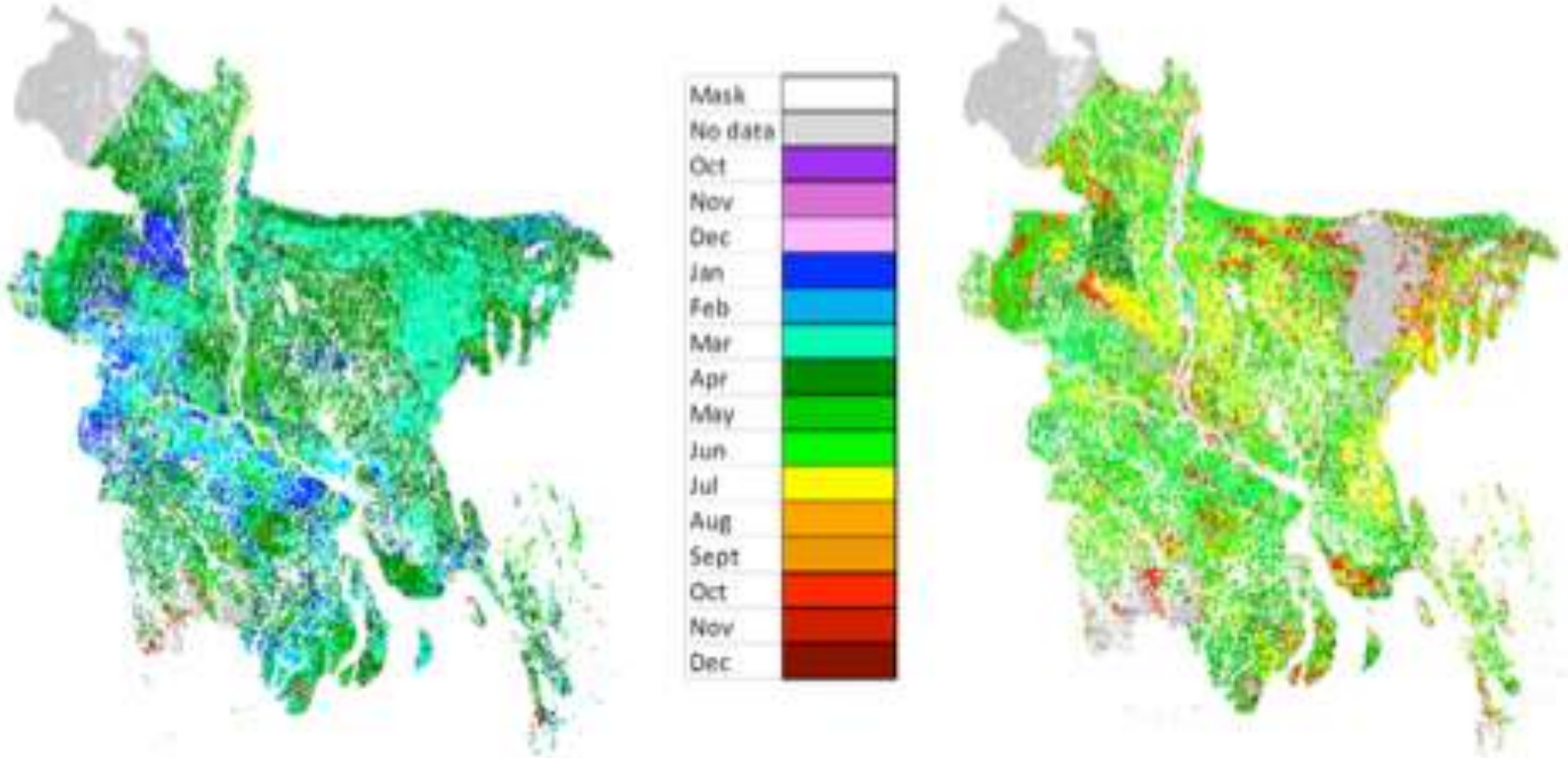
Sharp results: Multi-temporal filtering

5m detail suitable for monitoring of small farms

SarVision

ASTRIUM

Crop growth monitoring



First season, peak of season

Second season, peak of season

Irrigation advice

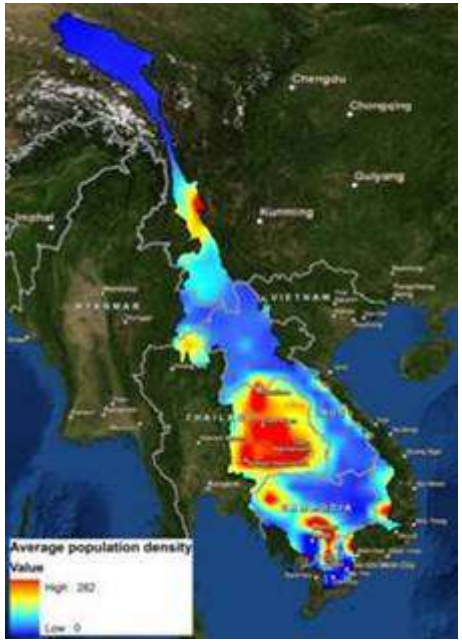
The crop has no water stress when the soil moisture is above the critical level and below the field capacity

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

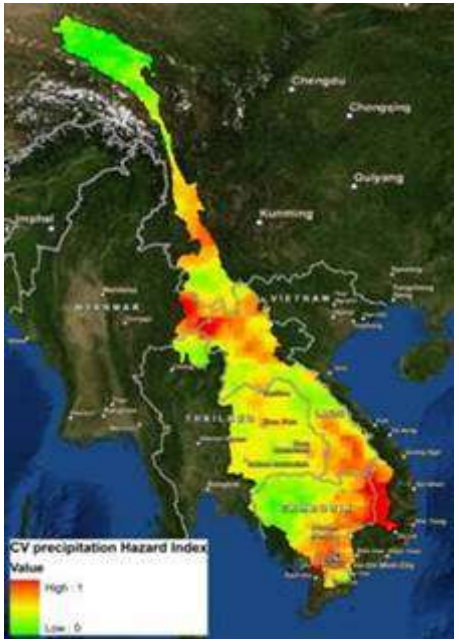
Advice and warning

Hazard & Risk Analysis

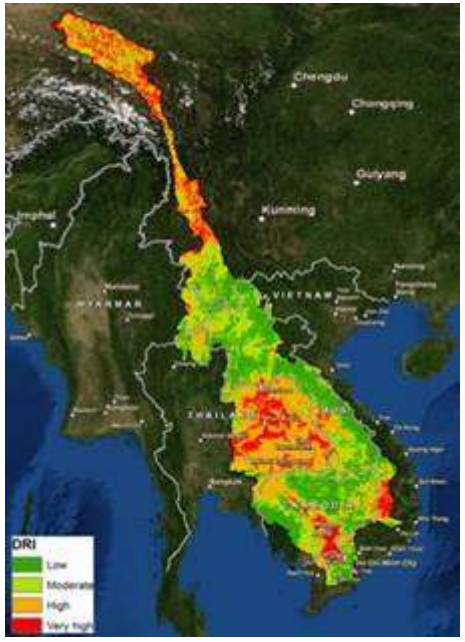
Vulnerability Index
Distance
to river



Vulnerability Index
Population density



Vulnerability Index
Precipitation



Drought
Risk Map

FutureWater

Advice and warning

Early warning

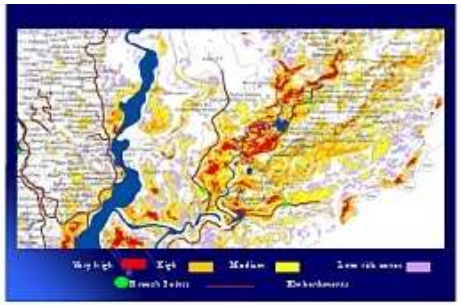
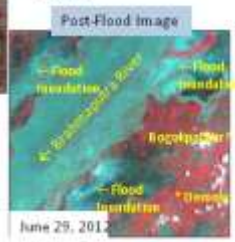
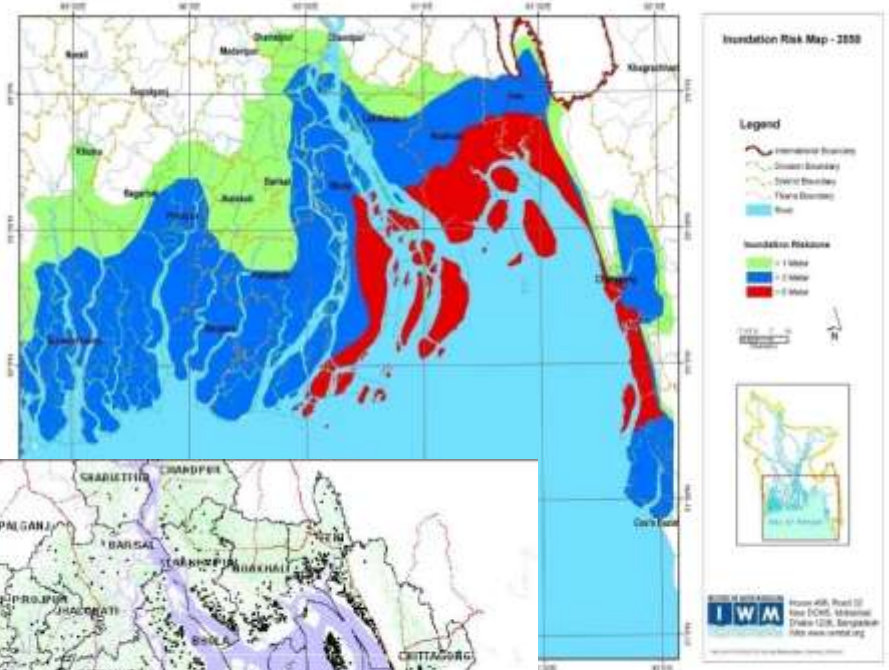
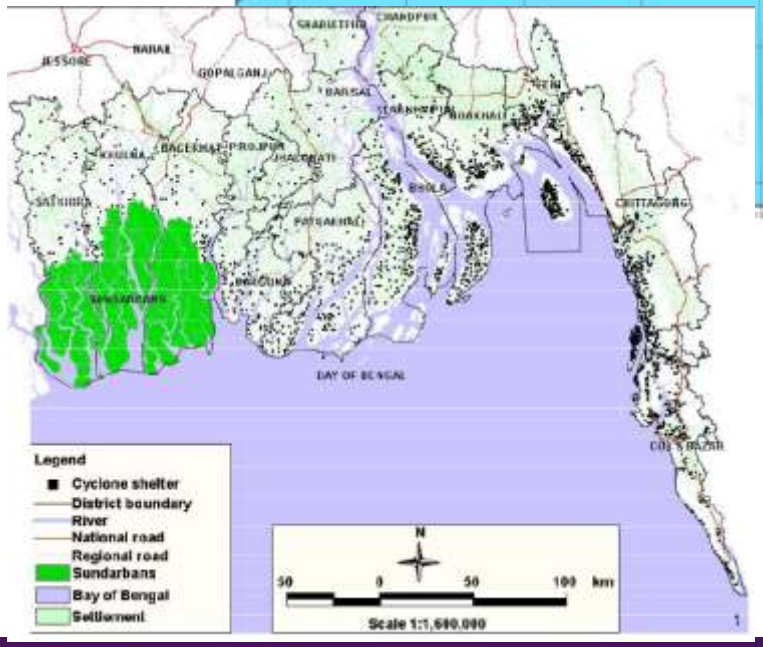


Fig: Flood hazard maps corresponding to various flood discharge and levels

Monitoring of Flood







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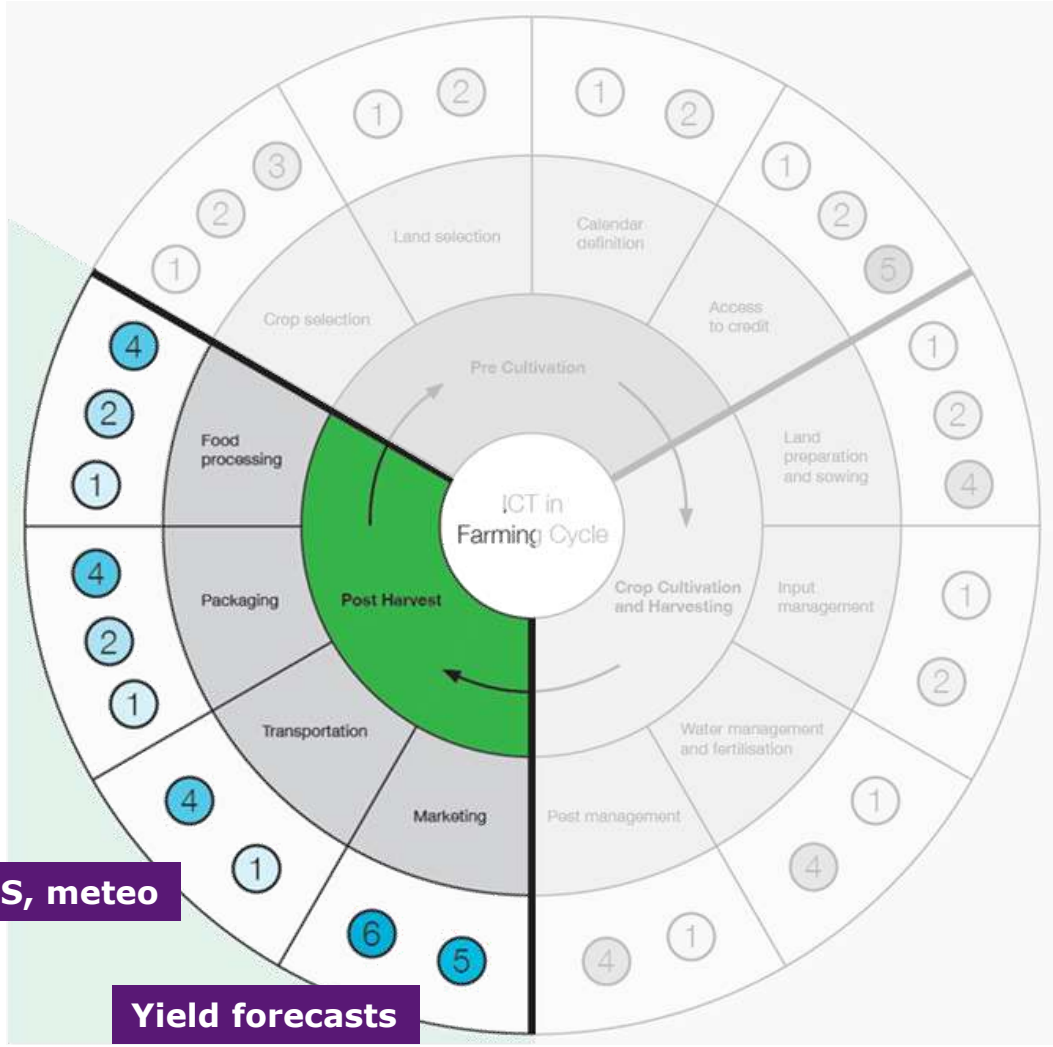
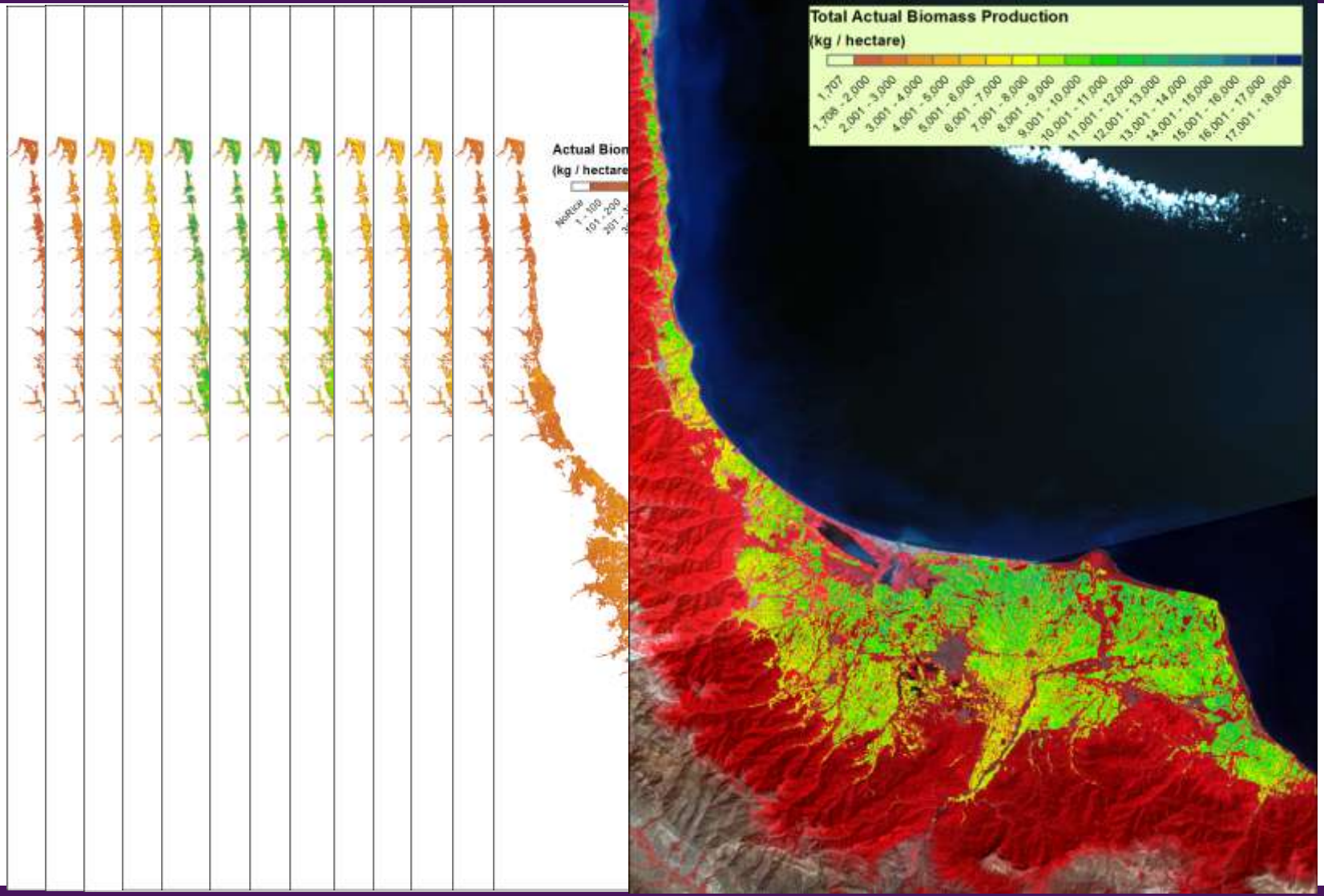


GPS, meteo

Yield forecasts

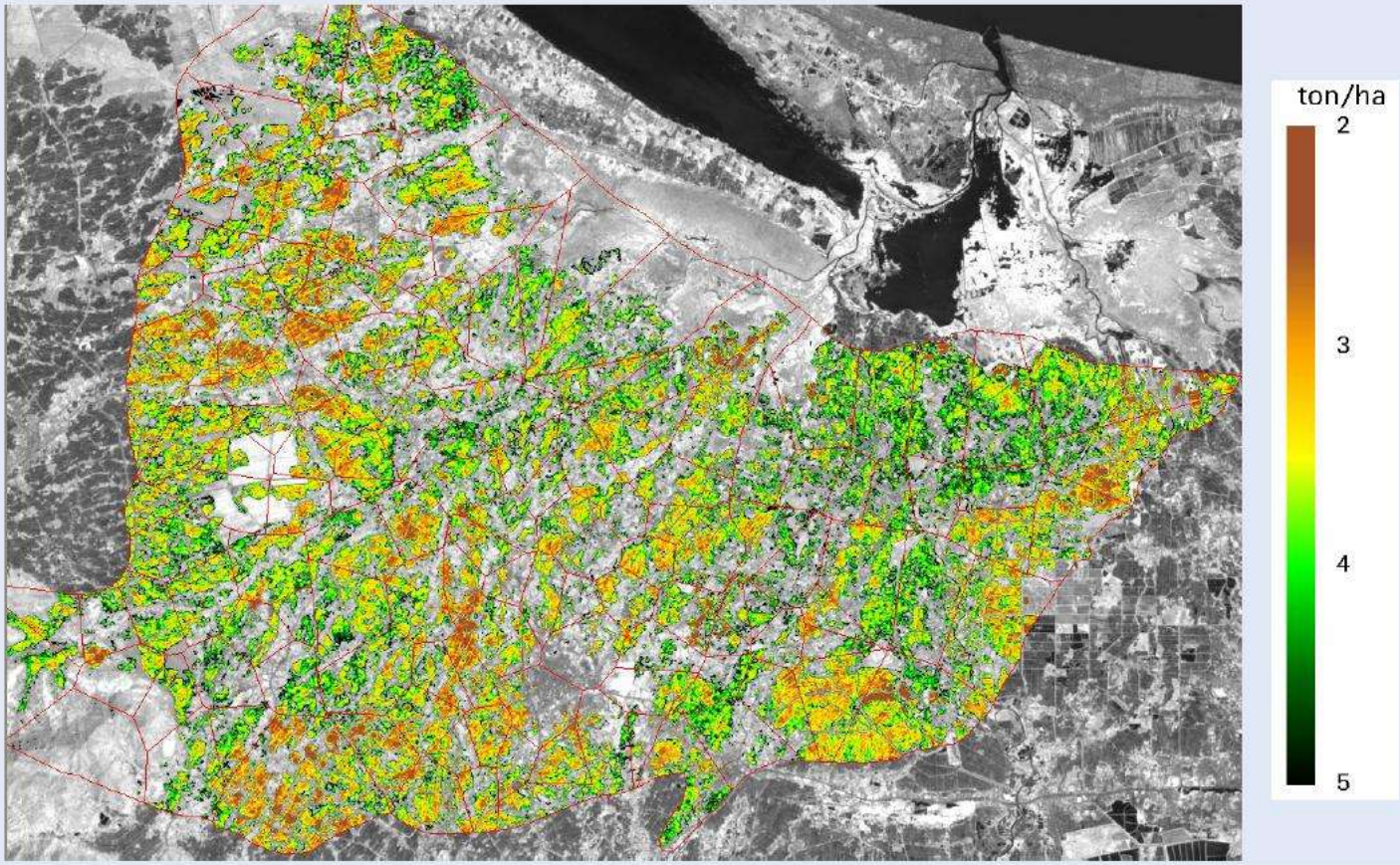
Yield forecast



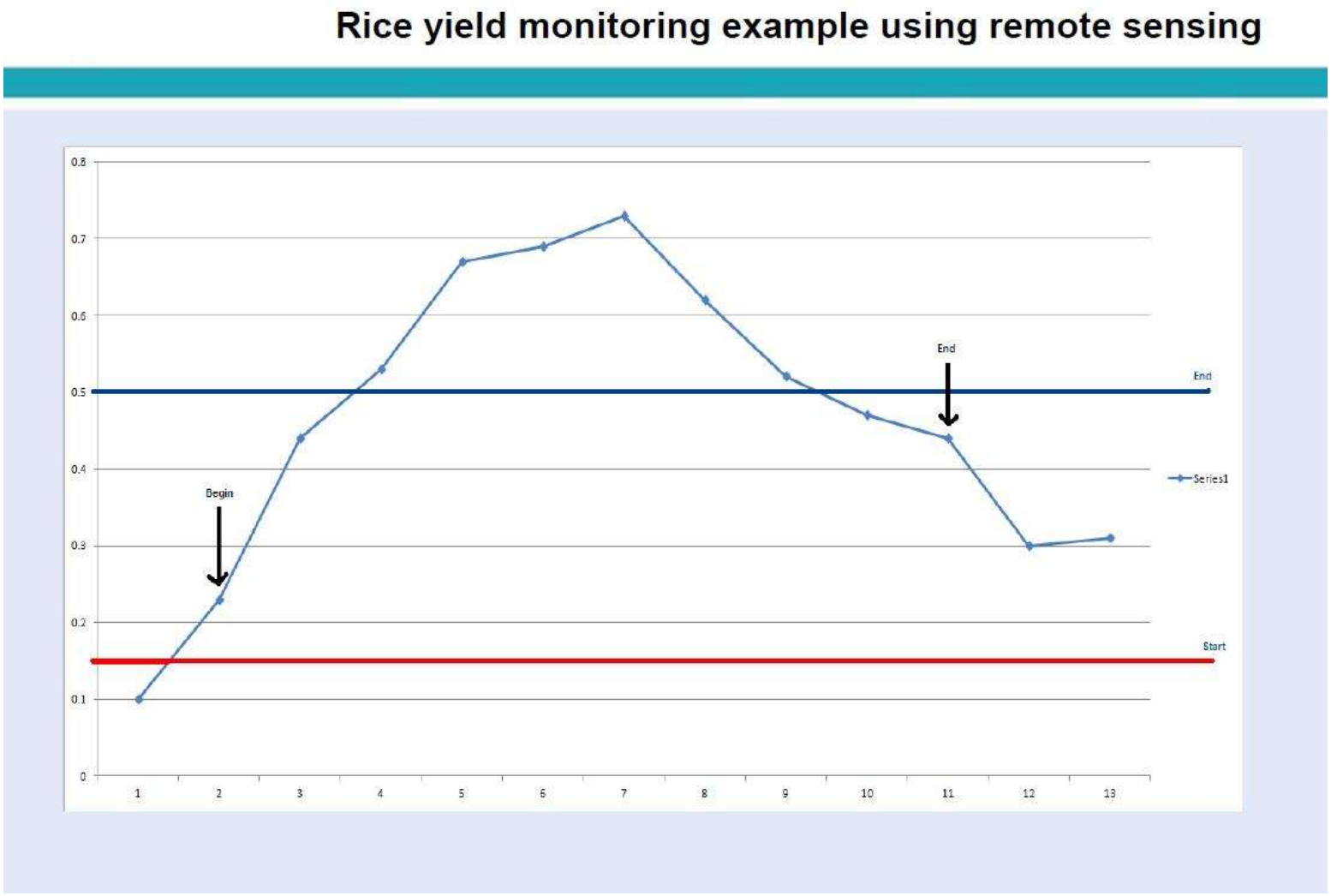
GSM: Actual Biomass Production

Yield forecast

Rice Yield maps



Yield forecast



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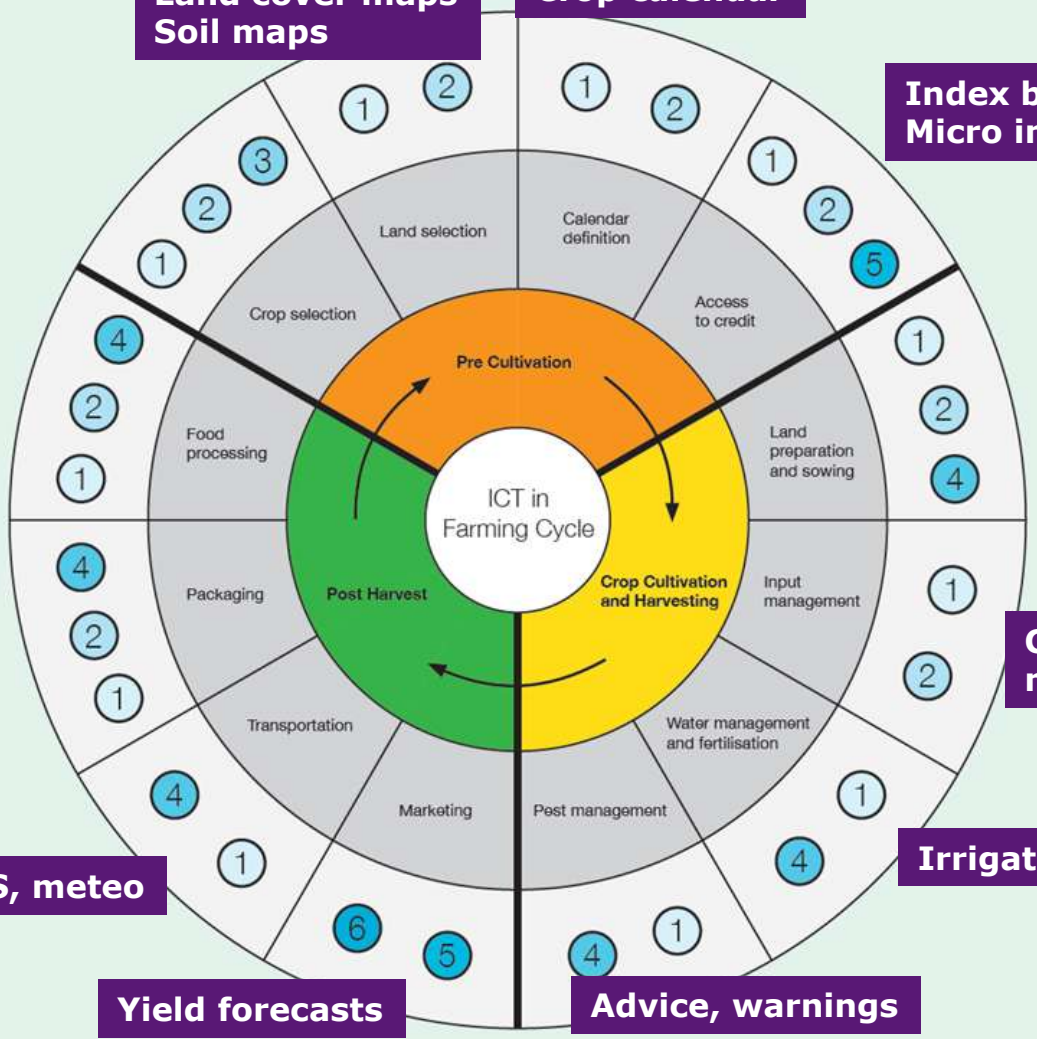


Land cover maps
Soil maps

Crop calendar

Index based
Micro insurance

Land cover maps
Soil maps

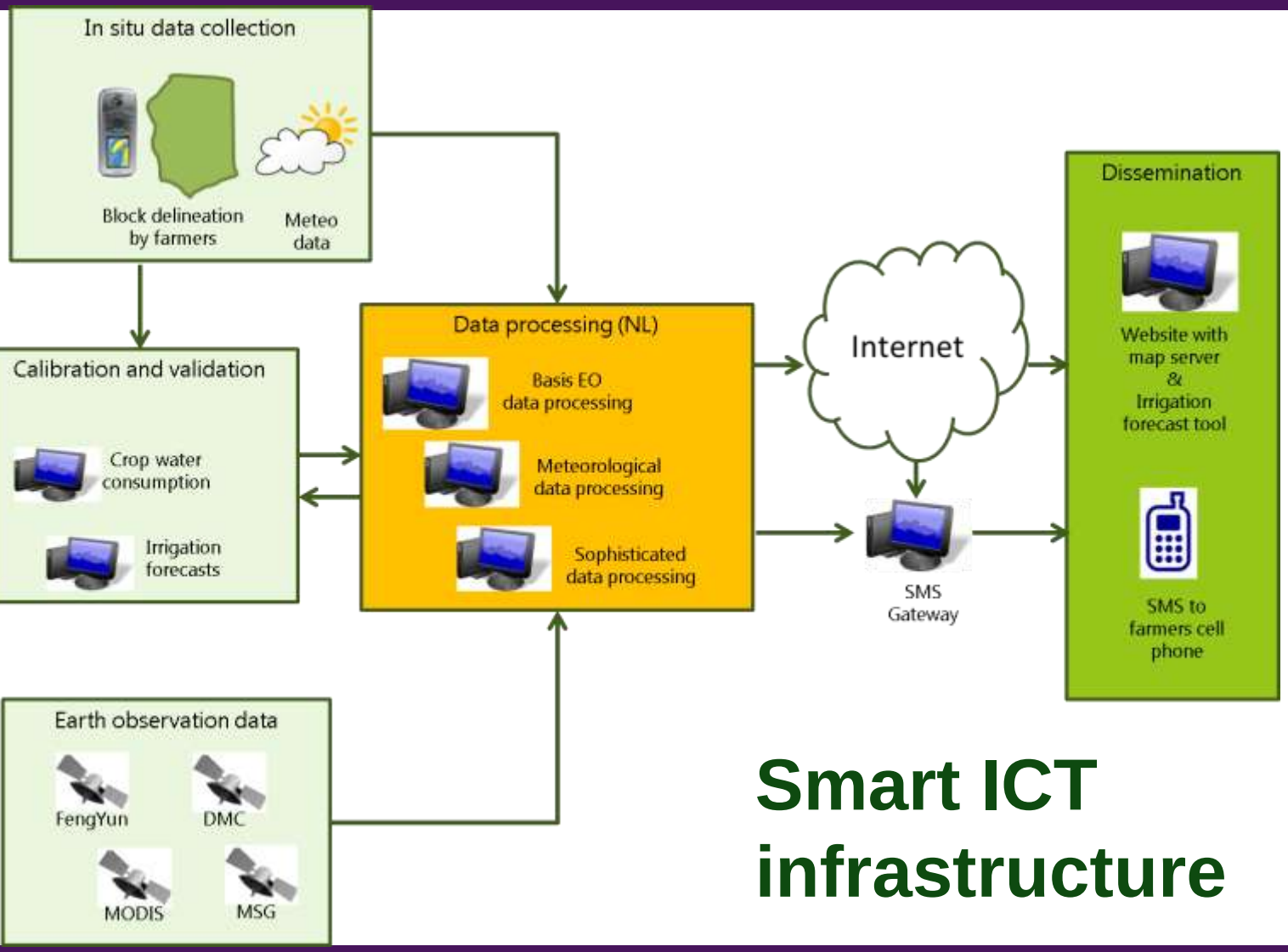
Crop growth monitoring

Irrigation advice

Advice, warnings

Yield forecasts

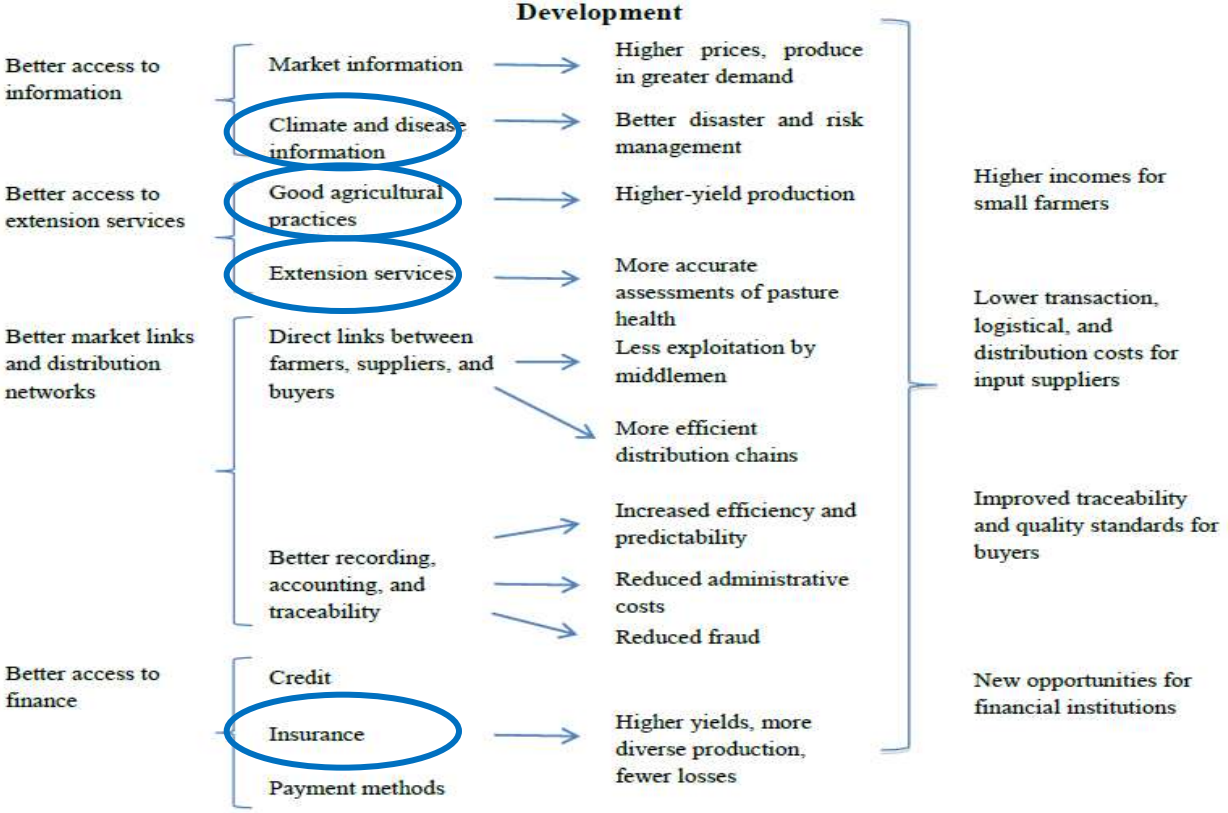
GPS, meteo



Smart ICT infrastructure

Mobile/ICT applications

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

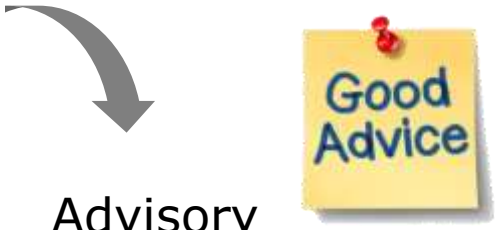


Mobile Applications for Agriculture and Rural Development

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

ICT Sector Unit
World Bank

December 2011



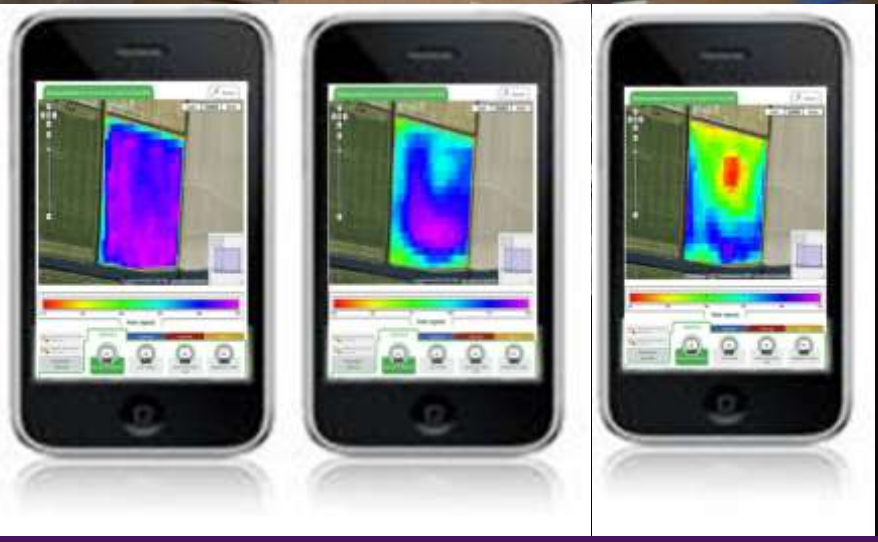
Advisory

Insurance/finance

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

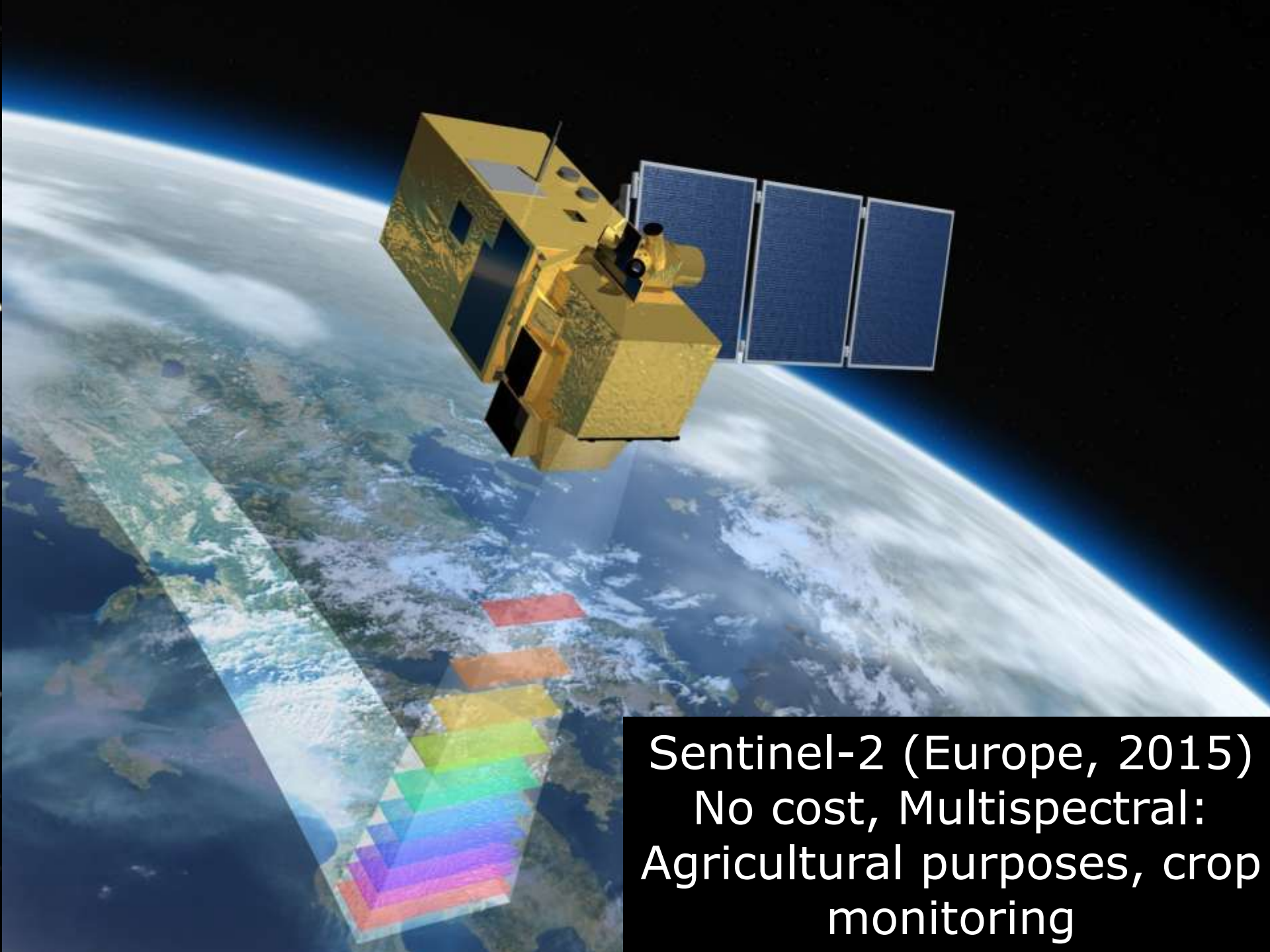

Landsat 8 (US, 2013)
No cost

Planet Labs (2014)

Skybox (2014)

Constellation
High revisit time
Commercial
Low cost

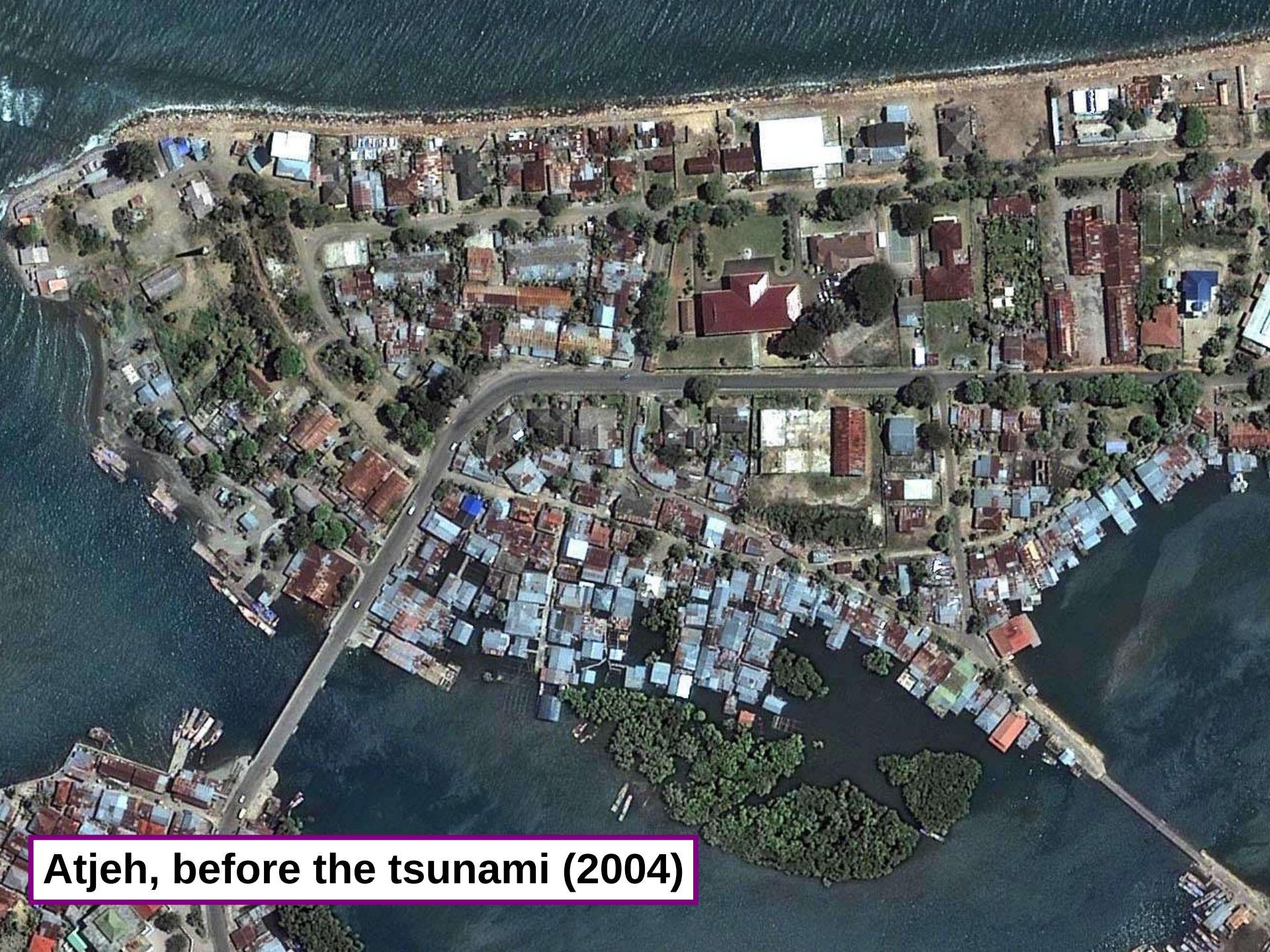

Sentinel-1 (Europe, 2014)
No cost
Looking through clouds, day & night


Sentinel-2 (Europe, 2015)
No cost, Multispectral:
Agricultural purposes, crop
monitoring

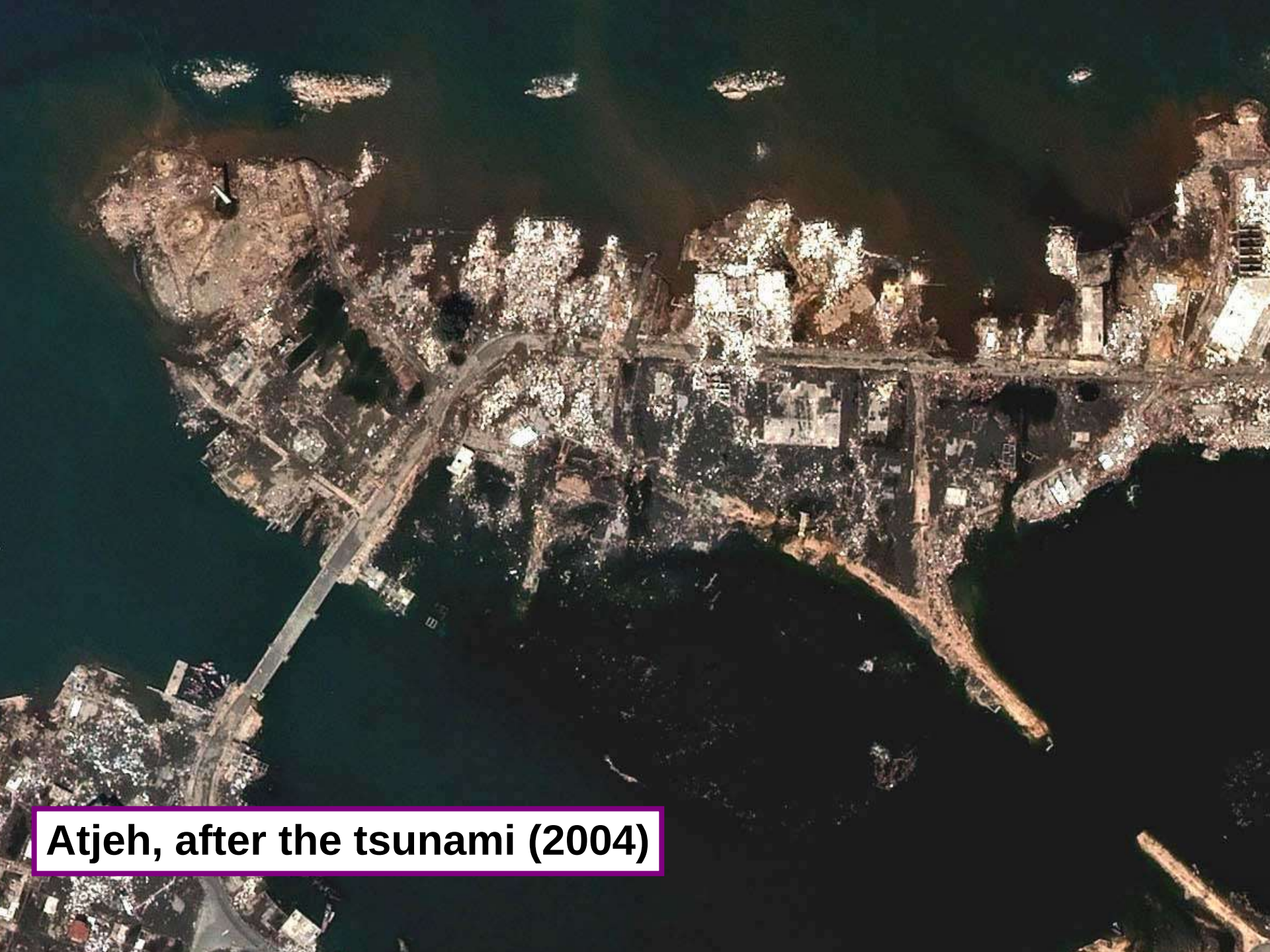
High resolution VNIR satellites

Worldview-2


Optical images : 50 cm resolution



Atjeh, before the tsunami (2004)



Atjeh, after the tsunami (2004)

Thank you for your attention

Required for a G4AW application

- User demand / information needs
- Possible service provision
- Partnership
- Business model
- Cooperation Agreement

Reaching small holders

- Small holders represented through intermediate, e.g.:

  - Ministry of Agriculture (extension officers)
  - Industry (brewery, nutrient supplier, etc)
  - local NGO
  - farmer cooperation
  - other

Possible service provision – insurance (2)

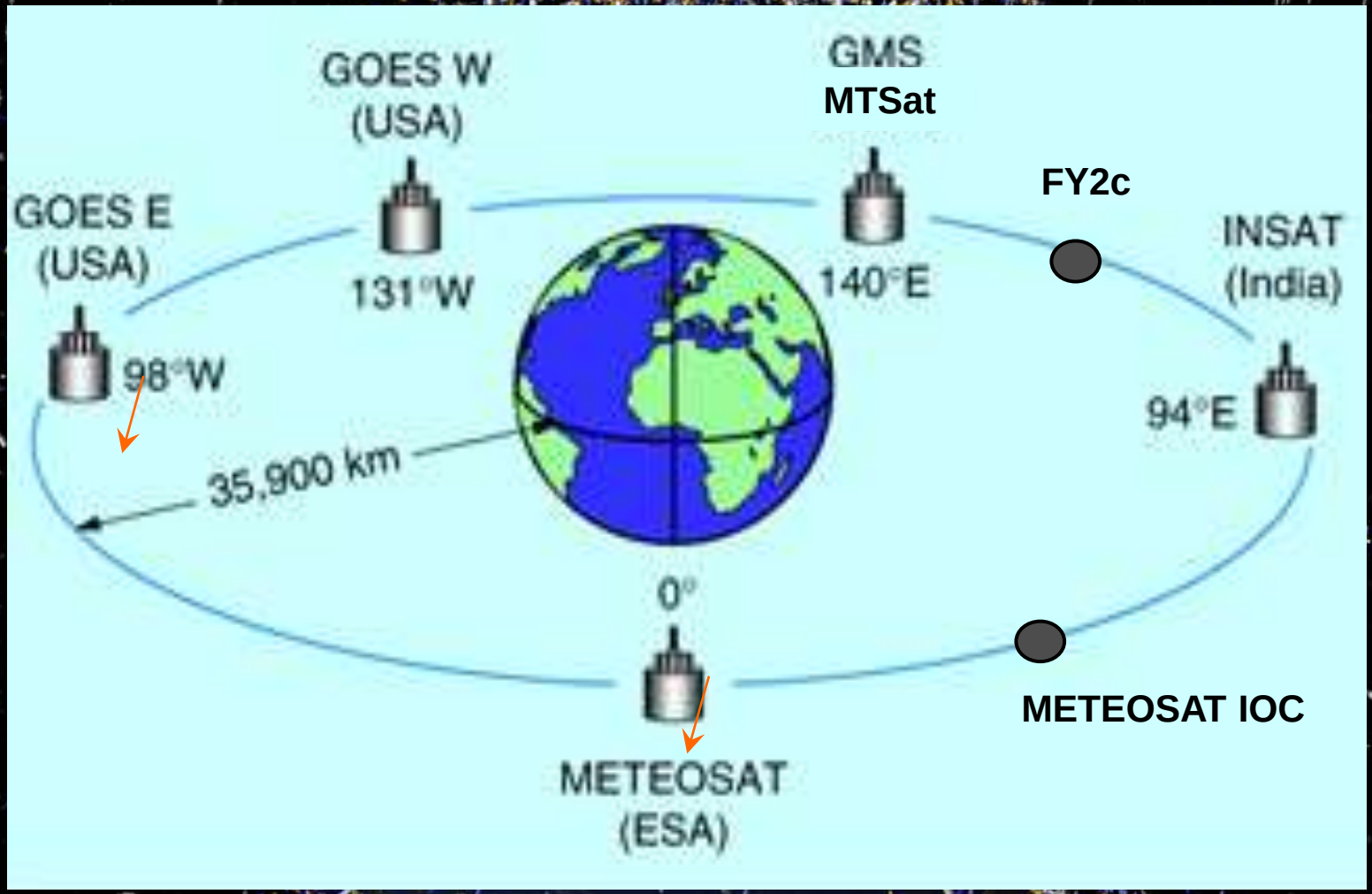
Partnership might include e.g.:

- Intermediate(s) (MinAg, NGO, value chain organization, other)
- (Spatial) information service provider(s)
- Local insurance companies
- Re-insurance company
- Others, e.g. mobile telecom provider, bank

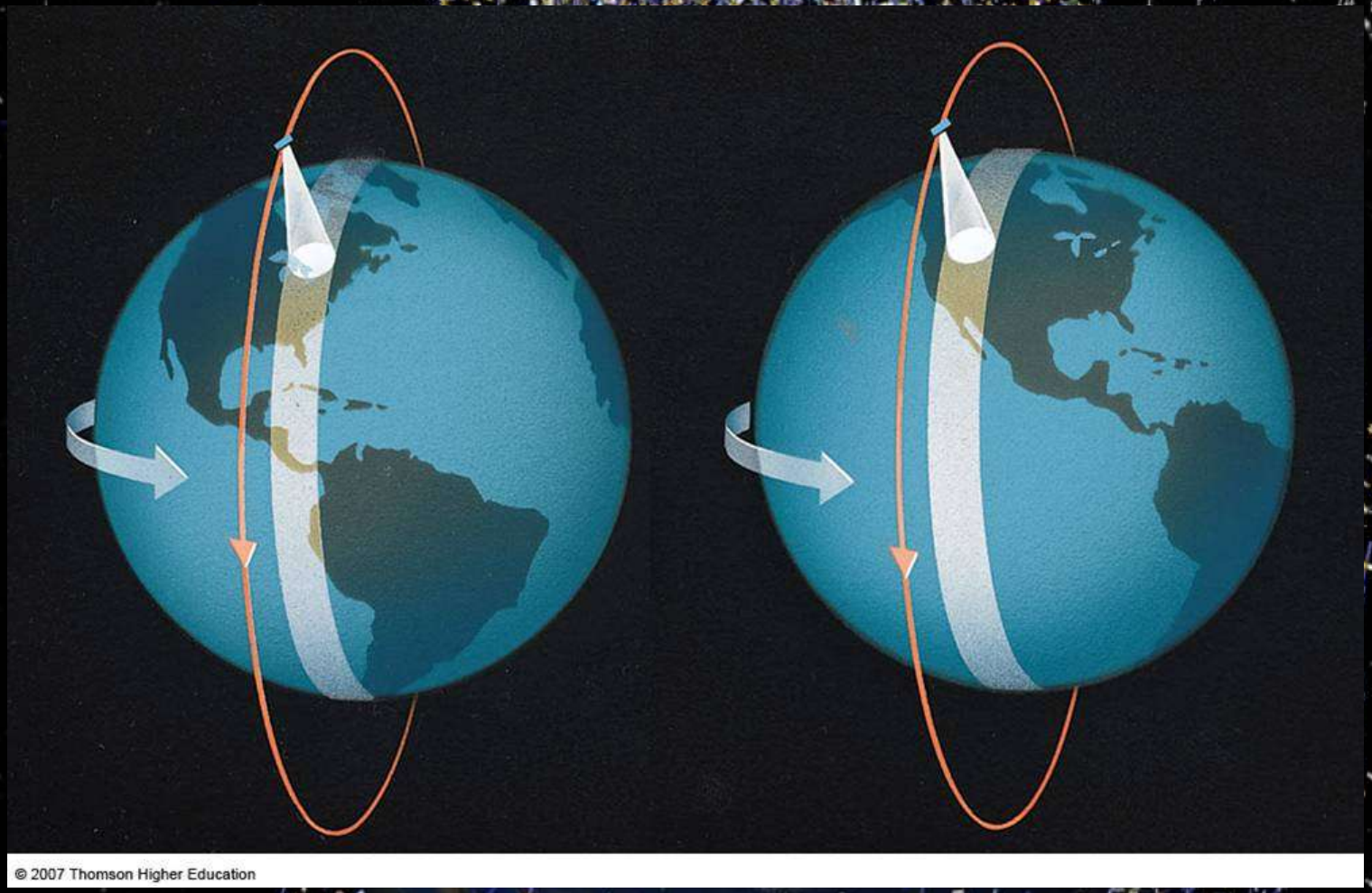
Possible service provision – advice (2)

Partnership may include, e.g.:

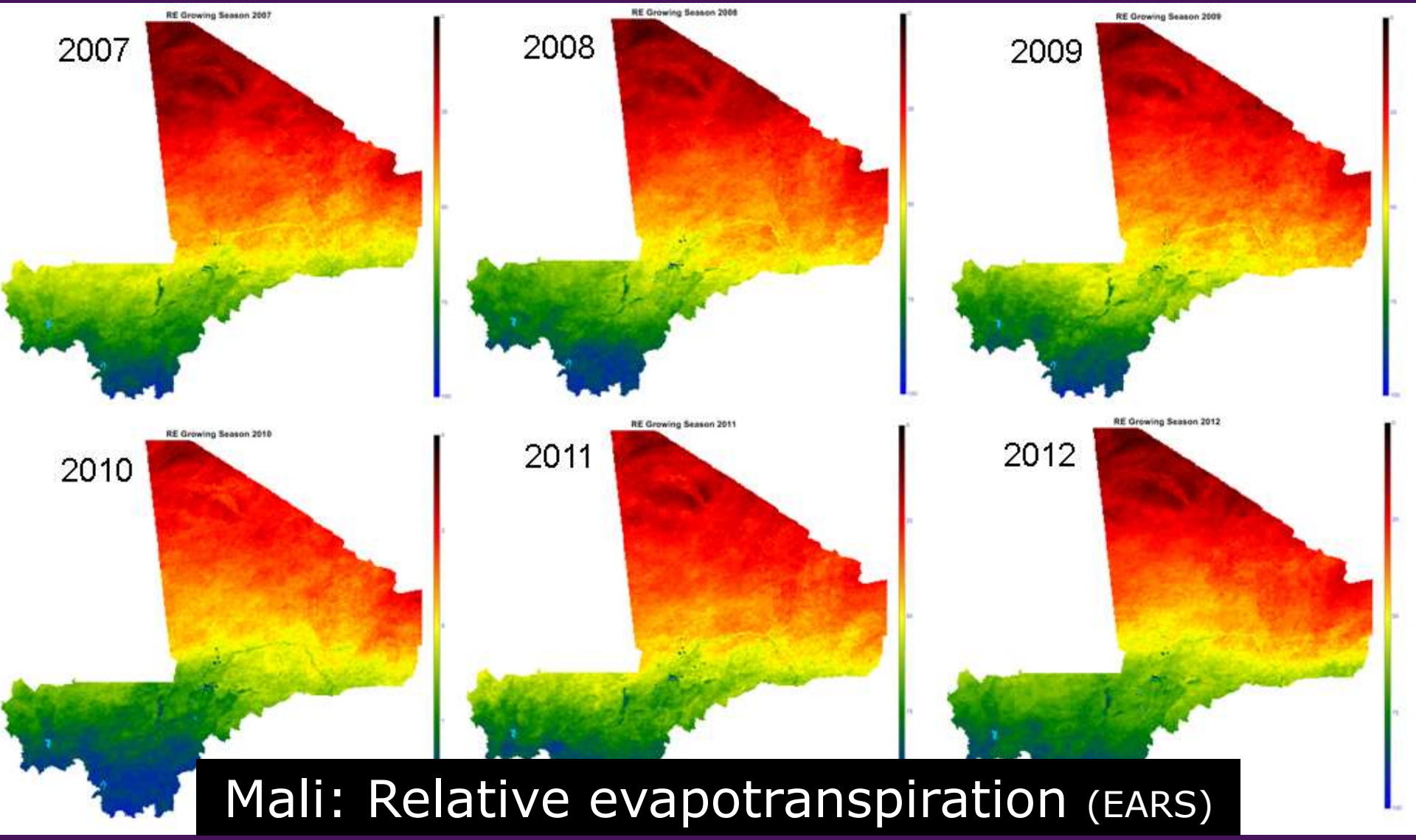
- Intermediate(s) (MinAg, NGO, value chain organization, other)
- (Spatial) information service provider(s)
- Knowledge institutes
- Meteorological Offices
- Others, e.g. mobile telecom provider, bank



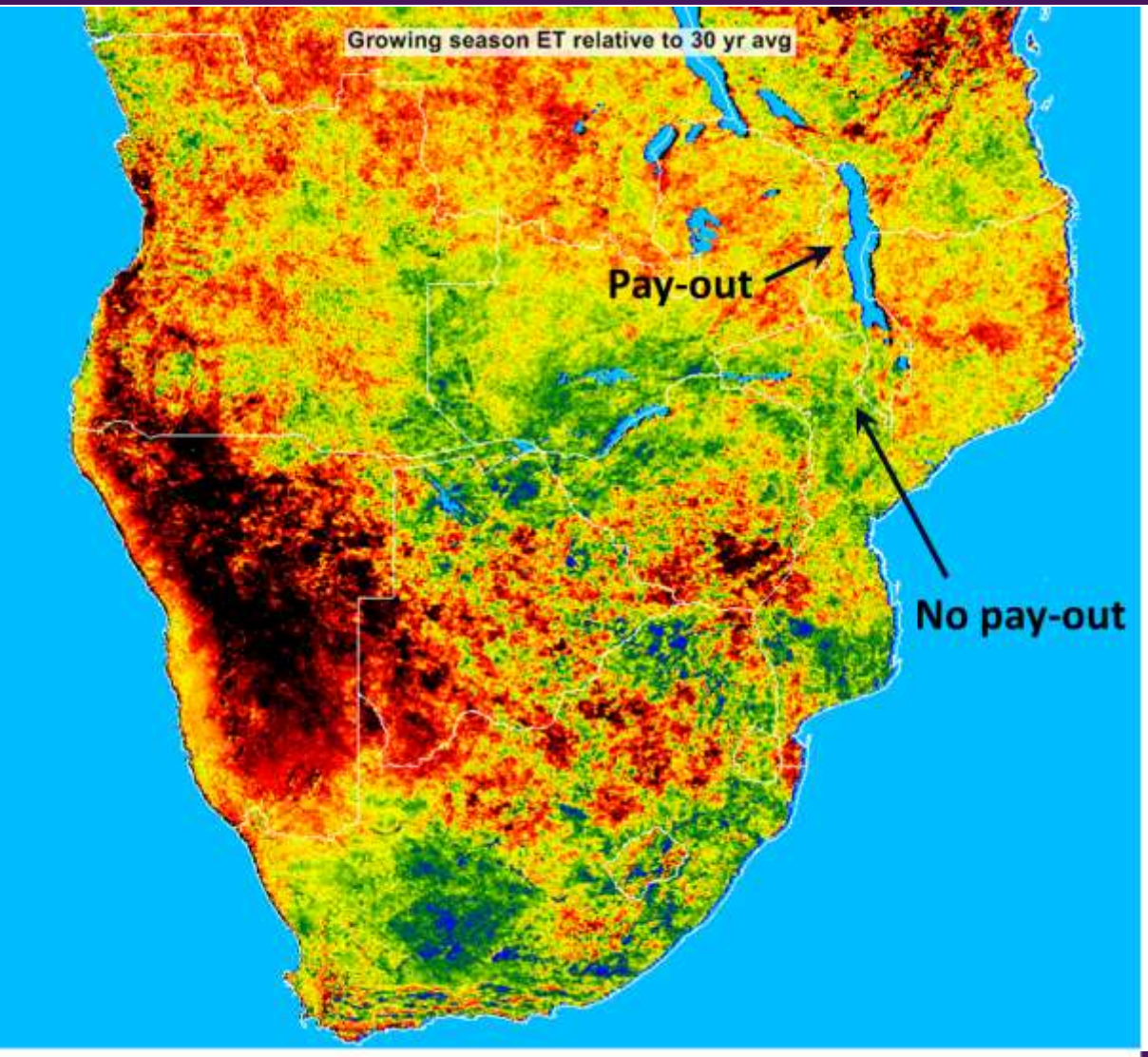
Geostationary satellites
(upto every 15min, 3x3 km)



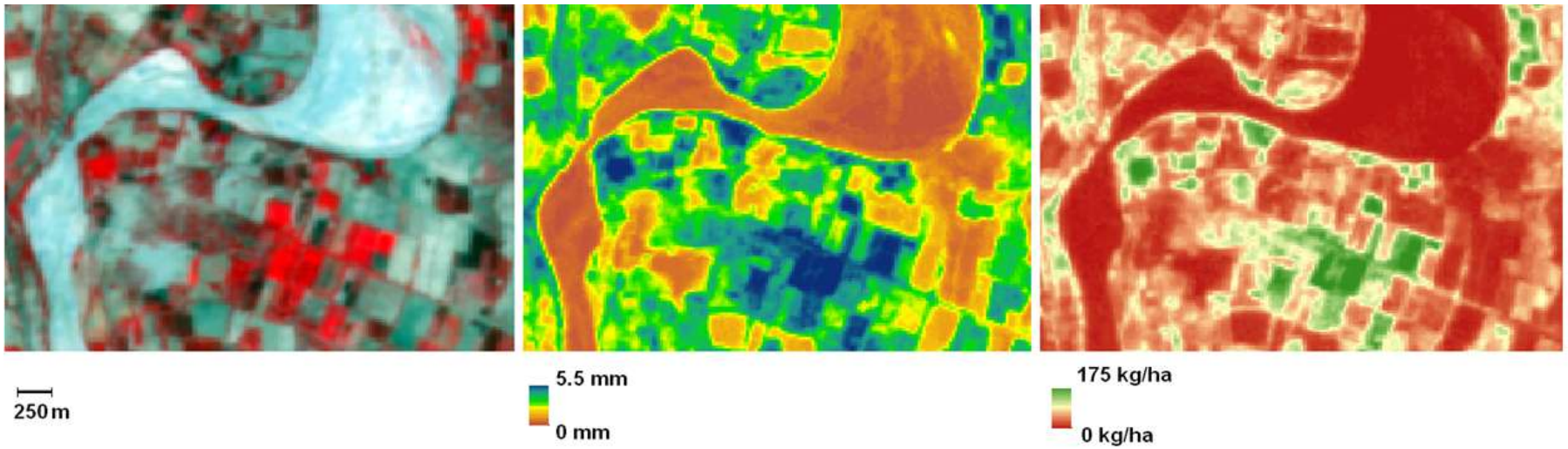
Polar orbiting satellites
(cycle ~90min, revisit few to ~30 days)



Mali: Relative evapotranspiration (EARS)



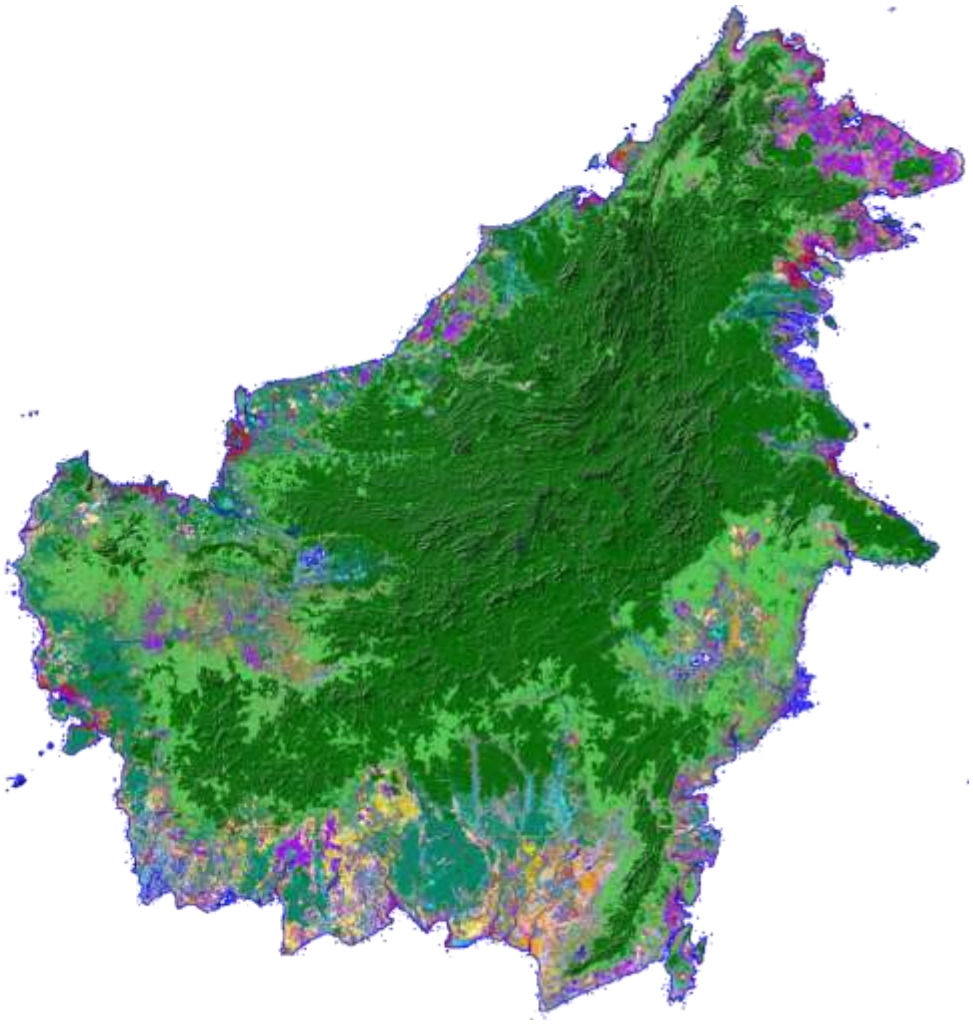
Malawi: Maize index insurance (EARS)



Example: Raw satellite data (L), derived daily evapotranspiration (M) and biomass production (R).

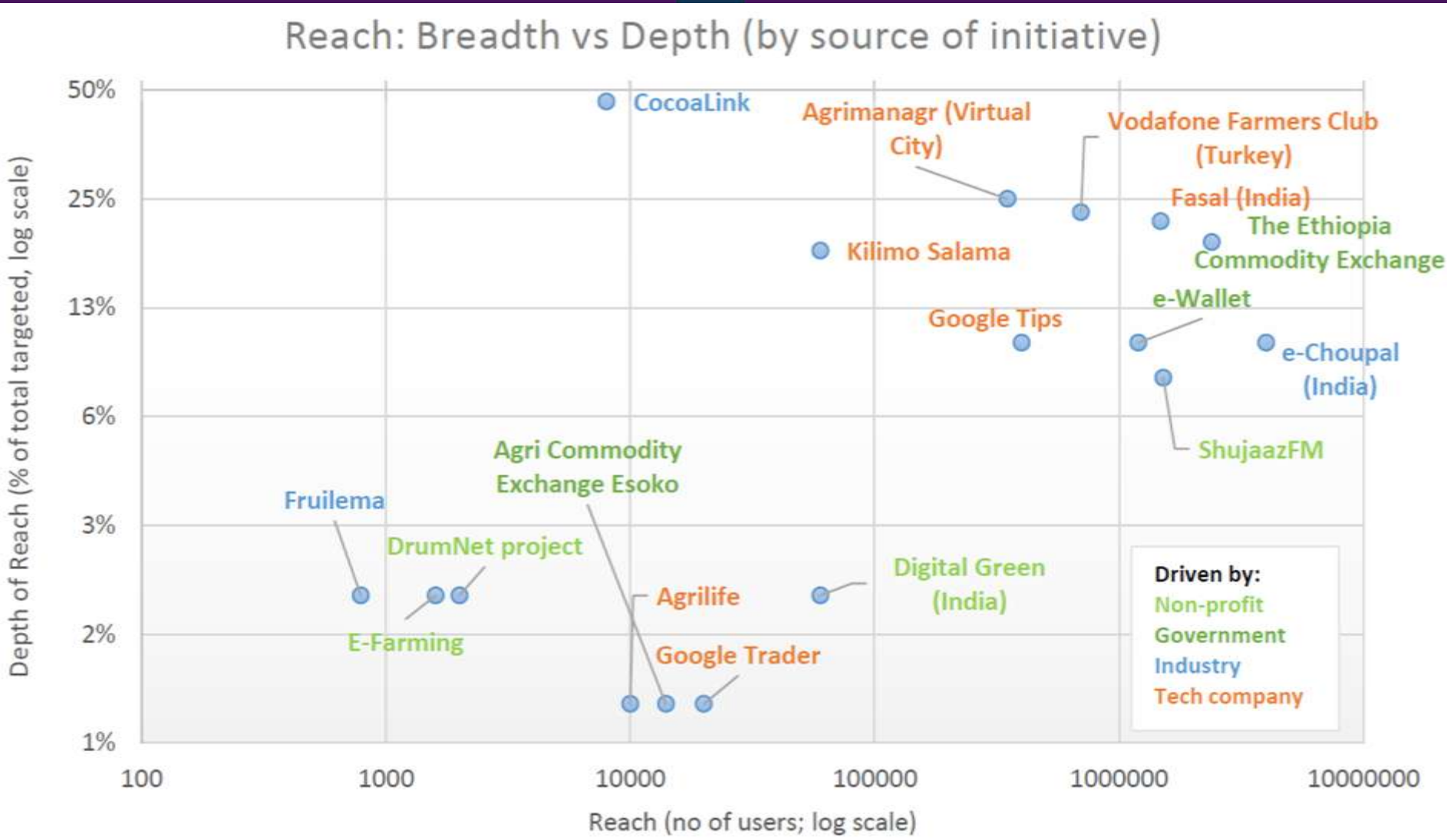
Gash: Example (eLeaf)

Kalimantan Land cover map (radar)
(SarVision)



Thank you for your attention

More info: www.spaceoffice.nl/g4aw


Reach: Breadth vs Depth (by source of initiative)
Depth of Reach (% of total targeted, log scale)
50%
25%
13%
6%
3%
2%
1%
100
1000
10000
100000
1000000
10000000
Reach (no of users; log scale)
CocoaLink
Agrimanagr (Virtual City)
Vodafone Farmers Club (Turkey)
Fasal (India)
The Ethiopia Commodity Exchange
Kilimo Salama
e-Wallet
Google Tips
e-Choupal (India)
ShujaazFM
Agri Commodity Exchange Esoko
Fruilema
DrumNet project
Digital Green (India)
Agrilife
E-Farming
Google Trader
Driven by:
Non-profit
Government
Industry
Tech company