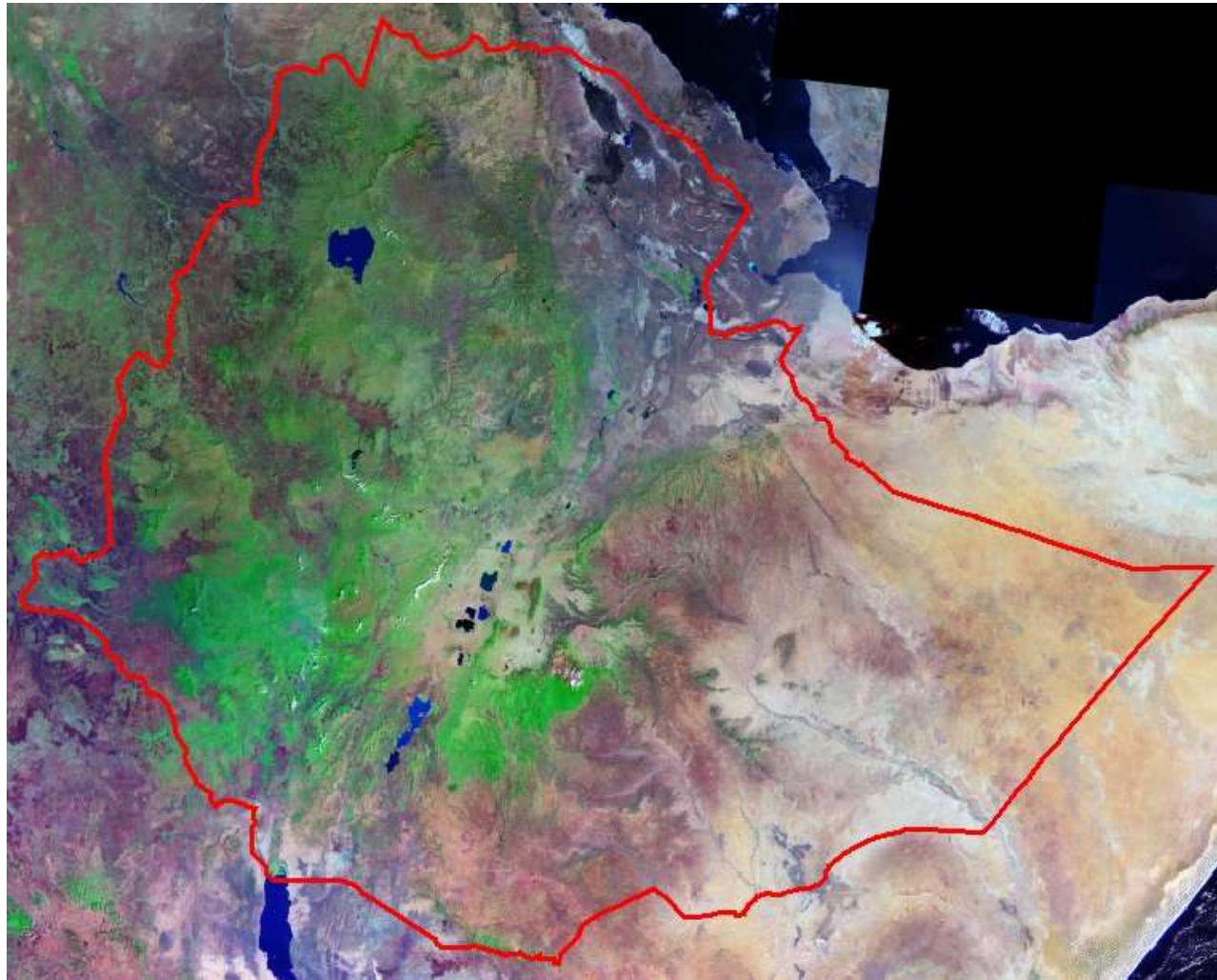# Food security & Satellite information services
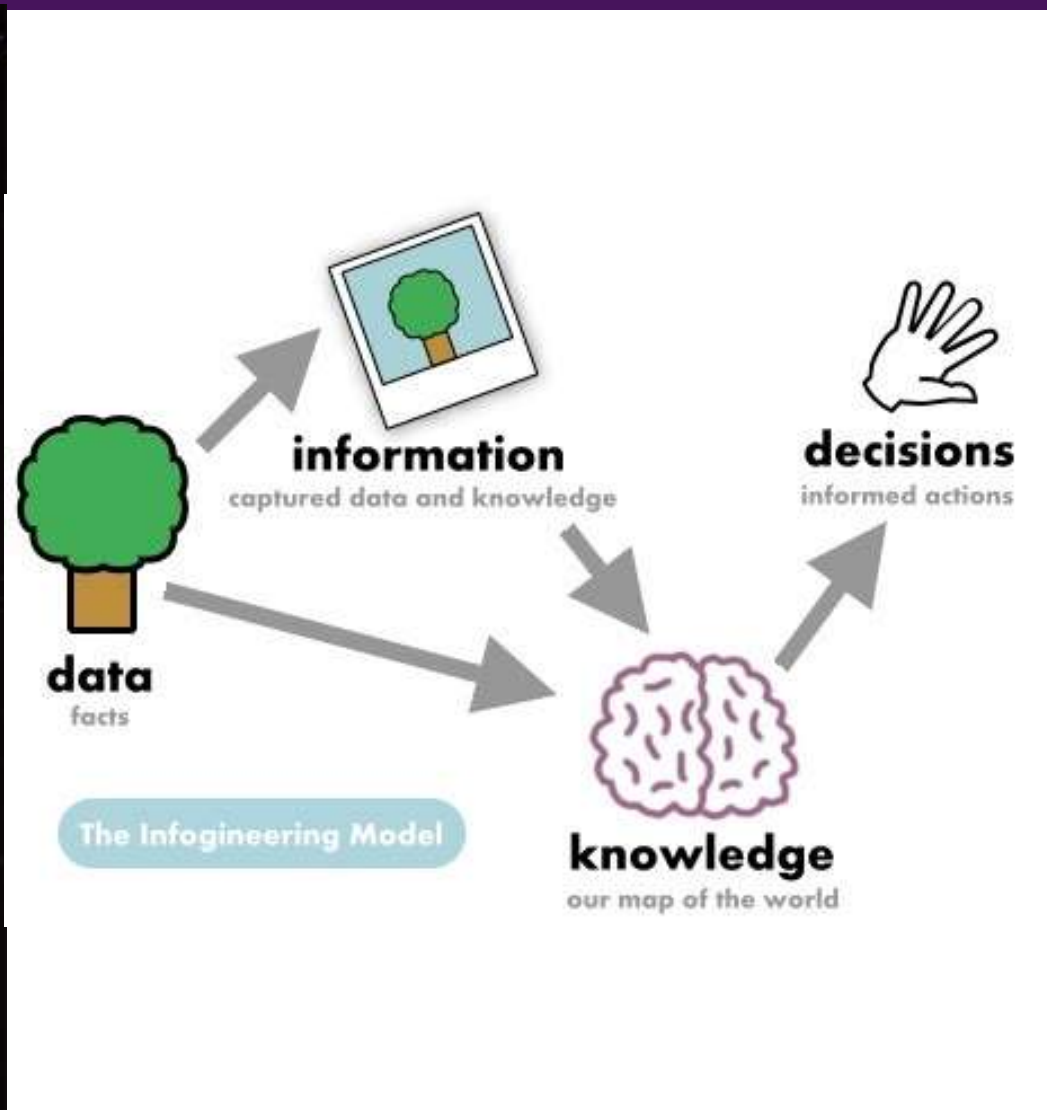

Mark Loos

Netherlands Space Office (NSO)
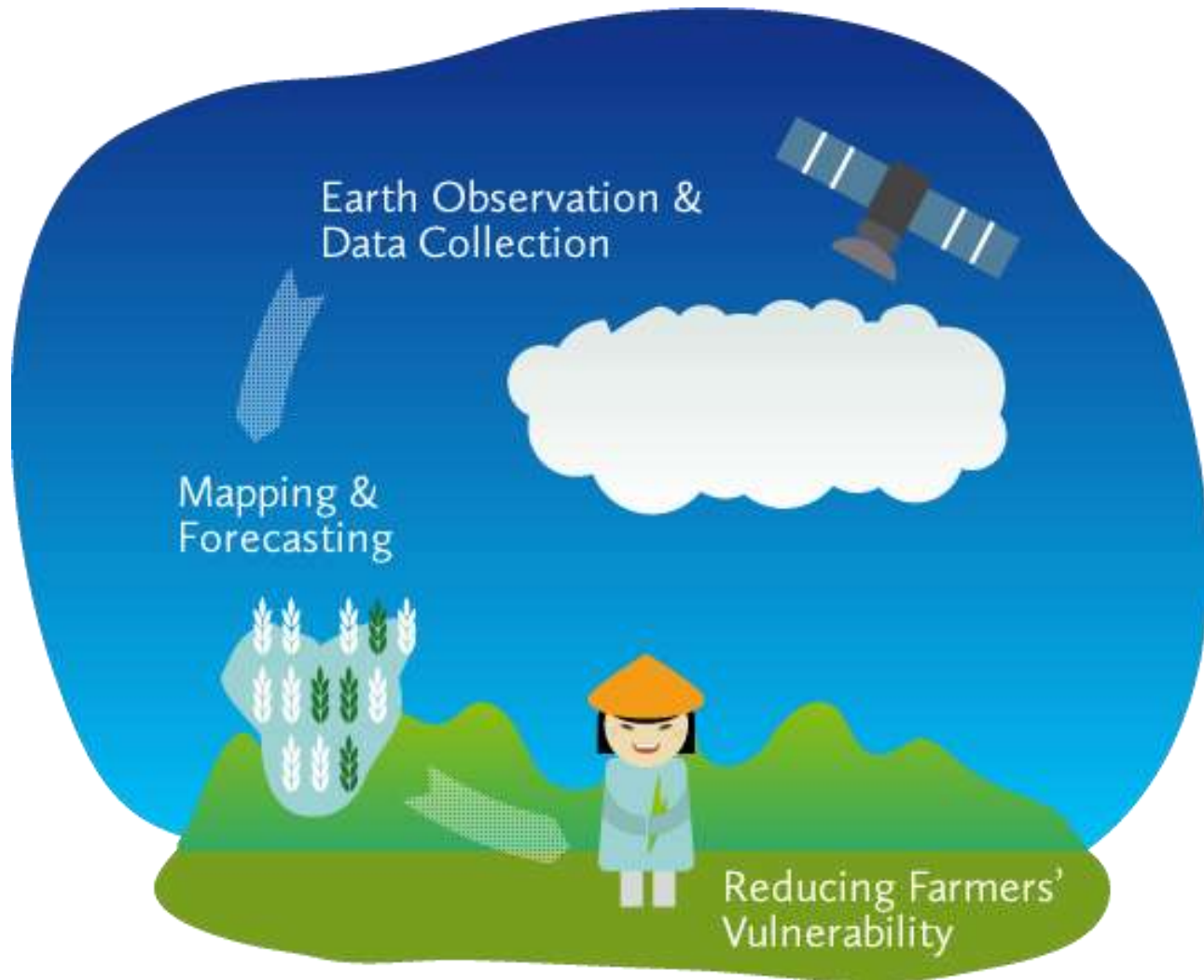
Effects of climate change on
Food & water security

data
facts

information
captured data and knowledge

knowledge
our map of the world

decisions
informed actions

The Infogineering Model

Legend:

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)

ICT in Farming Cycle

Pre Cultivation
- Calendar definition
- Land selection
- Crop selection
- Access to credit

Crop Cultivation and Harvesting
- Land preparation and sowing
- Input management
- Water management and fertilisation
- Pest management

Post Harvest
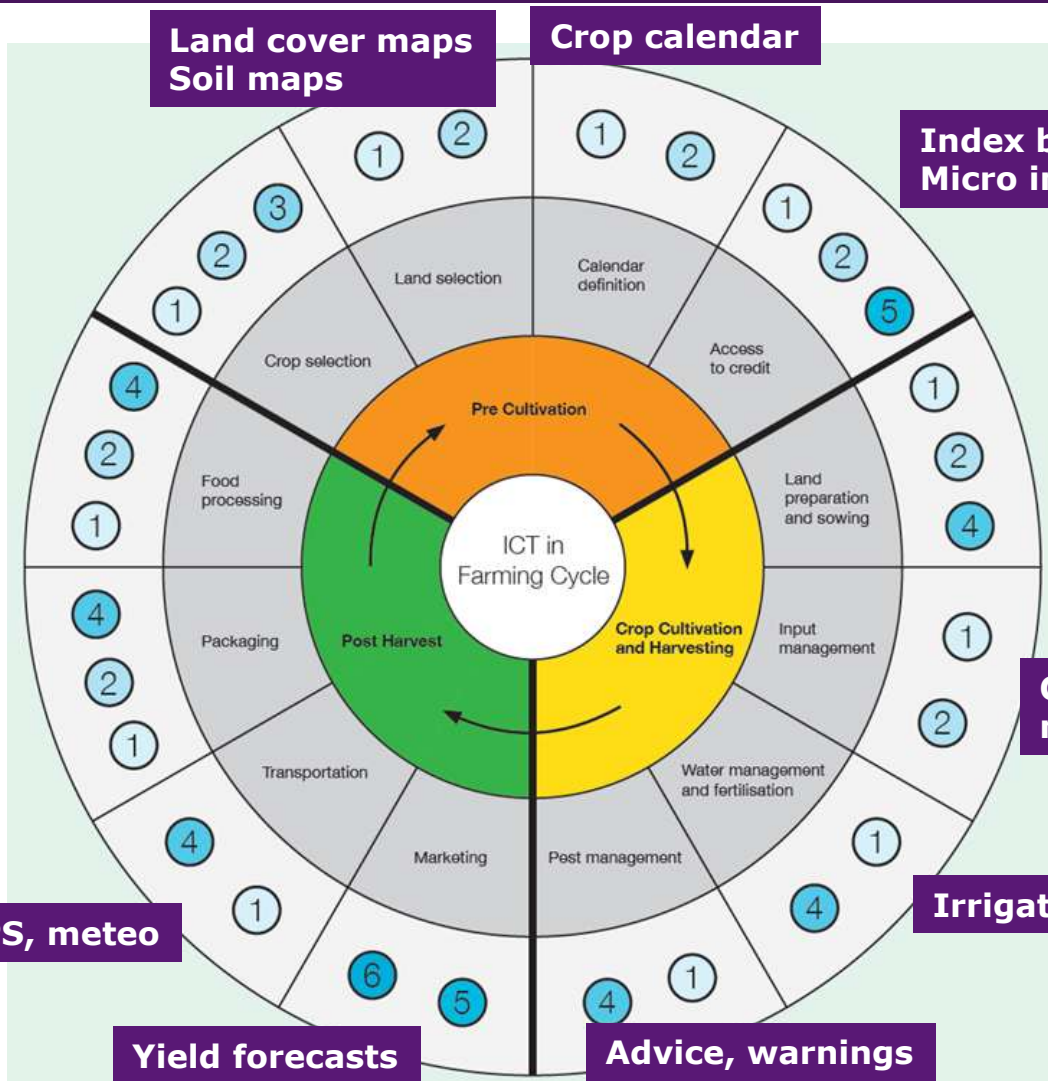- Marketing
- Transportation
- Packaging
- Food processing

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

ICT in Farming Cycle

Pre Cultivation: Crop selection, Land selection
Crop Cultivation and Harvesting: Calendar definition, Access to credit, Land preparation and sowing, Input management, Water management and fertilisation, Pest management
Post Harvest: Food processing, Packaging, Transportation, Marketing

Labels:
- Land cover maps / Soil maps
- Crop calendar
- Index based Micro insurance
- Land cover maps / Soil maps
- Crop growth monitoring
- Irrigation advice
- Advice, warnings
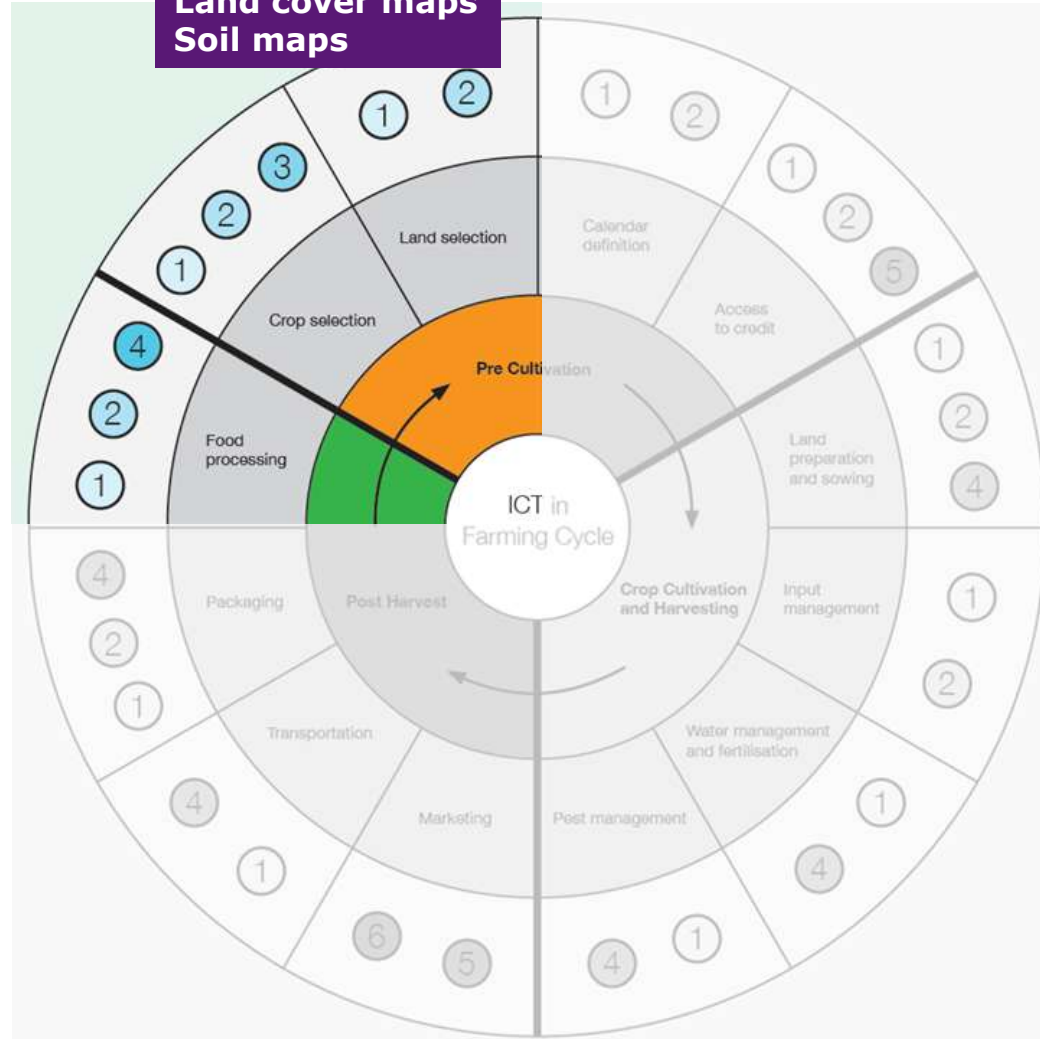- Yield forecasts
- GPS, meteo

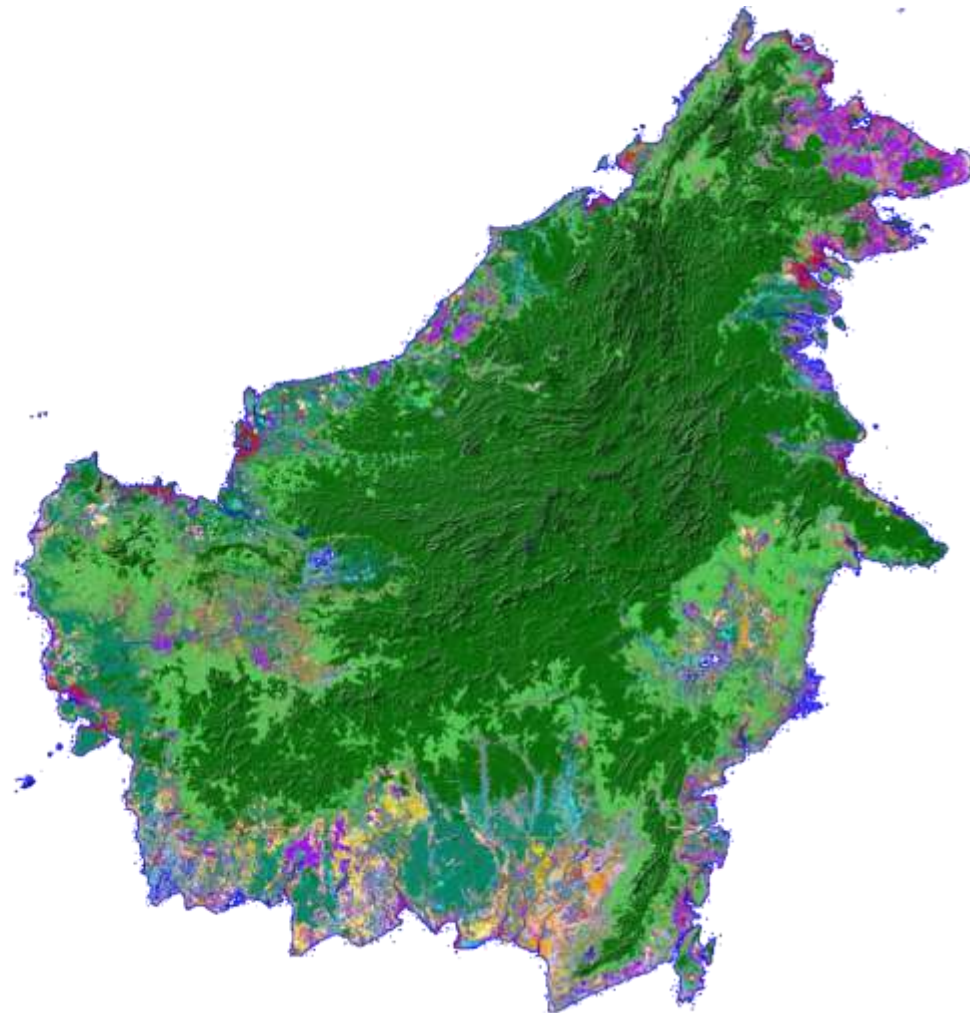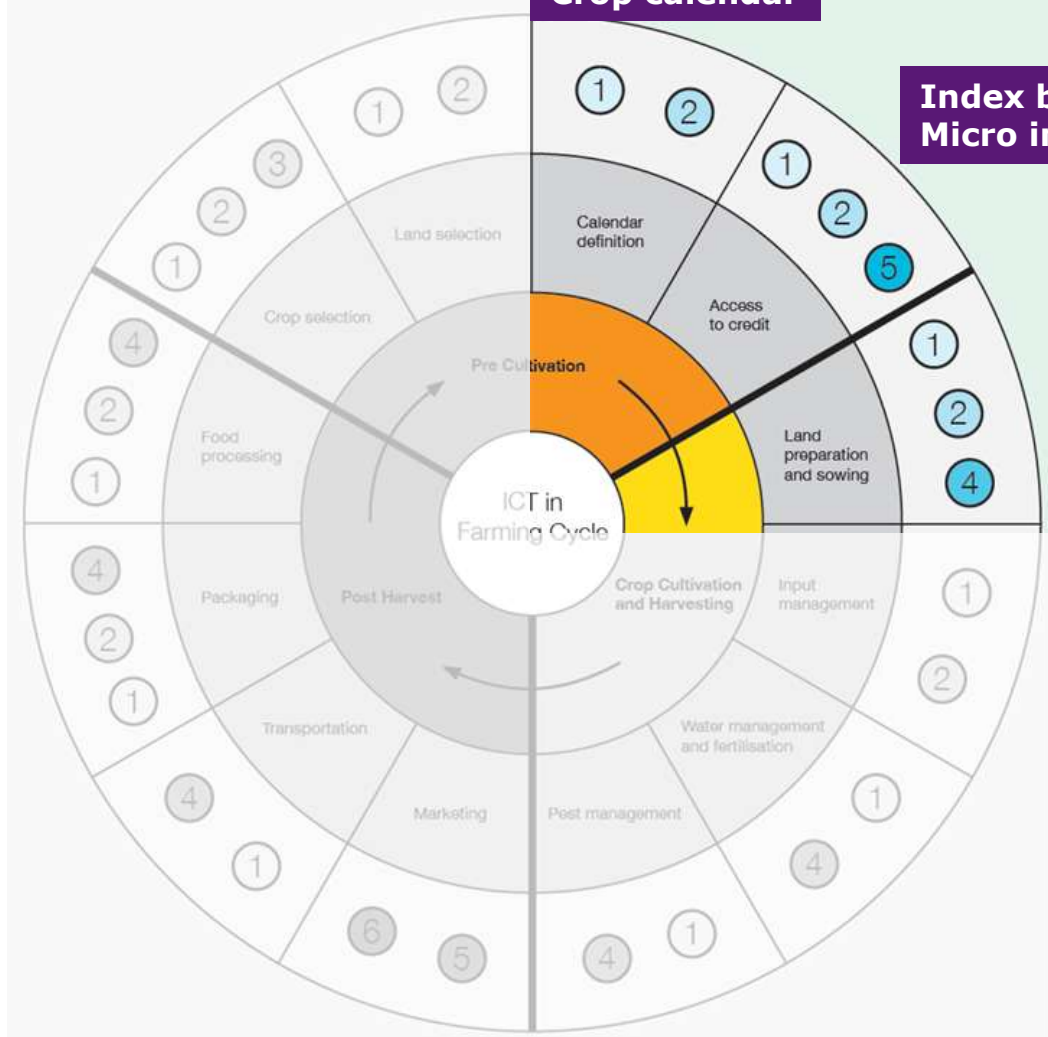G4AW — Geodata for Agriculture and Water

Land cover maps
Soil maps

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)

ICT in Farming Cycle

Pre Cultivation
- Land selection
- Crop selection

Food processing

Calendar definition
Access to credit
Land preparation and sowing

Crop Cultivation and Harvesting
- Input management
- Water management and fertilisation
- Pest management

Post Harvest
- Packaging
- Transportation
- Marketing

G4AW
Geodata for Agriculture and Water

Kalimantan Land cover map (radar)
(SarVision)

■	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

Crop calendar

Index based Micro insurance

Land cover maps Soil maps

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)

ICT in Farming Cycle

Land selection
Crop selection
Food processing
Packaging
Transportation
Marketing
Post management
Water management and fertilisation
Input management
Crop Cultivation and Harvesting
Land preparation and sowing
Access to credit
Calendar definition
Pre Cultivation
Post Harvest

G4AW
Geodata for Agriculture and Water

INTEGRATION OF CROPPING PATTERNS, SEASONAL RAINFALL AND SATELLITE IMAGE ANALYSIS

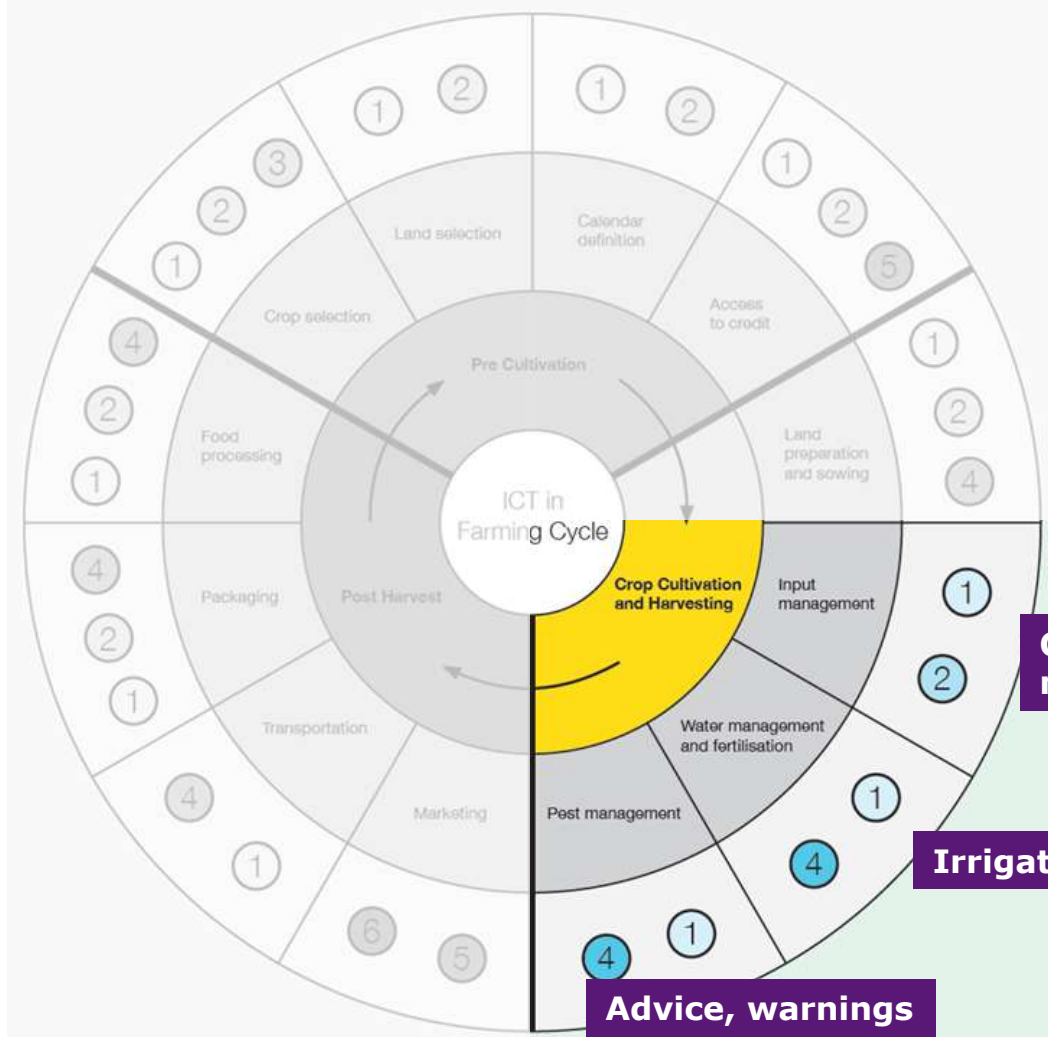| POTENTIAL CROPPING CALENDAR (IAARD)	SEASONAL RAINFALL PREDICTION (BMKG)	DROUGHT IMAGE ANALYSIS (ICALRD)
WET: PS1, PS2, PS3	FORECAST OF MONTHLY RAINFALL (mm/month)	NDVI
NORMAL: PS1, PS2, PS3		VCI
DRY: PS1, PS2, PS3	PROSPECT OF BEGINNING OF SEASON	Data Used: • MODIS, • MTSAT • AMSER-E • ALOS AVNIR-2 & PALSAR (acq before May 2011) — KBDI
Data Used: Rainfall Data	PROSPECT OF SEASON TYPE (WET, NORMAL, DRY)	VHI

Growing season ET relative to 30 yr avg

Pay-out

No pay-out

Malawi: Maize index insurance
(EARS)

Information systems including DSS/MISS/GIS etc

ICT-enabled learning and knowledge exchange

Modelling solutions

Sensory and proximity devices

ICT-enabled networking solutions

Online commerce tools (eCommerce/mCommerce)

ICT in Farming Cycle

Pre Cultivation

Post Harvest

Land selection

Calendar definition

Crop selection

Access to credit

Food processing

Land preparation and sowing

Packaging

Crop Cultivation and Harvesting

Input management

Transportation

Water management and fertilisation

Marketing

Pest management

Crop growth monitoring

Irrigation advice

Advice, warnings

G4AW
Geodata for Agriculture and Water

- ## Growth
  - biomass production (kg/ha)
  - CO2 intake (kg/ha)
  - leaf area index LAI (m2 leaf/m2 ground)
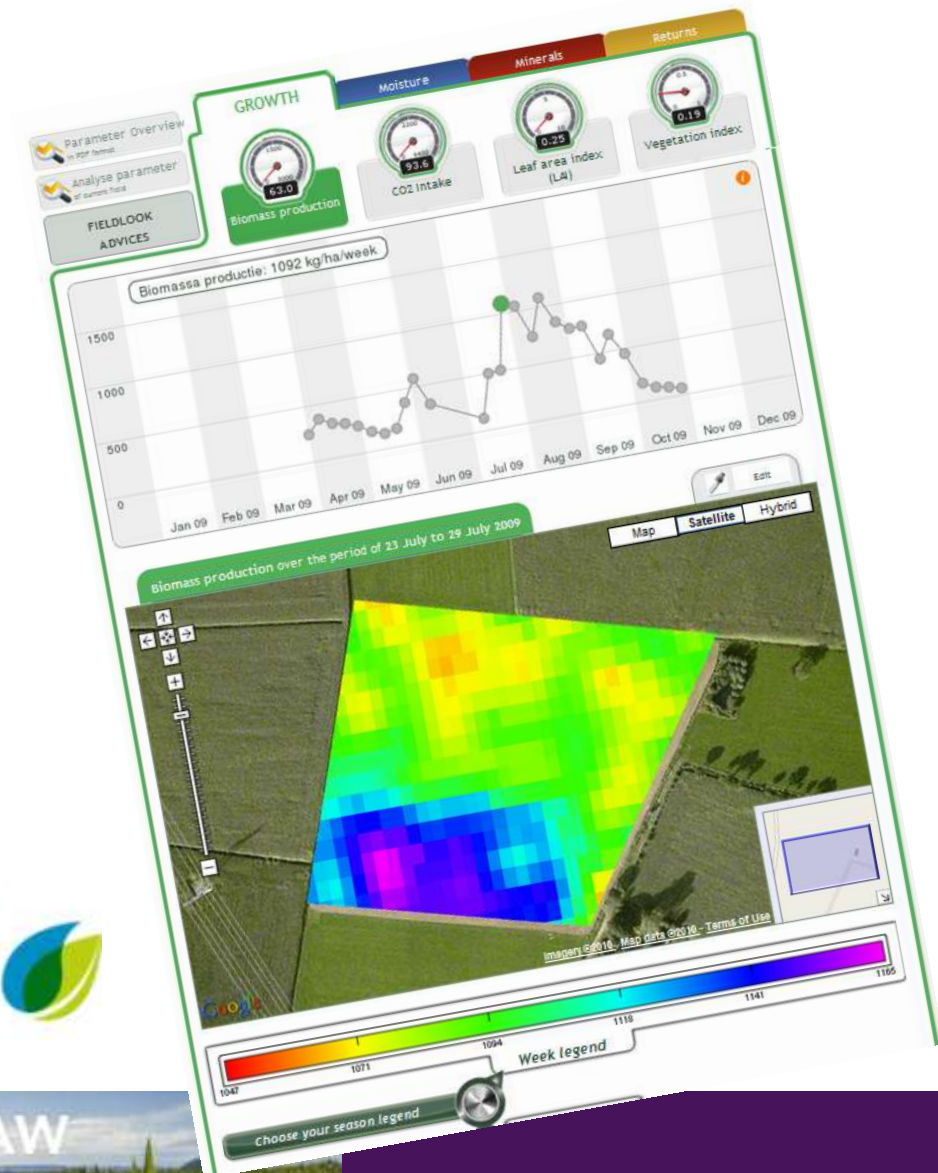 - vegetation index NDVI

- ## Moisture
  - evaporation shortage (mm/week)
  - current evaporation (mm/week)
  - surplus rain (mm/2 weeks)
  - reference evaporation

- ## Minerals
  - Nitrogen content in the top leaf layer (kg/ha)
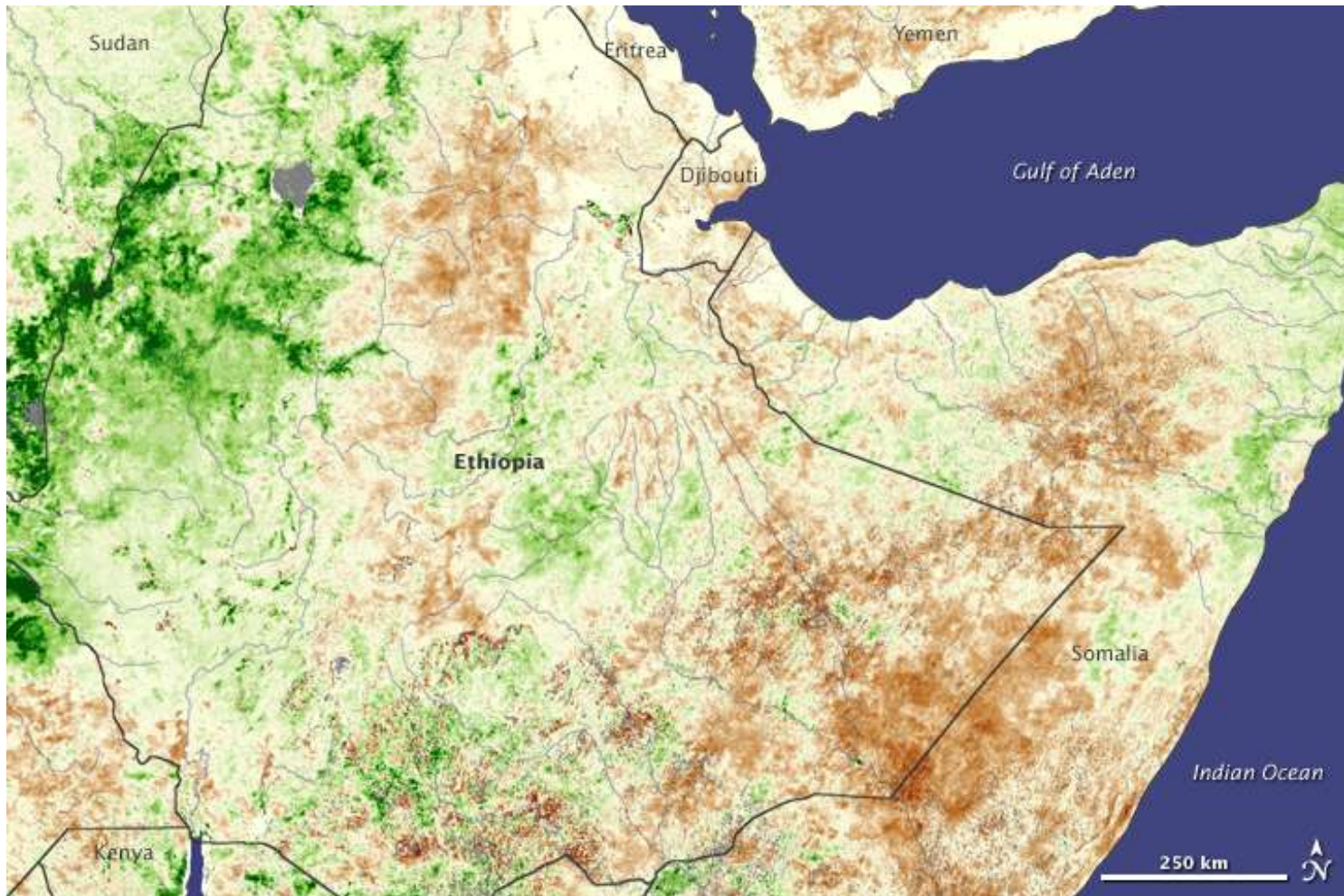 - Nitrogen content in all leafs (kg/ha)

- ## Yield
  - Fruit Yield
  - Root Yield
  - Dry matter content
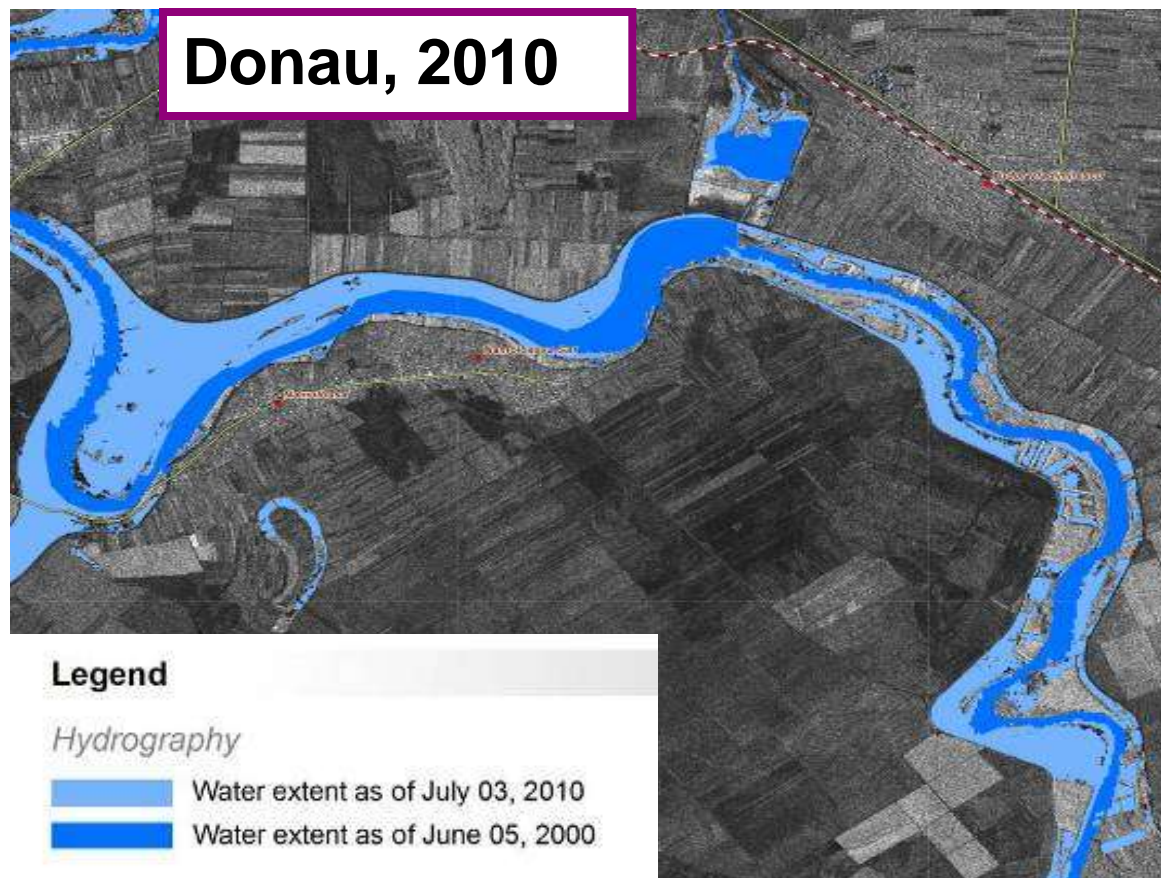 - Sugar Yield
  - Protein content

eleaf
FACTS FROM SPACE

G4AW
Geodata for Agriculture and Water

Drought in Ethiopia in 2008

Flood monitoring

Donau, 2010

Legend

Hydrography

Water extent as of July 03, 2010
Water extent as of June 05, 2000

Hazard & Risk Analysis

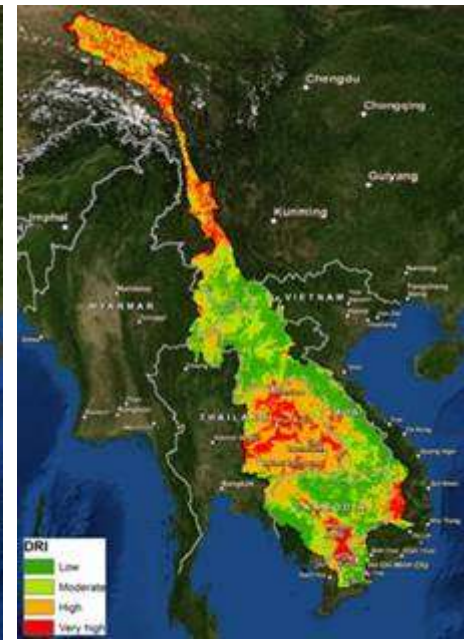
Vulnerability Index
Distance
to river

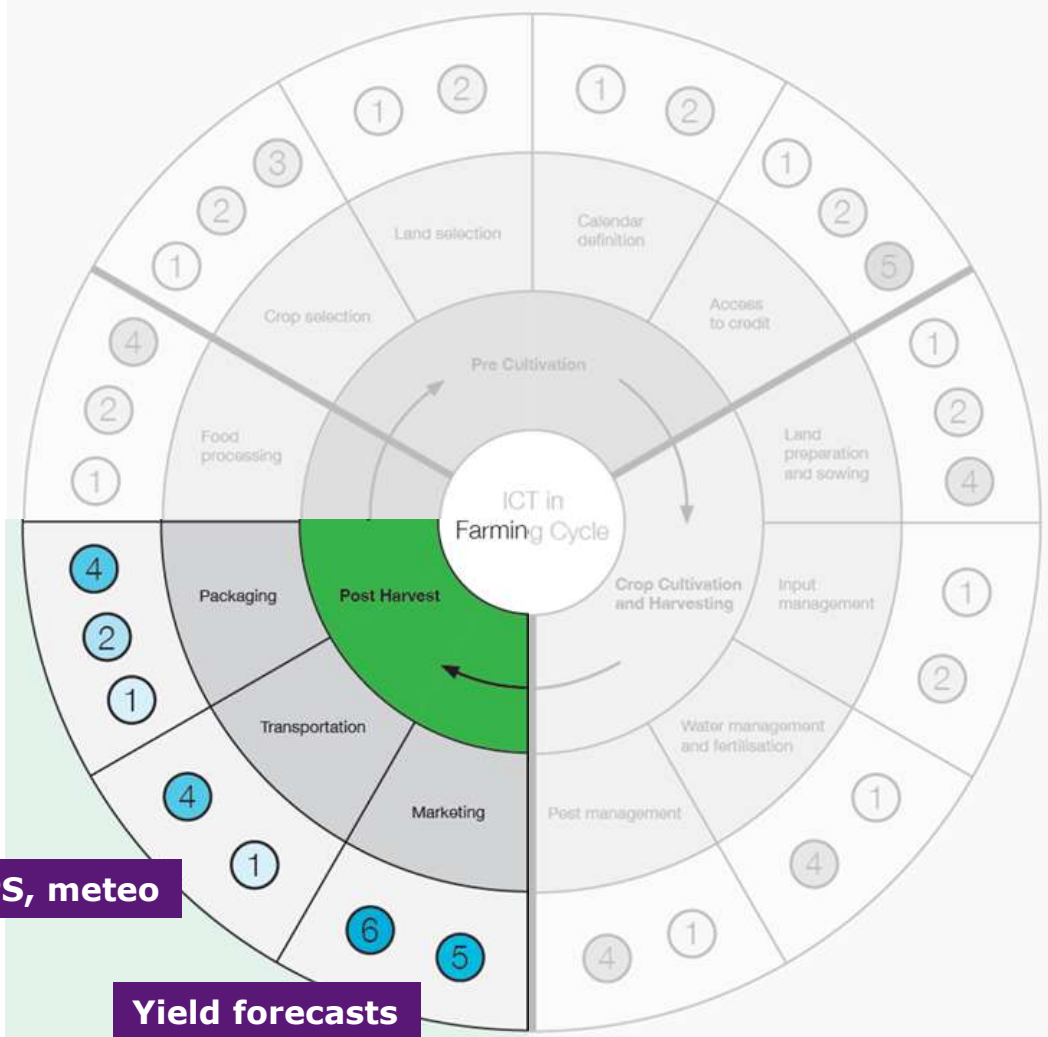Vulnerability Index
Population density

Vulnerability Index
Precipitation

Drought
Risk Map

FutureWater

Information systems including DSS/MISS/GIS etc

ICT-enabled learning and knowledge exchange

Modelling solutions

Sensory and proximity devices

ICT-enabled networking solutions

Online commerce tools (eCommerce/mCommerce)

ICT in Farming Cycle
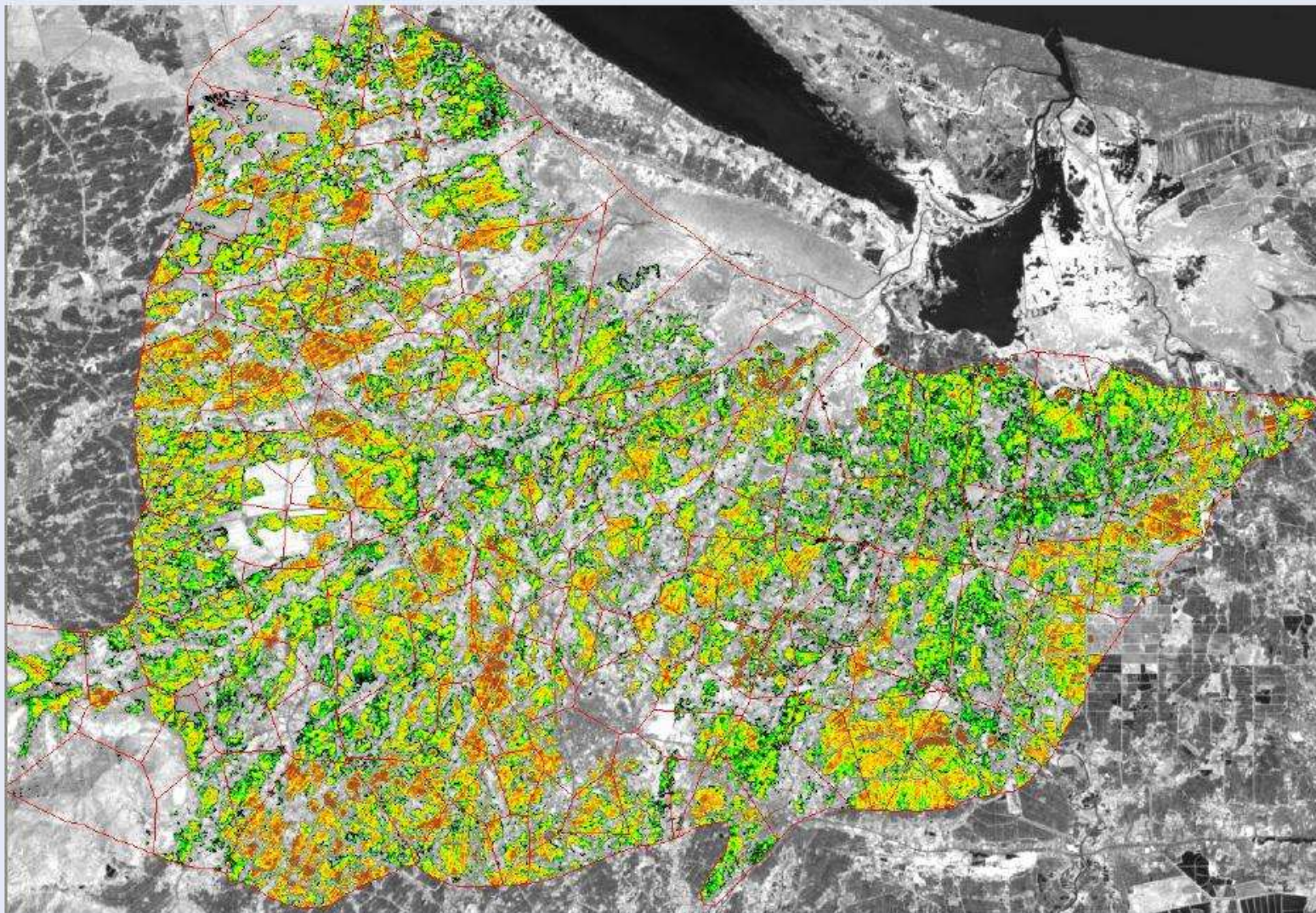
Land selection

Calendar definition

Crop selection

Access to credit

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Food processing

Land preparation and sowing

Packaging

Post Harvest

Crop Cultivation and Harvesting

Input management

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Water management and fertilisation

Marketing

Pest management

GPS, meteo

Yield forecasts

G4AW
Geodata for Agriculture and Water

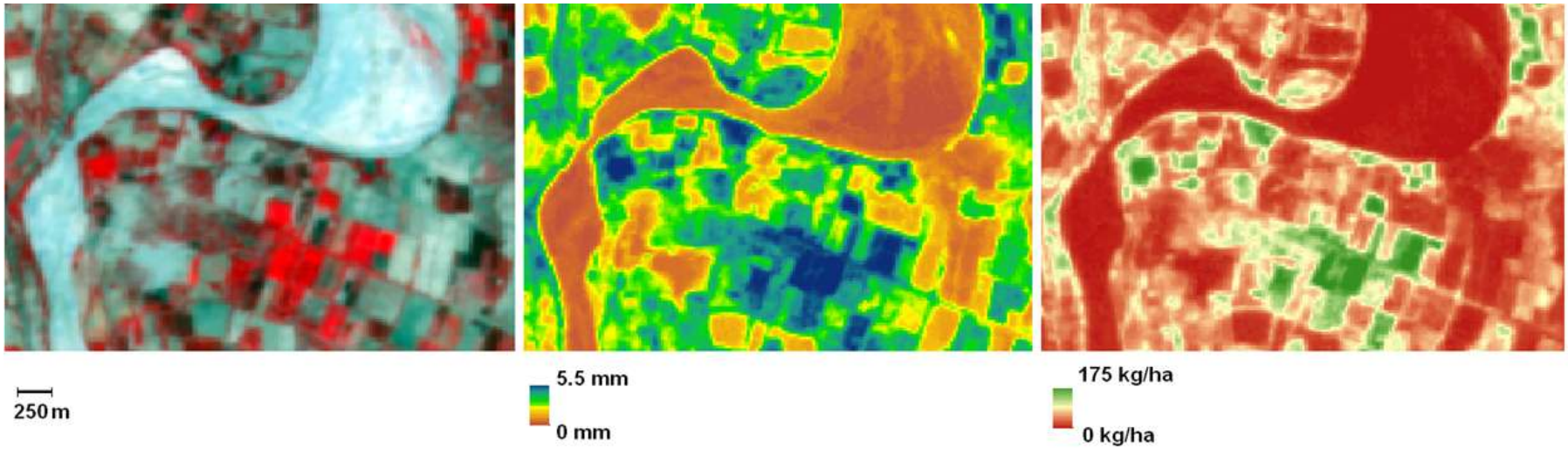# Rice Yield maps

Why based on satellite data?

- Objective, consistent, cross border, frequent

- Sparse (local) ground monitoring infrastructure

- 25+ years time series (geostationary satellite, Landsat)

- Many new satellites (to be) launched, no or low cost

TIME SERIES

250 m

5.5 mm
0 mm

175 kg/ha
0 kg/ha

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

Thank you for your attention

Mobile/ICT applications

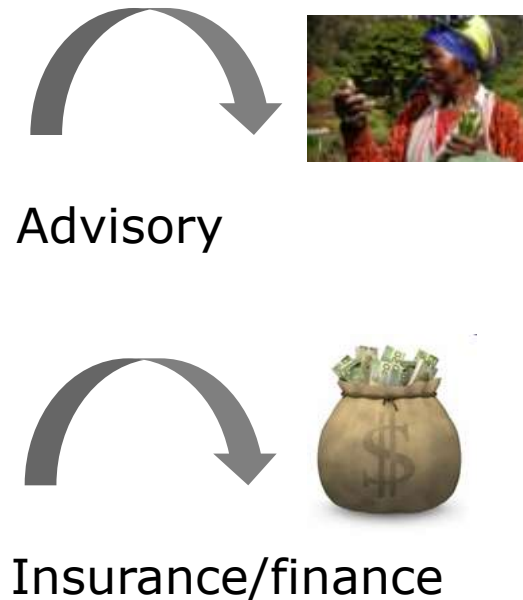Figure 1. Results Generated by Mobile Applications for Agricultural and Rural Development
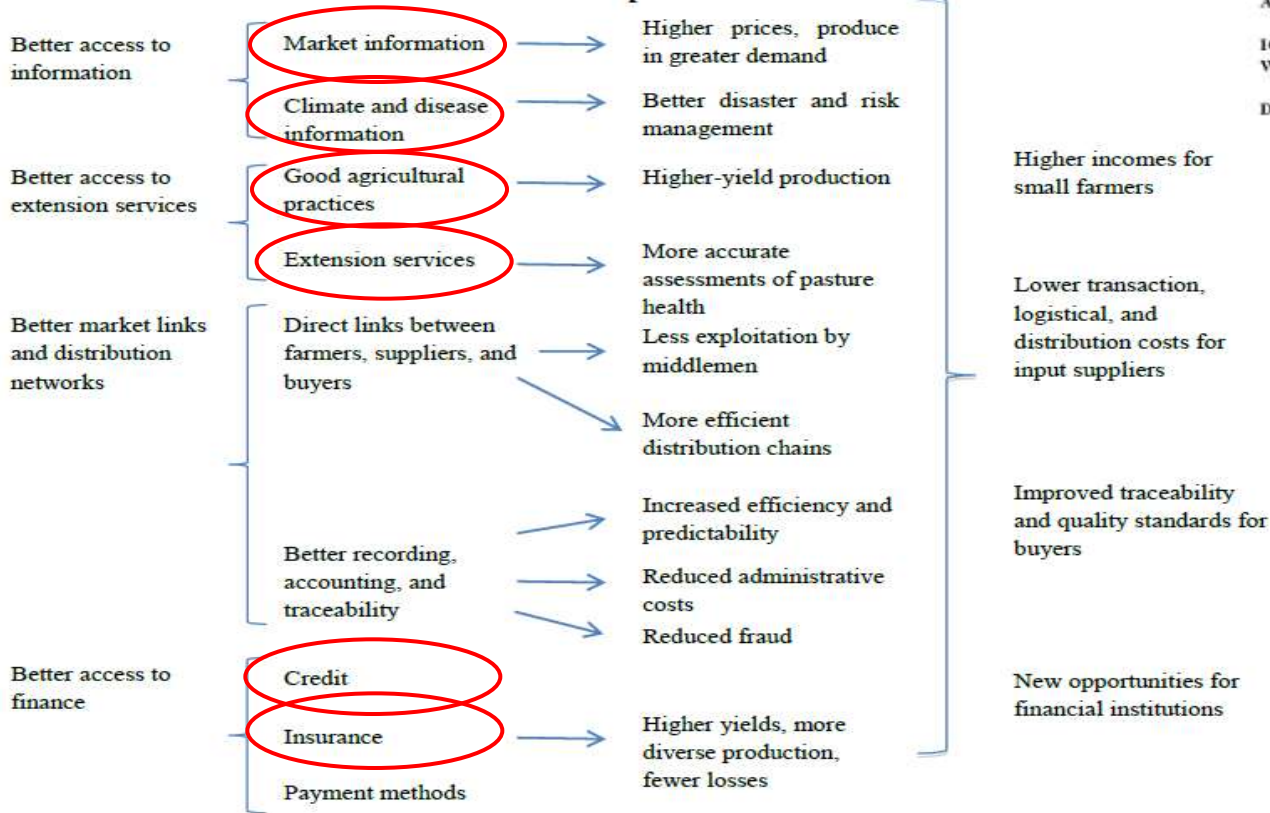
Mobile Applications for Agriculture and Rural Development

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

ICT Sector Unit
World Bank

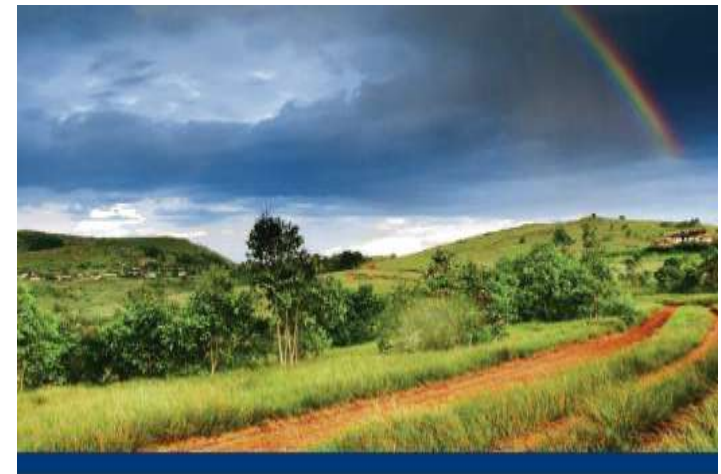December 2011

Advisory

Insurance/finance

Possible service provision – financial

Possible financial services may include, e.g.:

Index-based insurance
Credit/loans

- Weather information
- Climate information
- Soil mapping
- Crop yields
- Monitoring (e.g. vegetation growth)
- Crop forecasts

Weather Index-based Insurance
in Agricultural Development
A Technical Guide

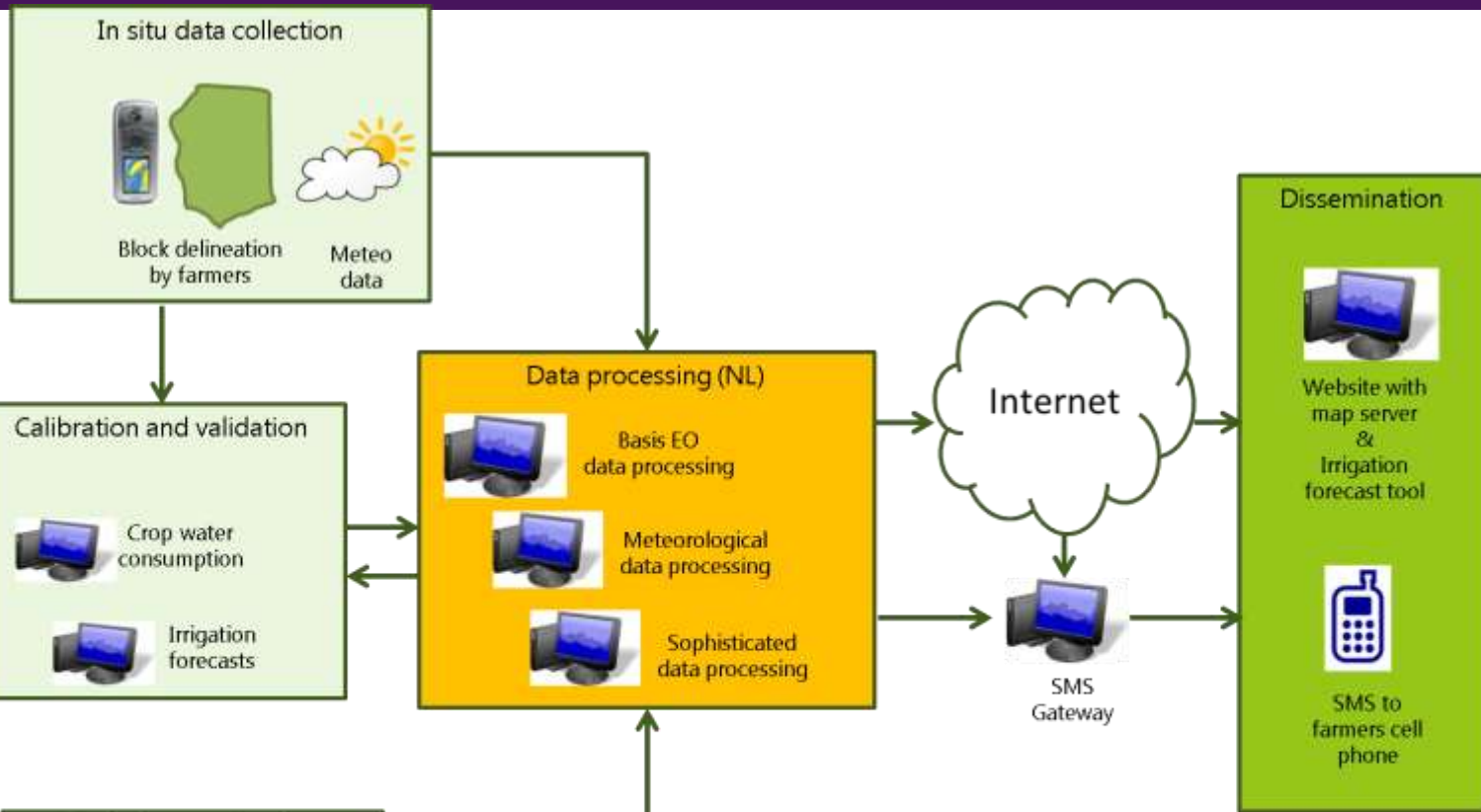**http://www.ifad.org/ruralfinance/pub/WII_tech_guide.pdf**

Possible service provision – advice

Possible advisory services may include, e.g.:

- 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

Smart ICT infrastructure

Irrigation advice