



G4AW

Geodata for Agriculture and Water

Images: CIAT & ESA



Netherlands
Space
Office



Satellite based information services and smallholders



Netherlands Space Office (NSO)

Workshop Nairobi June 12 , 2014

A satellite view of the Earth, showing the African continent and surrounding oceans. The image is centered on the African continent, with the Atlantic Ocean to the west and the Indian Ocean to the east. The landmasses are shown in shades of green and brown, while the oceans are a deep blue. A large, white, swirling cloud pattern is visible in the lower-left quadrant of the image.

**Improving Foodsecurity
Innovation from Satellites
and IT for smallholders**



Effects of climate change on
Food & Water security

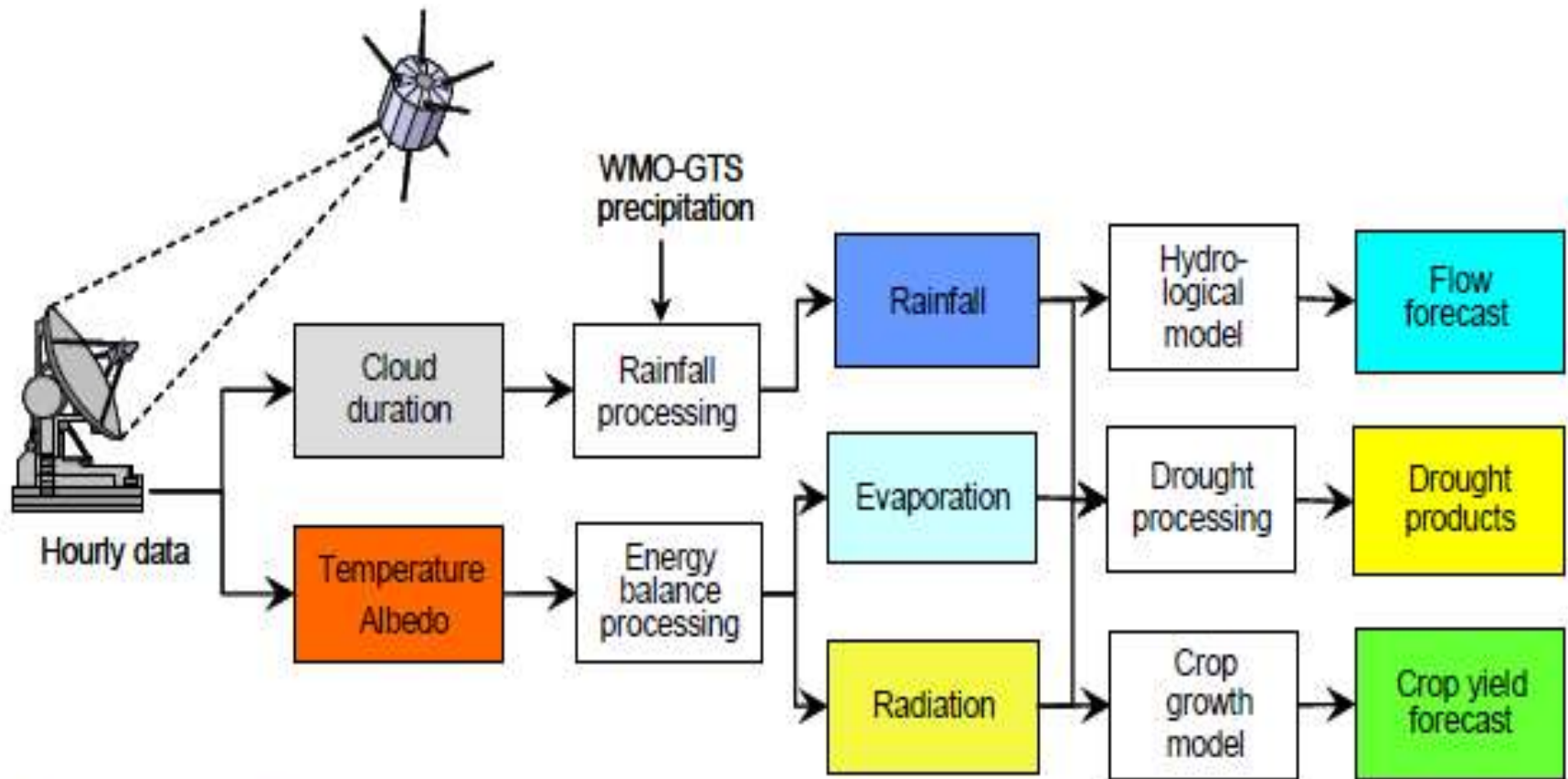
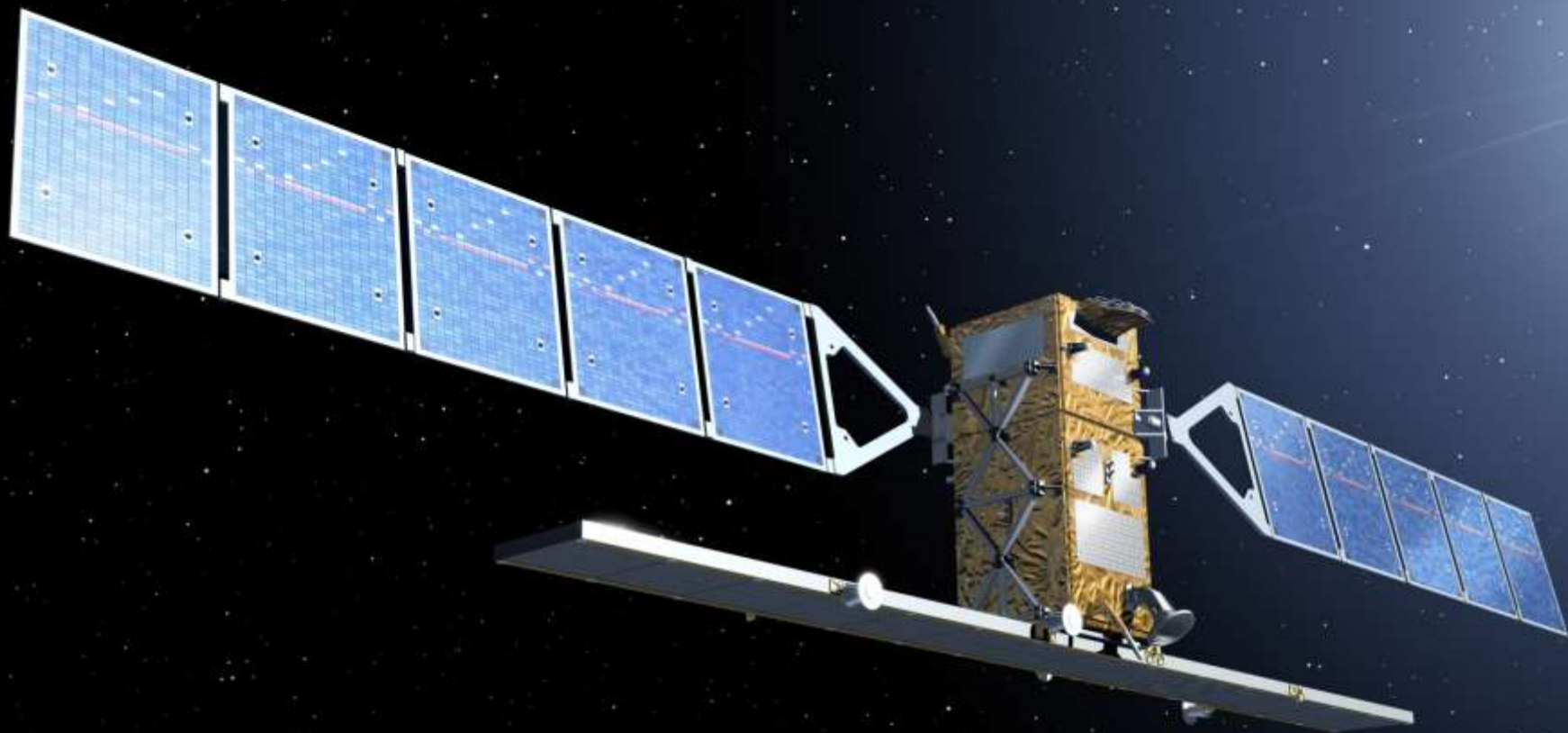
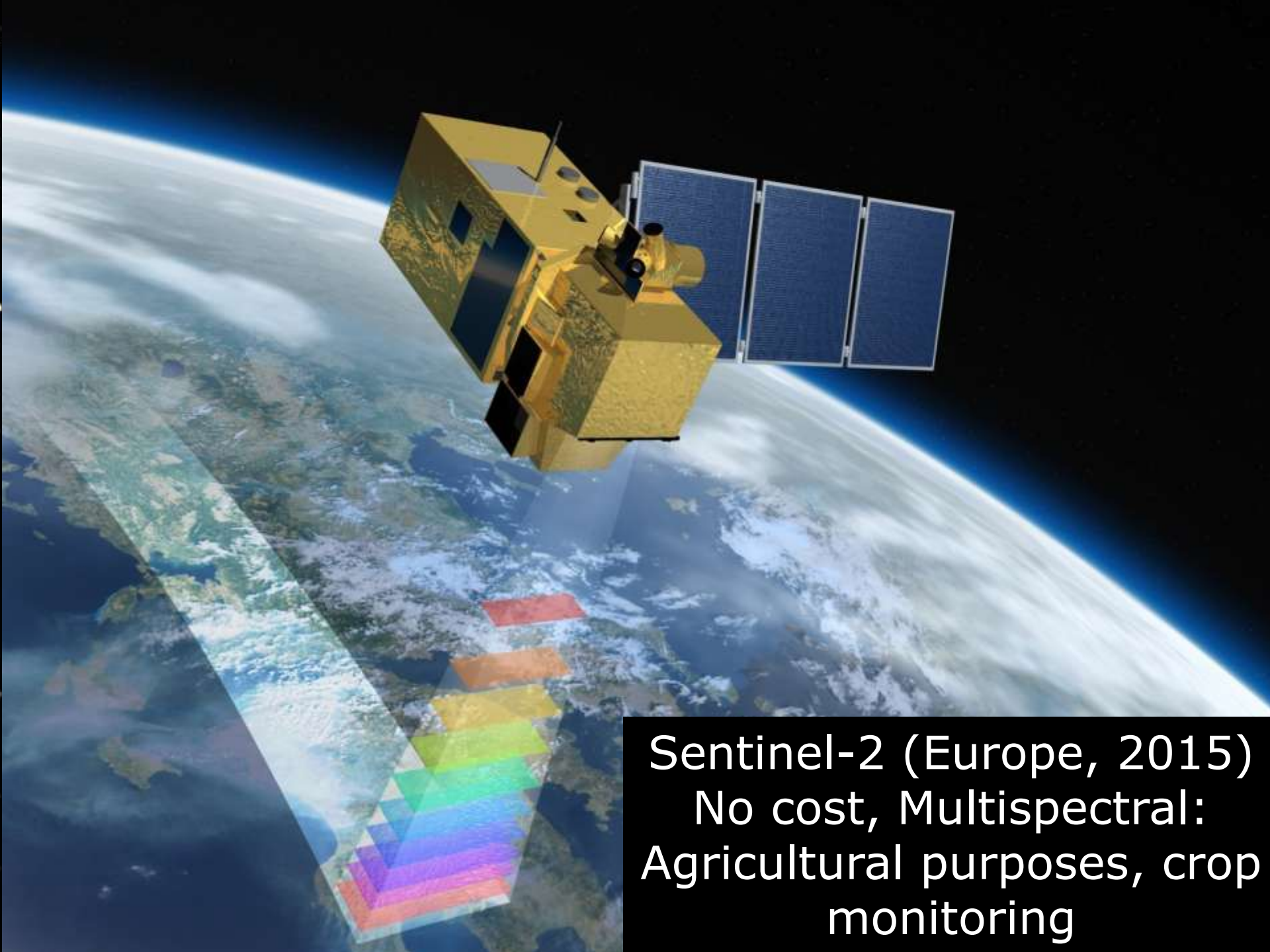


Figure 2.1: Overview of the Energy and Water Balance Monitoring System.



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



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

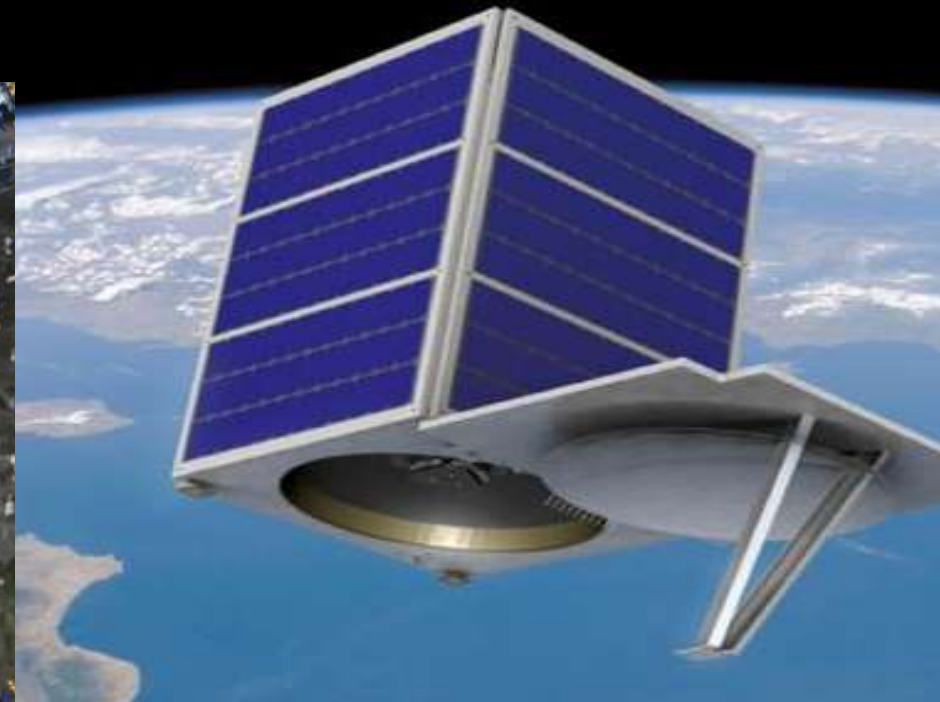
High resolution
VNIR satellites

Worldview-2





Planet Labs (2014)

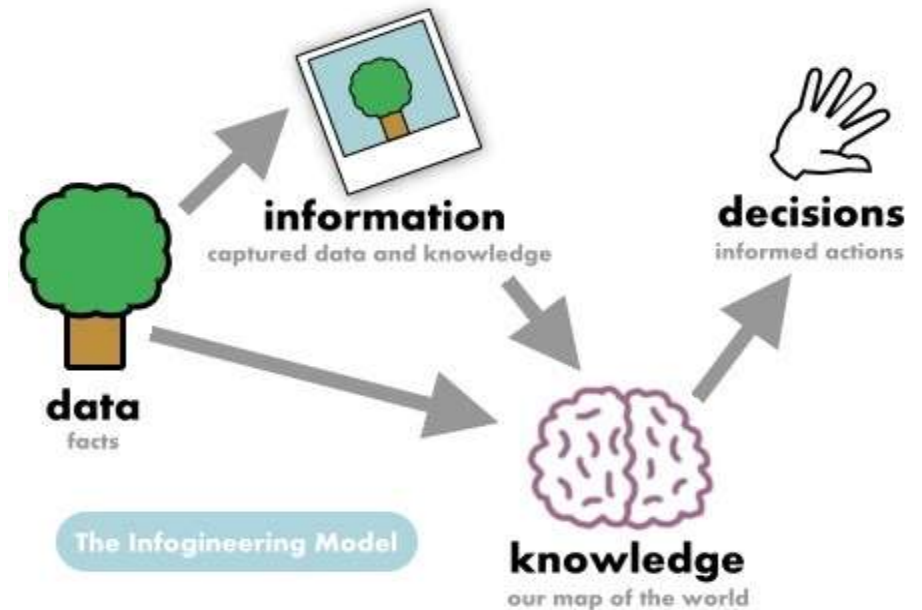


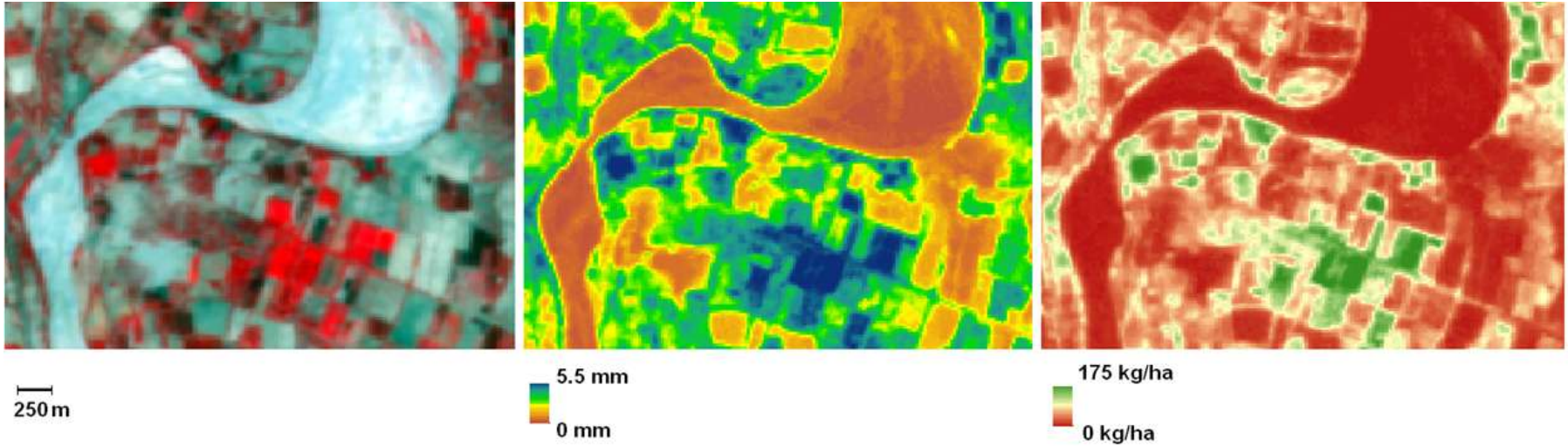
Skybox (2014)

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

Large scale
Contract farming



Smallholders
farming



Intermediary parties

Employment
agencies

Agri ICT (geo)
services

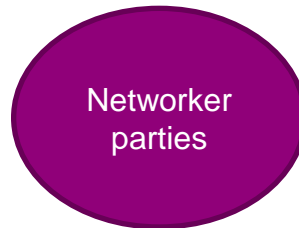
Contractors



Cooperatives



Agric .advisors &
Agri services



Government

Institutes &
University
(R&D)

Extension
services

Education &
information

relevant
agencies

Agri- industry

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



*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”

General
Information
Services

Flood
Safety
Services

Water
Management
Services

Water
Security
Services

Food
Security
Services

Other
services




Crop calendar



english français español

Crop calendar - a crop production information tool for decision making



Food and Agriculture Organization of the United Nations

FAO Home

Plant Production and Protection Home

Seeds and PGR Home

State of the World

Knowledge Resources

WIEWS

Crop calendar

about

rehabilitation activities following natural or human-led disasters. Furthermore, the Crop Calendar can serve as a quick reference tool in selecting crop varieties to adapt to changing weather patterns accelerated by climate change.

The Crop Calendar database is being maintained at a regional level and is based on inputs from member countries. The Crop Calendar database currently covers 43 African countries and contains information on more than 130 crops, located in 283 agro-ecological zones.

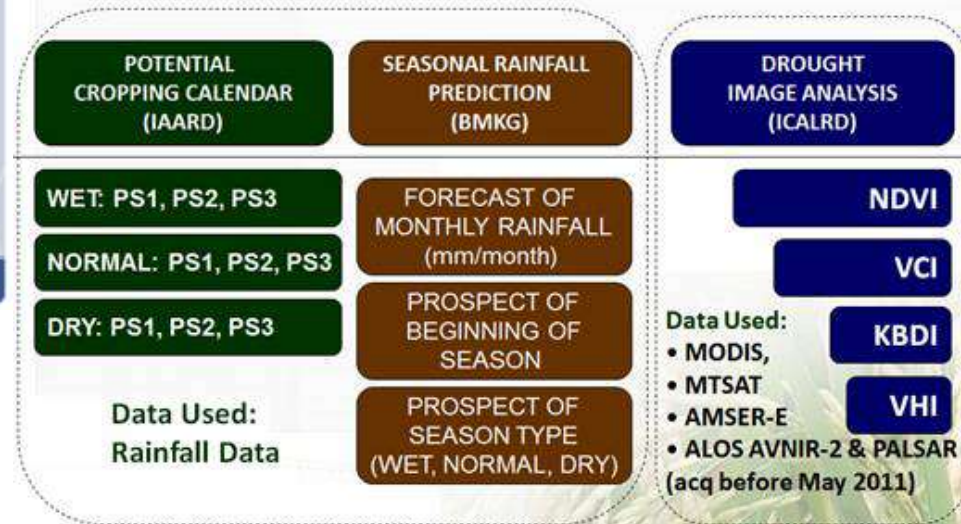
read more instructions

select a crop

- Amaranthus
- Artichoke
- Asparagus
- Aubergine
- Bambara groundnut
- Banana
- Banana, Abyssinian
- Barley
- Bean common, dry
- Bean, Lima
- Bean, broad
- Bean, broad green
- Bean, faba
- Bean, green
- Beet, red
- Beet, table
- Benniseed
- Bitterweed

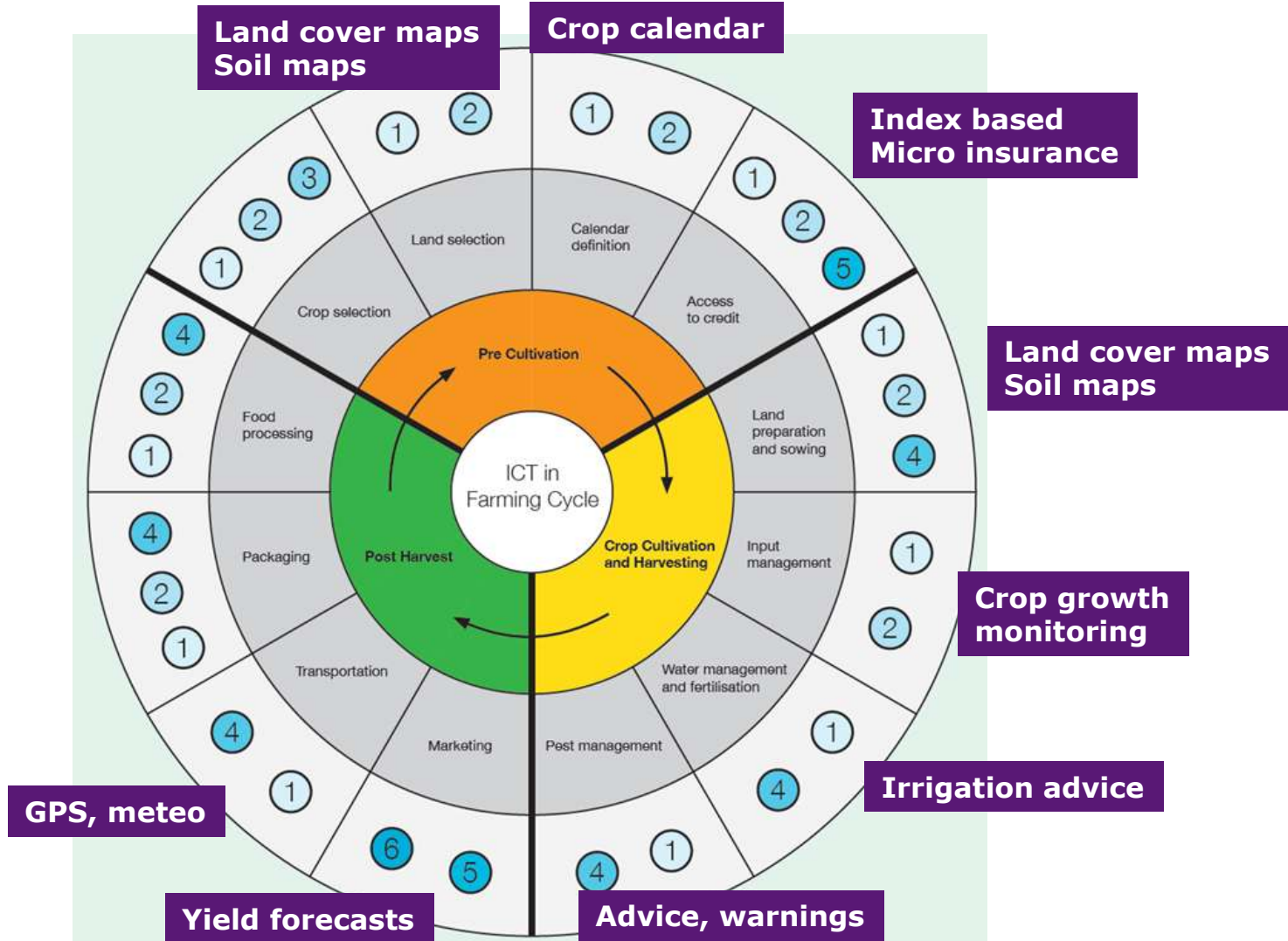
next

INTEGRATION OF CROPPING PATTERNS, SEASONAL RAINFALL AND SATELLITE IMAGE ANALYSIS





- 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)



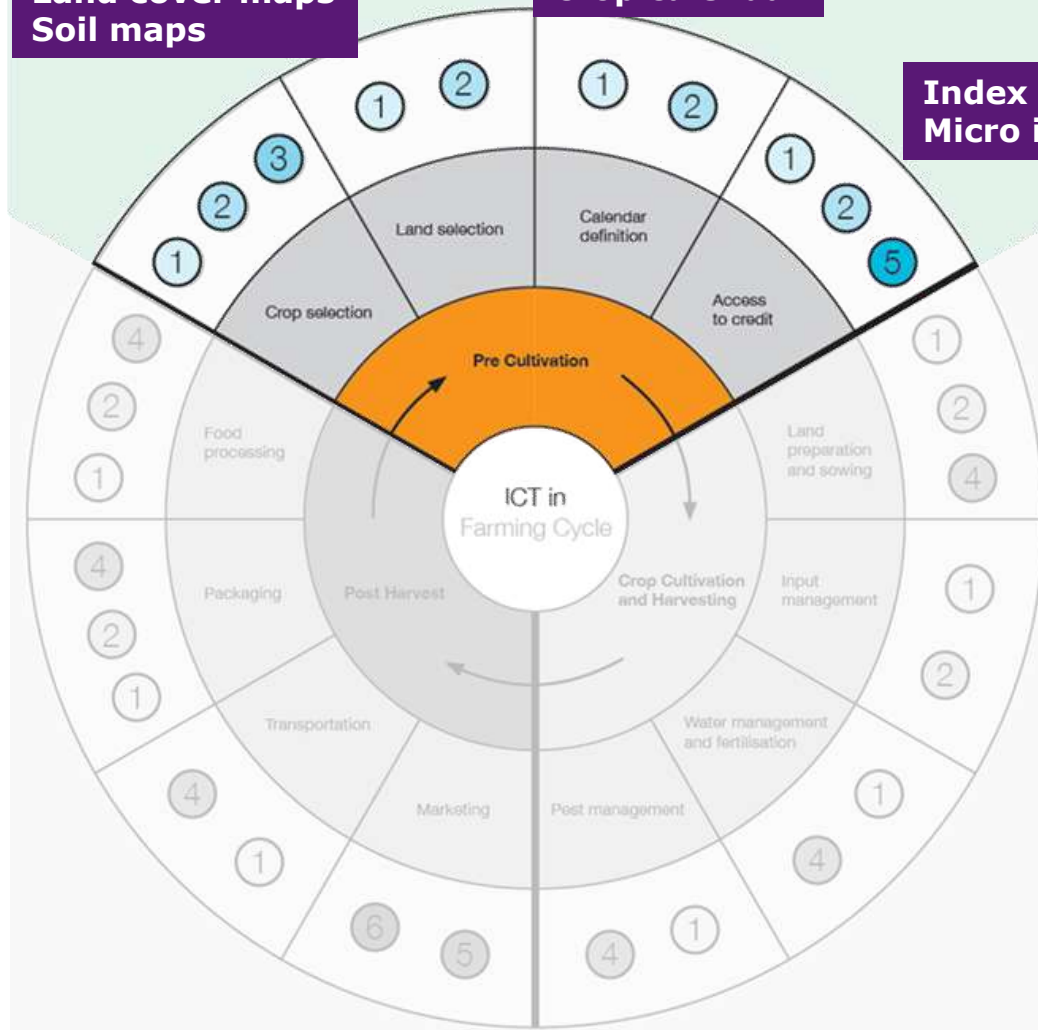


Land cover maps Soil maps

Crop calendar

Index based Micro insurance

- 1 Information systems including DSS/MISS/GIS etc
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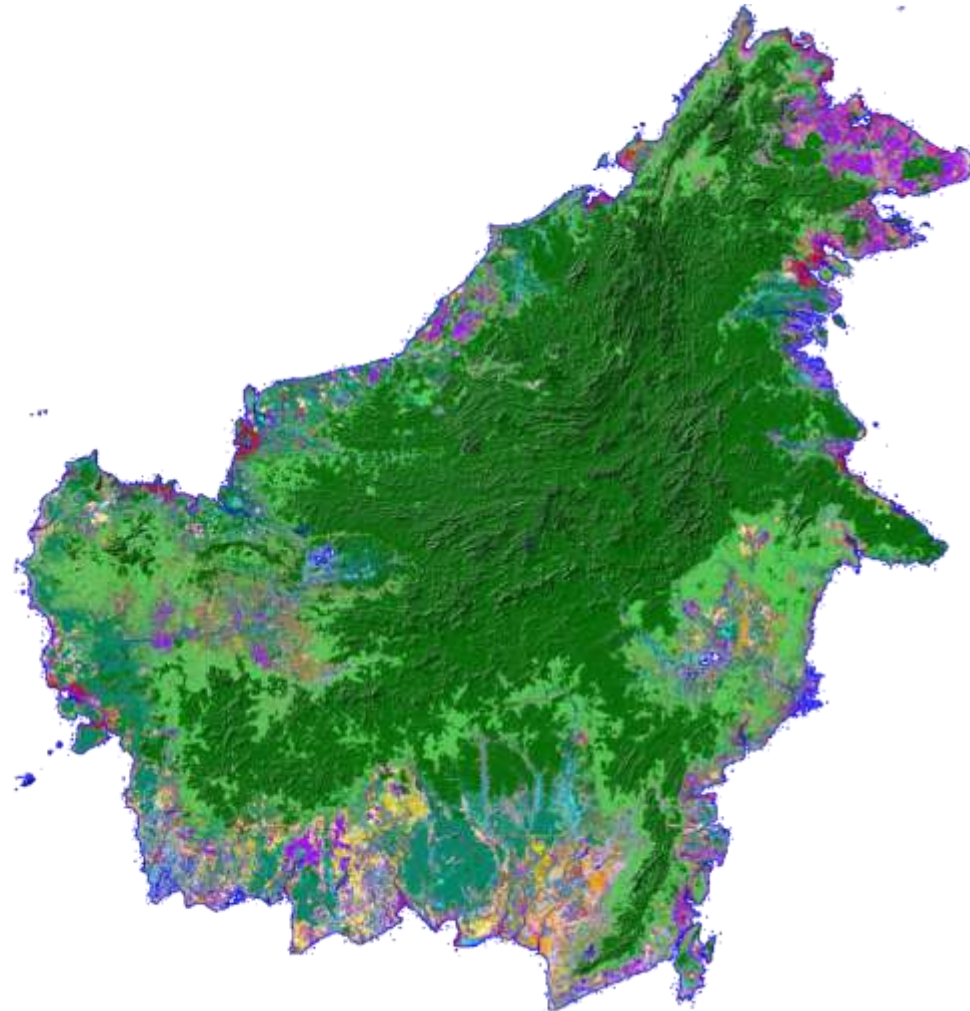




Land cover maps

Kalimantan Land cover map (radar) (SarVision)

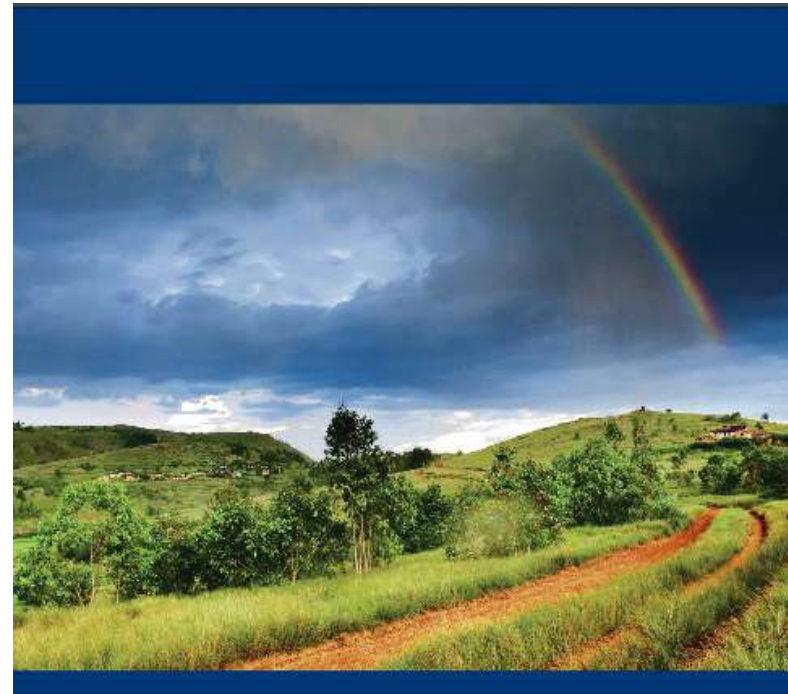
	Lowland forest
	Riverine forest
	Swamp forest
	Mangrove forest
	<i>Nipah</i> mangrove forest
	Peat swamp forest (pole)
	Peat swamp/riverine shrub
	Forest mosaics/degraded
	High shrub
	Medium shrub
	Ferns / grass
	Grassland
	Cropland (upland)
	Cropland (irrigated)
	Plantations (oil palm)
	Tree cover,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





Micro insurance

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



Weather Index-based Insurance
in Agricultural Development
A Technical Guide

→ Time for Up-scaling

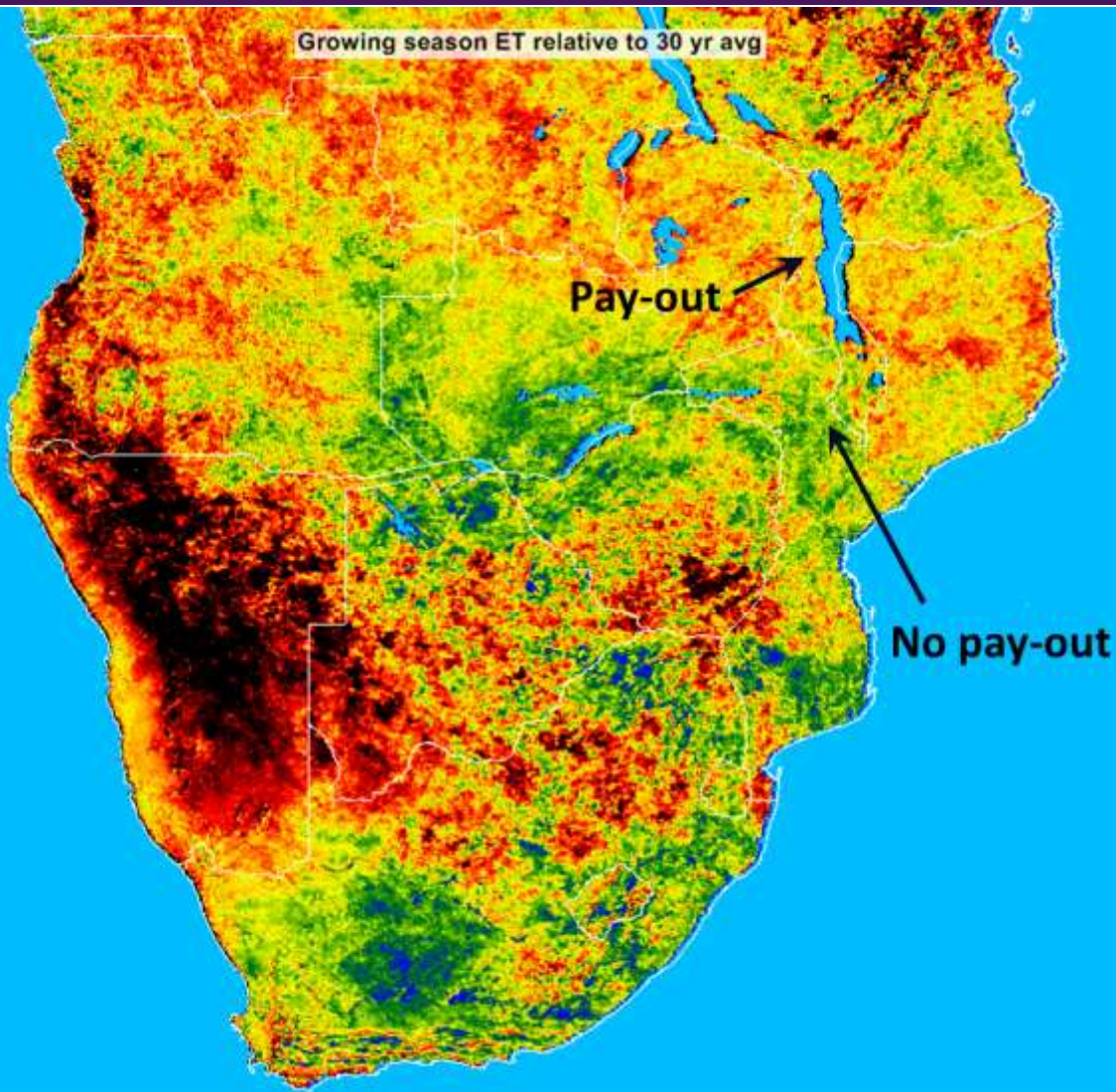


World Food Programme



Enabling poor rural people to overcome poverty

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



Malawi:
Maize index
insurance
(EARS)



FESA Micro-Insurance: Crop insurance reaching every farmer in Africa

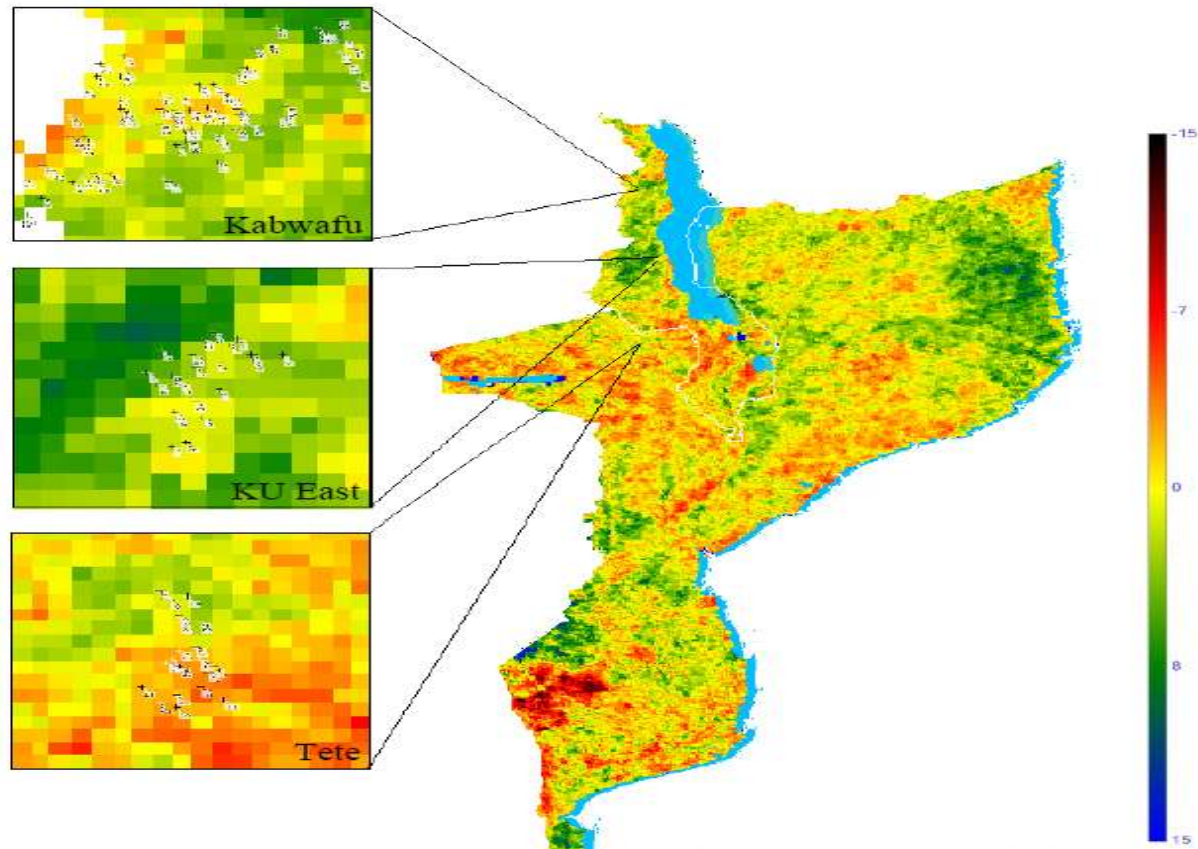


Figure 8.49: Difference evapotranspiration (DE) for growing season 2012/13 (dekad 62-78). Scale runs from -15% (dark red) to +15% (green, blue). On the left, detailed croppings of the three target areas are shown. Best growing season conditions occurred in KU-East, mid Malawi.

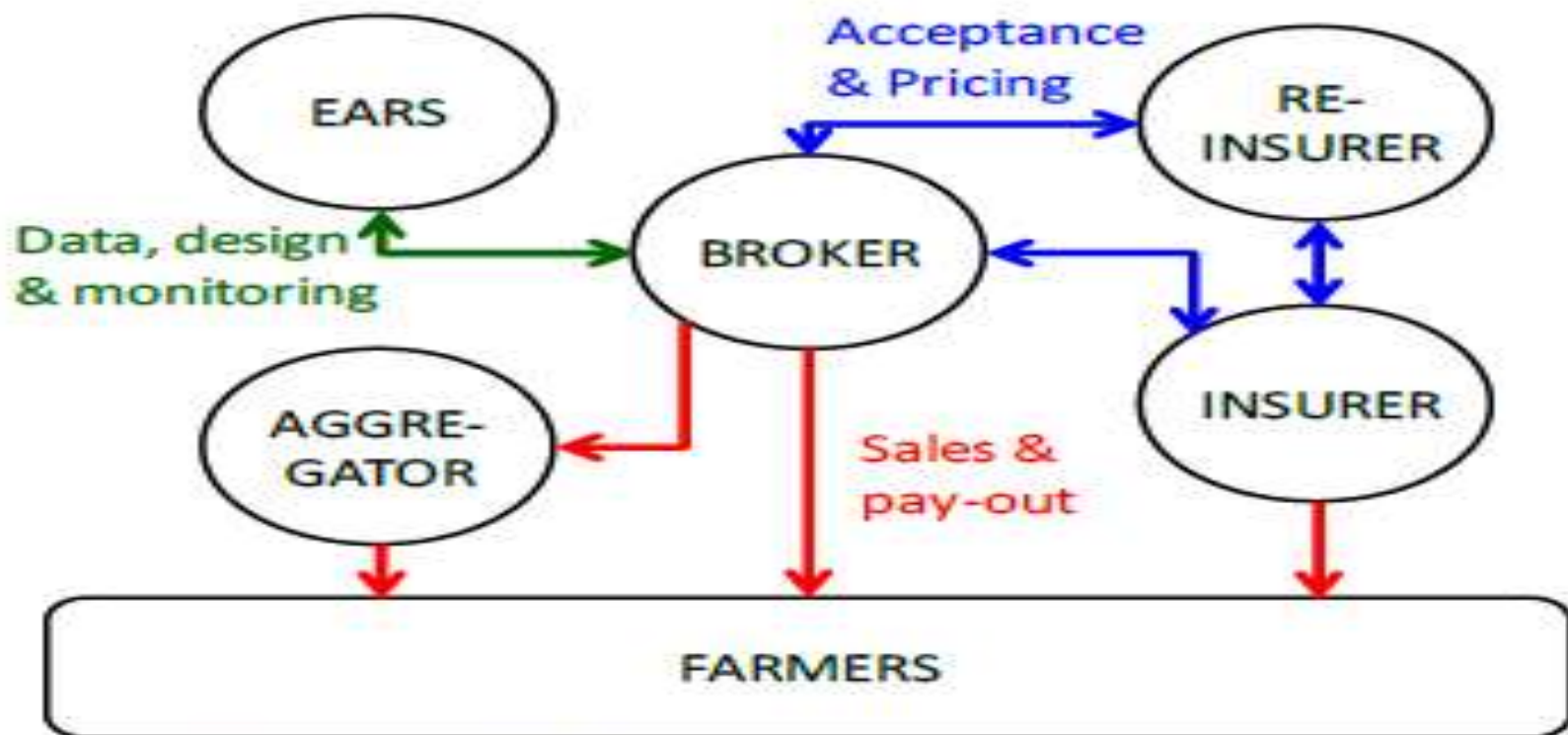


Figure 8.1: Scheme of the index insurance service chain.



Micro insurance

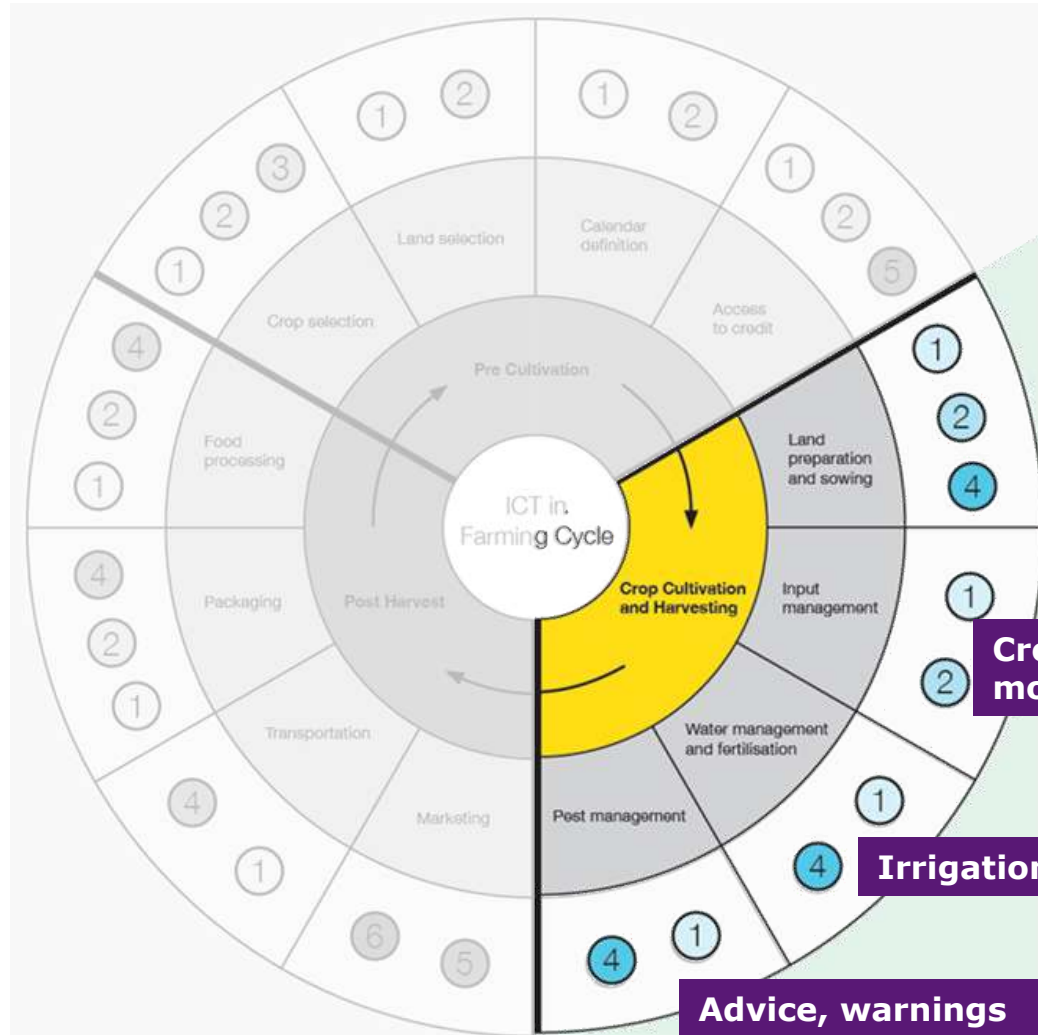
Video Kilimo Salama



The Tech Awards 2013 Laureate Kilimo Salama Syngenta Foundation - Snelkoppeling.nl



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**Land cover maps
Soil maps**

**Crop growth
monitoring**

Irrigation advice

Advice, warnings



Crop growth monitoring



Cloud
free
radar
image



Crop growth monitoring

Sugar beet at 25m resolution every
24 days

22/04/2012



Radar analysis

Bare soil



Crop growth monitoring

Sugar beet at 25m resolution every
24 days

16/05/2012



Radar analysis

Bare soil
Emergence



Crop growth monitoring

Sugar beet at 25m resolution every
24 days

09/06/2012



Radar analysis

Bare soil
Emergence
Increment



Crop growth monitoring

Sugar beet at 25m resolution every
24 days

03/07/2012



Radar analysis

Bare soil
Emergence
Increment
Closure



Crop growth monitoring

Sugar beet at 25m resolution every
24 days

07/10/2012



Radar analysis

Bare soil
Emergence
Increment
Closure
Harvest



Crop growth monitoring

Rice at 5m resolution every 5-11 days

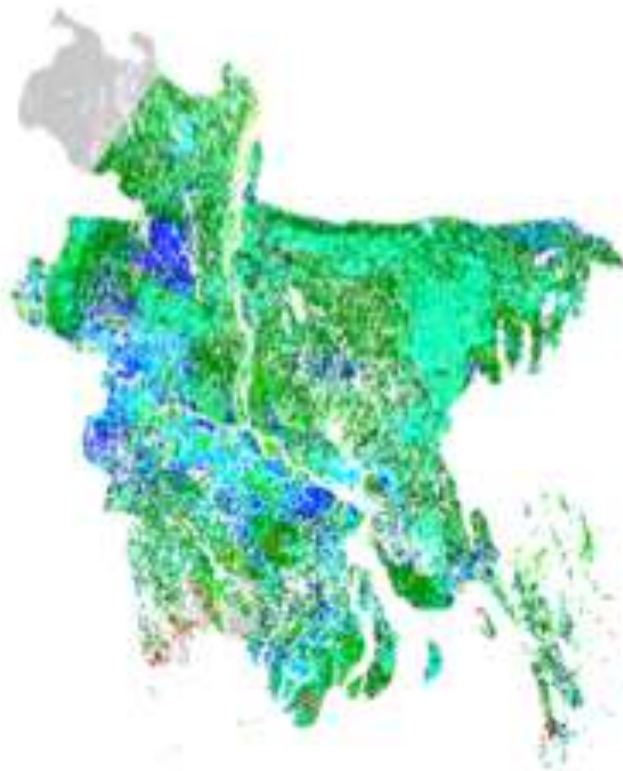


Sharp results: Multi-temporal filtering

5m detail suitable for monitoring of small farms



Crop growth monitoring



Mask	
No data	
Oct	
Nov	
Dec	
Jan	
Feb	
Mar	
Apr	
May	
Jun	
Jul	
Aug	
Sept	
Oct	
Nov	
Dec	



First season, peak of season

Second season, peak of season



Irrigation advice



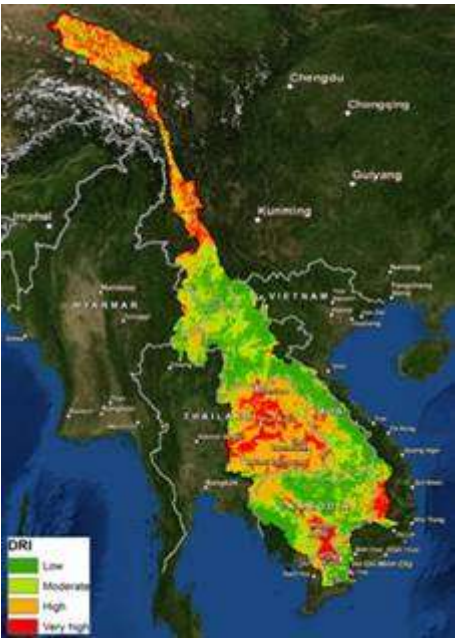
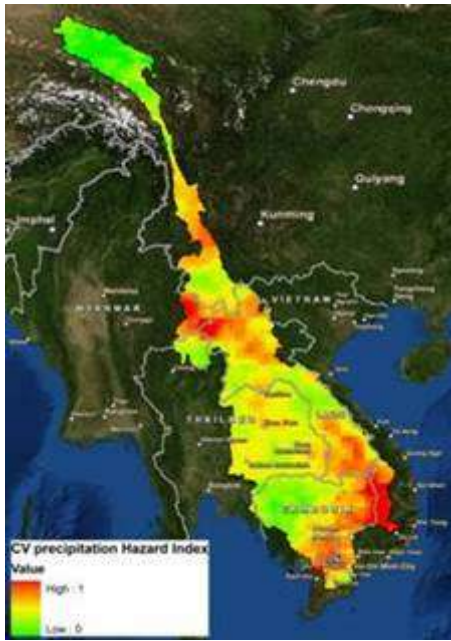
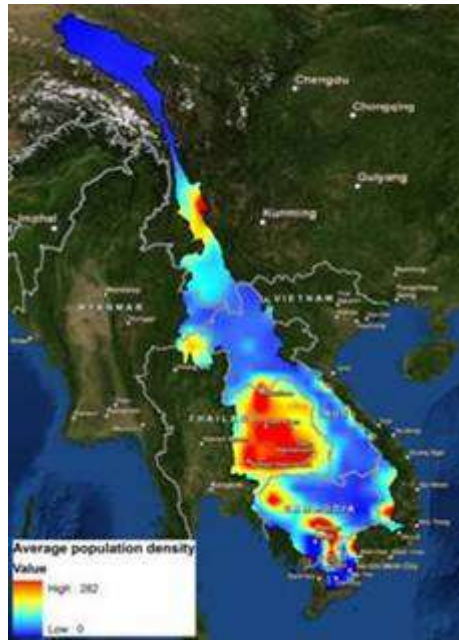
The crop has no water stress when the soil moisture is above the critical level and below the field capacity

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



Advice and warning

Early warning

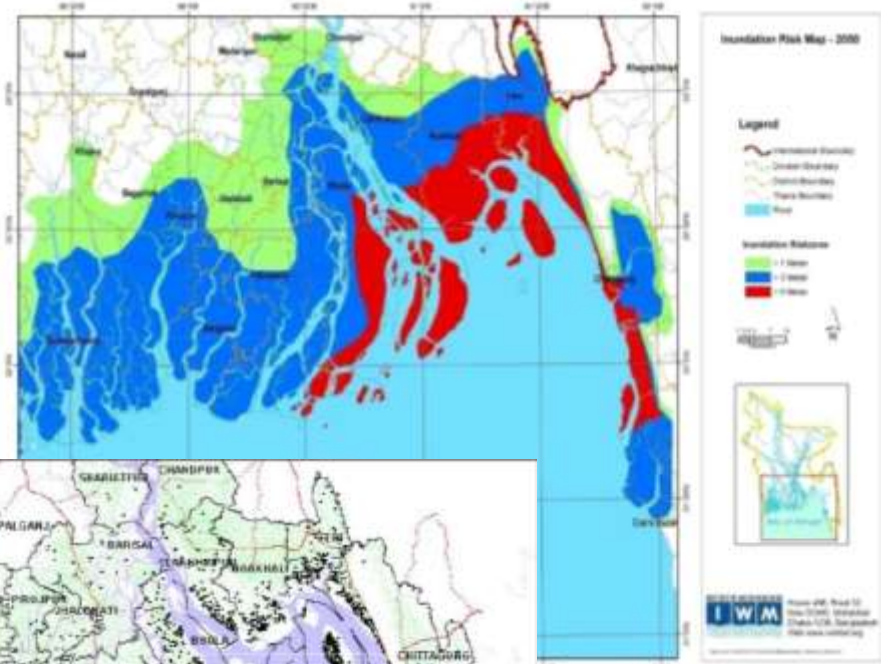
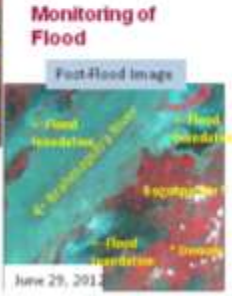
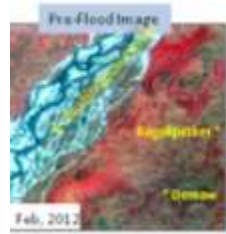
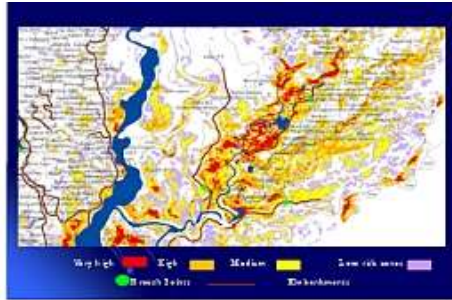
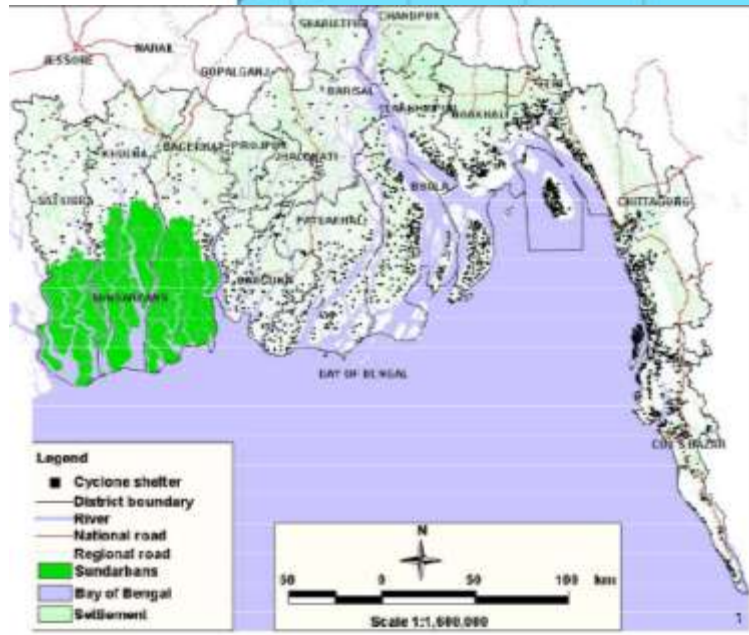
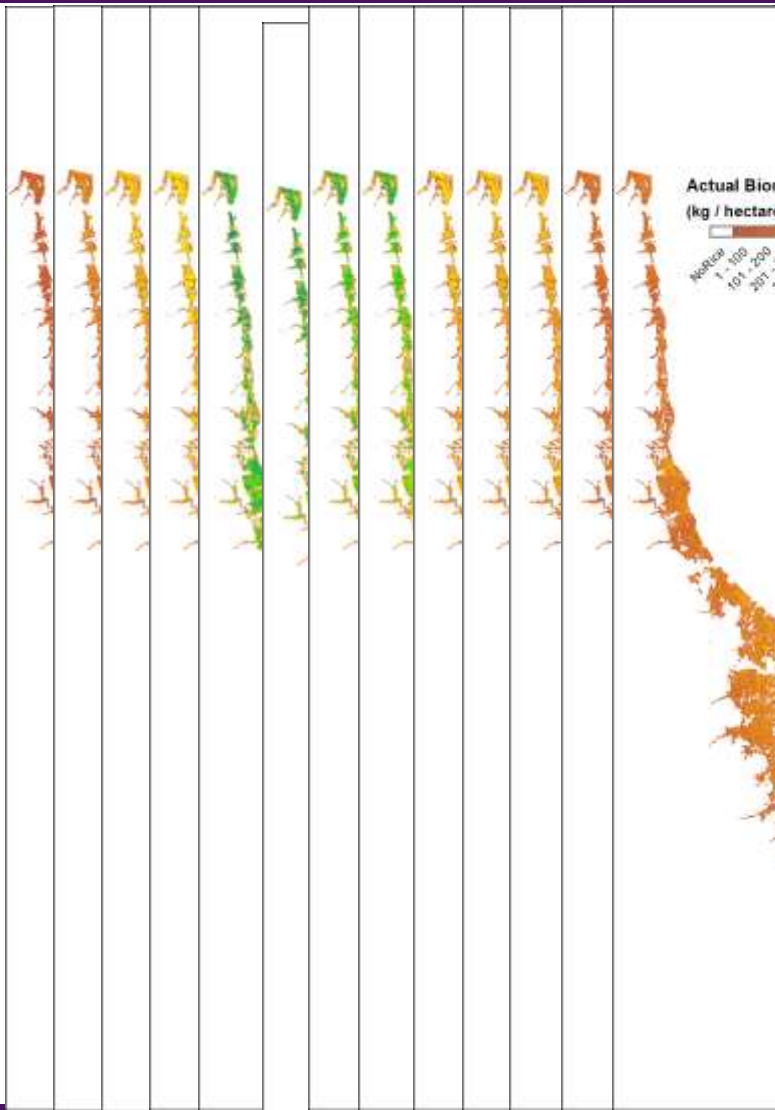


Fig: Flood hazard maps corresponding to various flood discharge and levels





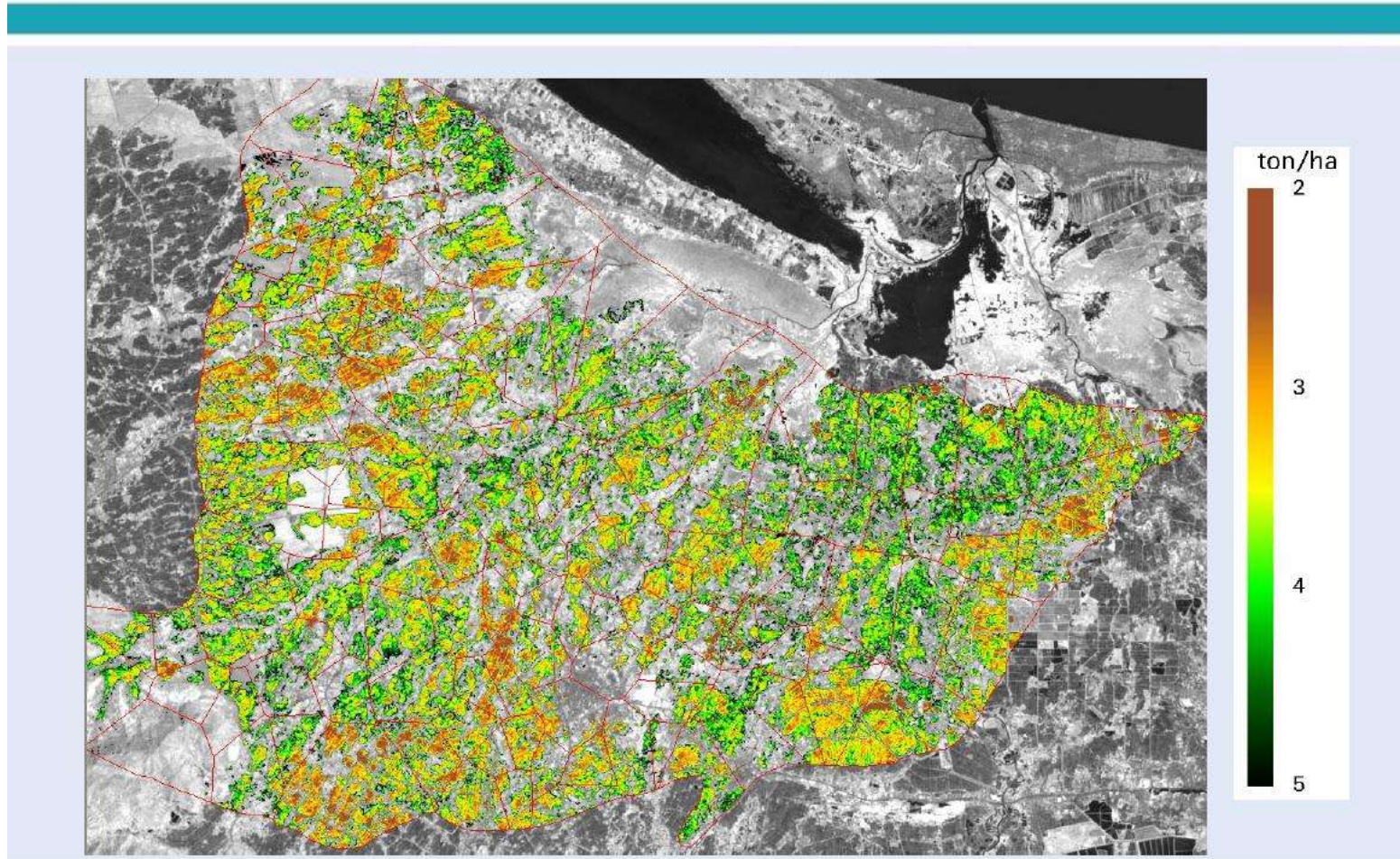
Yield forecast



GSM: Actual Biomass Production

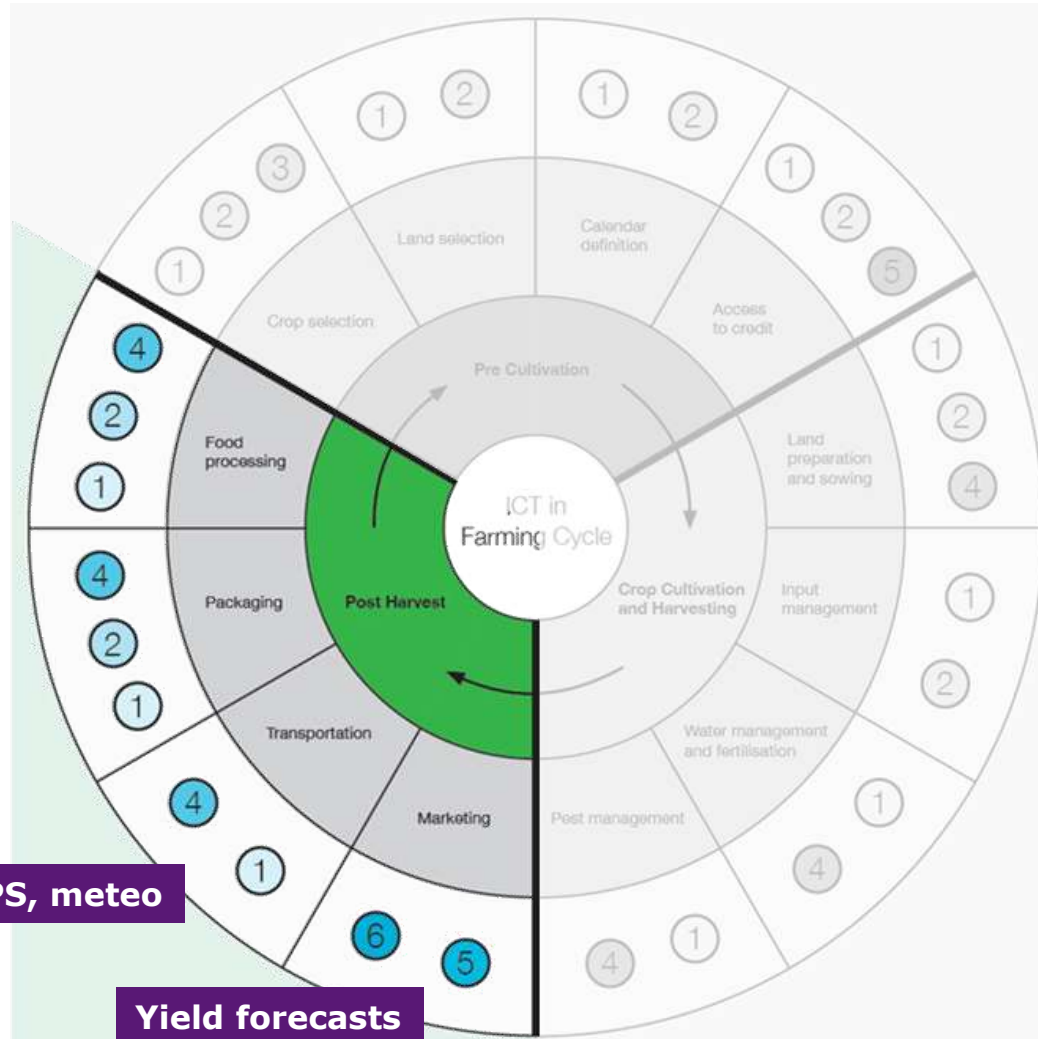


Rice Yield maps





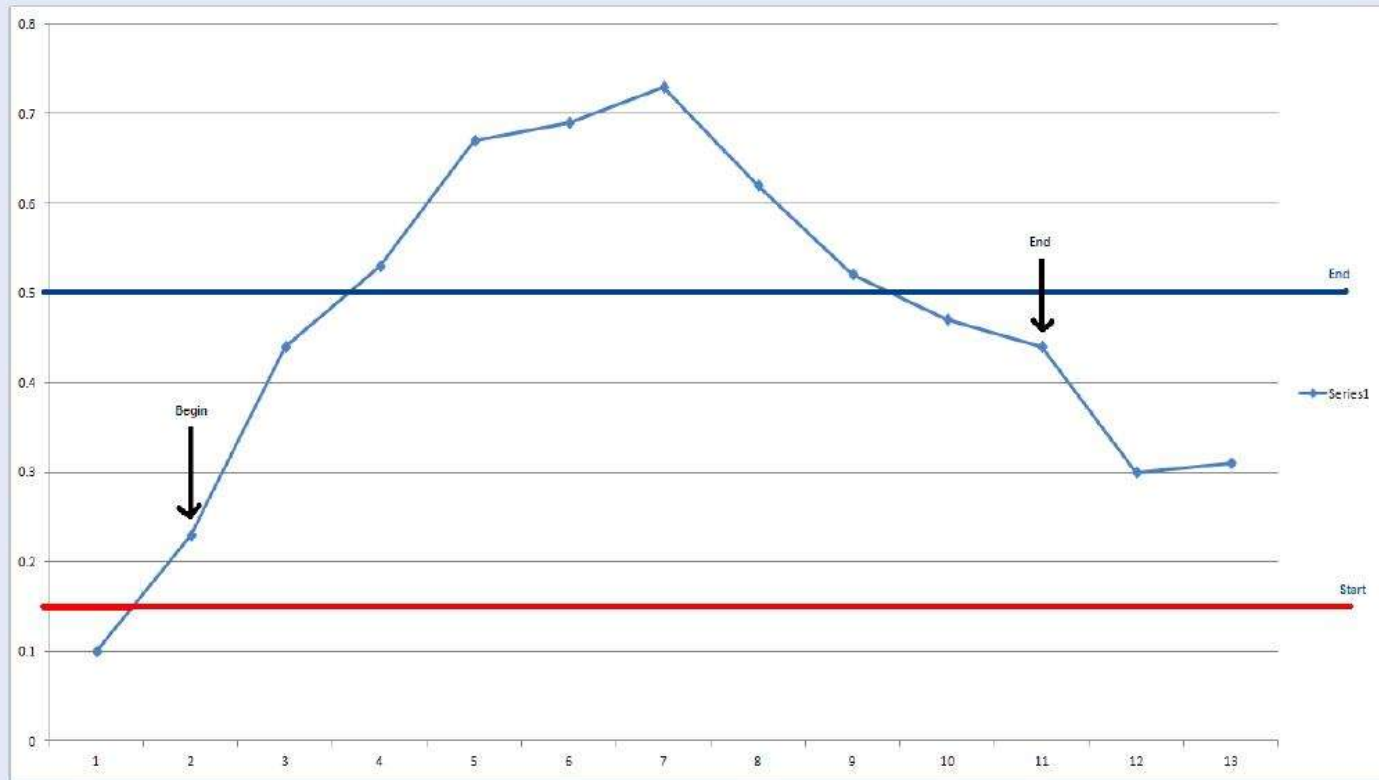
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Yield forecast

Rice yield monitoring example using remote sensing



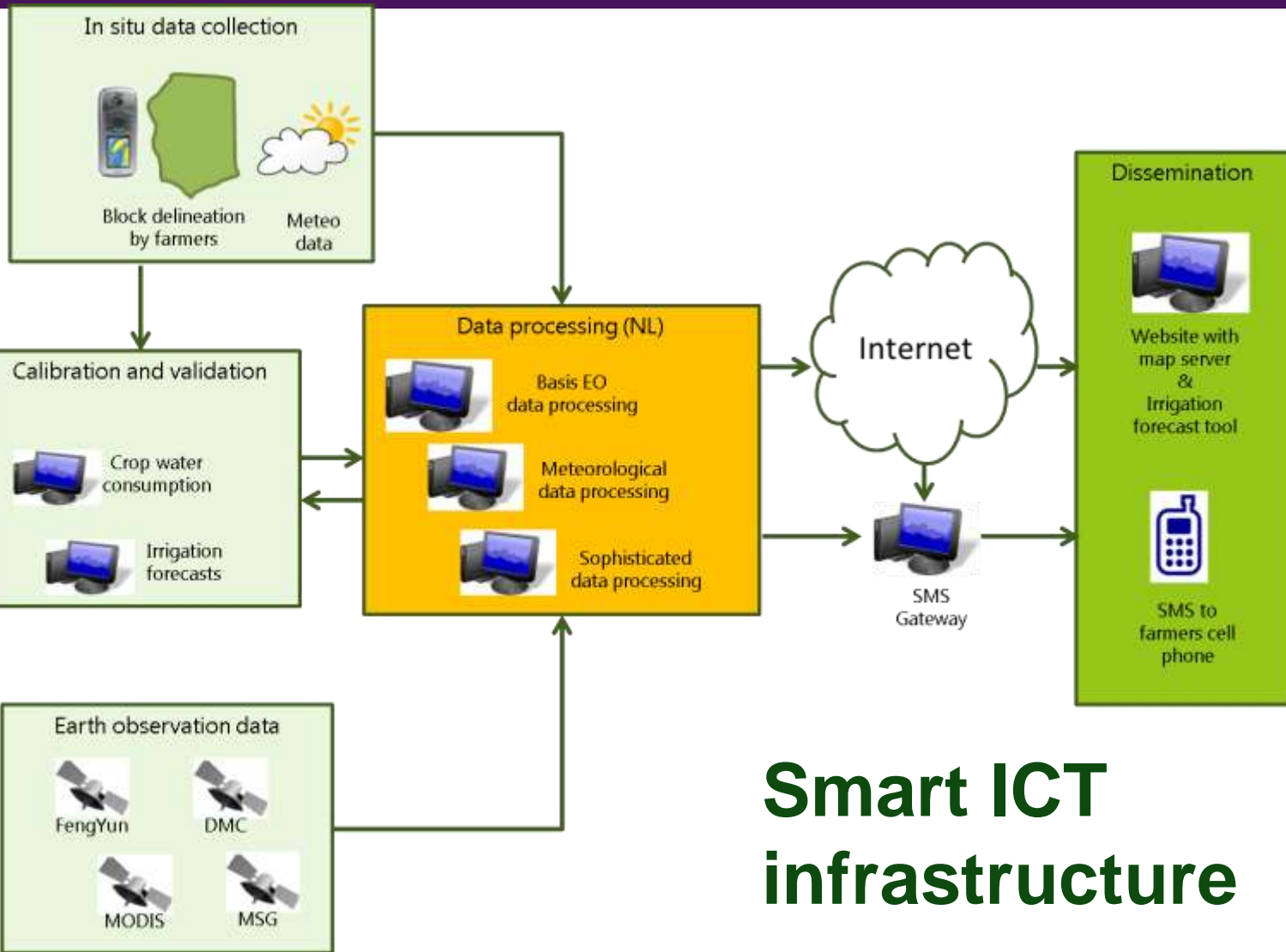


a revolution for Africa



Grameen Foundation AppLab Uganda Launch - Snelkoppeling,lnk



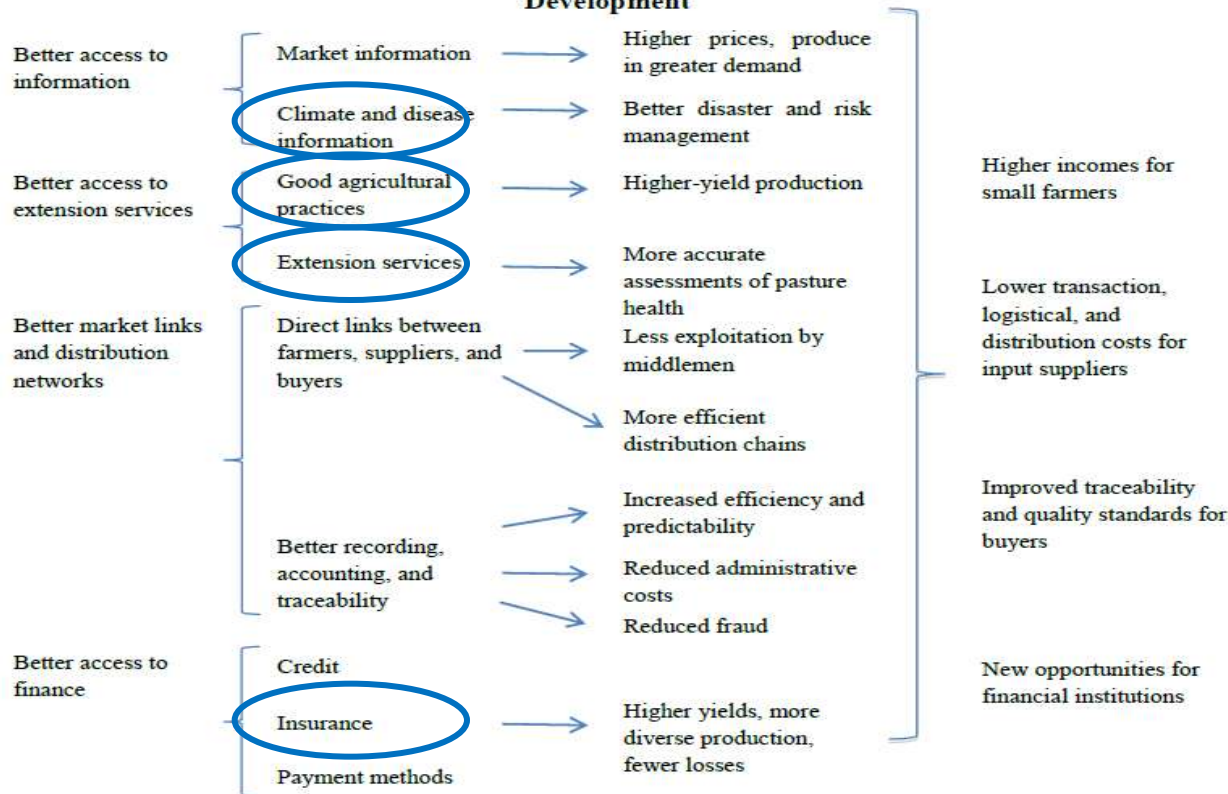


Smart ICT infrastructure



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



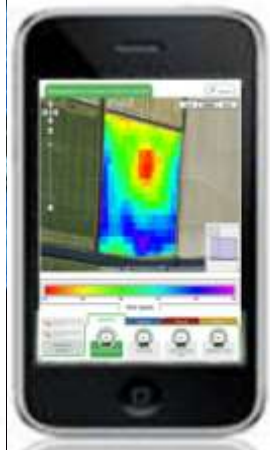
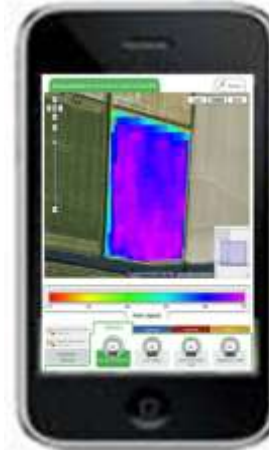
Insurance/finance





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 or 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?