Netherlands Space Office

Satellite based information services and smallholders

Netherlands Space Office (NSO)

Workshop Nairobi June 12 , 2014


Improving Foodsecurity
Innovation from Satellites
and IT for smallholders

Effects of climate change on
Food & Water security

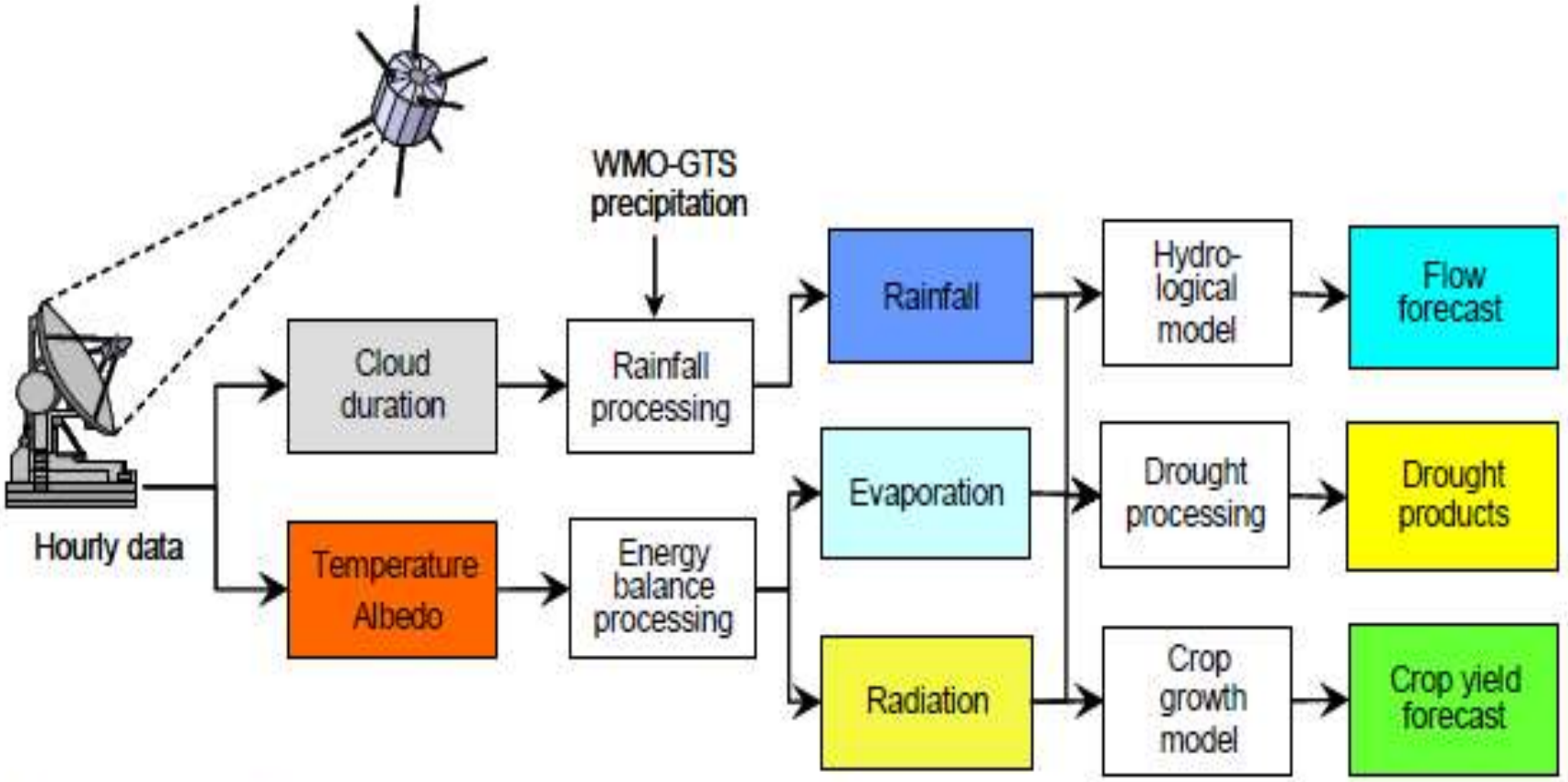
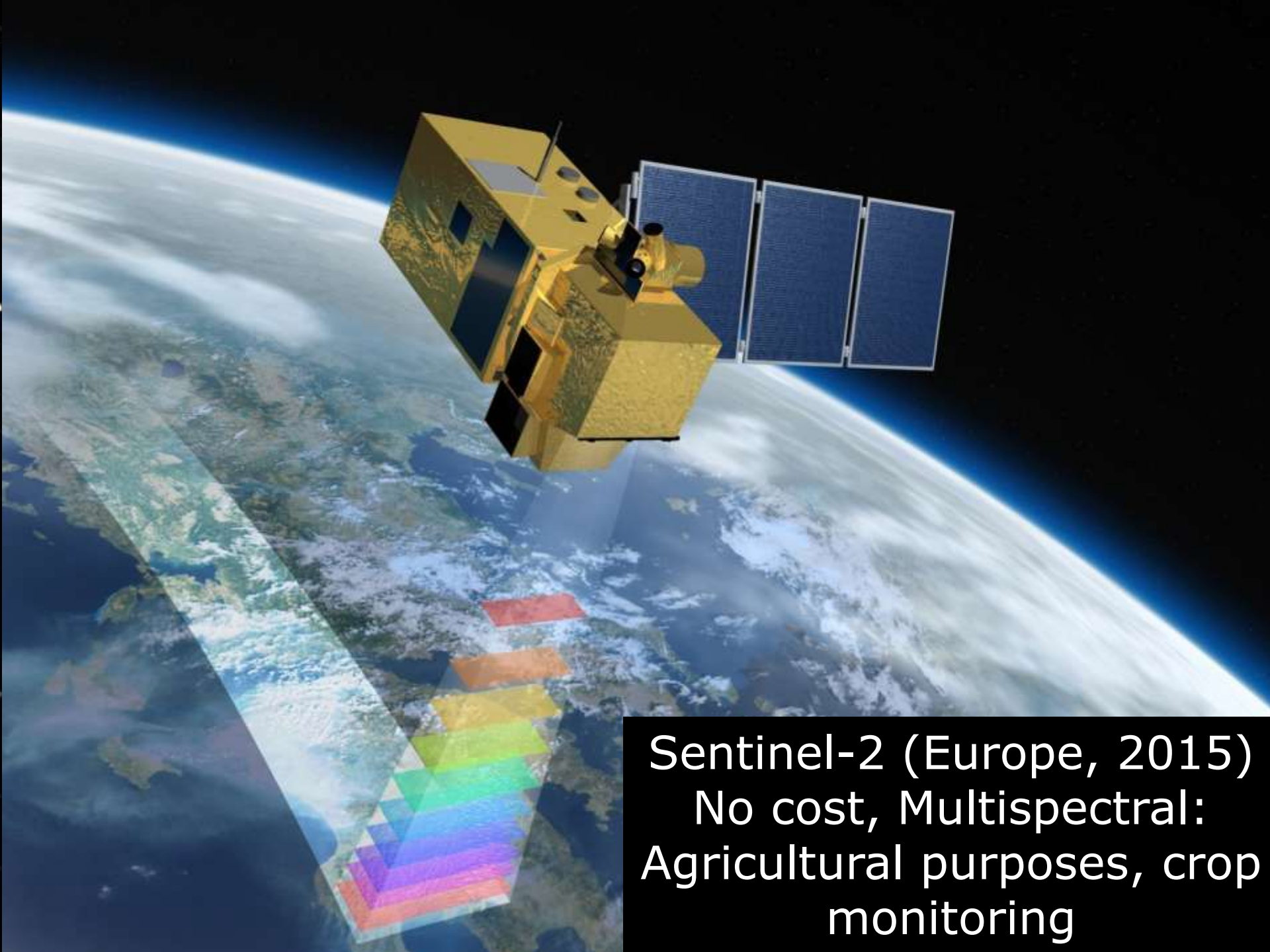


Figure 2.1: Overview of the Energy and Water Balance Monitoring System.


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


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

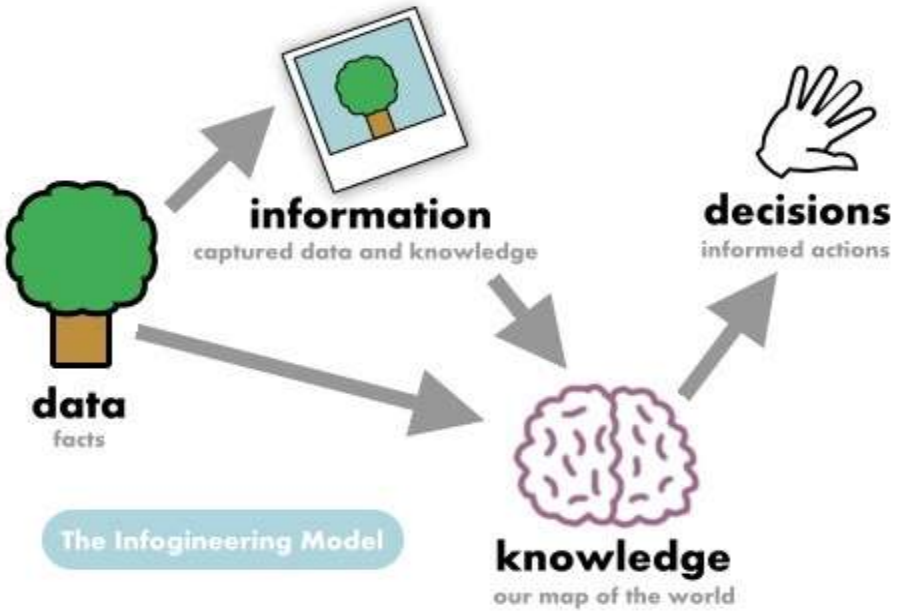

High resolution
VNIR satellites
Worldview-2

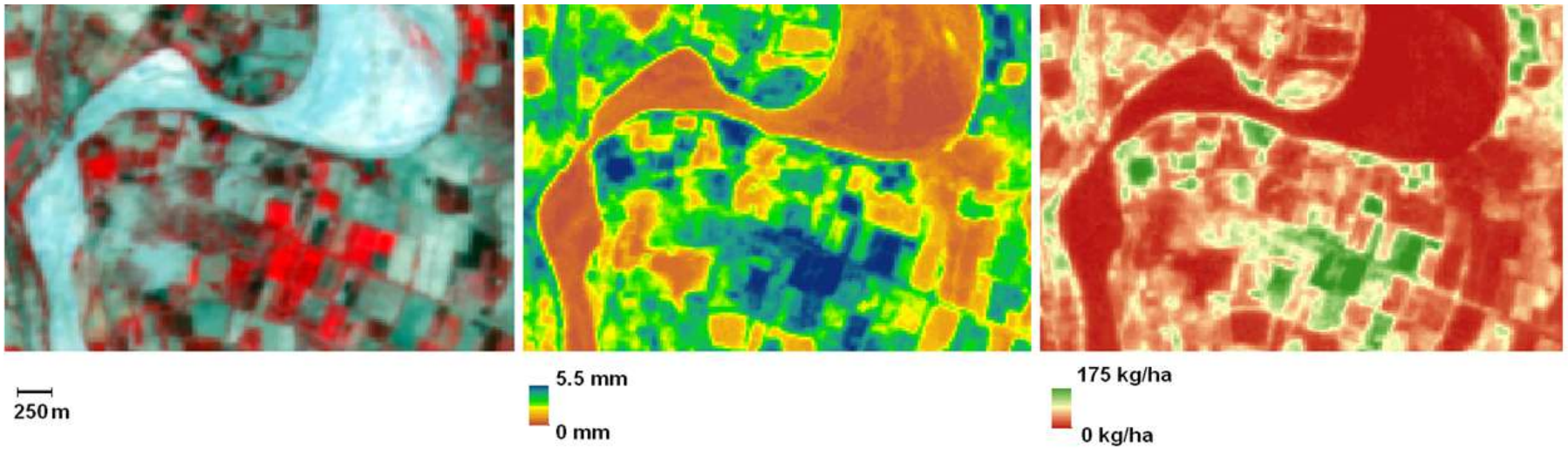
Planet Labs (2014)

Skybox (2014)

Constellation
High revisit time
Commercial
Low cost

Information chain - services





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

Government regulations/conditions Agri-Water-ITC & public services

Producing parties

Intermediary parties

Government

Agri- industry

Large scale
Contract farming

Smallholders
farming

Agri ICT (geo)
services

Employment
agencies

Contractors

Aggregator
Parties

Cooperatives

Agric .advisors &
Agri services

NGO's

Networker
parties

Institutes &
University
(R&D)

Extension
services

Education &
information

relevant
agencies

Food industry

Inputs
industry

Insurance &
Finance

Telecom
/Satcom

+ ao sectors

Consumer & (Local markets)

Inventory of Mechanisms and agri-chains

www.waterandclimateservices.org

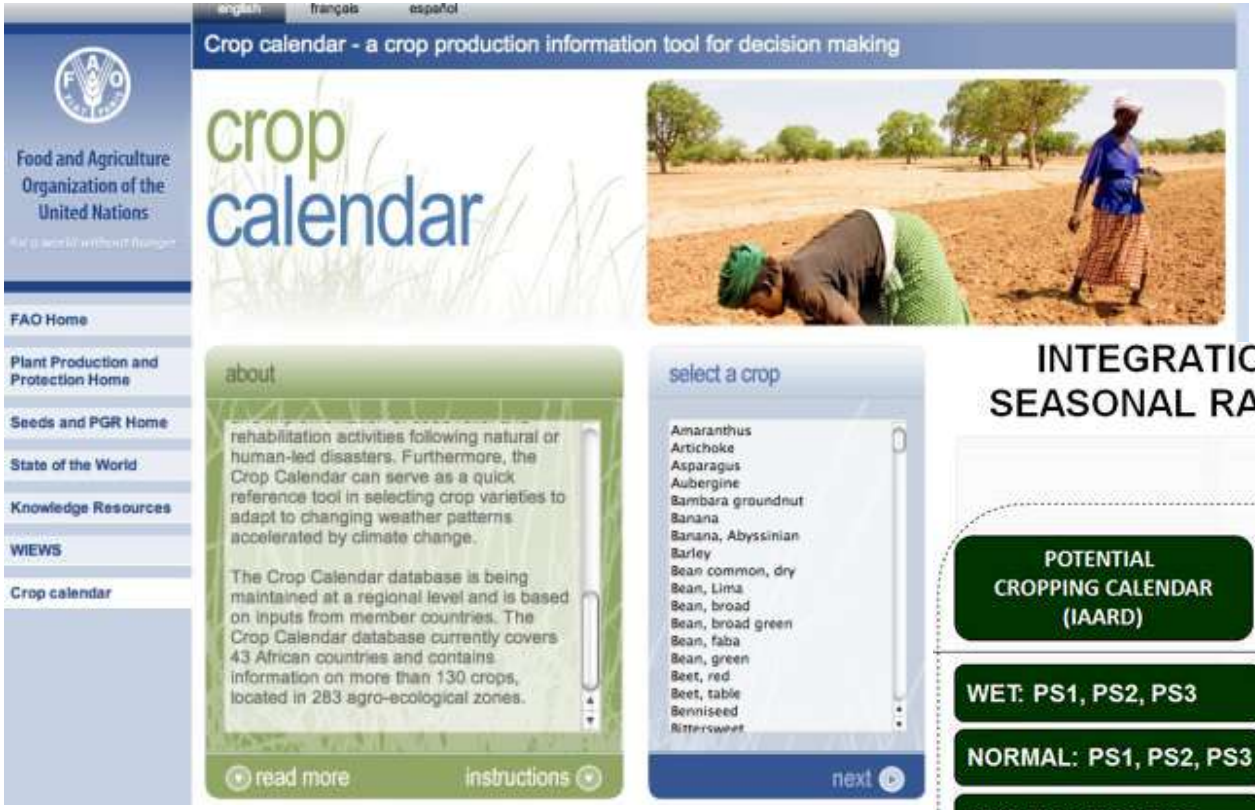
Netherlands Cooperation on Water and Climate Services

Holland

An unique cooperation of 45 Dutch organisations that offer solutions for water and climate related challenges

"Joint effort of 45 Dutch private companies, knowledge institutes to create added value within the Information Chain, from satellite to end-user, as a key towards affordable food security and water safety"

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)

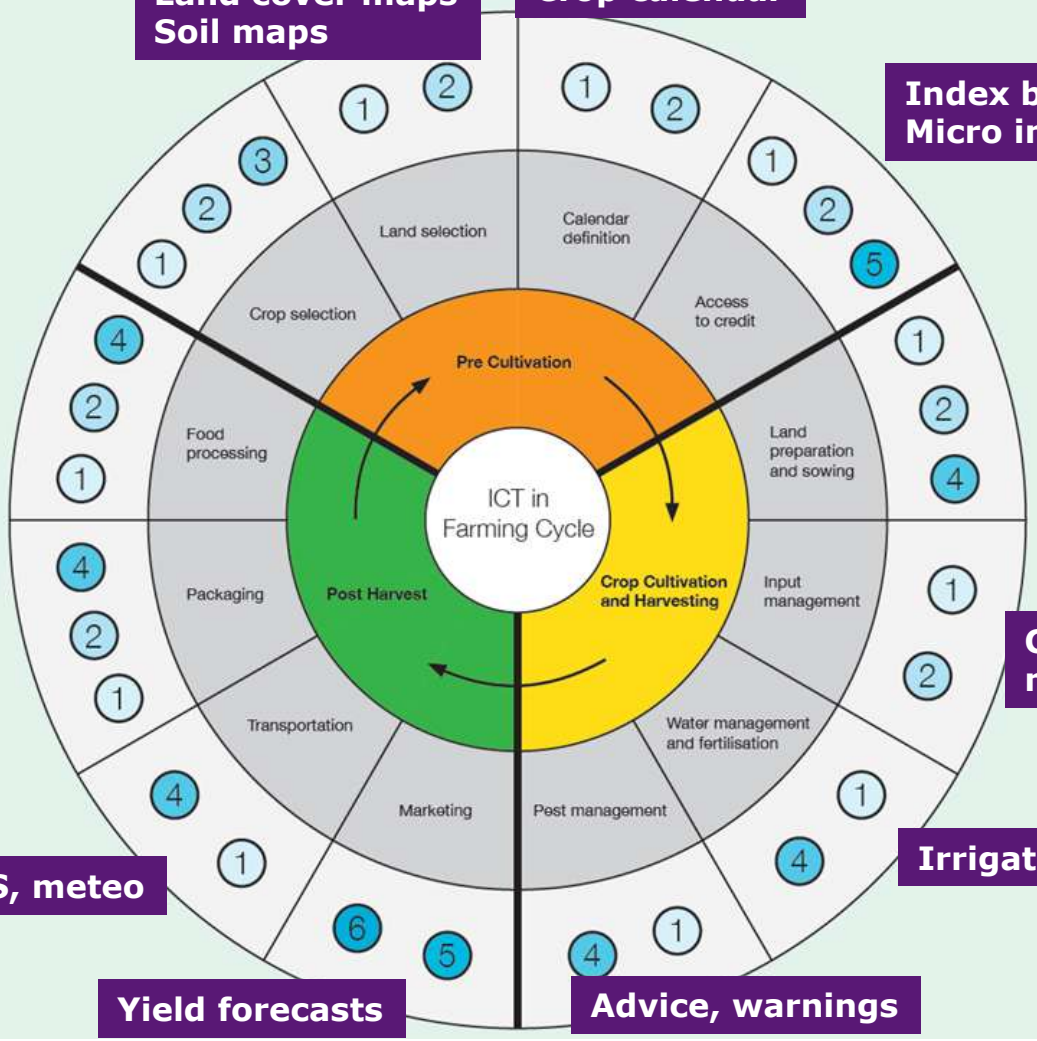
- FORECAST OF MONTHLY RAINFALL (mm/month)
- PROSPECT OF BEGINNING OF SEASON
- PROSPECT OF SEASON TYPE (WET, NORMAL, DRY)

DROUGHT IMAGE ANALYSIS (ICALRD)

- NDVI
- VCI
- KBDI
- VHI

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

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 maps
Soil maps

Crop growth monitoring

Irrigation advice

Advice, warnings

Yield forecasts

GPS, meteo

1. Information systems including DSS/MISS/GIS etc
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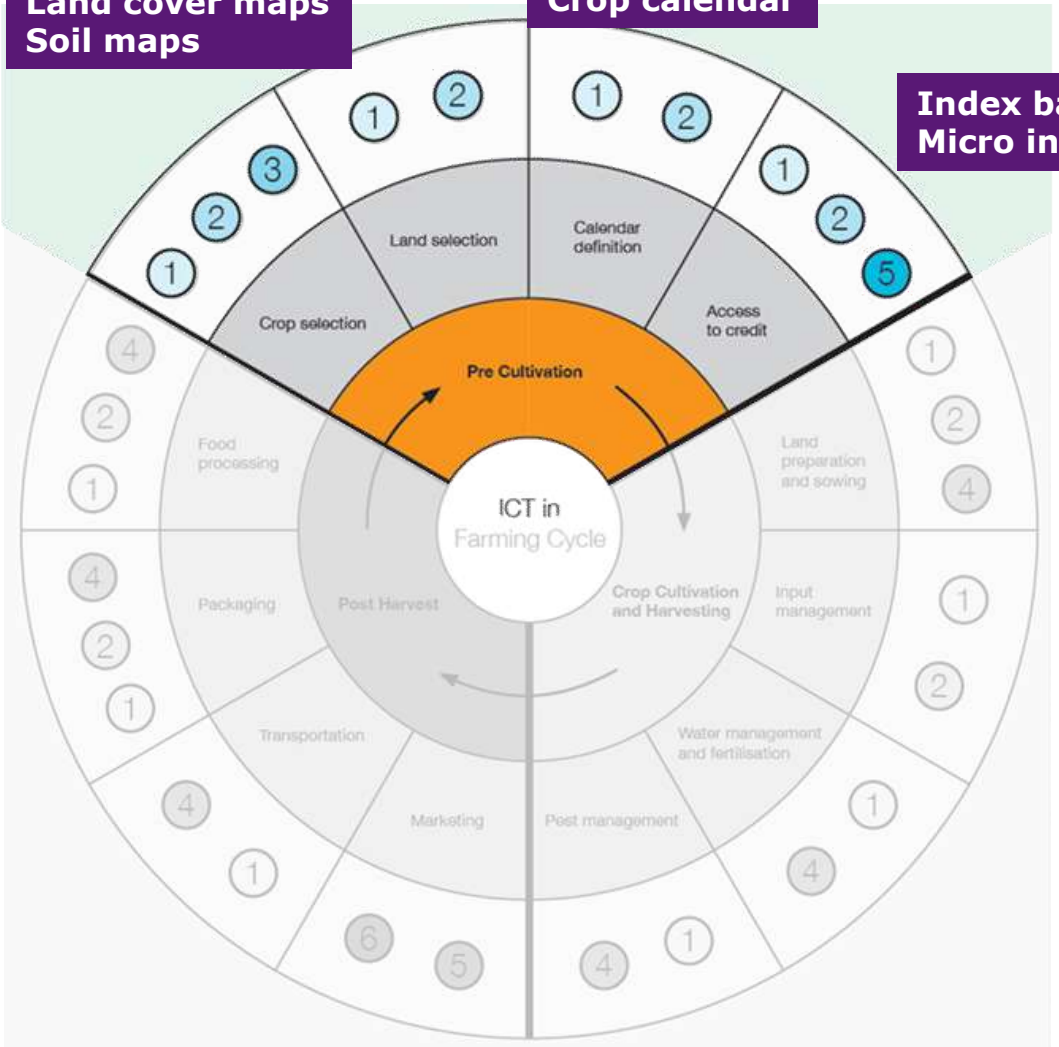
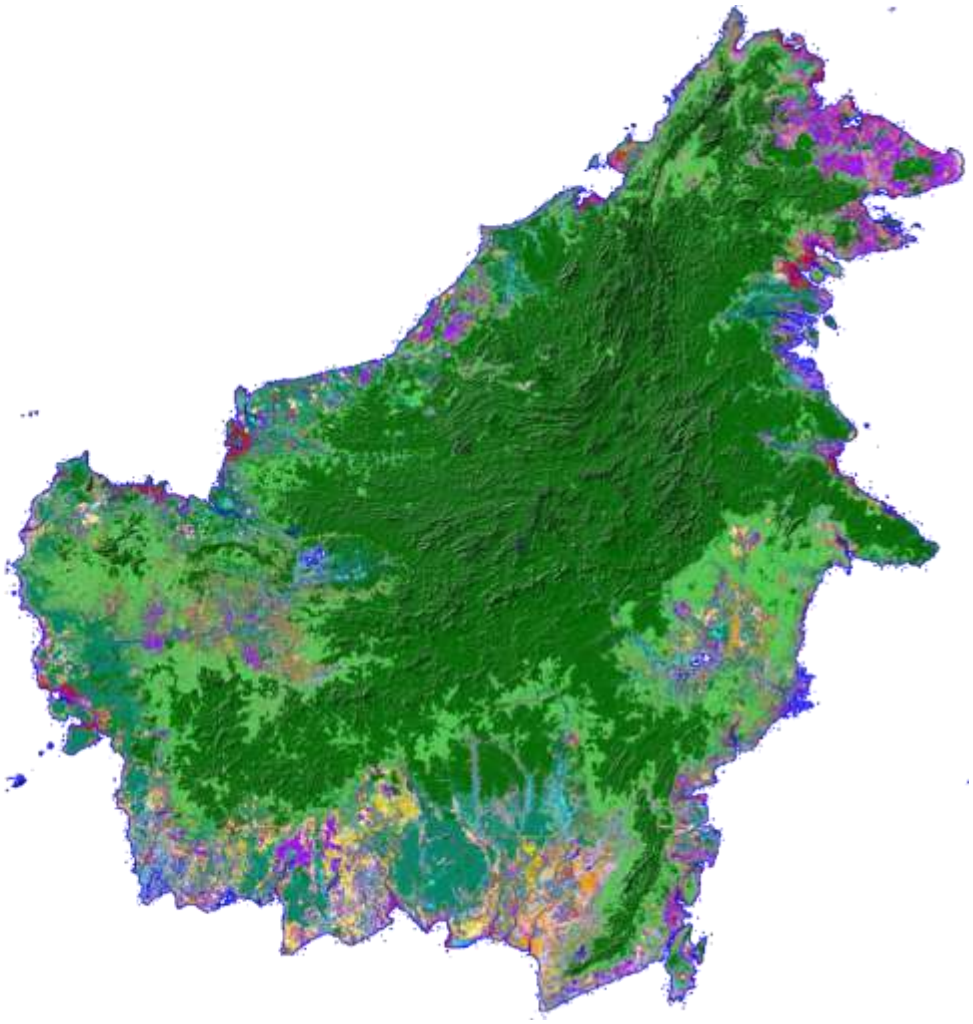
Index based
Micro insurance



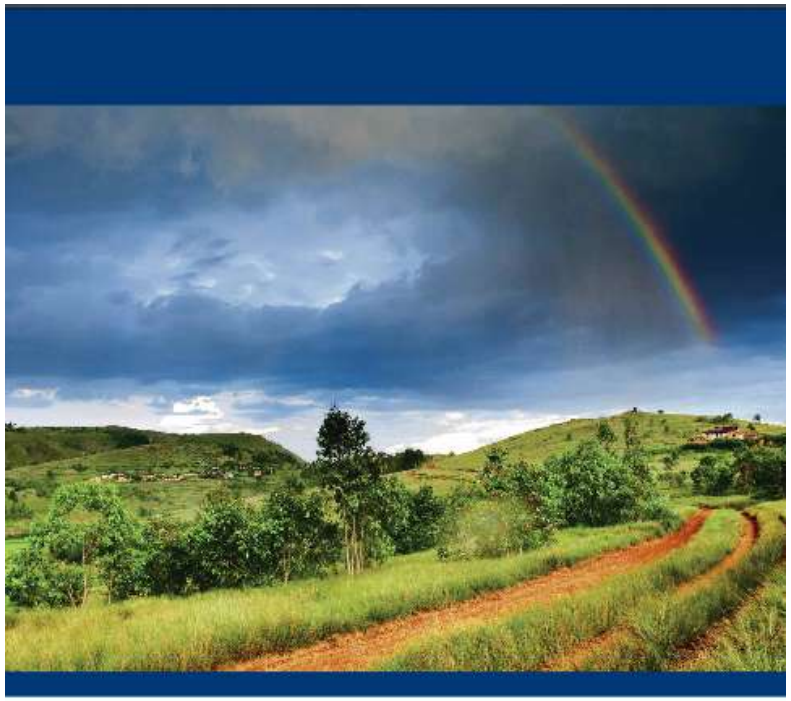
Land cover maps

Kalimantan Land cover map (radar)
(SarVision)



Micro insurance

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

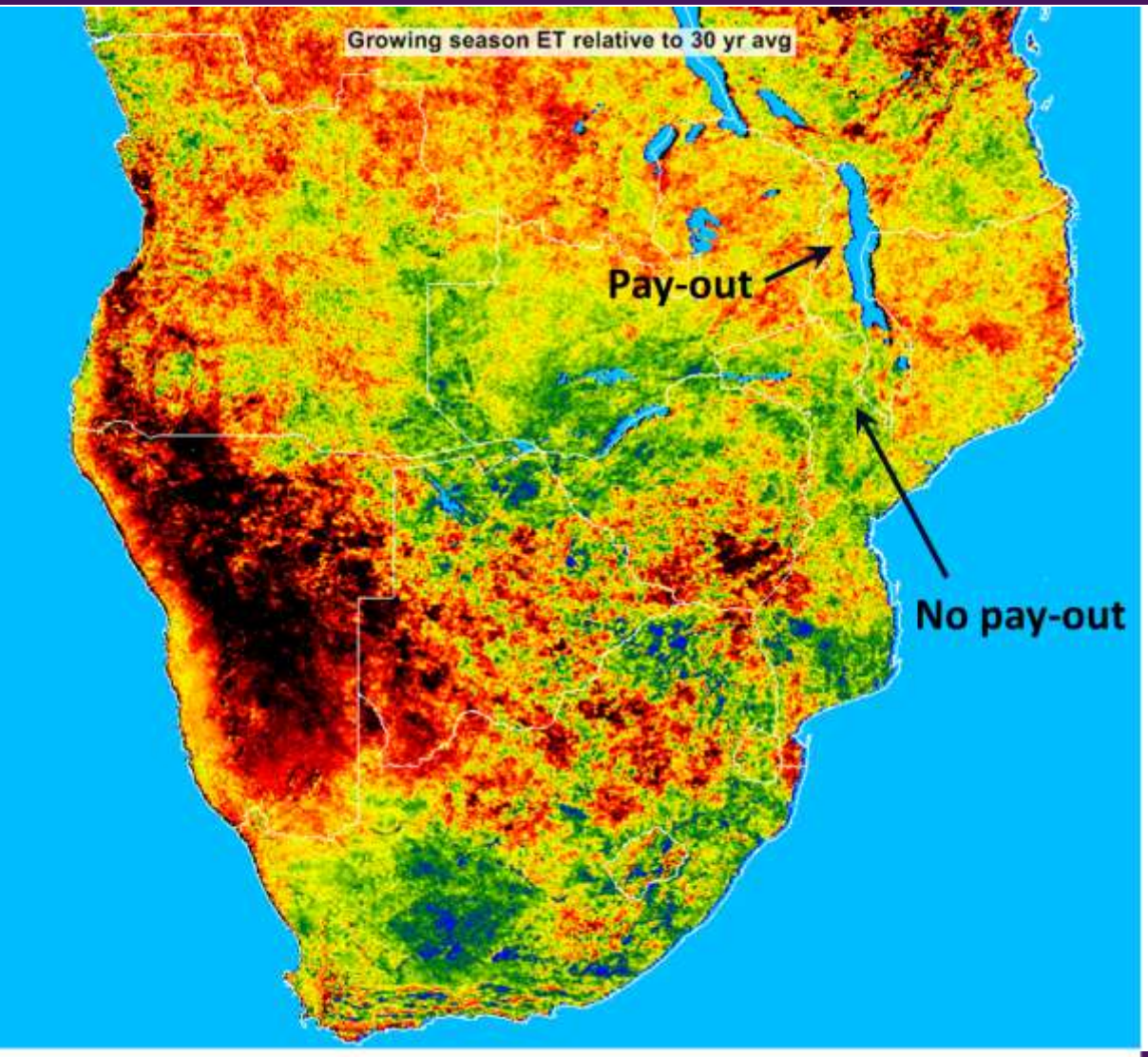


→ **Time for Up-scaling**

WFP World Food Programme wfp.org

IFAD Enabling poor rural people to overcome poverty

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



Malawi: Maize index insurance (EARS)

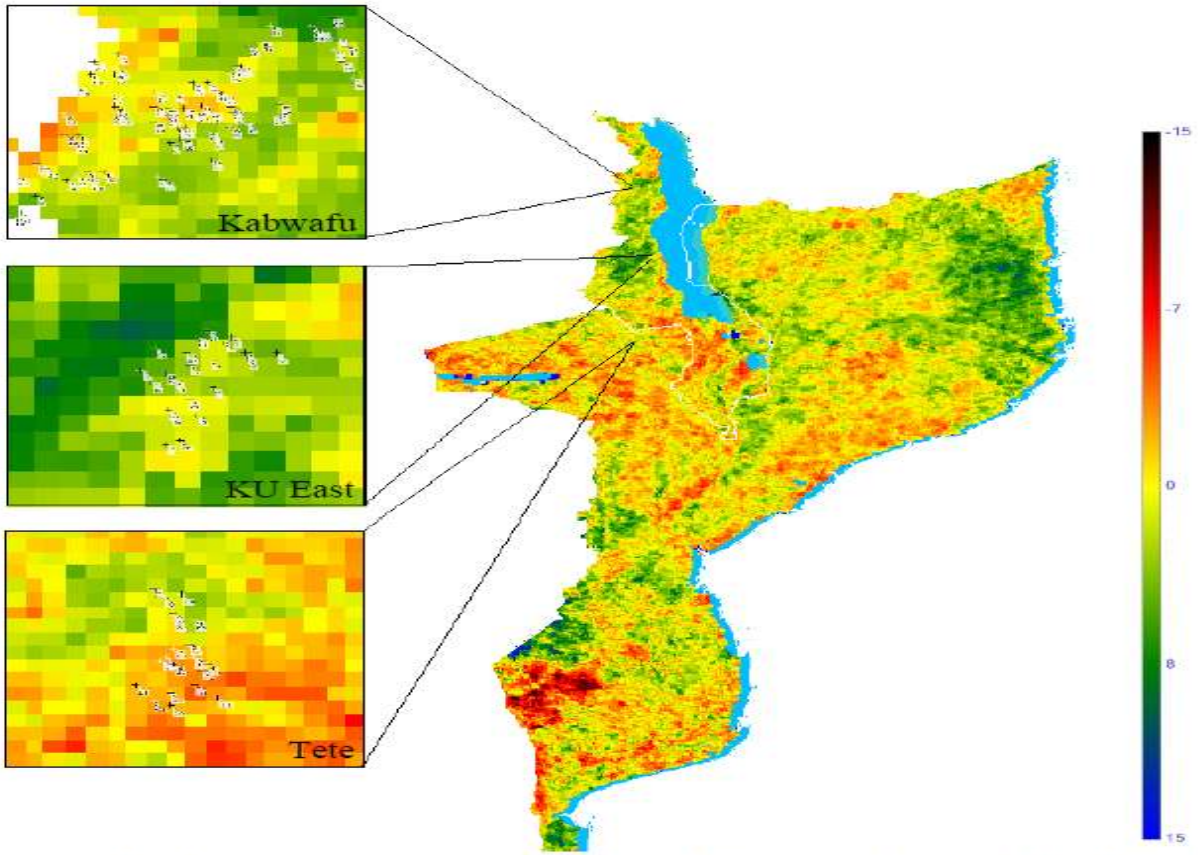


Figure 8.49: Difference evapotranspiration (DE) for growing season 2012/13 (dekad 62-78). Scale runs from -15% (dark red)) to +15% (green, blue). On the left, detailed croppings of the three target areas are shown. Best growing season conditions occurred in KU-East, mid Malawi.

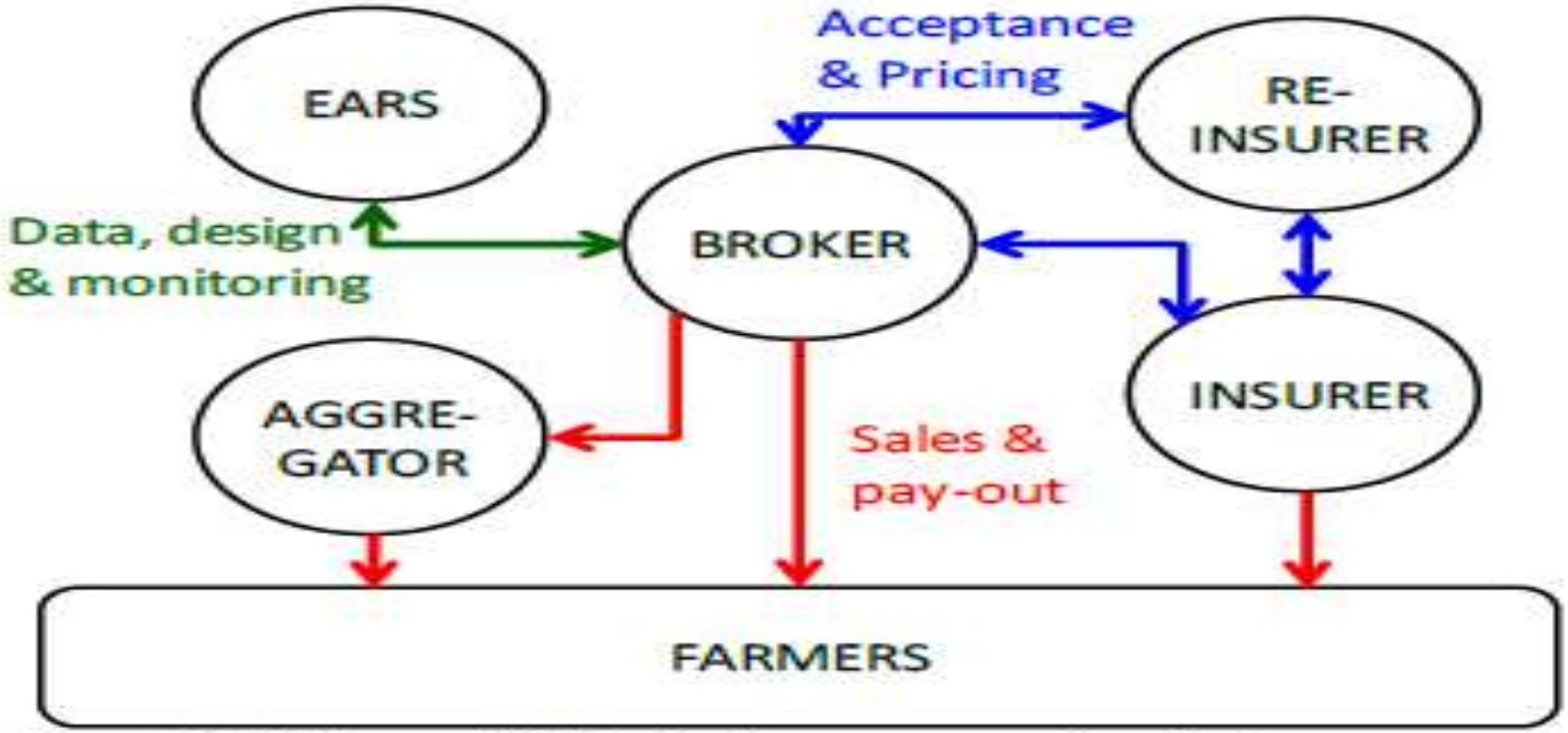


Figure 8.1: Scheme of the index insurance service chain.

Micro insurance

Video Kilimo Salama

The Tech Awards 2013 laureate Kilimo Salama Syngenta Foundation - Snelkoppeling.lnk

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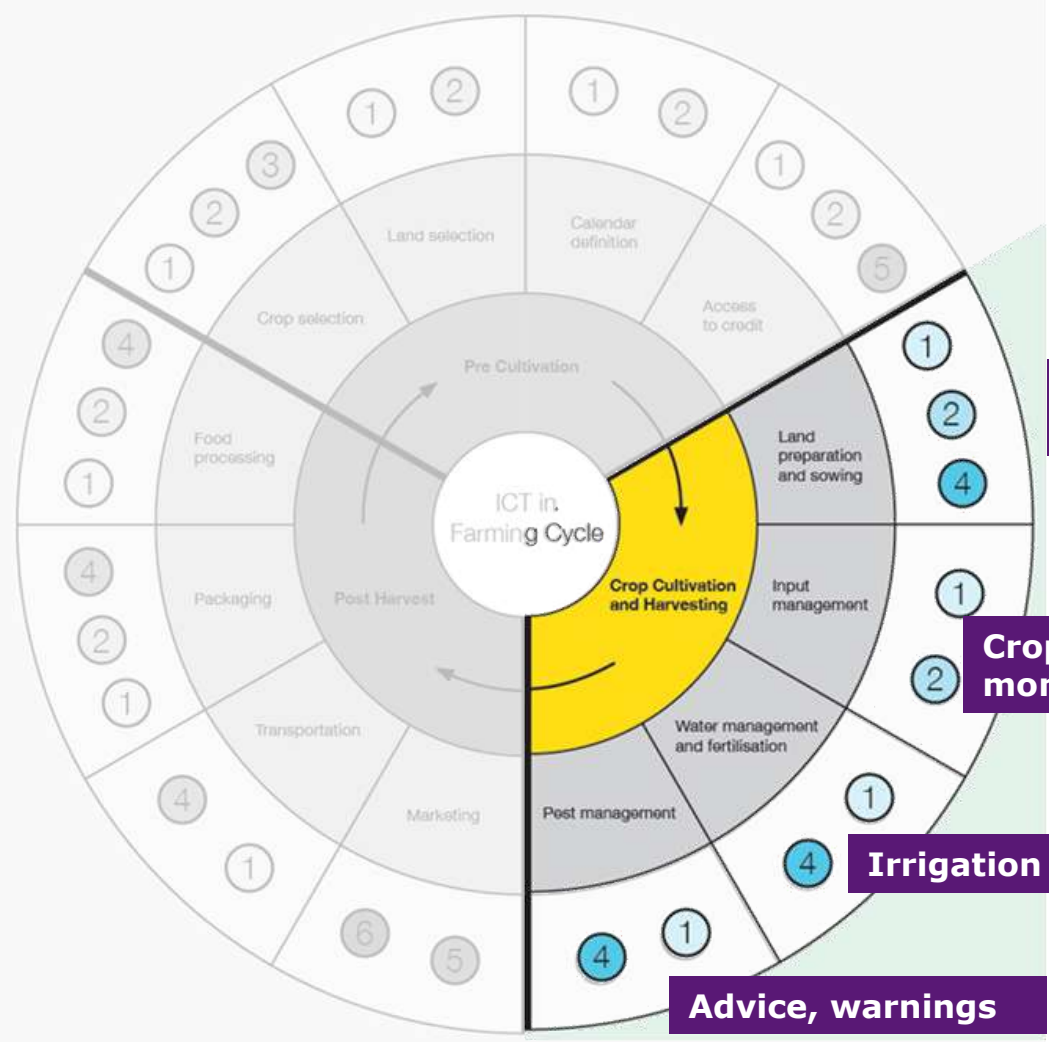


Land cover maps
Soil maps

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

16/05/2012

Radar analysis

Bare soil

Emergence

SarVision

wielaard@sarvision.nl

Crop growth monitoring

Sugar beet at 25m resolution every 24 days

09/06/2012

Radar analysis

Bare soil

Emergence

Increment

SarVision

wielaard@sarvision.nl

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

SarVision
wielaard@sarvision.nl

Crop growth monitoring

Rice at 5m resolution every 5-11 days

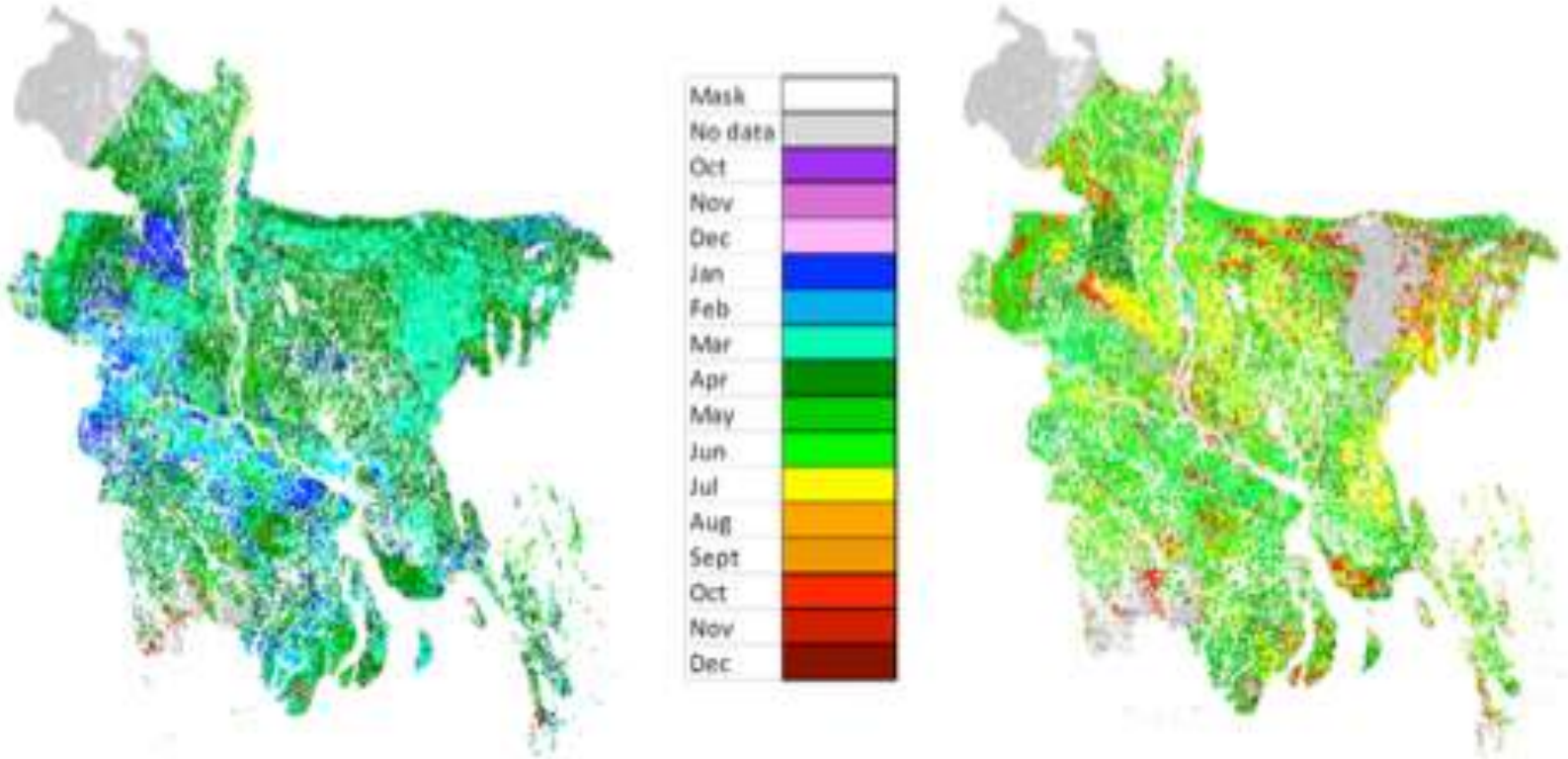
Sharp results: Multi-temporal filtering

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

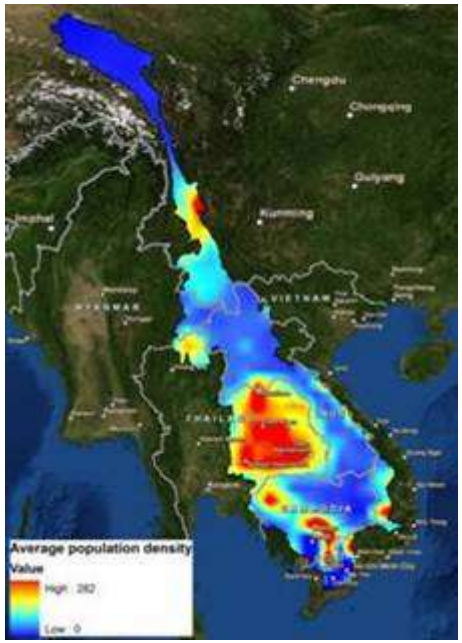
The crop has no water stress when the soil moisture is above the critical level and below the field capacity

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

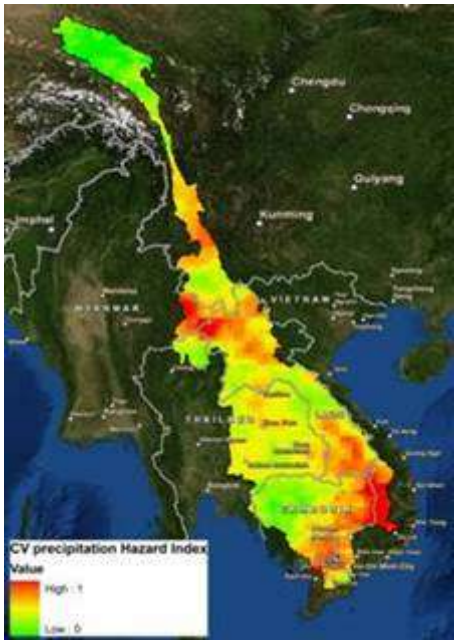
Advice and warning

Hazard & Risk Analysis

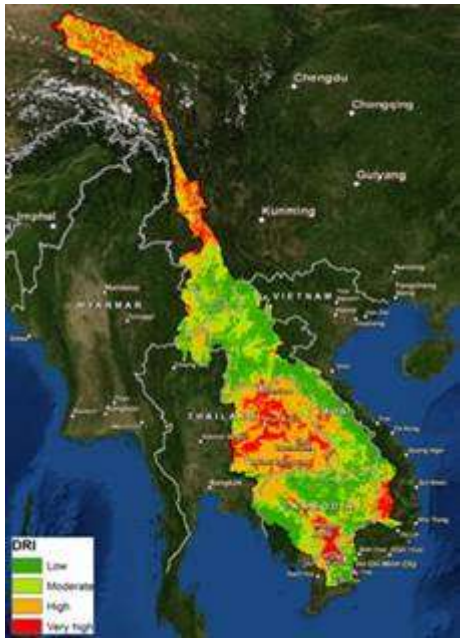
Vulnerability Index
Distance
to river



Vulnerability Index
Population density



Vulnerability Index
Precipitation



Drought
Risk Map

FutureWater

Advice and warning

Early warning

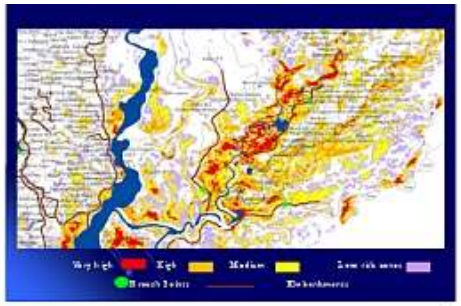
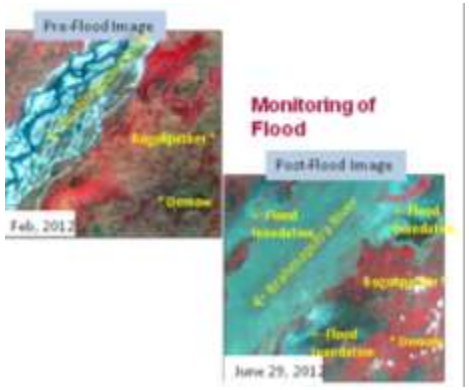
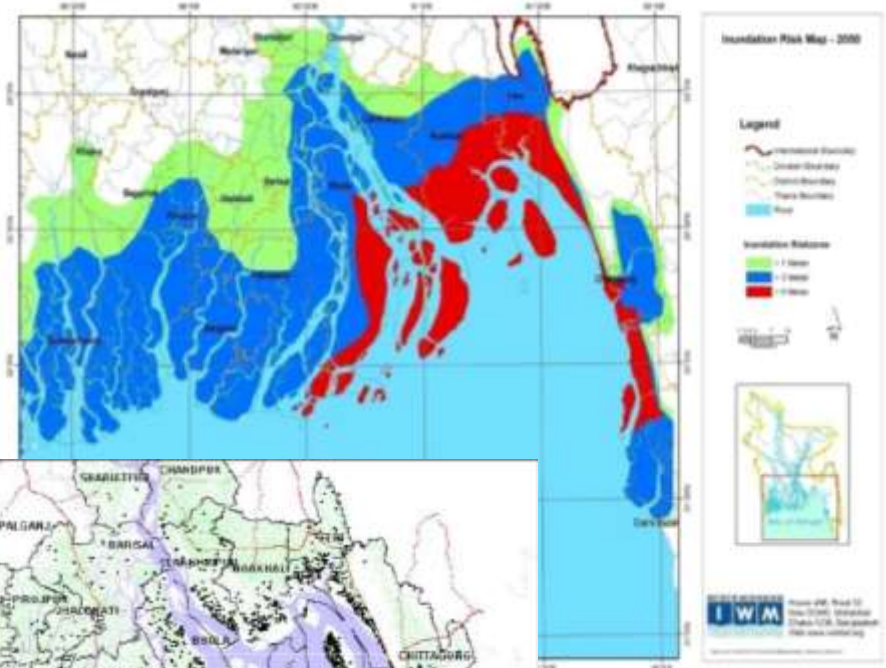
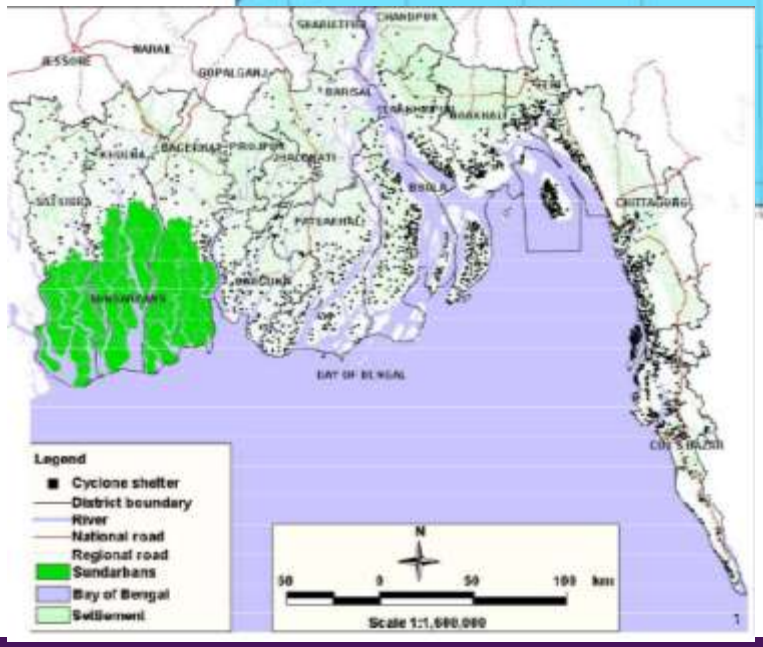


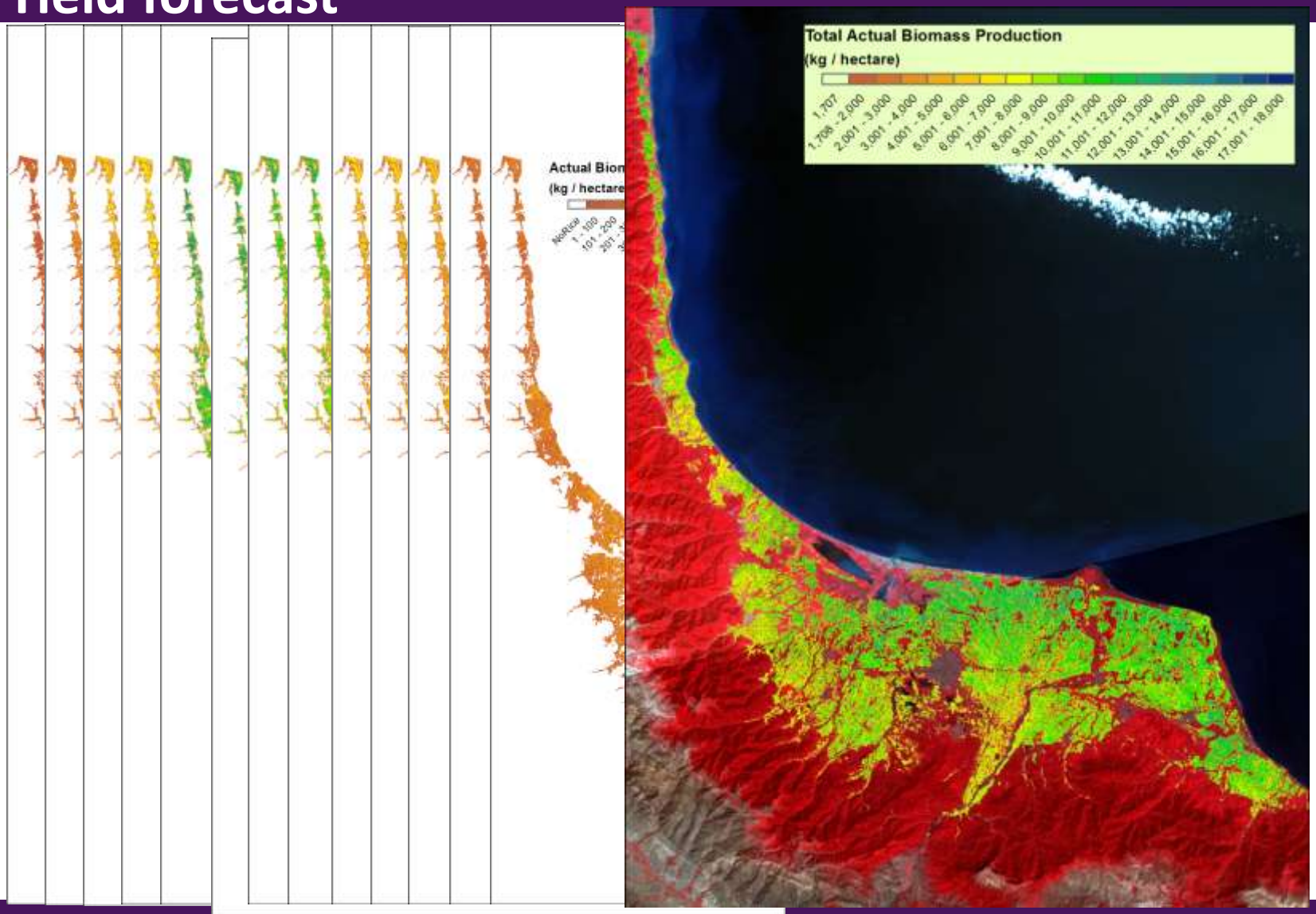
Fig: Flood hazard maps corresponding to various flood discharge and levels







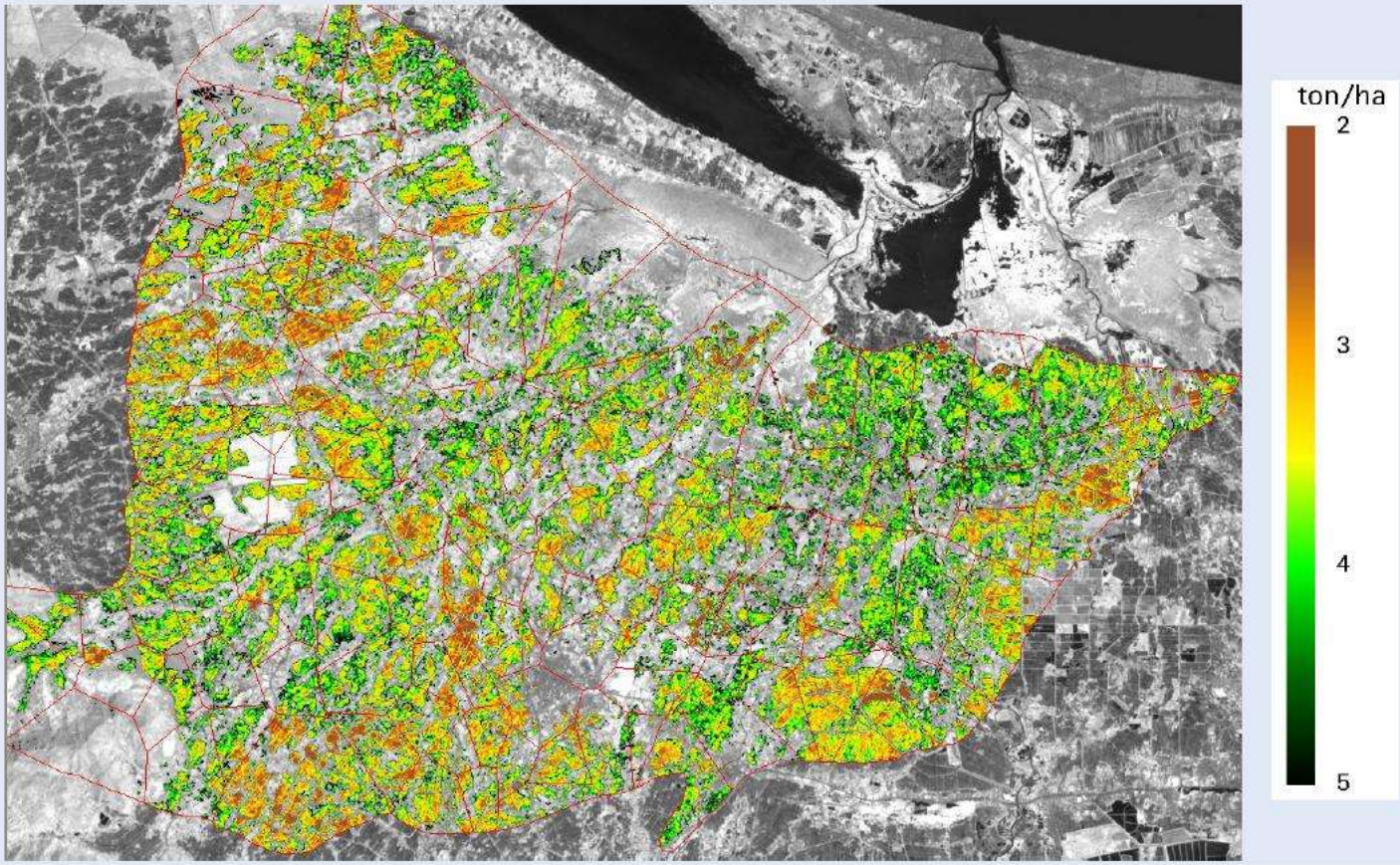
Yield forecast



GSM: Actual Biomass Production

Yield forecast

Rice Yield maps



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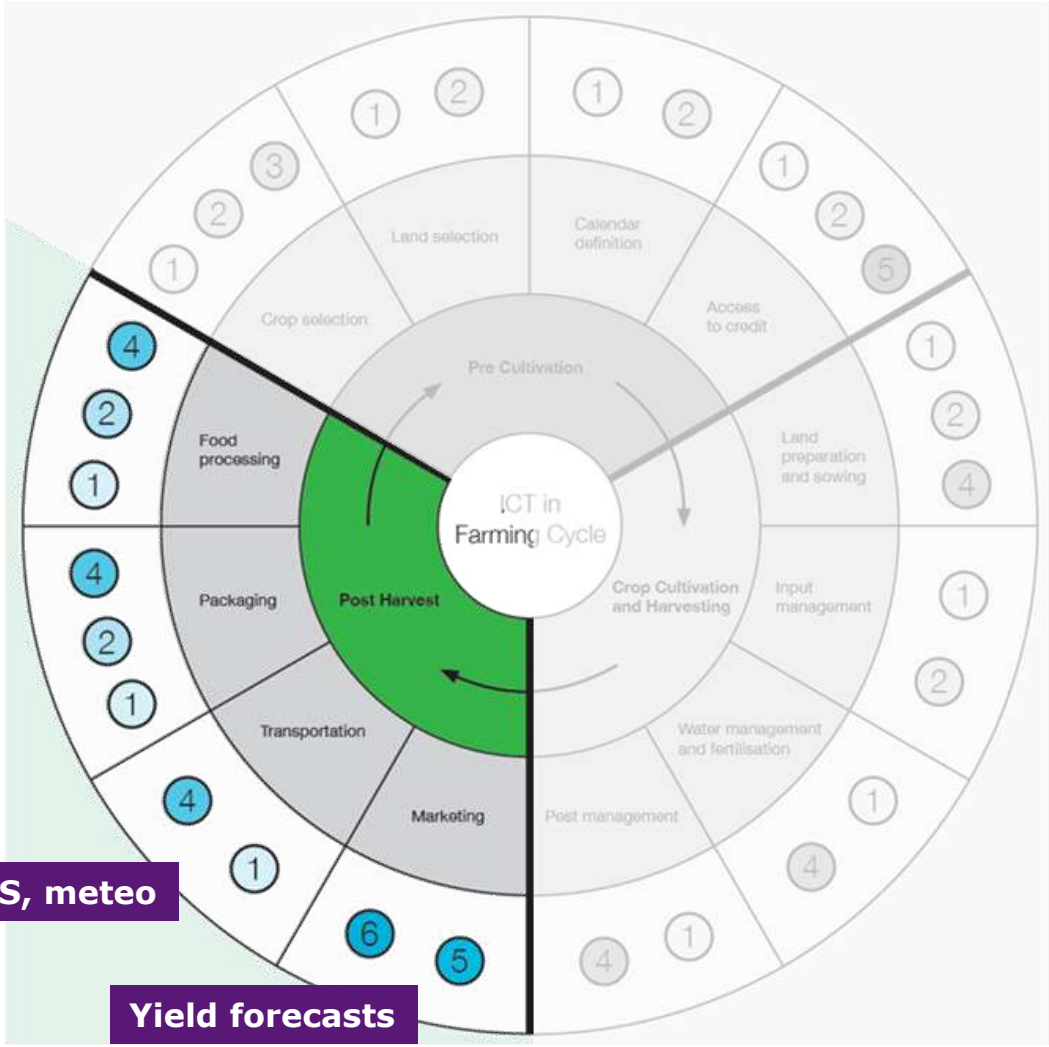
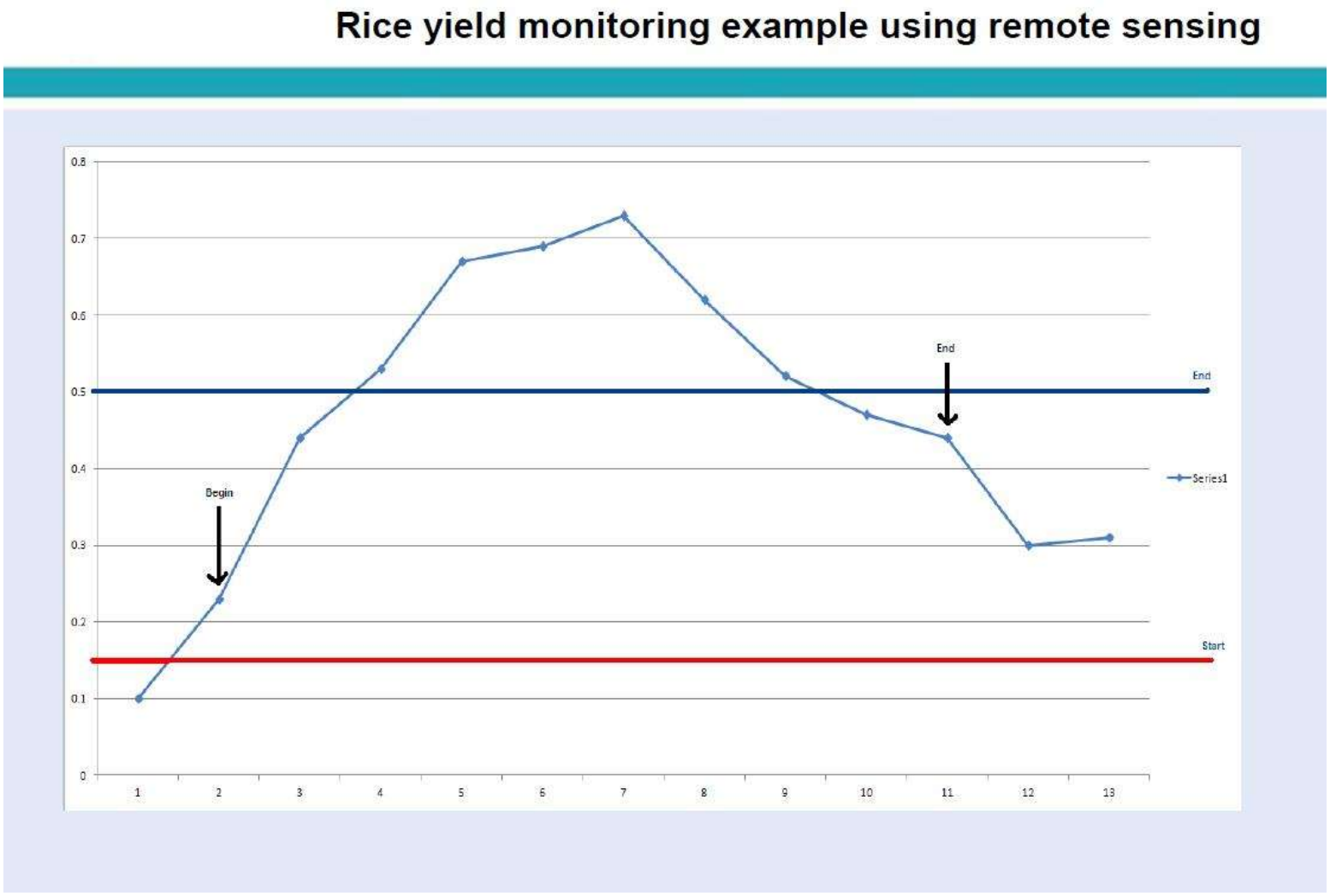


GPS, meteo

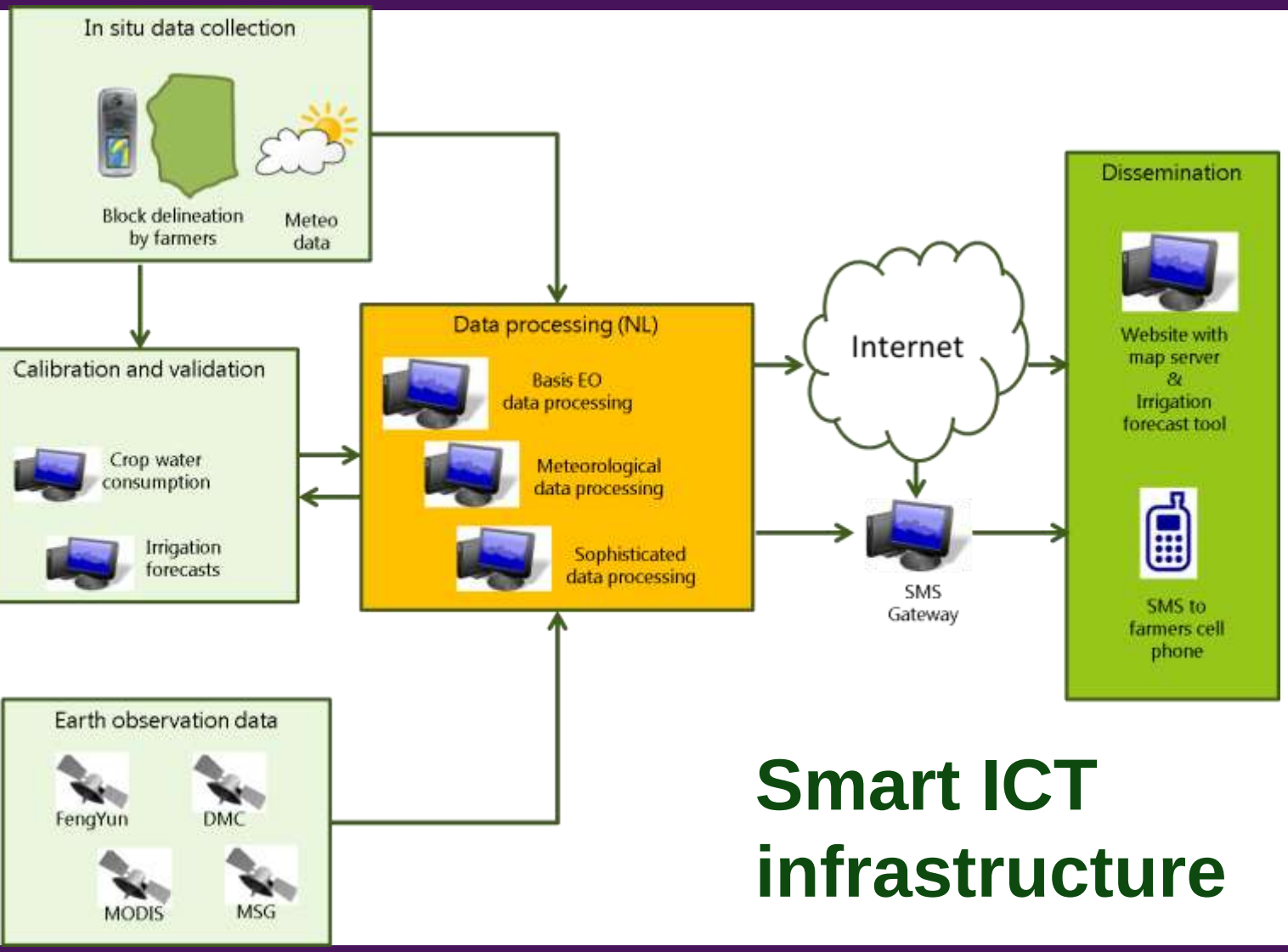
Yield forecasts

Yield forecast



a revolution for Africa

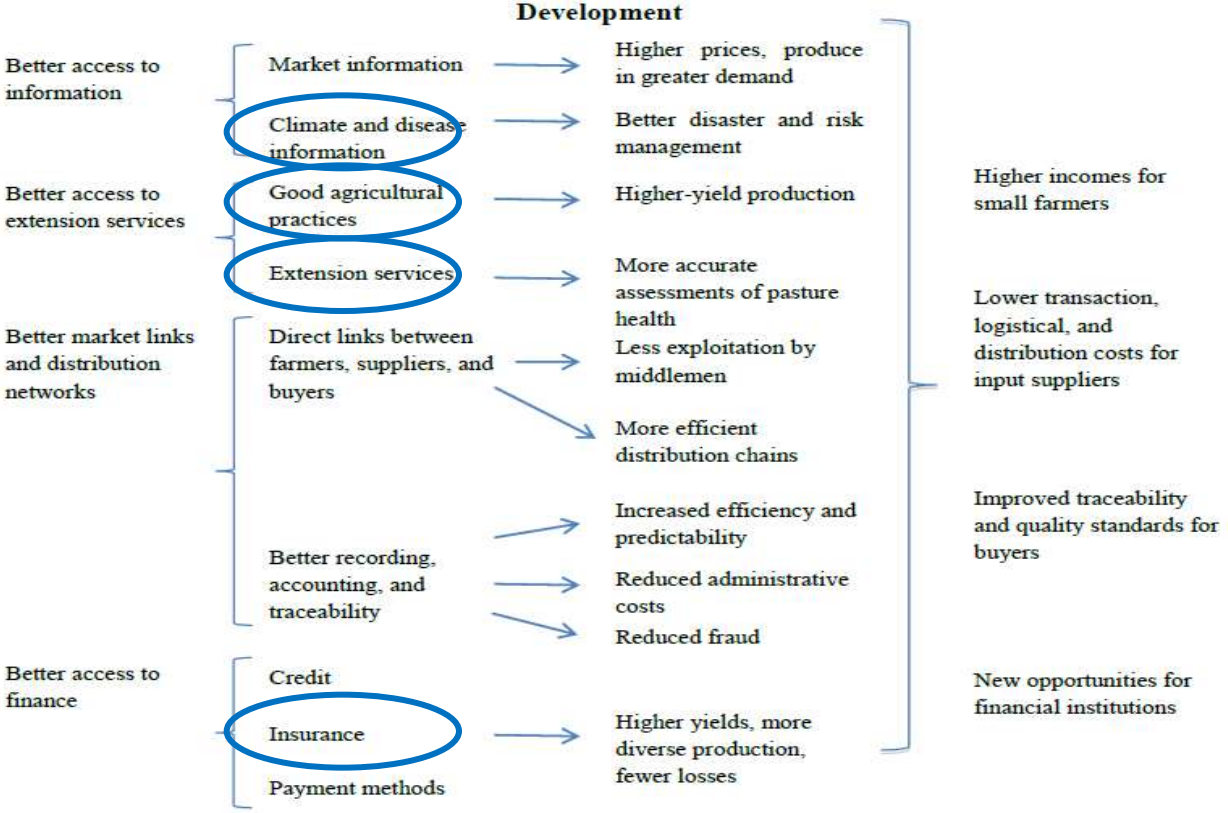
Grameen Foundation AppLab Uganda Launch - Snelkoppeling.lnk



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

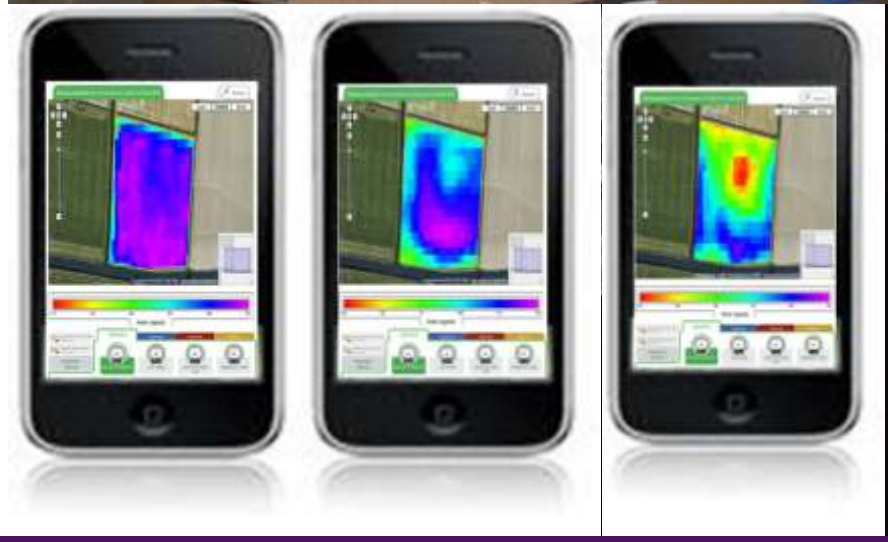
Advisory

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

Thank you for your attention

More info: www.spaceoffice.nl/g4aw

Questions

1. Do you recognize the results of the Quick Scan and what are your comments?
2. Is there a base for using geodata to improve the livelihood of the smallholder?
3. Which information theme's can be determined and do they effect each other?
4. What are the biggest challenges?