Info Session
25 July 2018 | ADB, Manilla, Philippines

Session 1 – Increase Agricultural productivity & Natural Resource Monitoring

EO4SD consortium, presented by Remco Dost, eLEAF

The consortium of EO4SD – Agriculture and Rural Development

SERVICE PROVISION

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THE NETHERLANDS

SATELLIGENCE
THE NETHERLANDS

DHI GRAS
DENMARK

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DATA INTEGRATION

Nelen & Schuurmans
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CAPACITY DEVELOPMENT

ITC
THE NETHERLANDS

COMMUNICATION

space·tec PARTNERS
BELGIUM

EO4SD consortium lead & service provider

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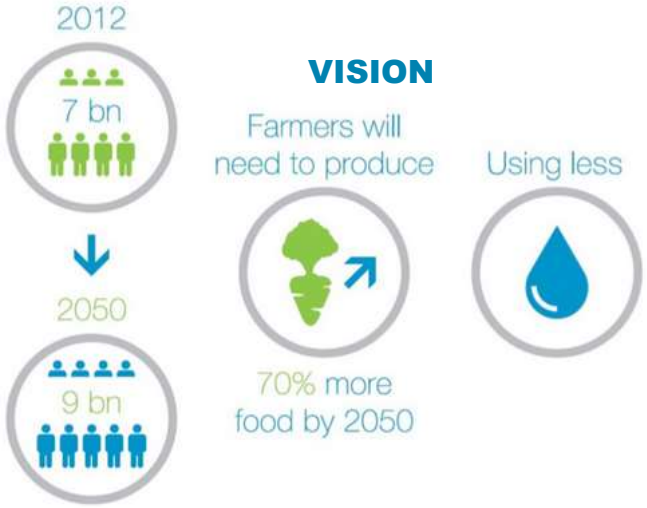
Global experience (dark green countries)



Agriculture | Water Management | Crop Insurance | Crop Certification

Satellite based applications and data to optimise crop production and water management

www.eLEAF.com

Established in 2000

eLEAF is a Netherlands based high-tech company with global experience offering quantitative information

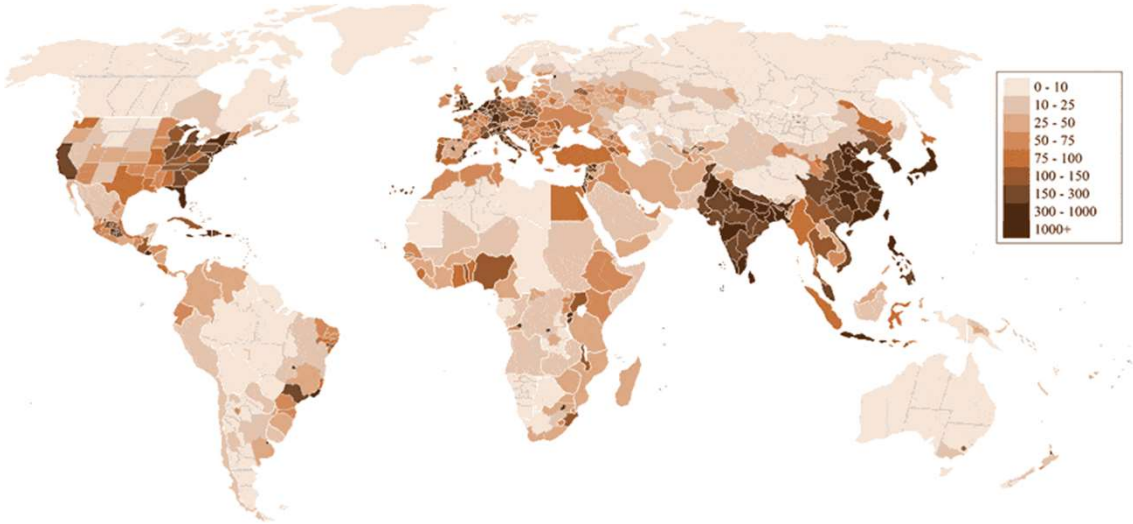
Quantitative Remote Sensing

=

PMAPPING

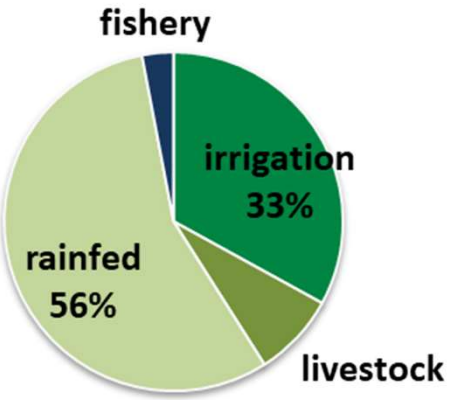
Setting the stage – projected world population

	Country	2013 Population	% of World Pop.	Area (km²)	Density (p/km²)	Change/Yr (curr.)	2050 Pop. (proj.)	% of World Pop.	Change 2013-2050
1	Asia	4,298,723,288	60.0%	31,915,445,635	135	1.03%	5,164,061,493	54.1%	20%
2	Africa	1,110,635,062	15.5%	30,955,879,982	36	2.46%	2,393,174,892	25.1%	115%
3	Europe	742,452,170	10.4%	23,048,931,144	32	0.08%	709,067,211	7.4%	-4%
4	Latin America and Caribbean	616,644,503	8.6%	20,546,598,127	30	1.11%	781,566,037	8.2%	27%
5	Northern America	355,360,791	5.0%	21,775,892,579	16	0.83%	446,200,868	4.7%	26%
6	Oceania	38,303,620	0.5%	8,563,295,328	4	1.42%	56,874,390	0.6%	48%
7	WORLD	7,162,119,434	100.00%	136,806,987,966	52	1.15%	9,550,944,891	100%	33%

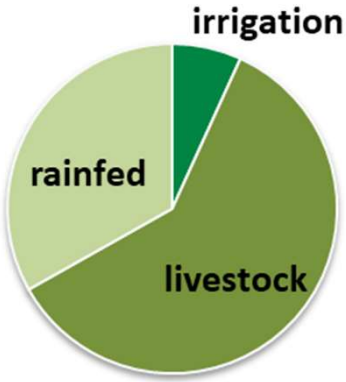


http://www.7billionworld.com

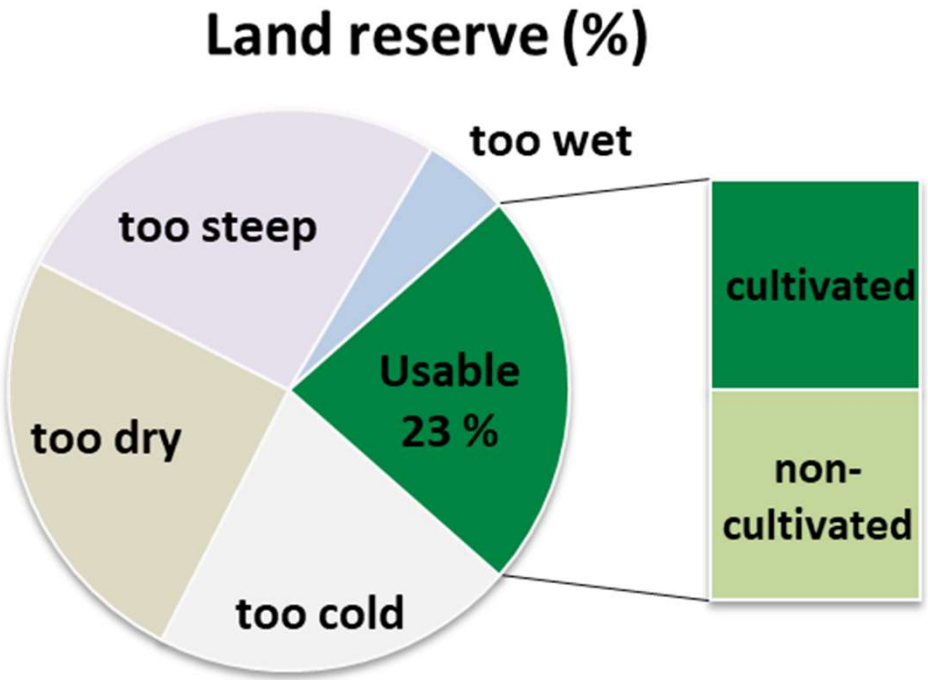
Setting the stage: world food production



Food production (%)



Area (million ha)



J. Deckers - kuleuven

Agricultural production

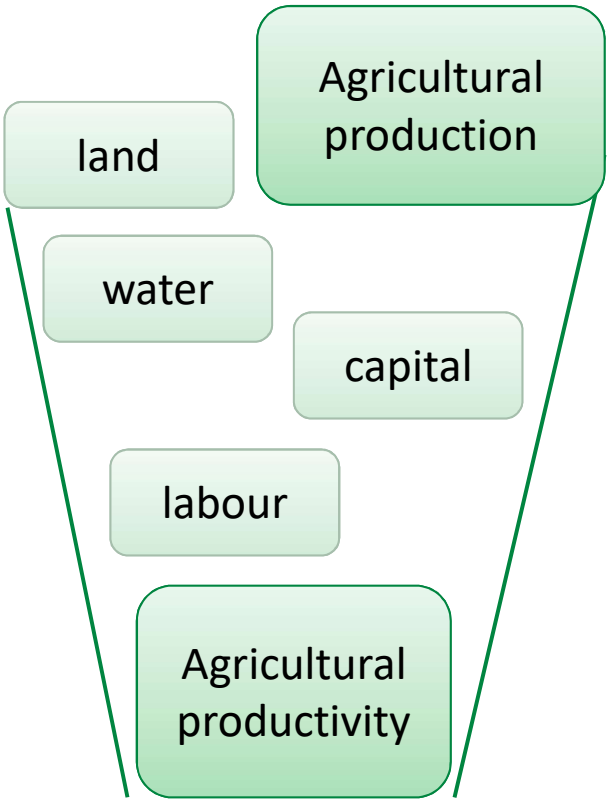
=

the volume of output

Agricultural productivity

=

the output in relation to resources (land, labour, capital, etc)



Raising **agricultural production** in a country:

- Raising the yield of individual crops
- Changing the pattern of production (intense system of cultivation, high value crops, increase the number of growing seasons, etc)
- Expand cultivated area

Agricultural productivity:

- Include resources in analysis
- Output in terms of calories or in terms of money value?

Role of Earth Observation

Agricultural productivity ⟺ **Access to information**

Earth Observation can provide the tools to monitor the baseline, status and trends of production of agricultural areas

A powerful technique for **continuously assessing** the status of **agricultural production** on a wide range of spatial and temporal scales.

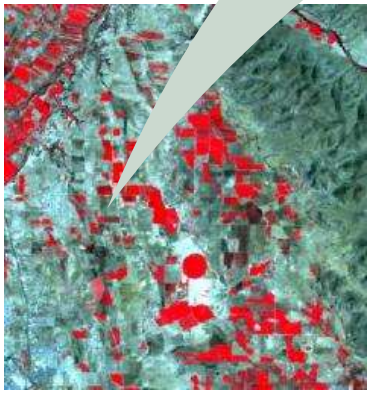
It provides **historical** as well as **actual** global information on a regular basis, and thus can **rapidly reveal where change has happened** in a consistent, repeatable and unbiased manner.

EO tooling and datsets

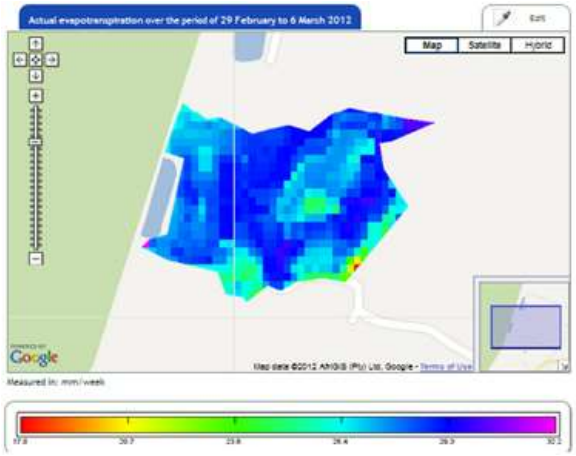
Instructive tools

Intelligent pixels

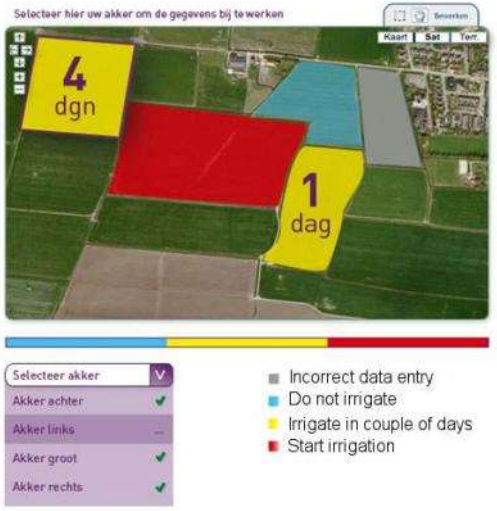
Remote sensing data



e.g. Sentinel



e.g. Crop water requirement



e.g. Irrigation advice

In the context of the Sustainable Development Goals

Goal 2
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

target 2.4 Increasing agricultural productivity

Sustainable use of **land** and **water** resources

target 15.3
Combat desertification and achieve a land degradation neutral world

target 6.4
Substantially increase water use efficiency

target 17.18
Increase the availability of high-quality, timely, and reliable data

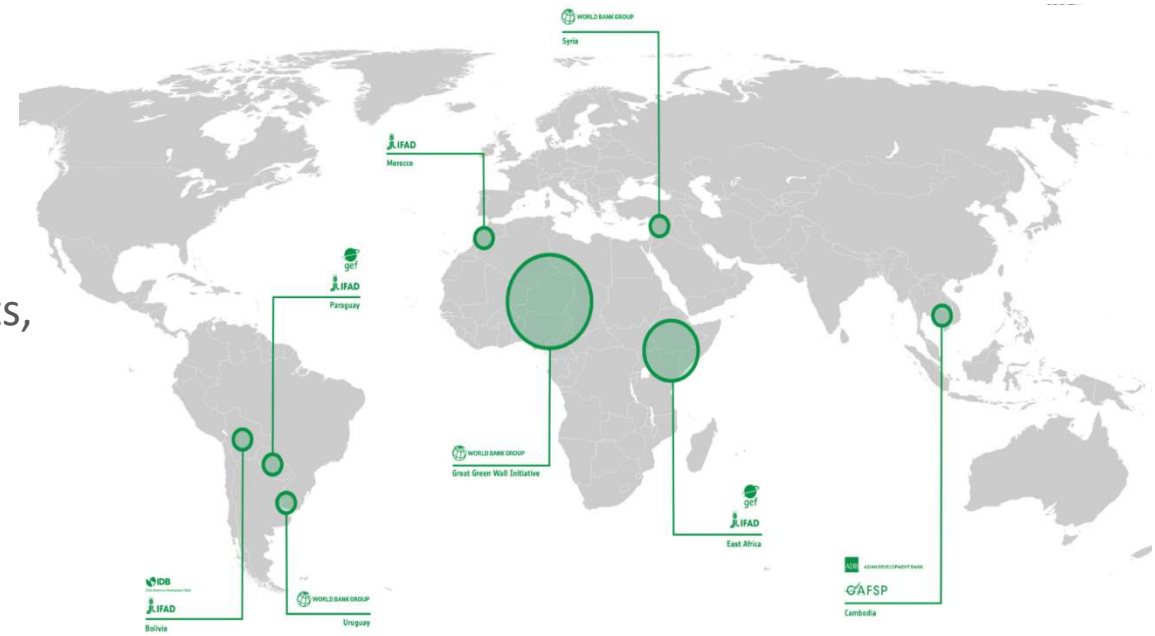
EO can contribute to:

- **Baseline / targeting criteria**
  (ie. land cover/land cover change, biomass production & climate variables)
- **In season management decisions**
  (ie. crop status assessment)
- **In season management decisions**
  (ie. yield estimation, productivity, drought assessment)
- **Progress / result indicators**
  (ie. Irrigation performance, (water) productivity)
- **Alternative development scenarios**
  (ie. agriculture commodities production impact on deforestation)

Focus demonstrations

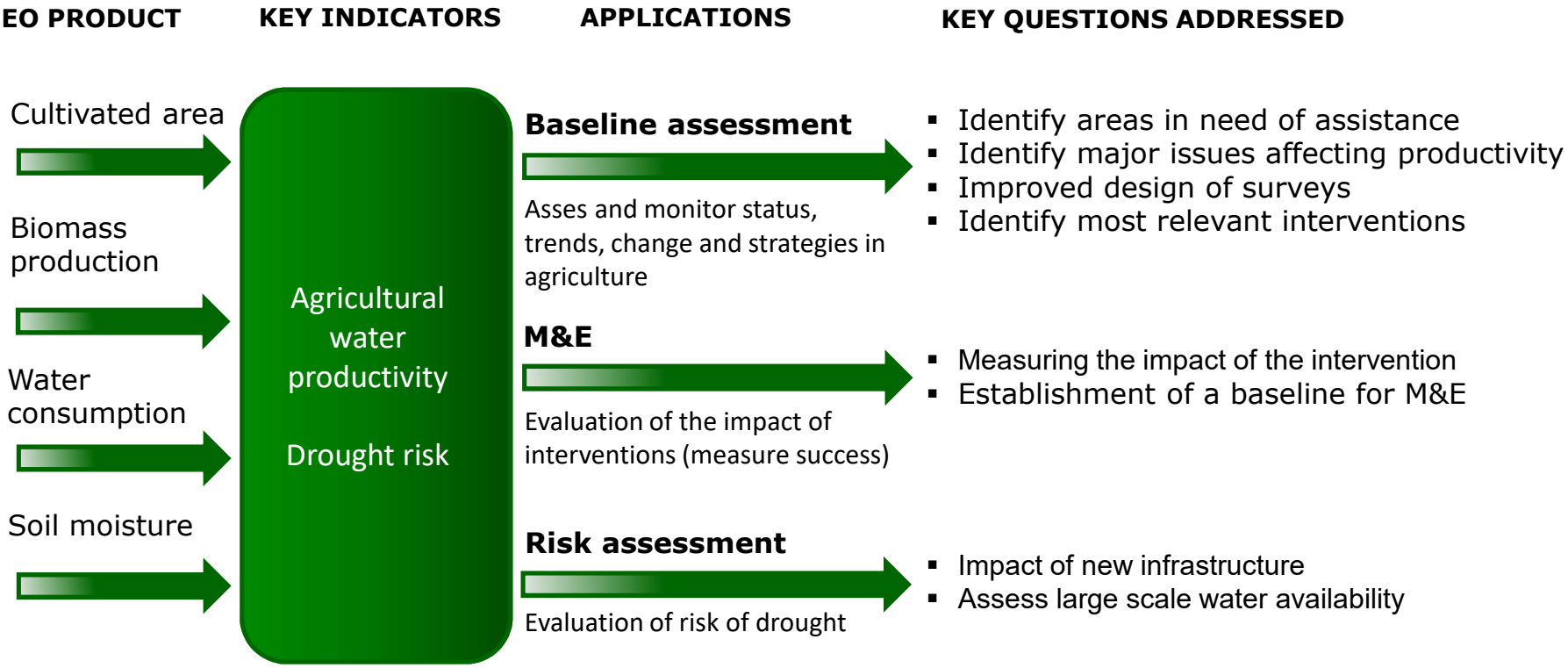
Selection based on:

- IFI opportunity, requirements, interest and involvement
- Technical feasibility
- Impact



Countries	Demonstration
Cambodia, Uganda, Syria	Agricultural production and food security applications
Sahel and sub-Saharan Africa, focus on Ethiopia, Burkina Faso and Morocco	Large-scale land degradation and environmental monitoring
Uganda, Bolivia, Paraguay	Agricultural commodities, impact on deforestation

Multi-scale monitoring Service to assess food security risks

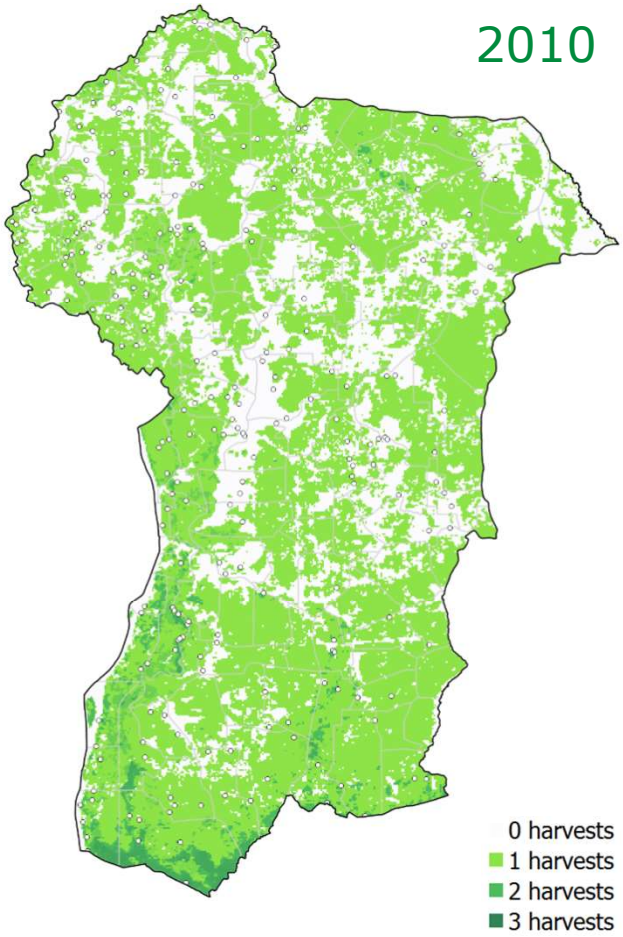


Related project:	
Cambodia	Tonle Sap Poverty Reduction and Smallholder Development Project (TSSD)
	Strengthening Coordination for Management of Disasters Project (SCMD)
	Climate –resilient rice commercialization sector development program (RICE SDP)

Crop intensity monitoring

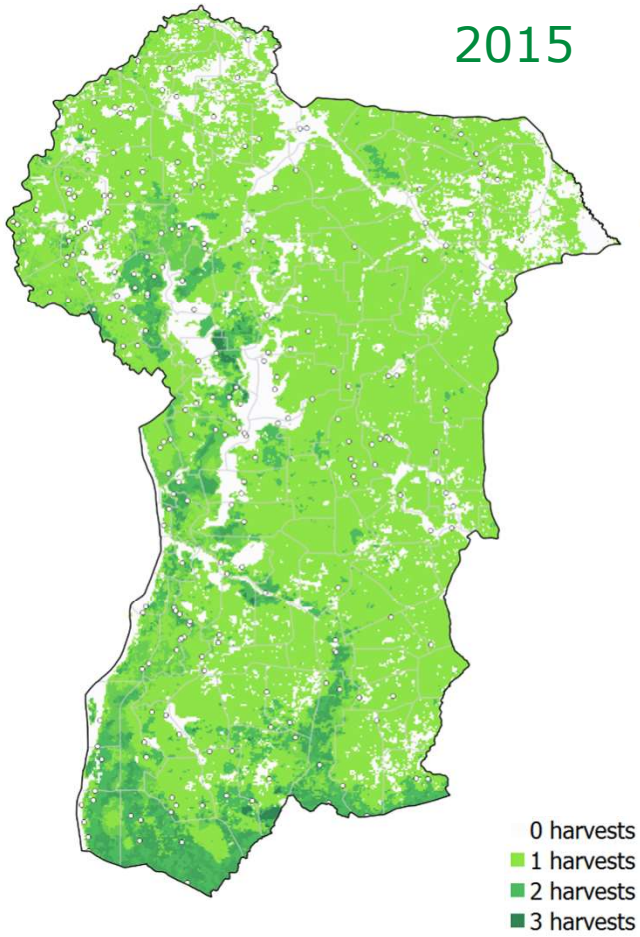
Productivity crop intensity

2010



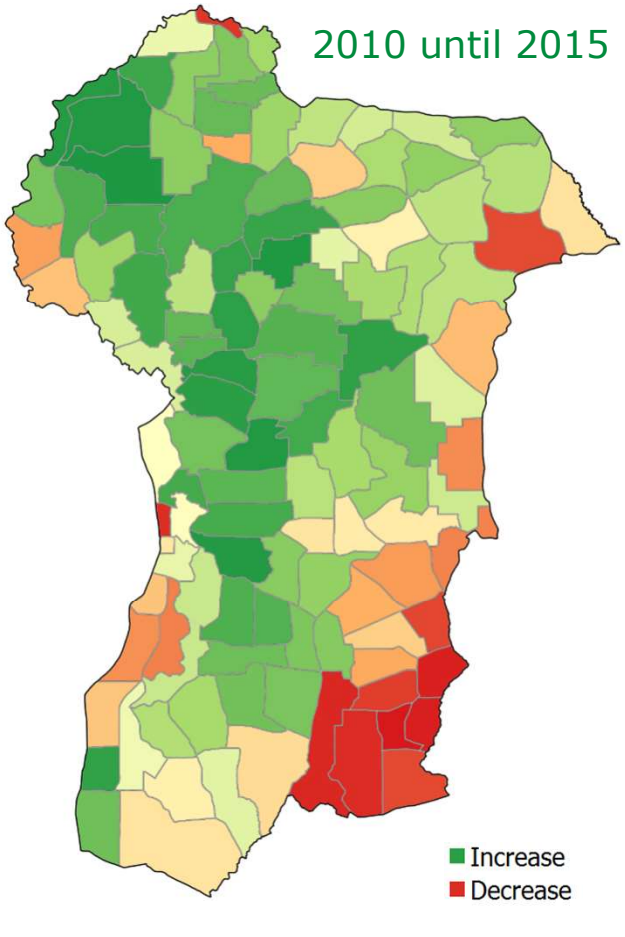
Productivity crop intensity

2015



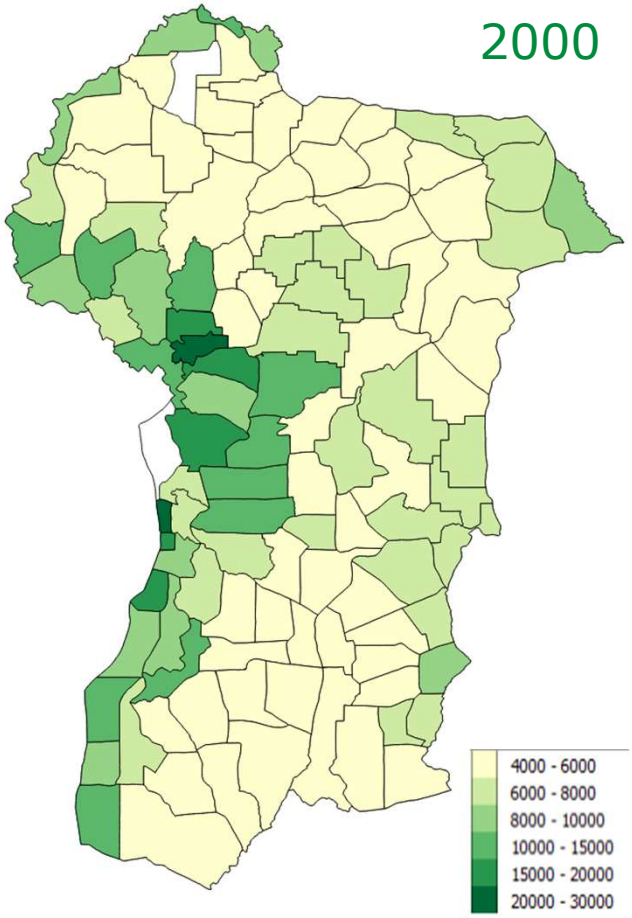
Productivity crop intensity change

2010 until 2015

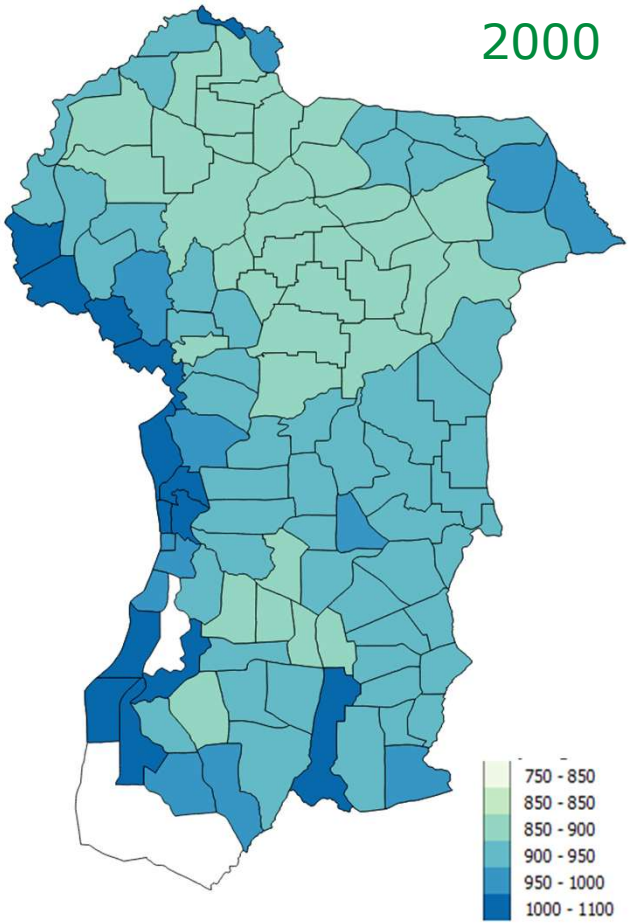


Agricultural water productivity: biomass and crop water use

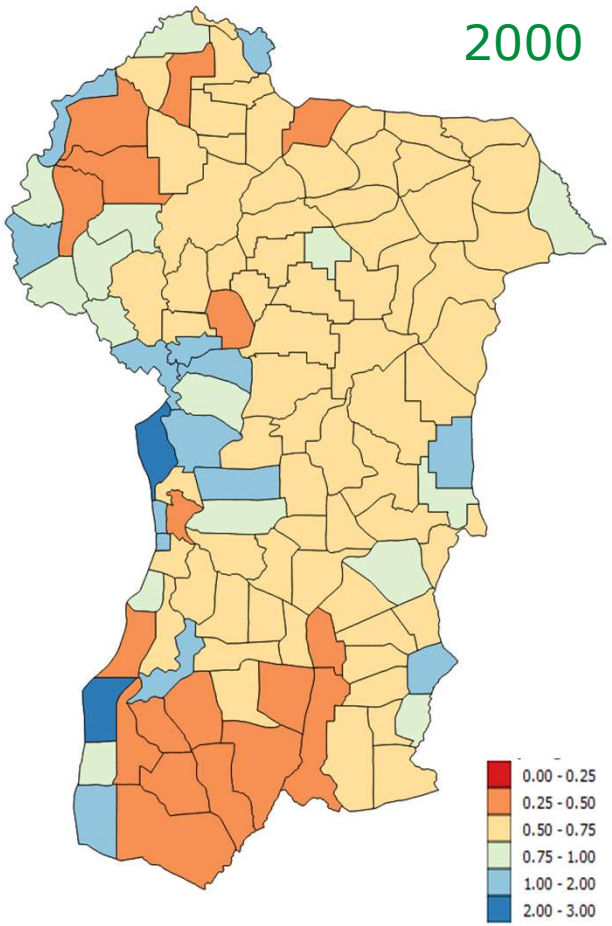
Gross primary productivity in kg/ha



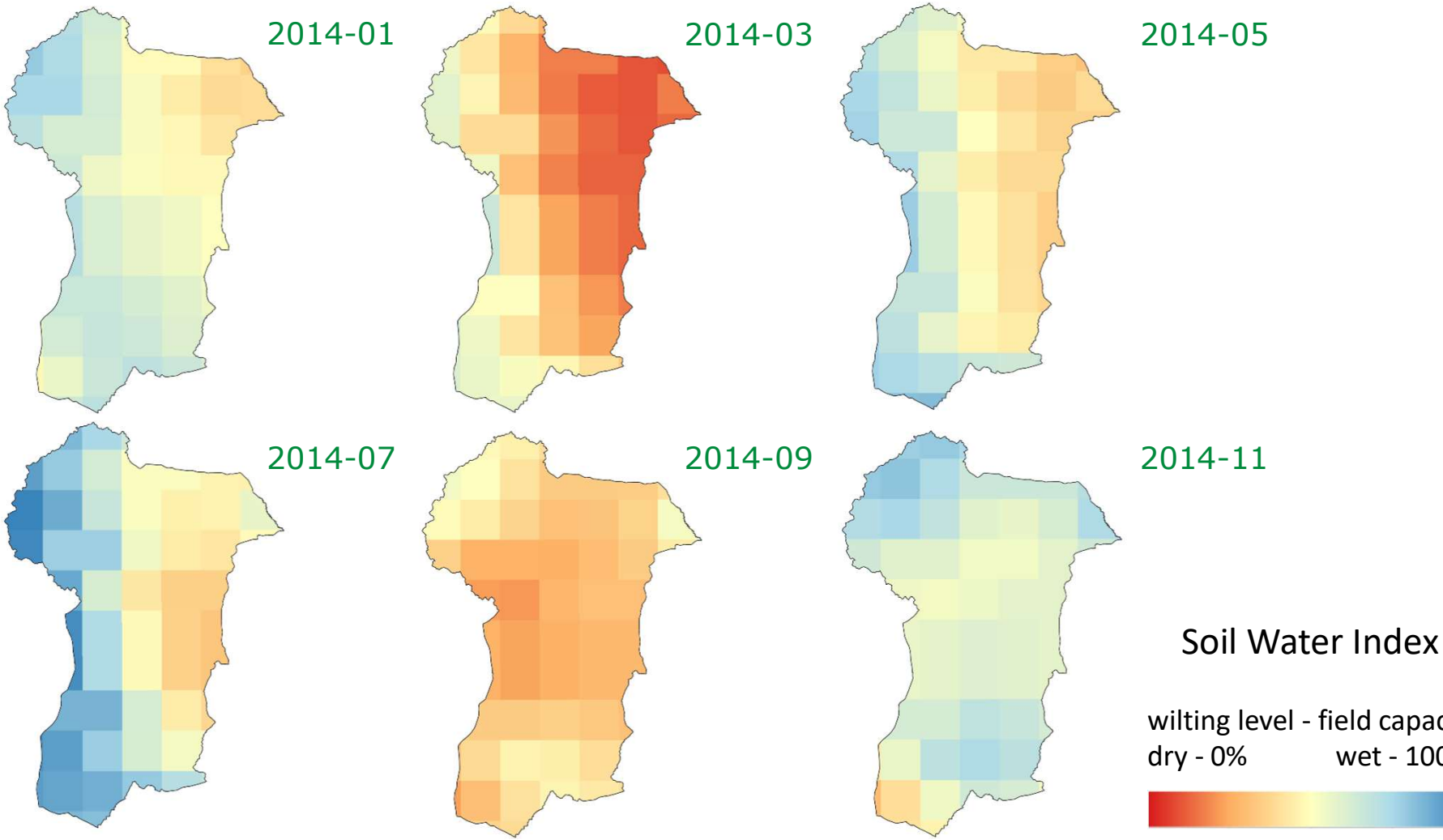
Water consumption (ET mm/year)



Biomass water productivity (kg/m3)

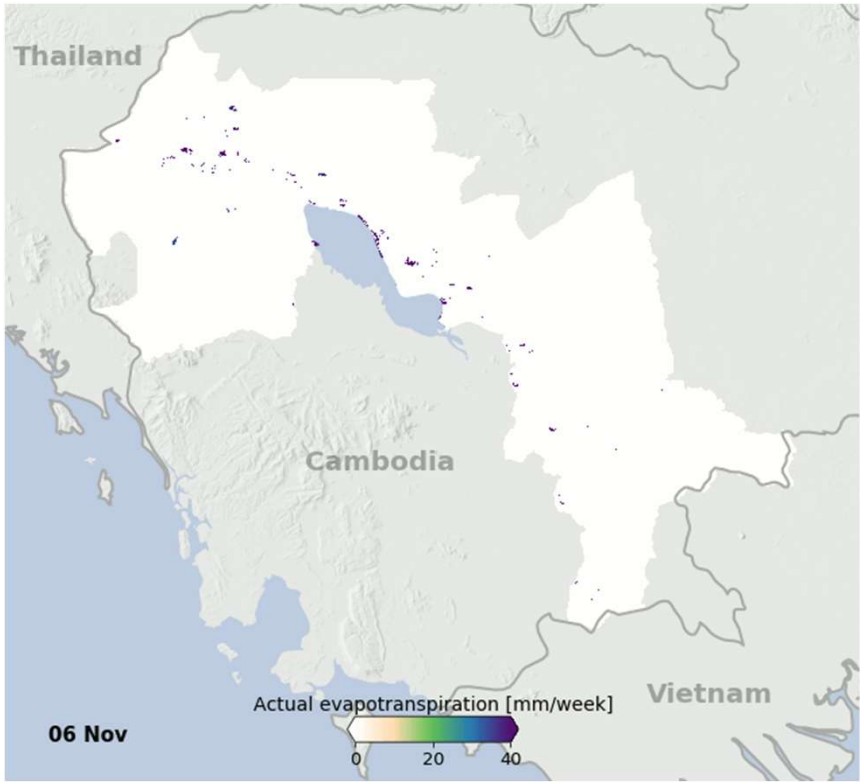


Drought: Soil Water Index

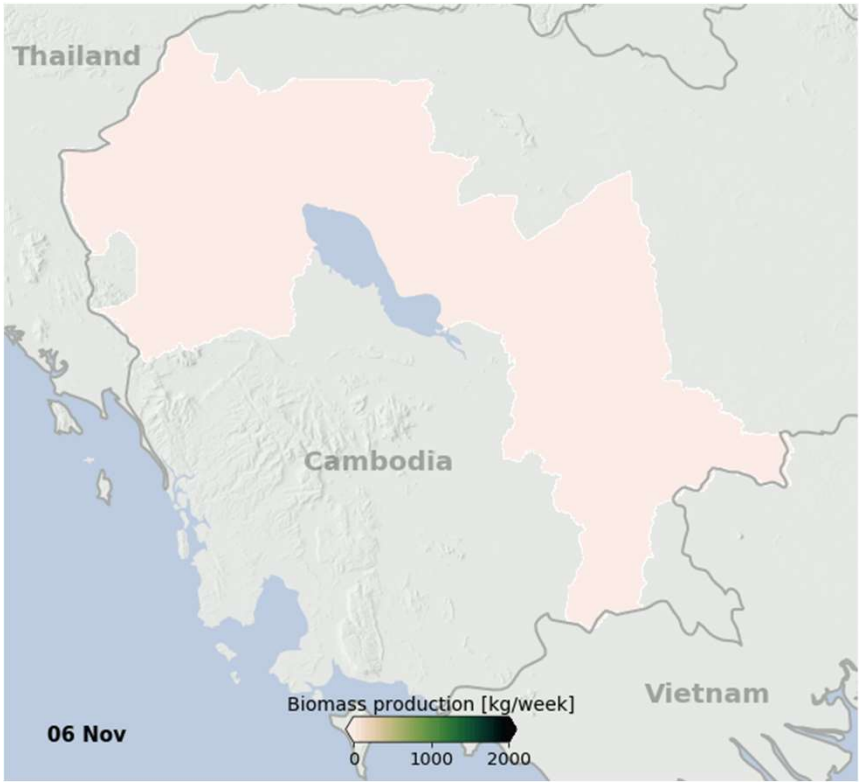


Weekly data animated from Nov'17-Apr'18

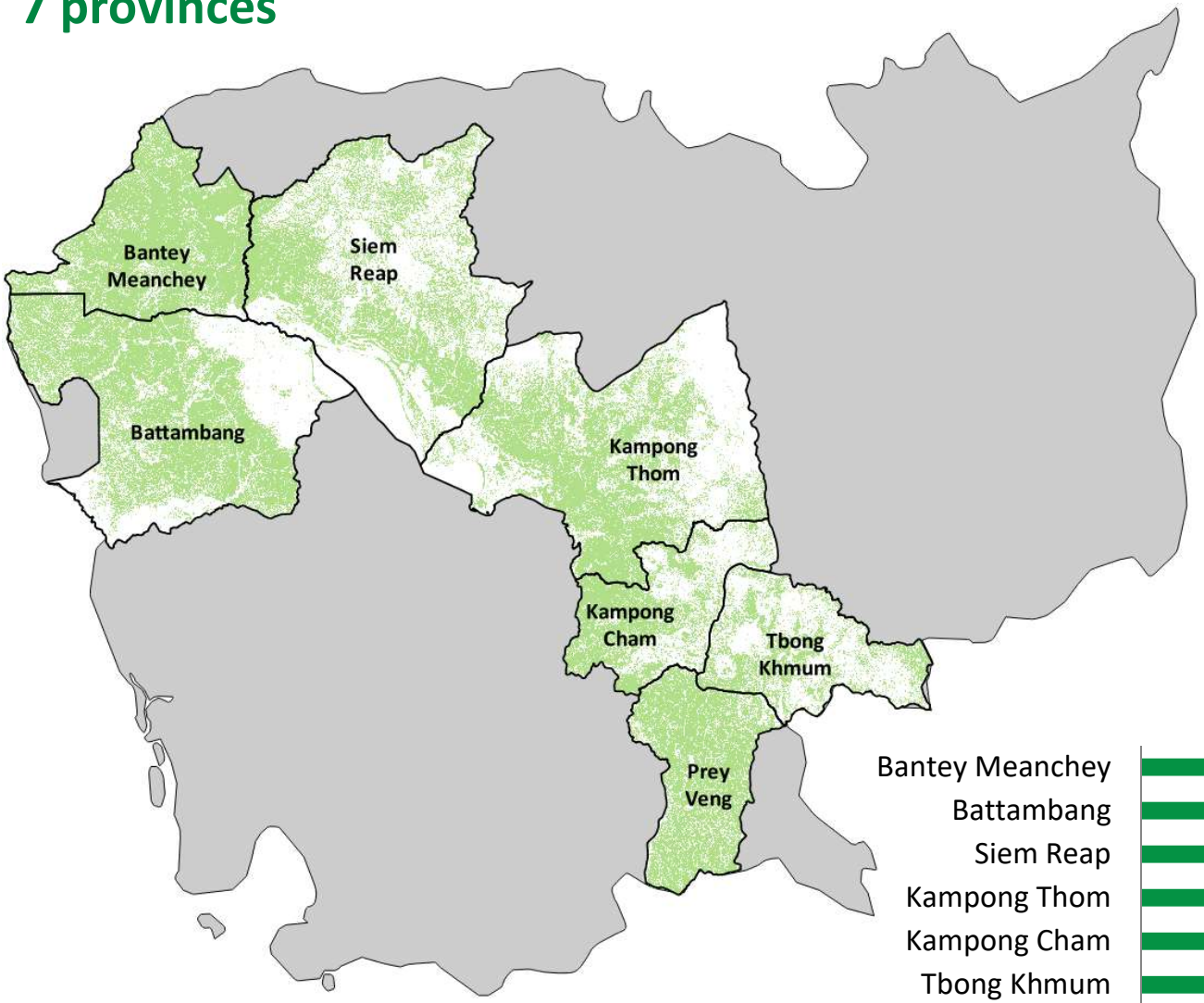
Actual evapotranspiration (mm/week)

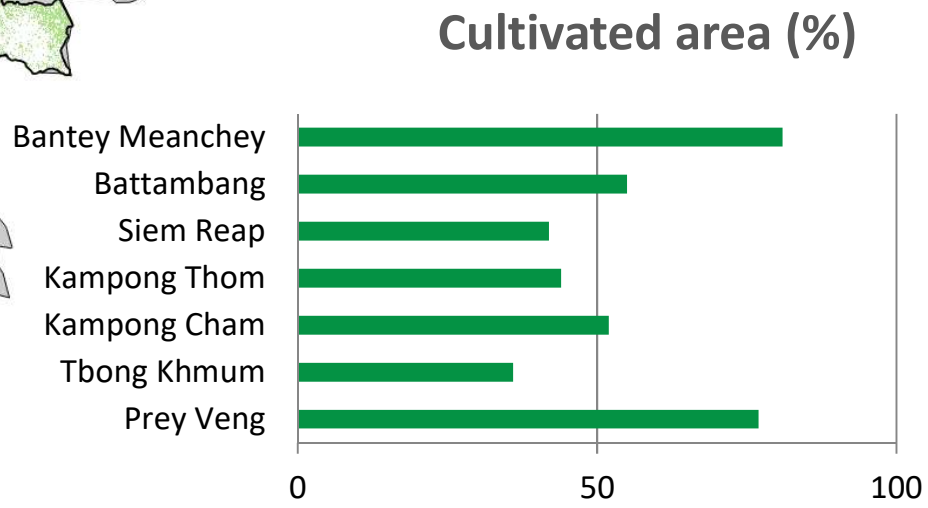


Biomass production (kg/ha/week)

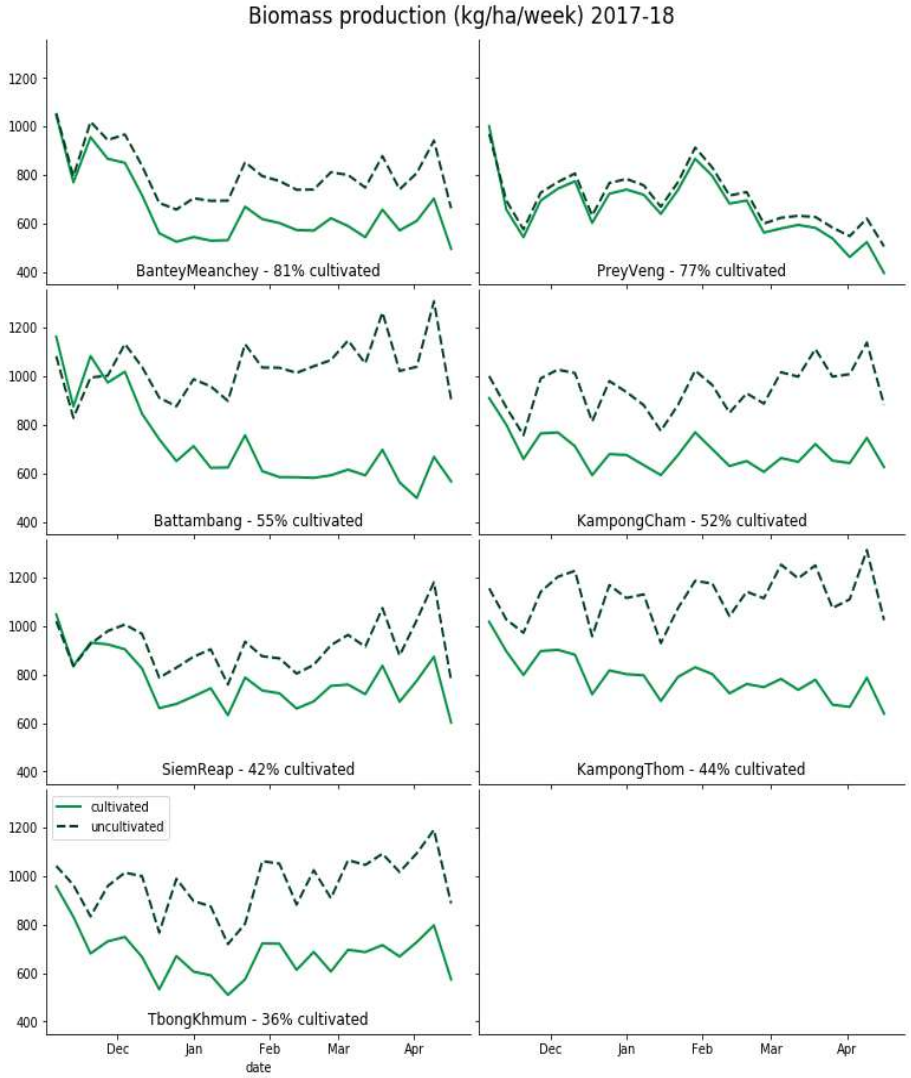


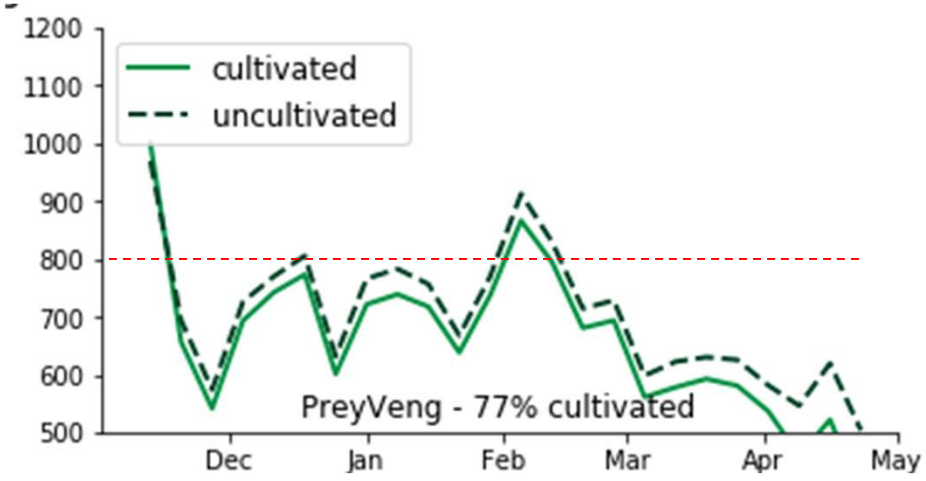
7 provinces

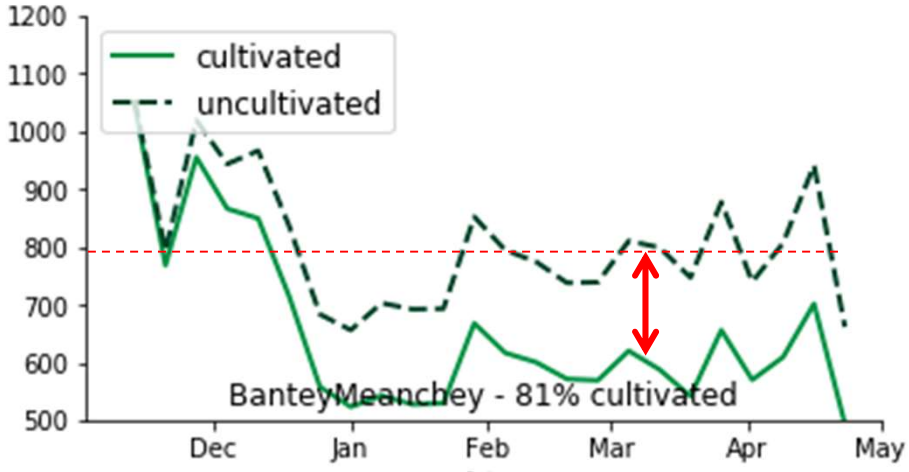

Bantey Meanchey
Siem Reap
Battambang
Kampong Thom
Kampong Cham
Tbong Khmum
Prey Veng


Cultivated area (%)
Bantey Meanchey
Battambang
Siem Reap
Kampong Thom
Kampong Cham
Tbong Khmum
Prey Veng
0
50
100

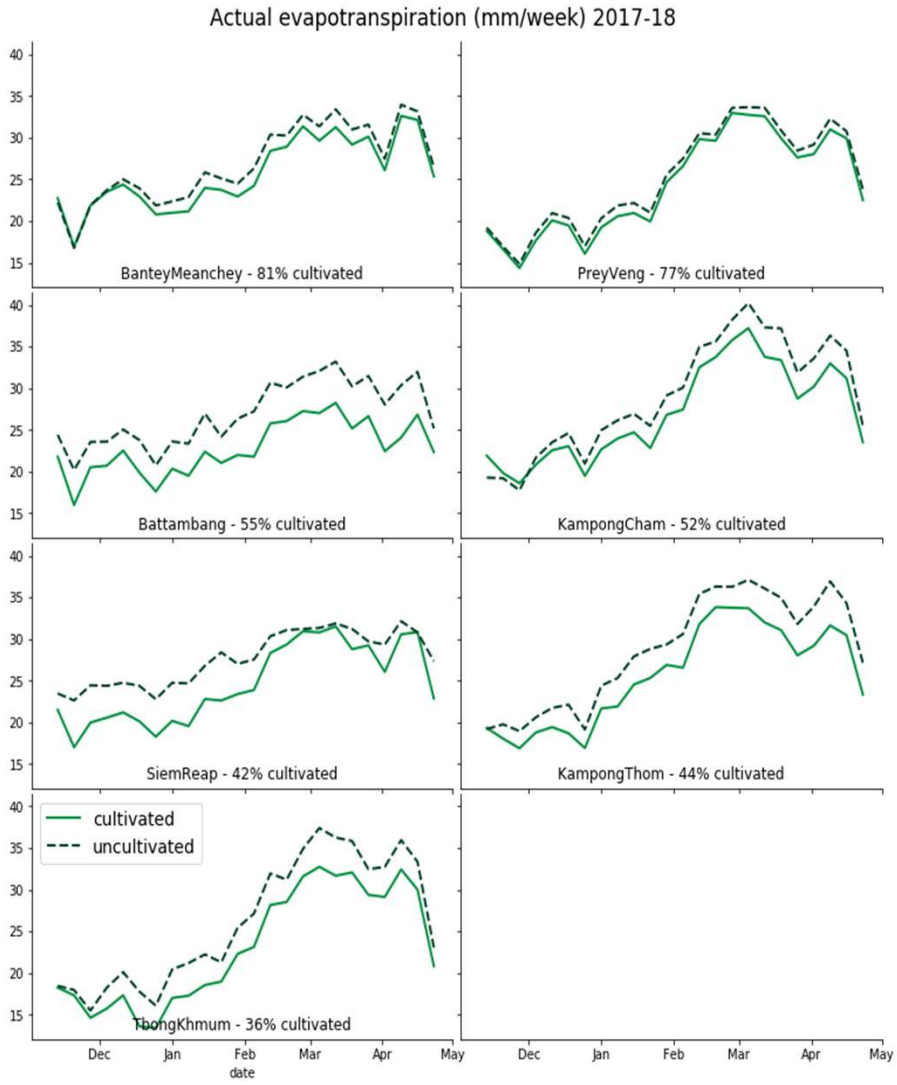
Biomass production in cultivated and uncultivated land

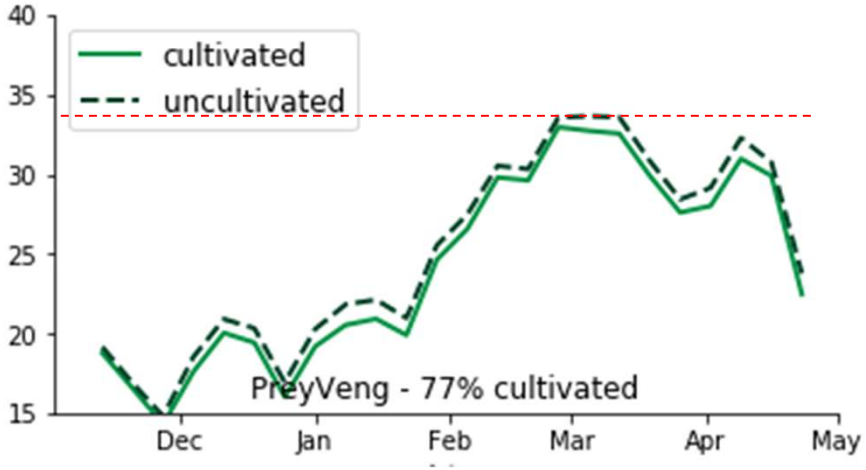


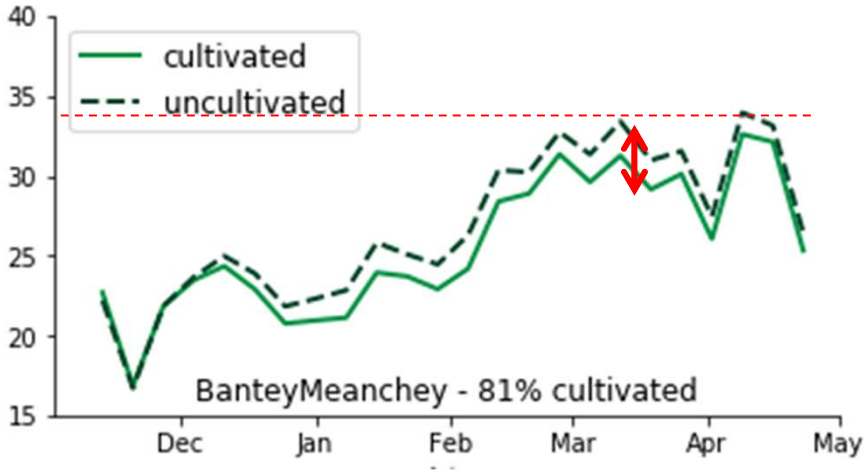




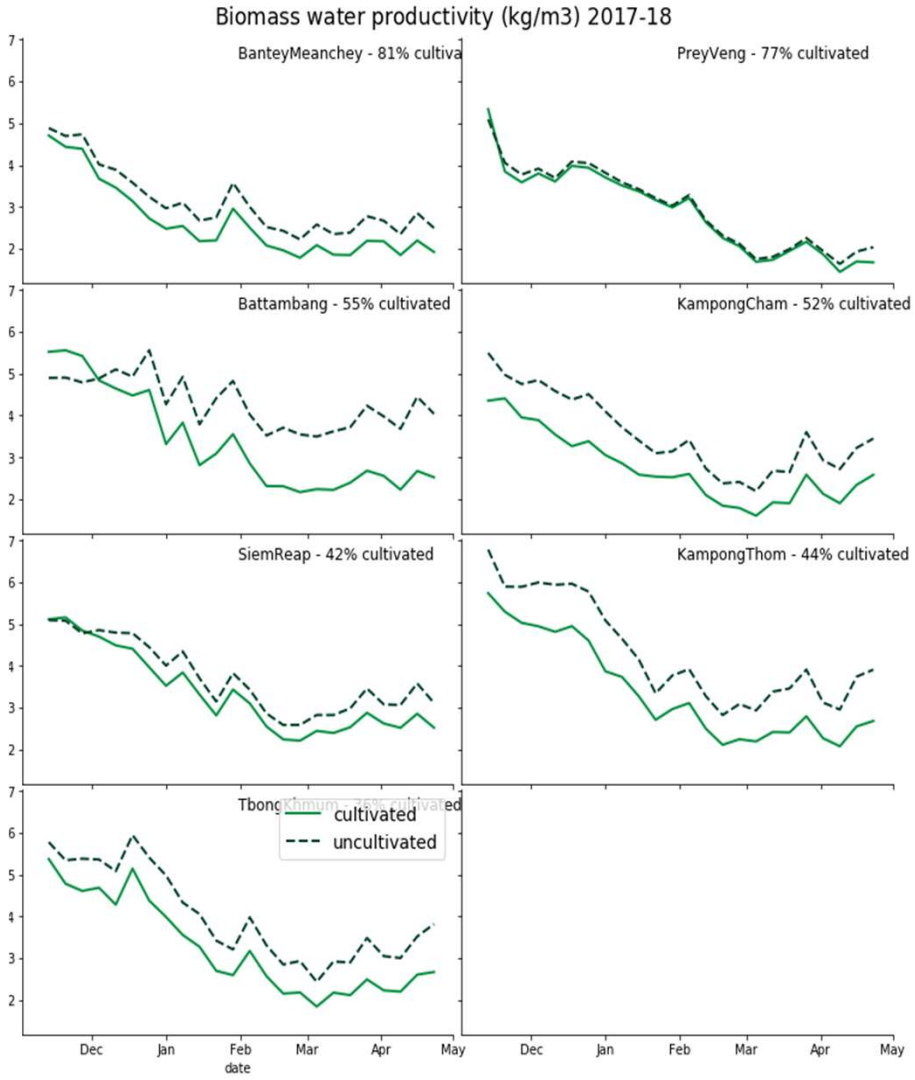
Actual evapotranspiration in cultivated and uncultivated land

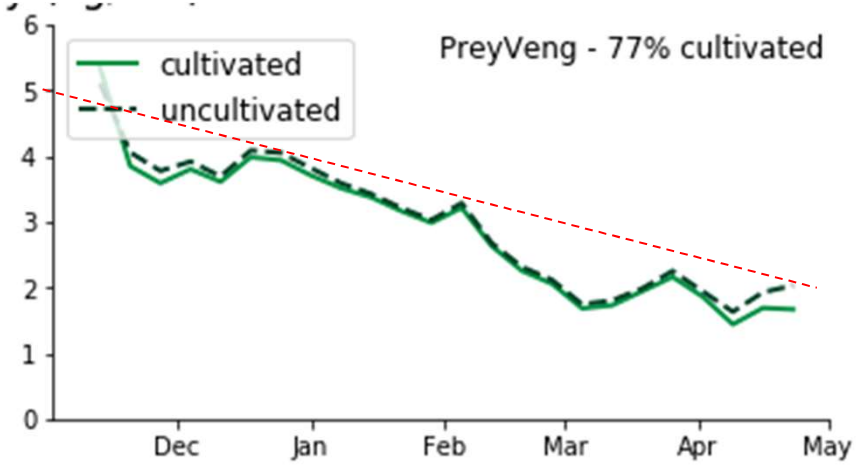


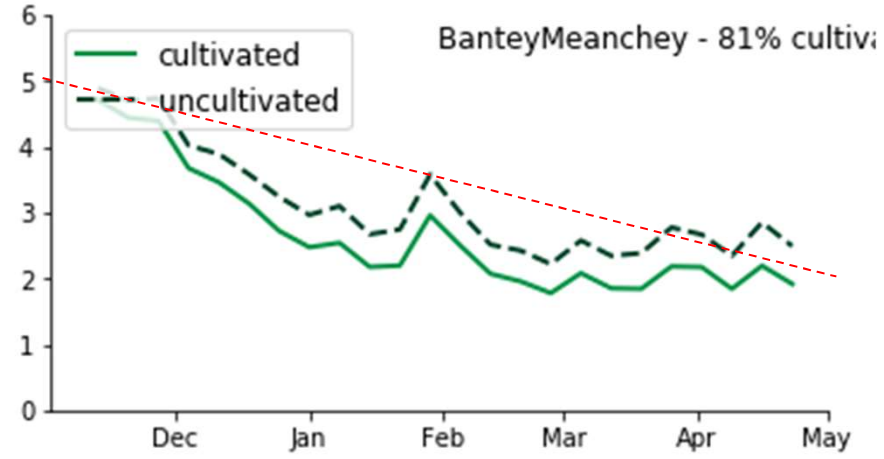




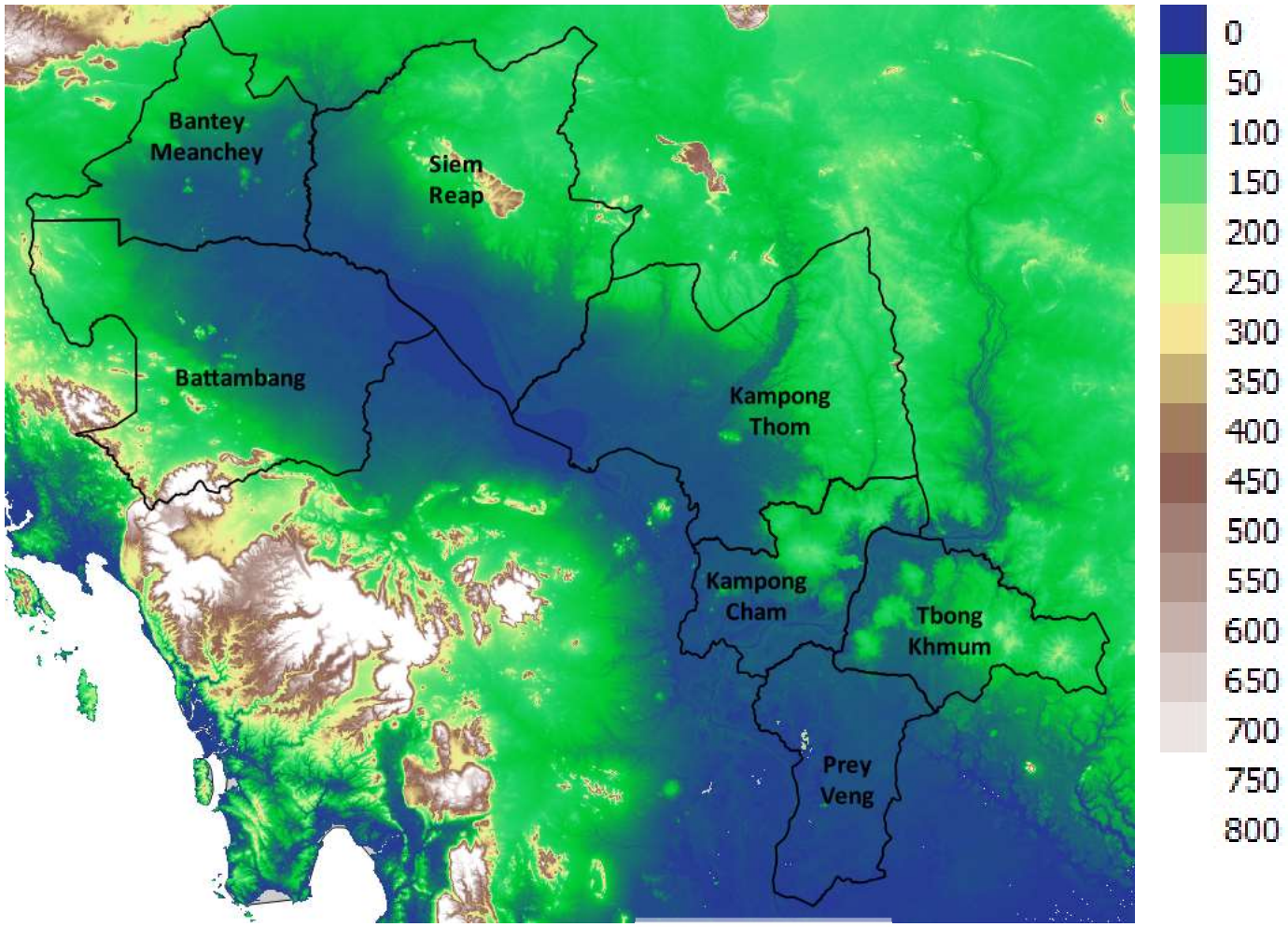
Biomass water productivity in cultivated and uncultivated land





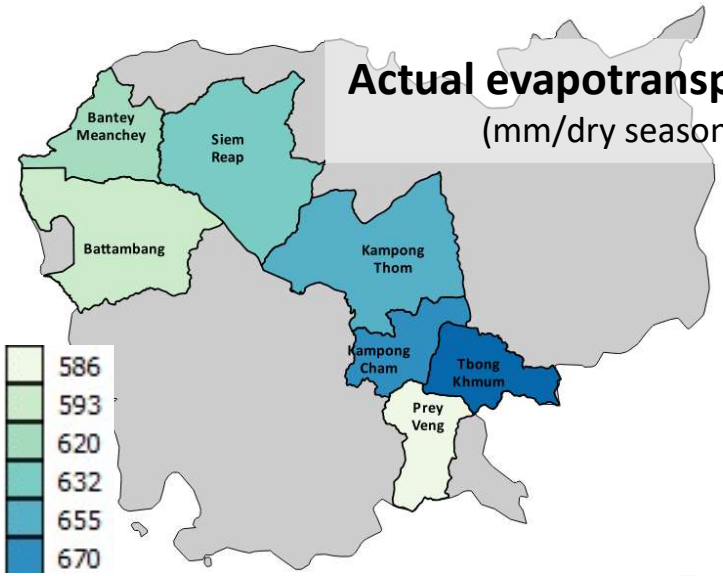


Elevation

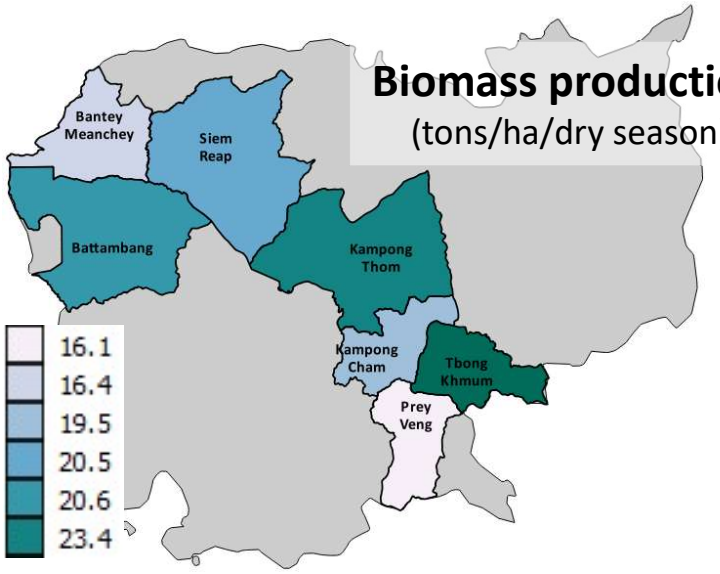


Source: SRTM DEM

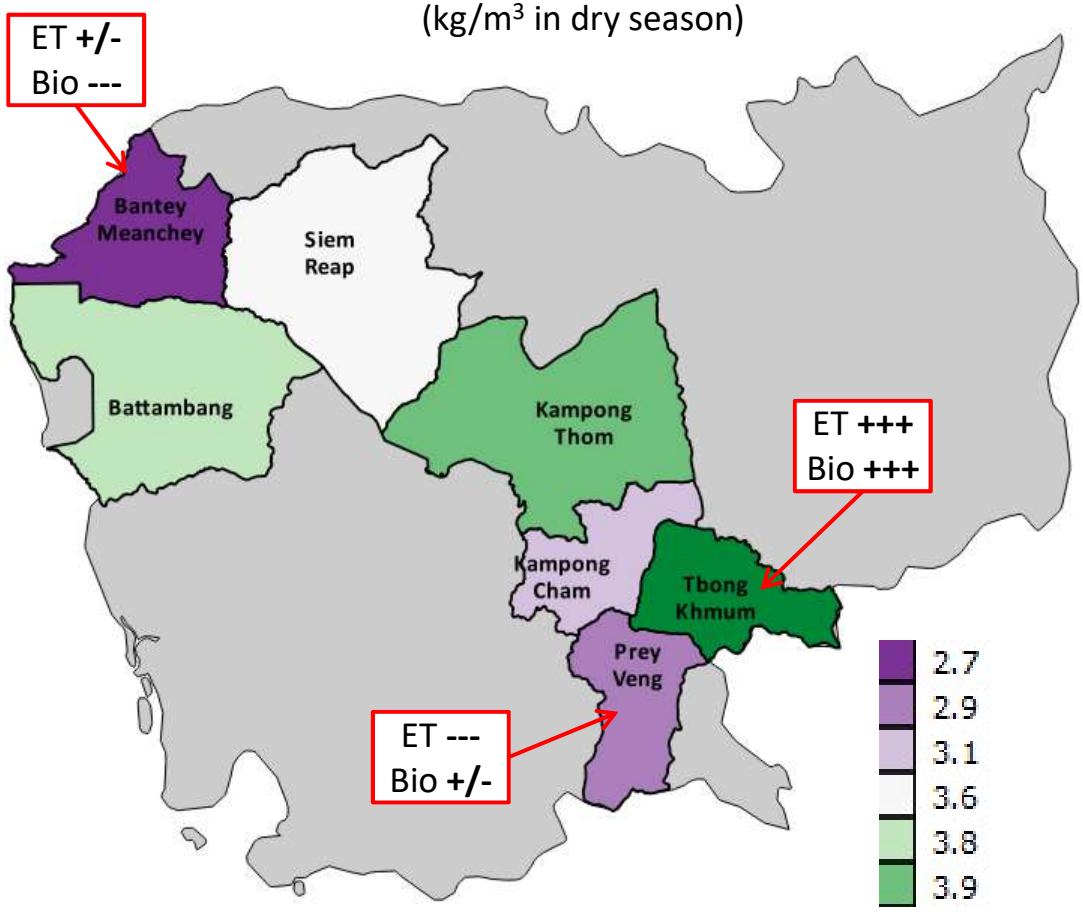
Actual evapotranspiration
(mm/dry season)



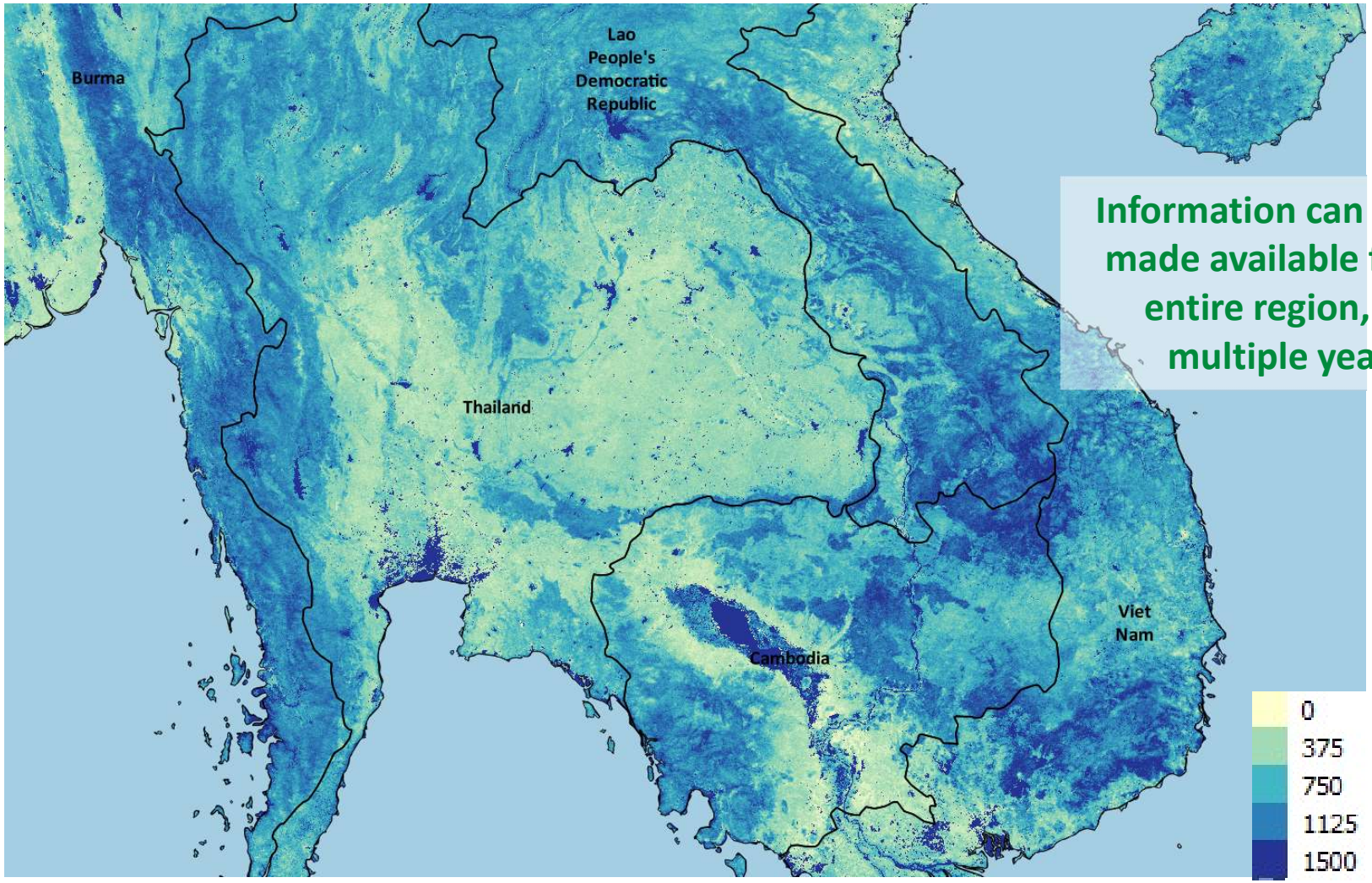
Biomass production
(tons/ha/dry season)



Biomass water productivity
(kg/m^3 in dry season)

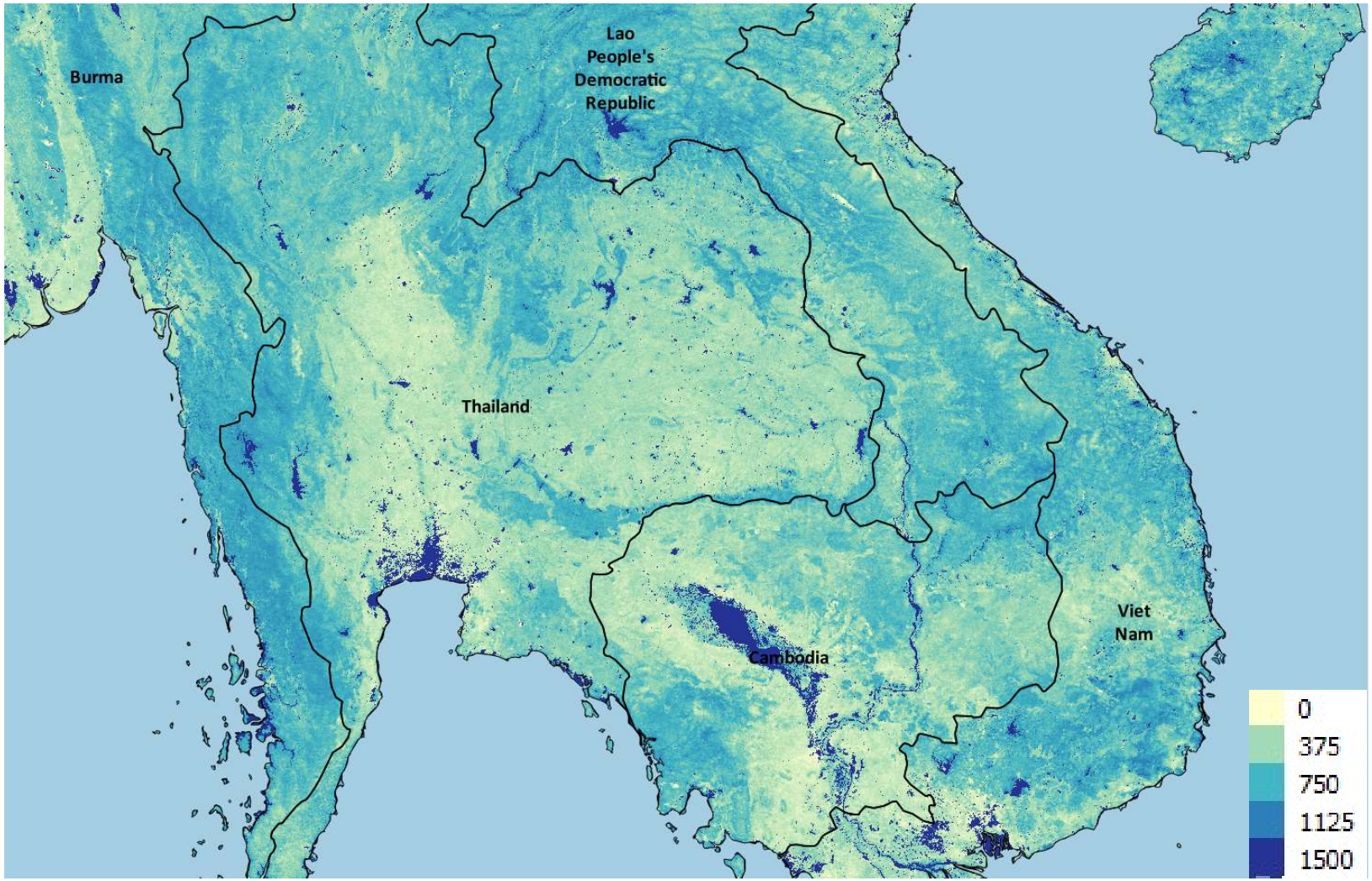


Annual actual evapotranspiration 2011 (mm/year)

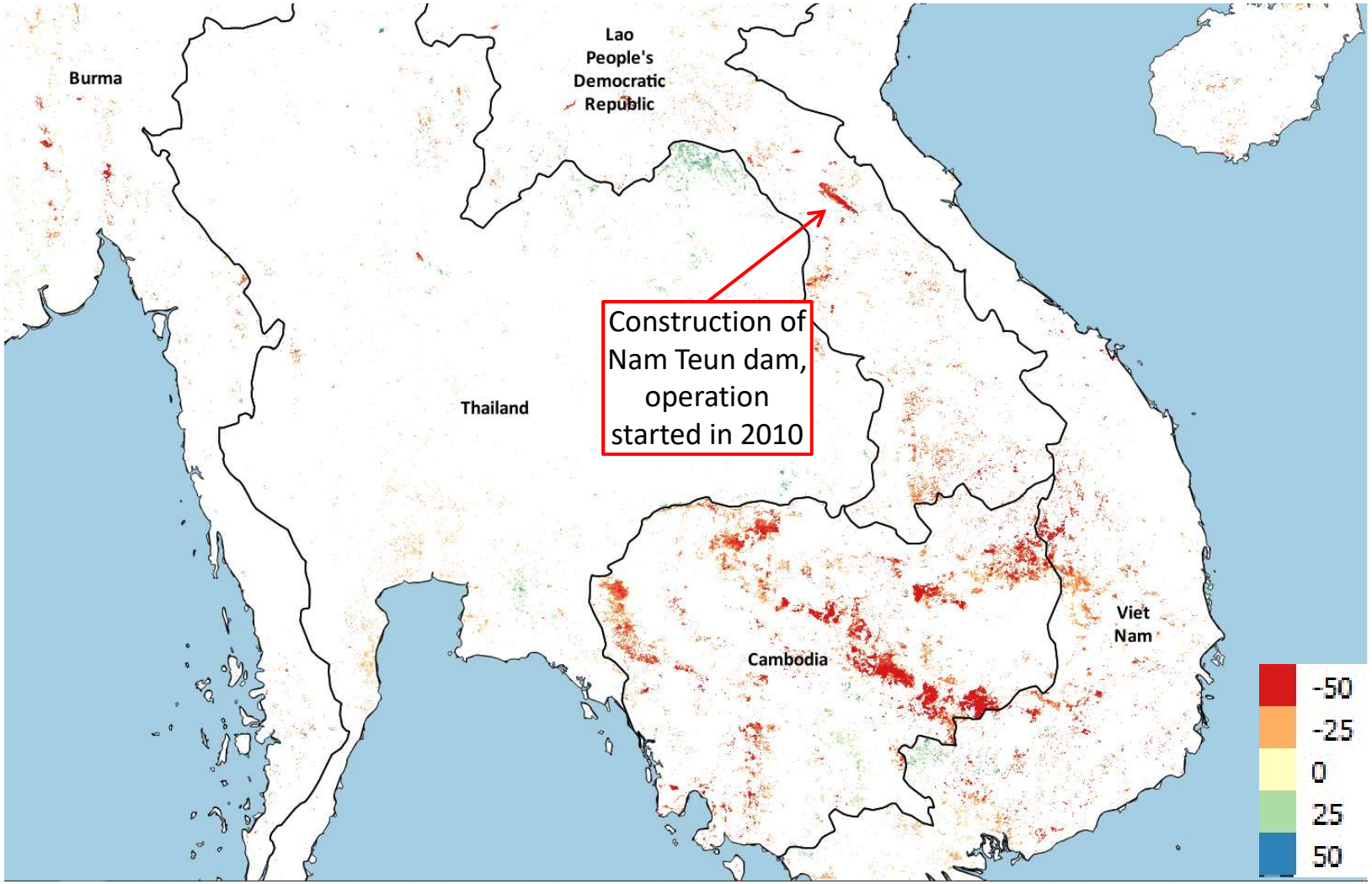


Information can also be made available for the entire region, and multiple years!

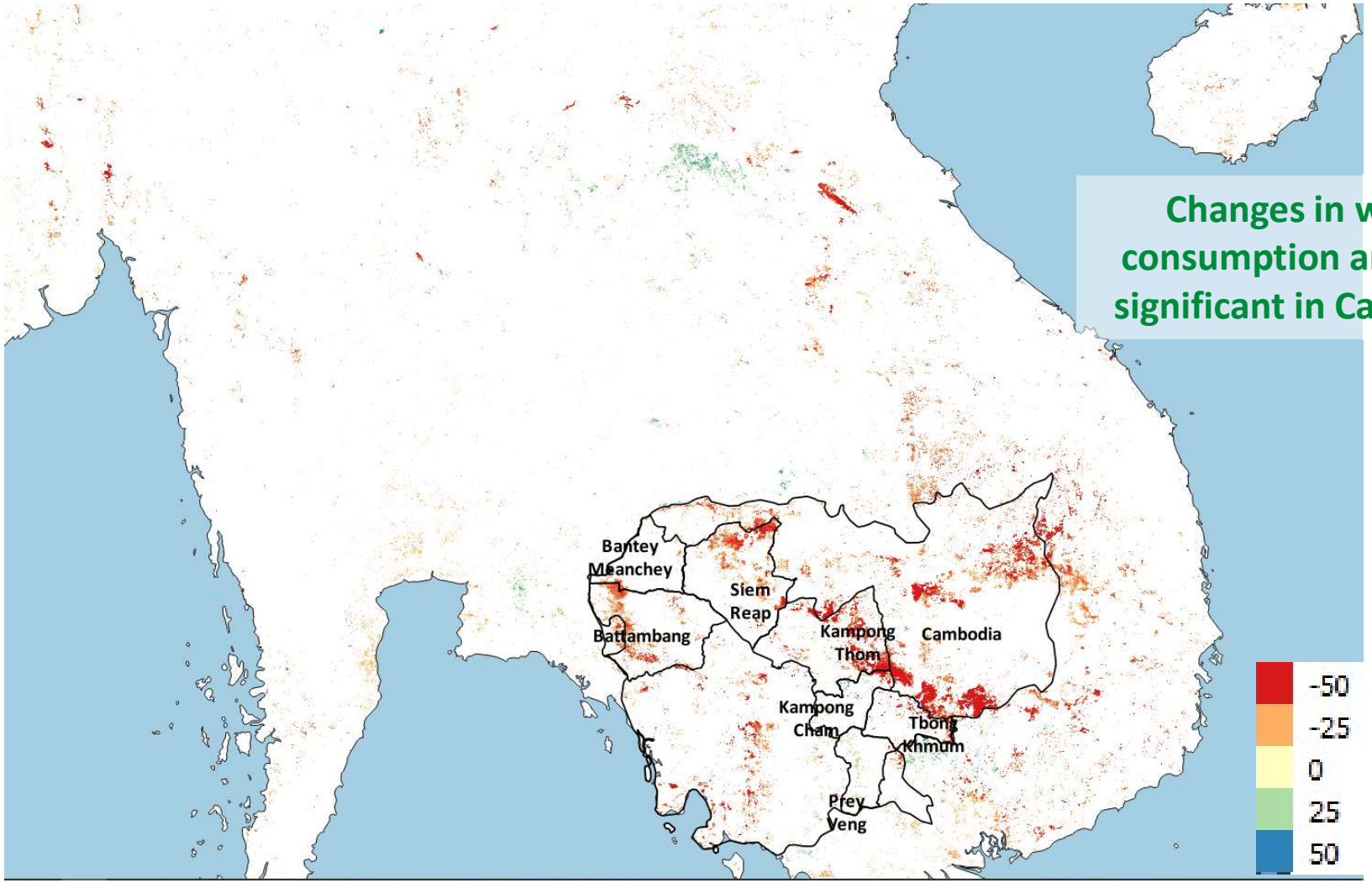
Annual actual evapotranspiration 2016 (mm/year)



Trends in actual evapotranspiration (mm/year change from 2001-2016)

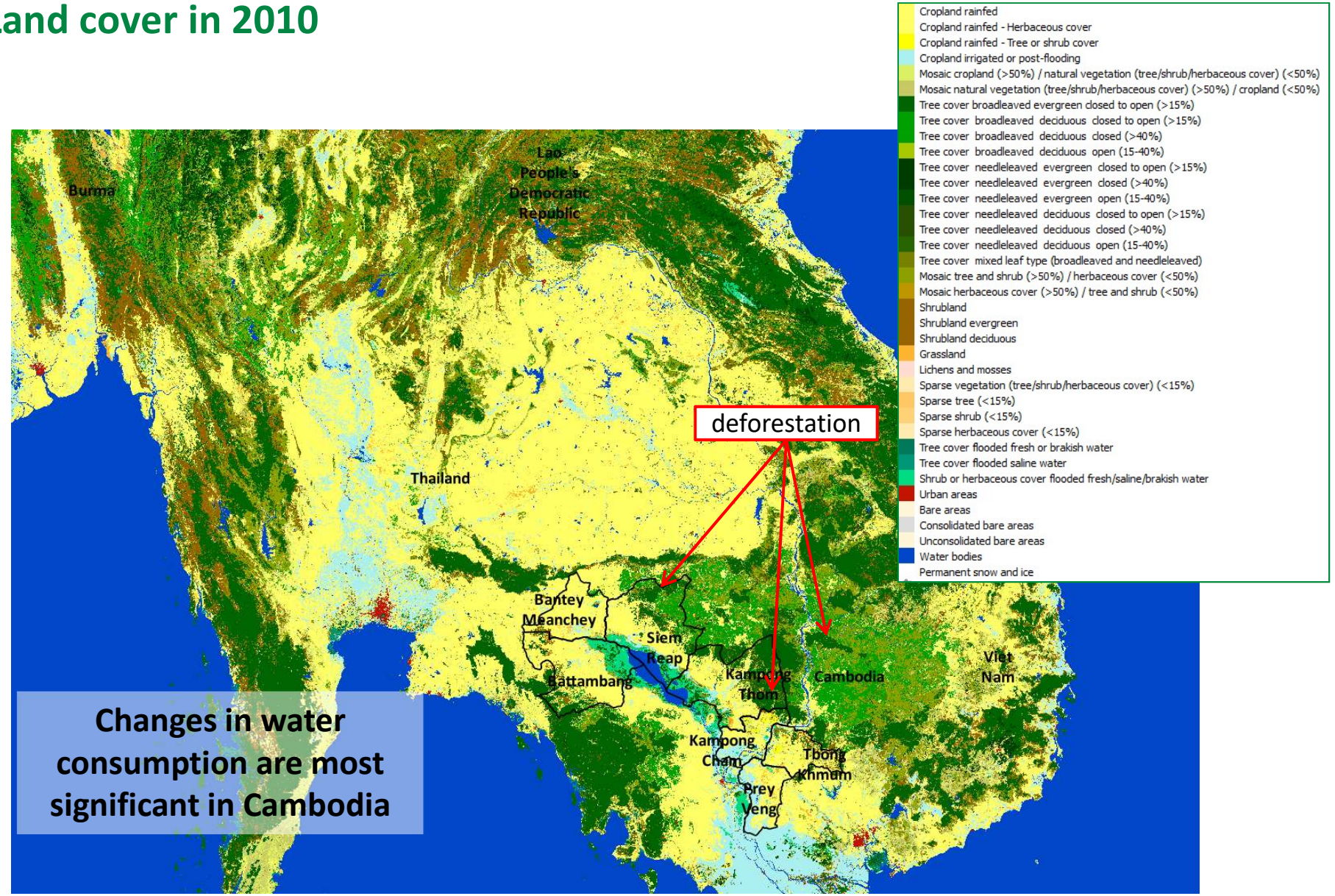


Trends in actual evapotranspiration (mm/year change from 2001-2016)

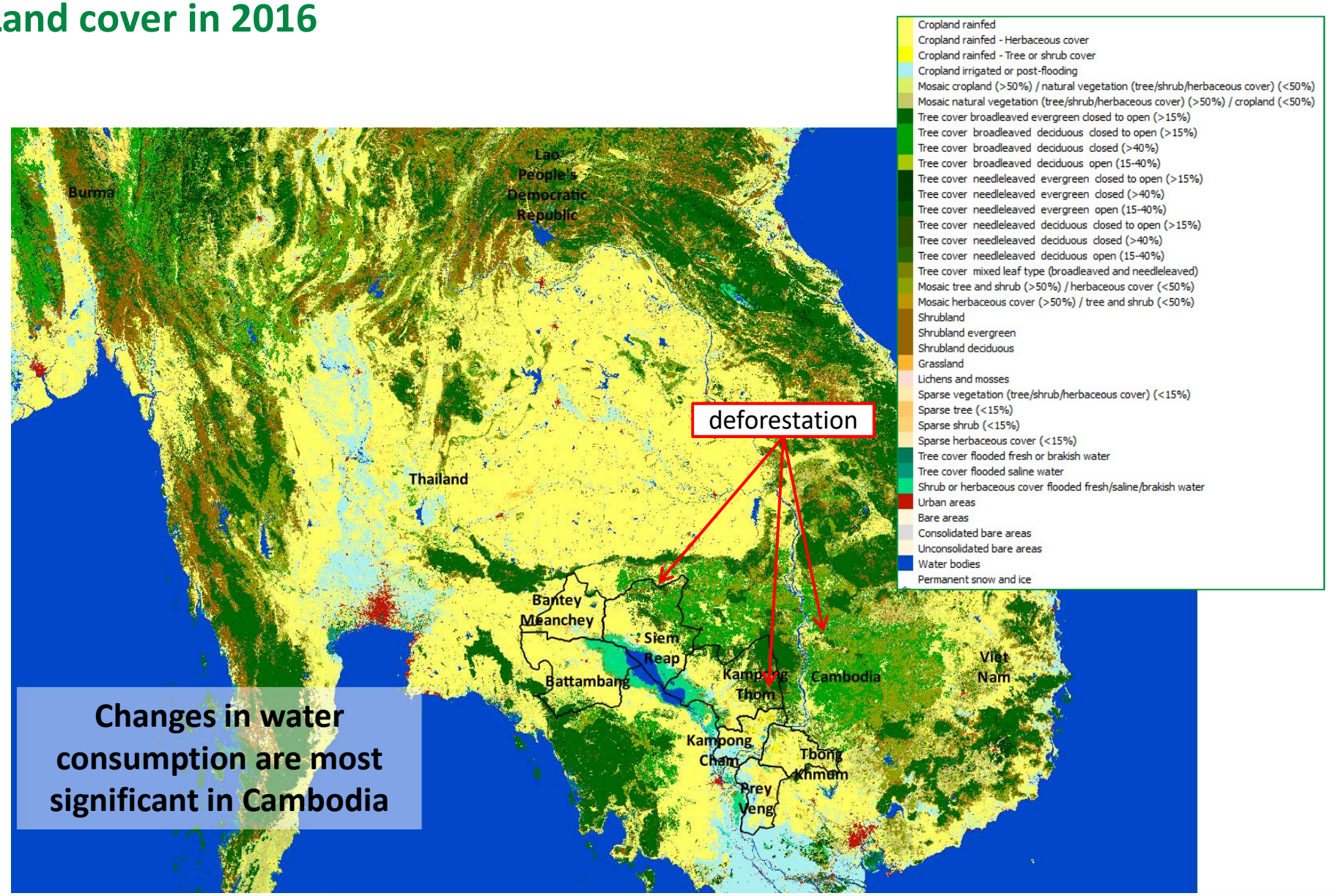


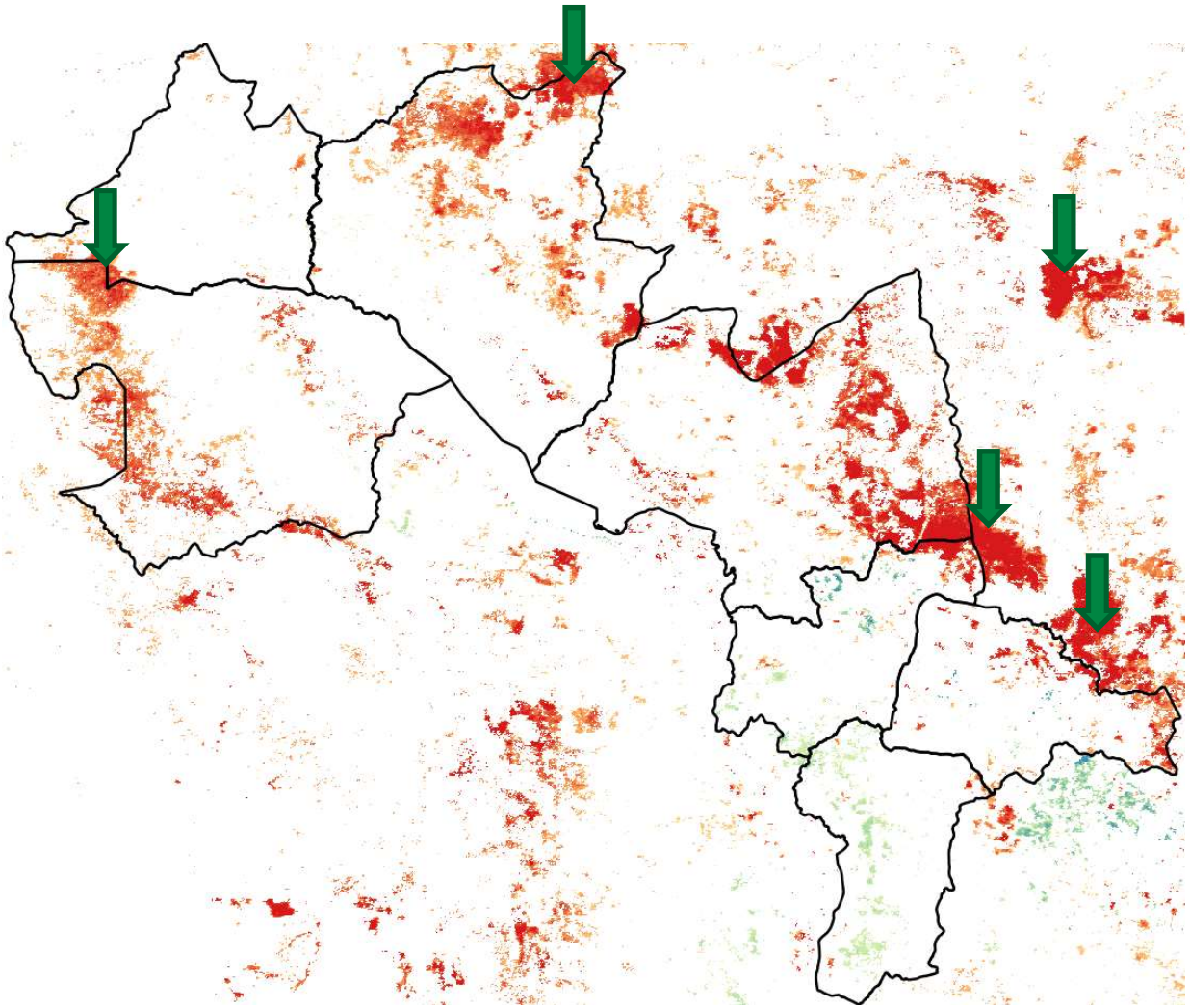
Changes in water consumption are most significant in Cambodia

Land cover in 2010



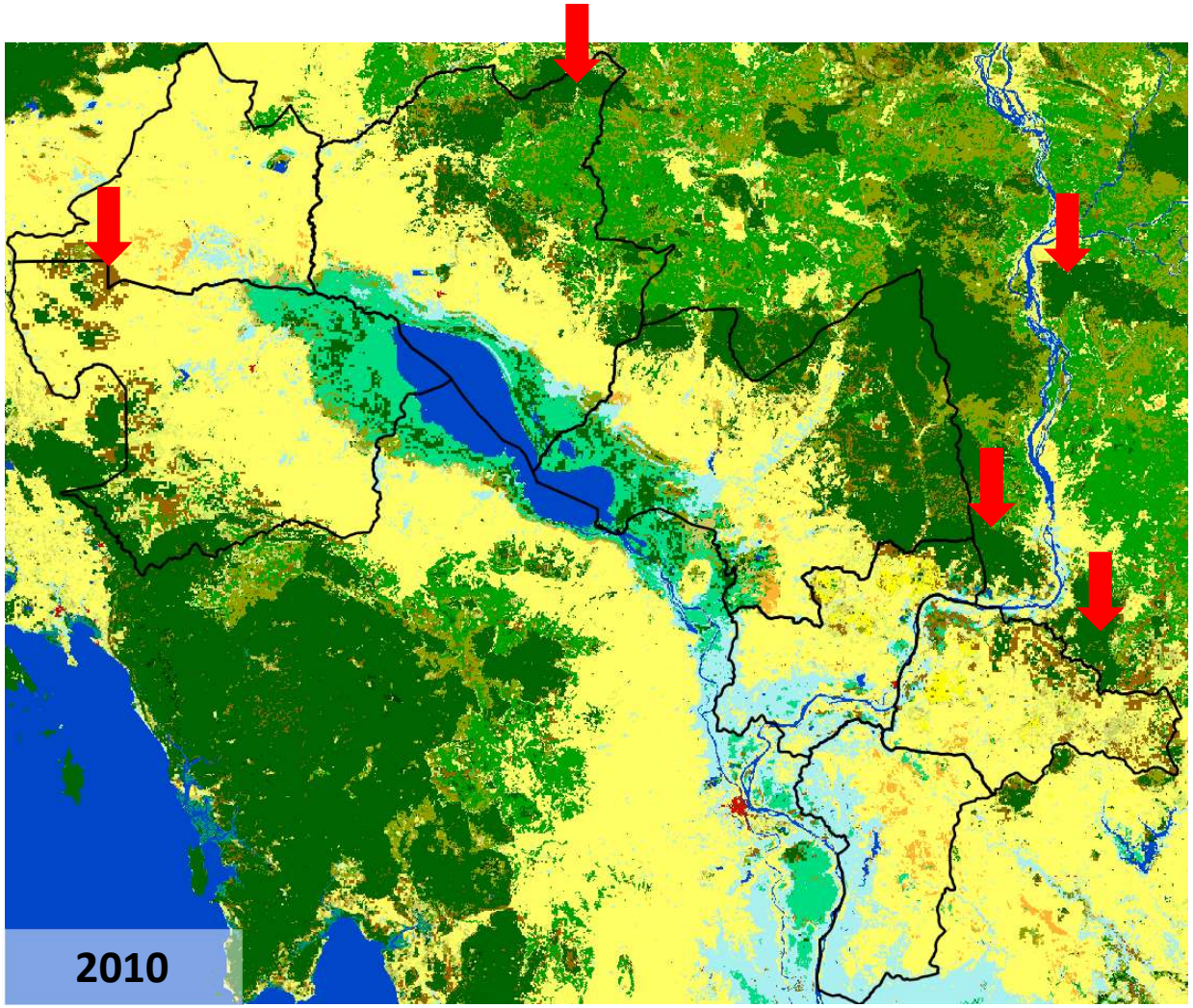
Land cover in 2016

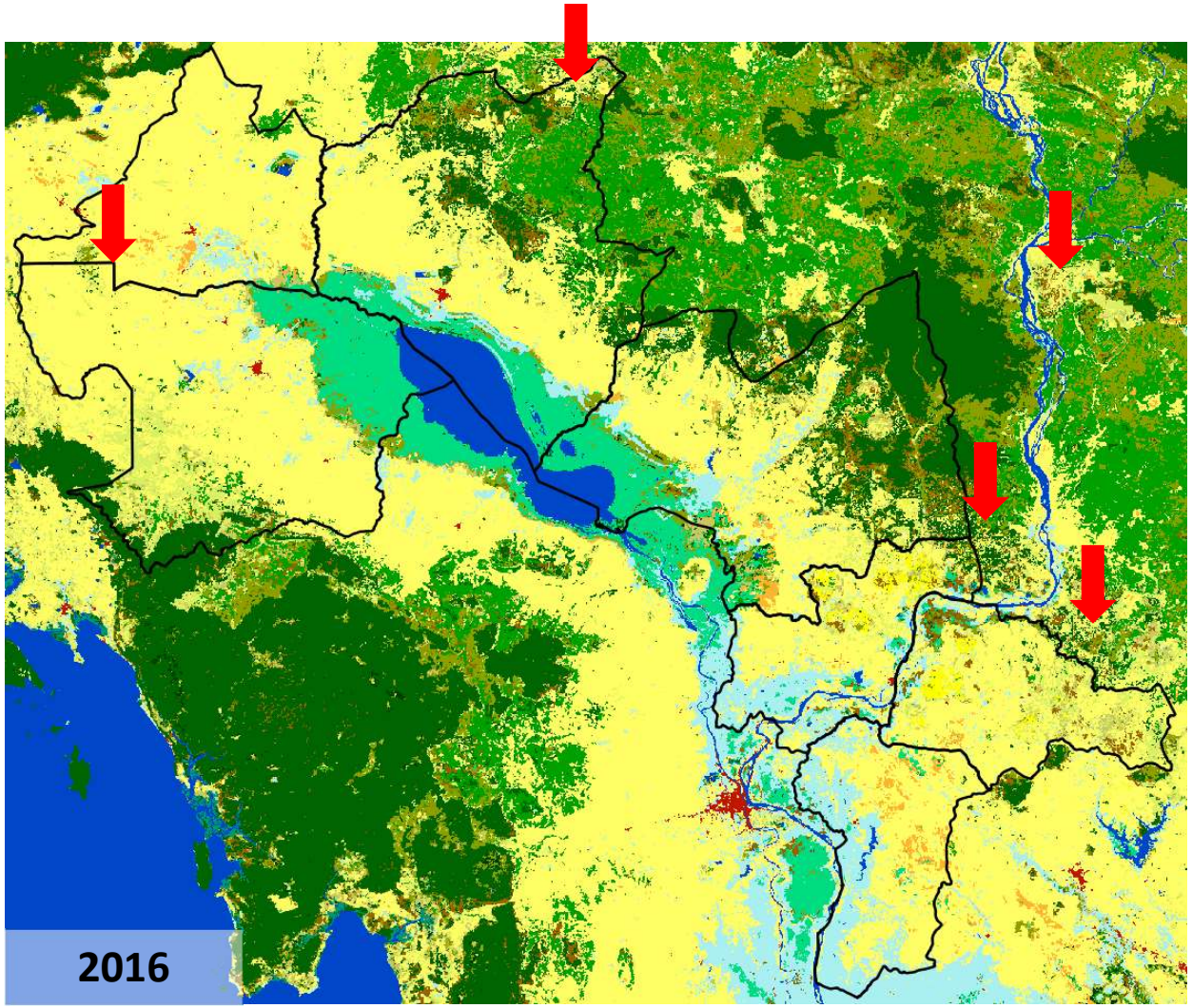


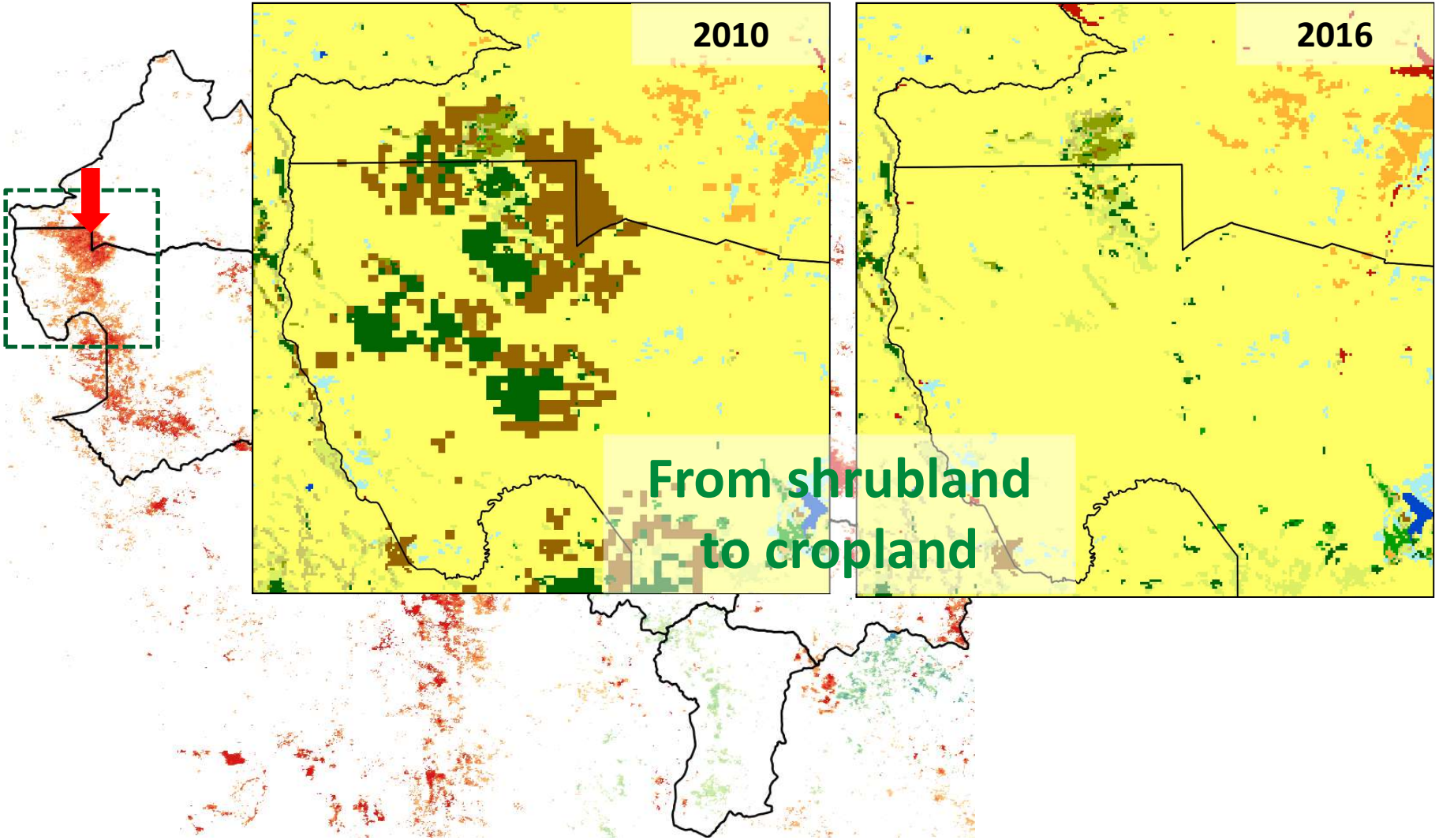


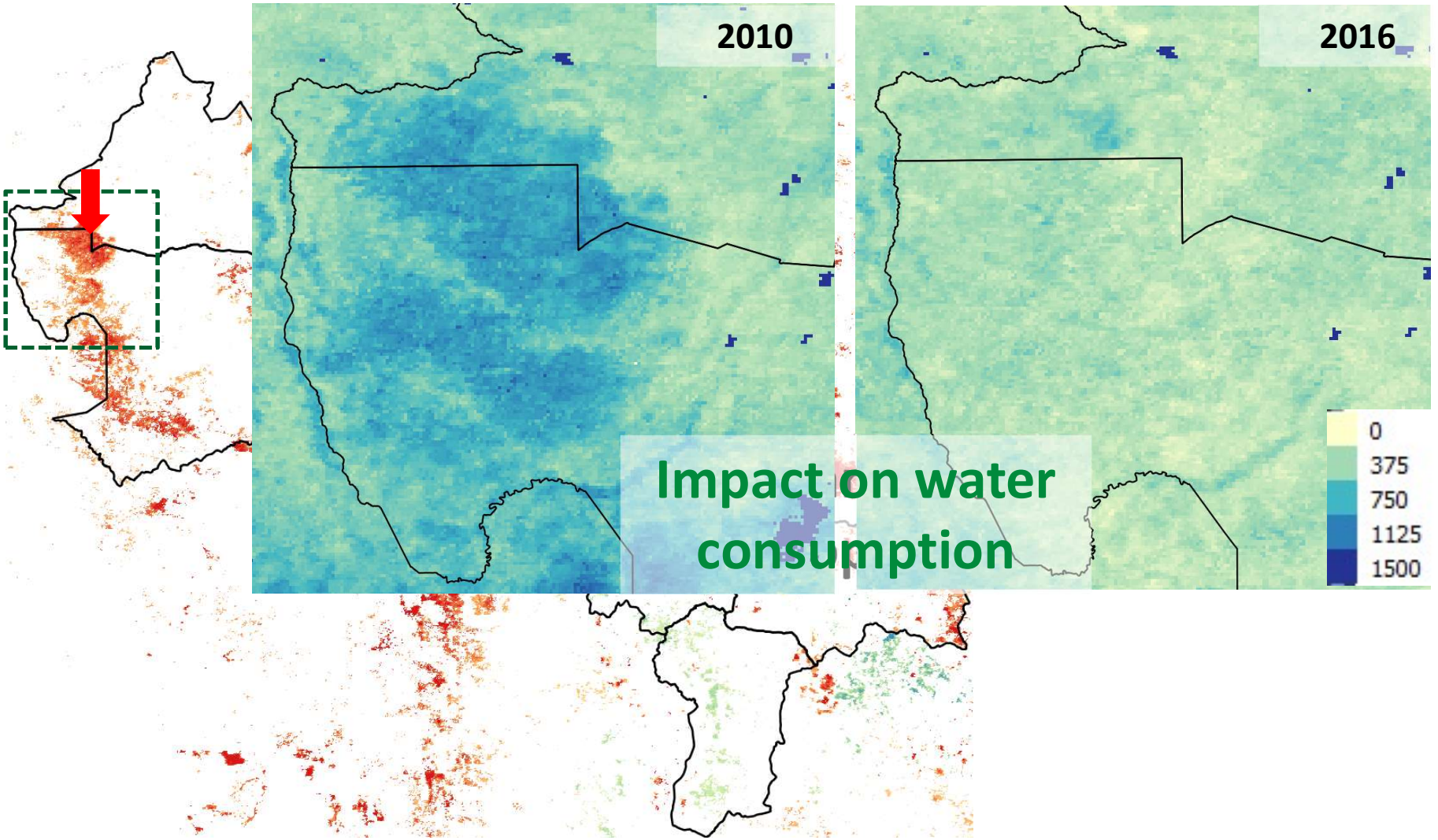
Largest decrease in water consumption in mountains:

Deforestation


2010


2016


2010
2016
From shrubland
to cropland


2010
2016
0
375
750
1125
1500
Impact on water consumption

Service fact sheet

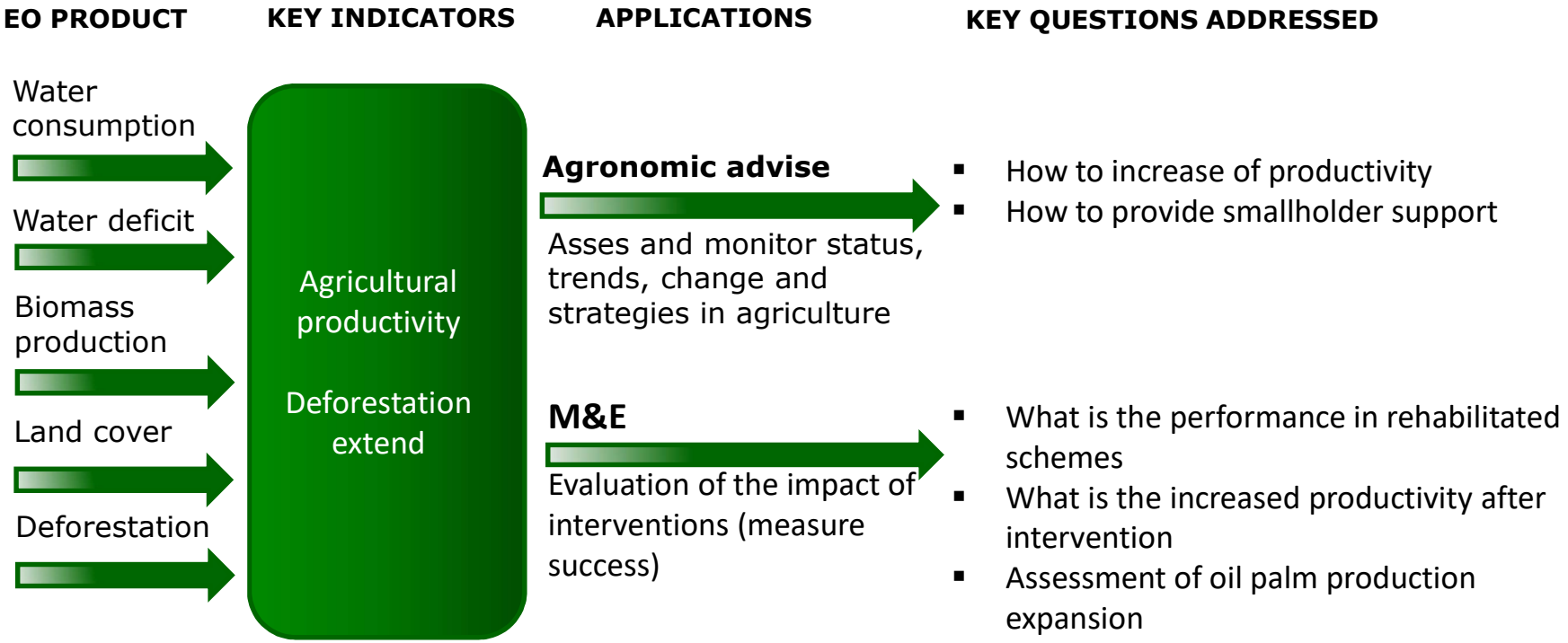
EO product	Cultivated area	Biomass production	Water consumption	Soil moisture
Detail	medium/high	Field level & regional	Field level & regional	low
Period	Historic / NRT	Historic / NRT	Historic / NRT	Historic / NRT
Frequency	Yearly/custom	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom	Weekly/monthly/yearly/custom
Format	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report
Access	Open/Commercial	Open/Commercial	Open/Commercial	Open/Commercial
Cost range (USD)	0 - on request	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD

EO indicator	Agricultural water productivity	Agricultural drought risk
Detail	Field level and regional	Field level and regional
Period	Historic / NRT	Historic / NRT
Frequency	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom
Format	Table/map/graph/report	Table/map/graph/report
Access	Open/Commercial	Open/Commercial
Cost range (USD)	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD

Capacity building event 17 – 19 July 2018, Phnom Penh, Cambodia

- Organised by RiceSPD, ADB and EO4SD-ESA
- 60+ participants from 2 projects
- 3 days of training
- Basic understanding of Earth Observation
- Hands-on data training
- Well received:
  - Data need for baseline
  - Data need for M&E
  - Index crop insurance
- Future events in the planning

Multi-scale monitoring service to assess agricultural and commodity production



Related projects:	
Uganda	Project for Restoration of Livelihoods in the Northern Region (PRELNOR)
	Food Security IAP: Fostering Sustainability and Resilience for Food Security in Karamoja sub-region
	The Integrating climate resilience into agricultural and pastoral production in Uganda, through a Farmer/Agro-pastoralist Field School Approach (LDCF)

Methodology: monitor agricultural production over time

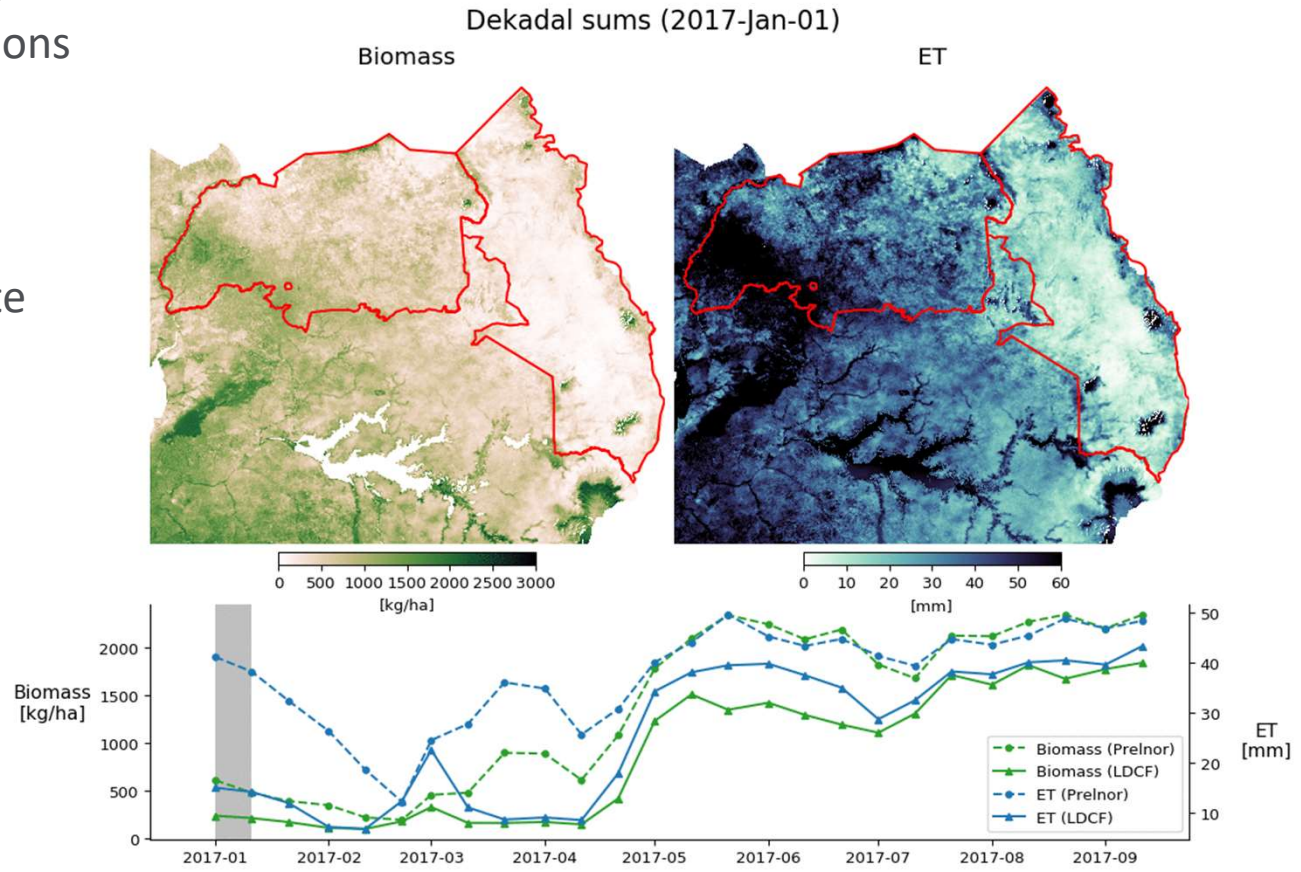
- Monitor productivity changes to evaluate the impact of the interventions (implementing entities)
- Improve smallholders understanding of climate resilient production (stakeholders)

Users in Uganda:

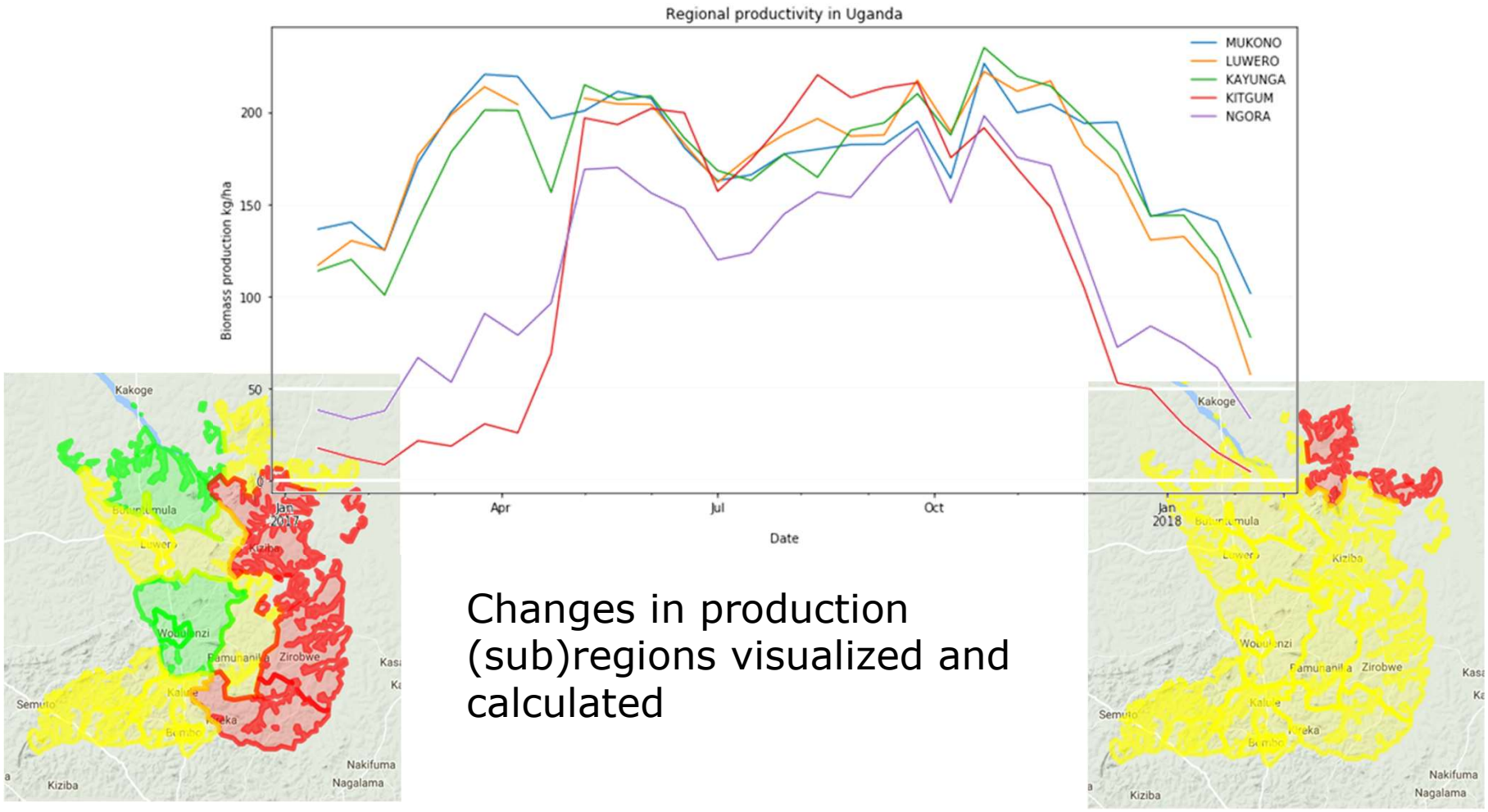
- IFAD
- IAP Food Security

Biomass production

Actual evapotranspiration



Methodology: regional M&E of productivity

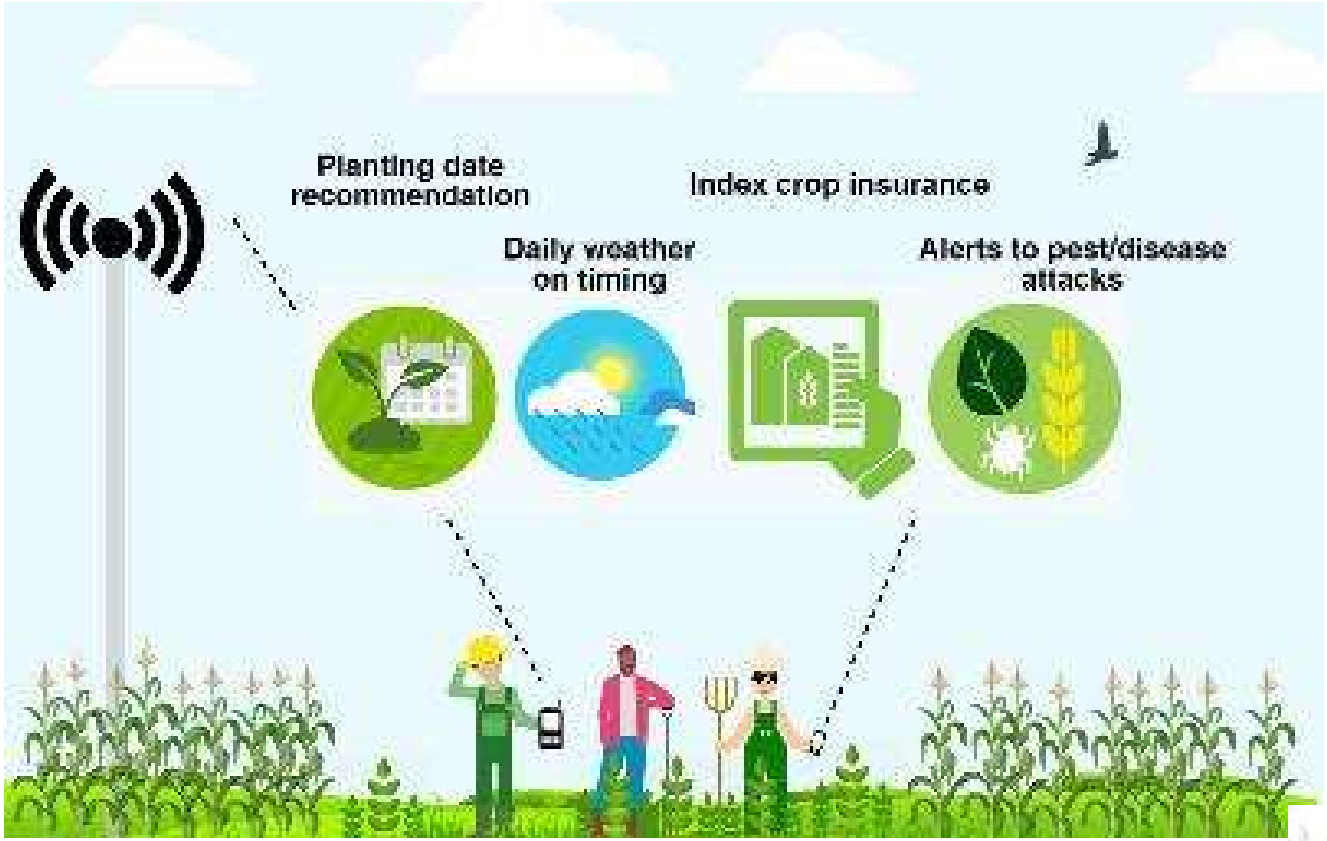


Changes in production (sub)regions visualized and calculated

2017 1st week Feb.

2018 1st week Feb.

Methodology: services for smallholders



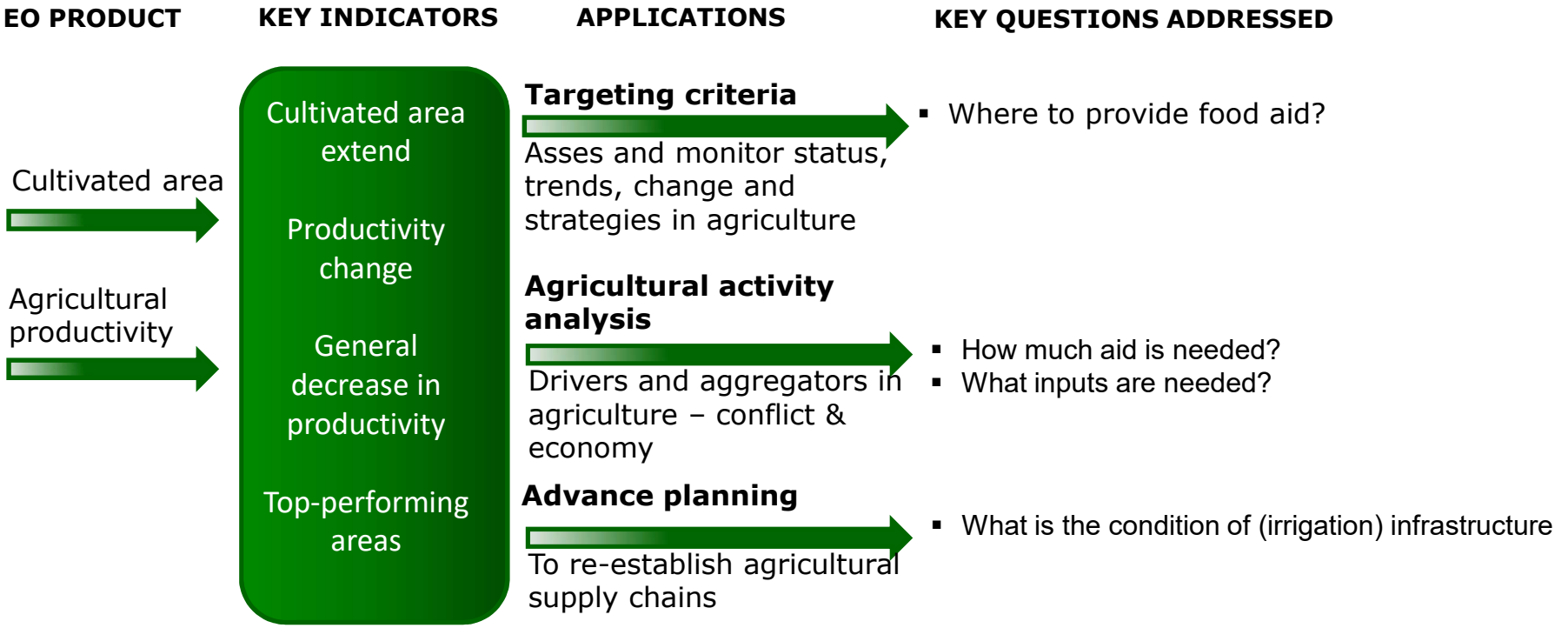
50,000 subscribers in 2018

Service factsheet

EO product	Water consumption	Water deficit	Biomass production	Land cover	Deforestation
Detail	medium/high	medium/high	medium/high	medium/high	medium/high
Period	Historic / NRT	Historic / NRT	Historic / NRT	Historic / NRT	Historic / NRT
Frequency	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom	yearly/custom	yearly/custom
Delivery type	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report
Source	Open/Commercial	Open/Commercial	Open/Commercial	Open/Commercial	Open/Commercial
Cost range (USD)	1-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD			on request	on request

EO indicator	Agronomic advice	M&E
Detail	Medium/high	low/medium/high
Period	Historic / NRT	Historic / NRT
Frequency	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom
Delivery type	Table/map/graph/report	Table/map/graph/report
Source	Institutional / Commercial	Institutional / Commercial
Cost range (USD)	5-75 US$/ha, on request	5-75 US$/ha, on request

Multi-scale monitoring service to assess food security



Related project:	
Syria	The World Bank Economic and Social Impact Assessment (ESIA) team

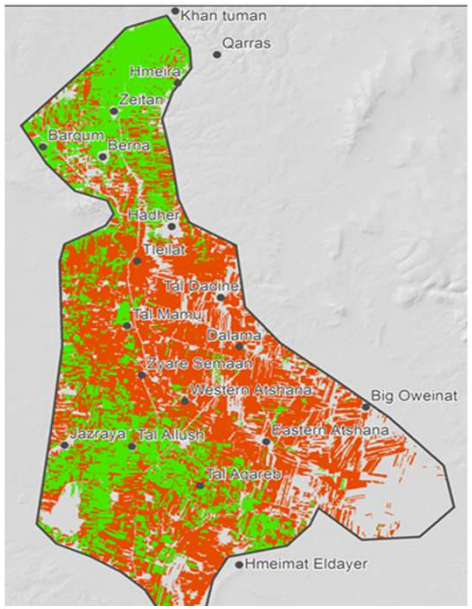
Methodology: provide statistics on cultivated areas at local and national scale

Satellite EO analysis 2011|2016- results for Al Eis (irrigation scheme Aleppo):

- **Cultivated area:** reduced by 64% (from 34,327 to 12,308 ha)
- **Agricultural productivity:** reduced by 36% (winter) and 47% (summer)
- **Irrigation:** in summer 2016 only 4% of scheme irrigated

Users: The World Bank Economic and Social Impact Assessment (ESIA) team needed to assess and monitor status, trends, and adaptive/ coping strategies in agricultural areas in Syria.

Problem: Inaccessible country - disrupted data collection and unreliable agricultural statistics.



Cultivated area extent change

Cultivated area extent change 2011 - 2016

Remaining cropland

Abandoned land

Productivity change

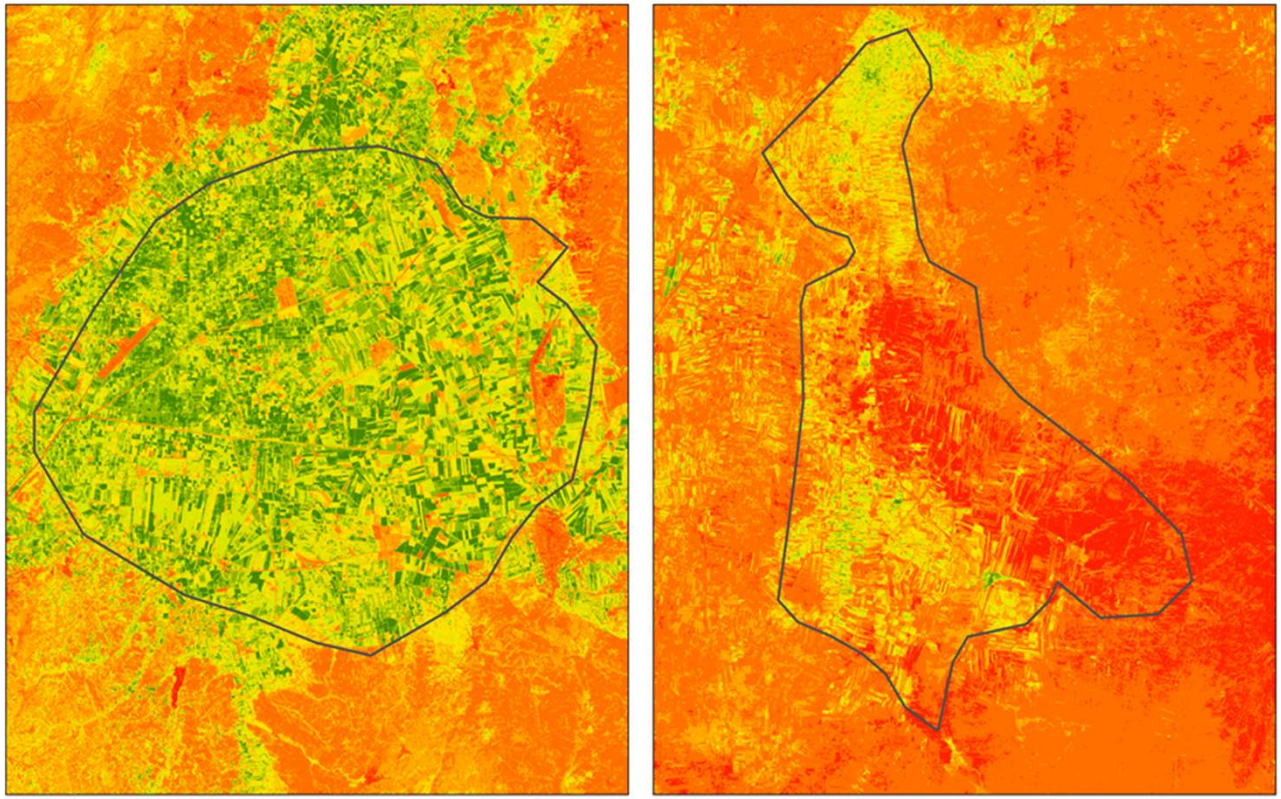
Greenness **September 2011-16**

less more

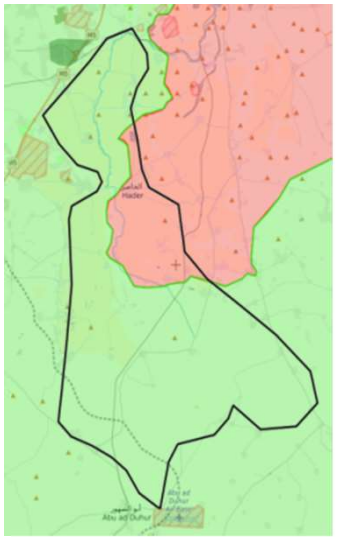
Vegetation activity in non-conflict and conflict areas

- Turkish area on the left is very productive with high maximum values (green)
- Al Eis irrigation scheme in Syria (right figure) shows no or low vegetation productivity (red to yellow)

maximum value of chlorophyll vegetation in 2017, derived from 60 Sentinel 2 images



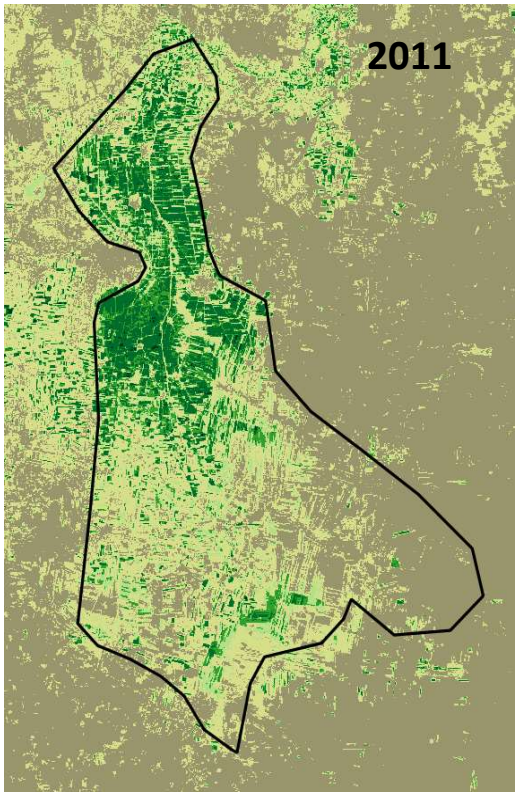
Coping and adaptive strategies



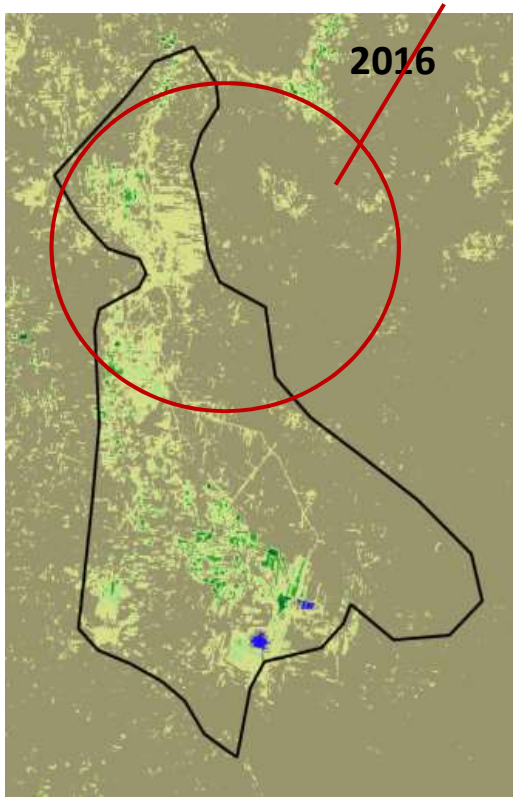
syria.liveuamap.com

Productivity

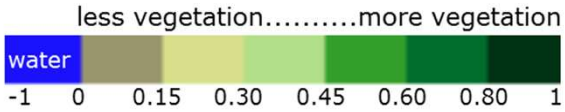
Impact of conflict



pre-conflict



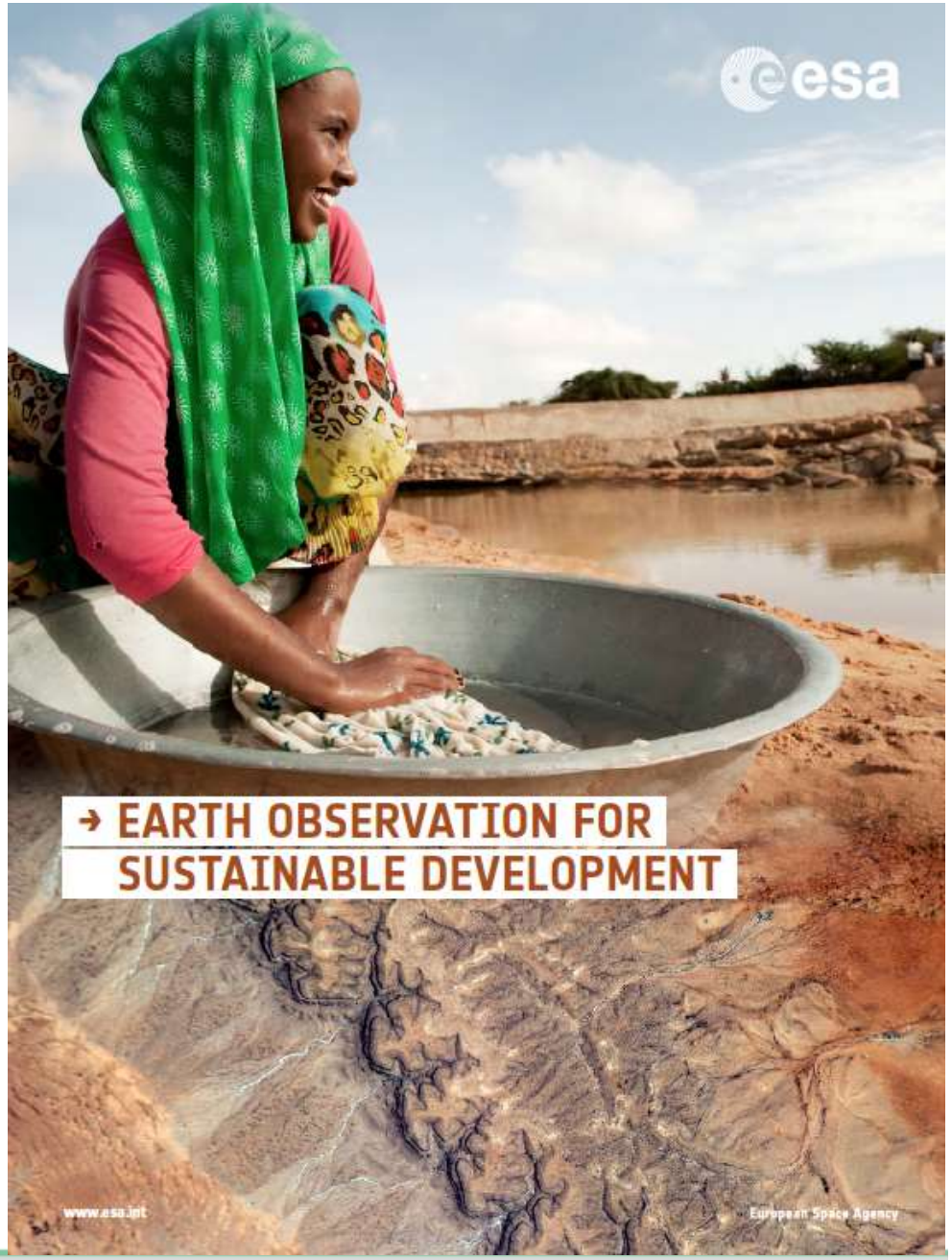
during conflict



Methodology: assess post-conflict support for food security

- **Food aid:**
  - Indicate priority regions for food aid as areas with highest % of production loss
  - Quantify aid / food aid per tonne per region as missing biomass /yield

- **Rehabilitation aid:**
  - Convert difference pre/post conflict growth in quantified inputs per region (seed / other)
  - Indicate areas of structural damage (pumping station/canal destruction)

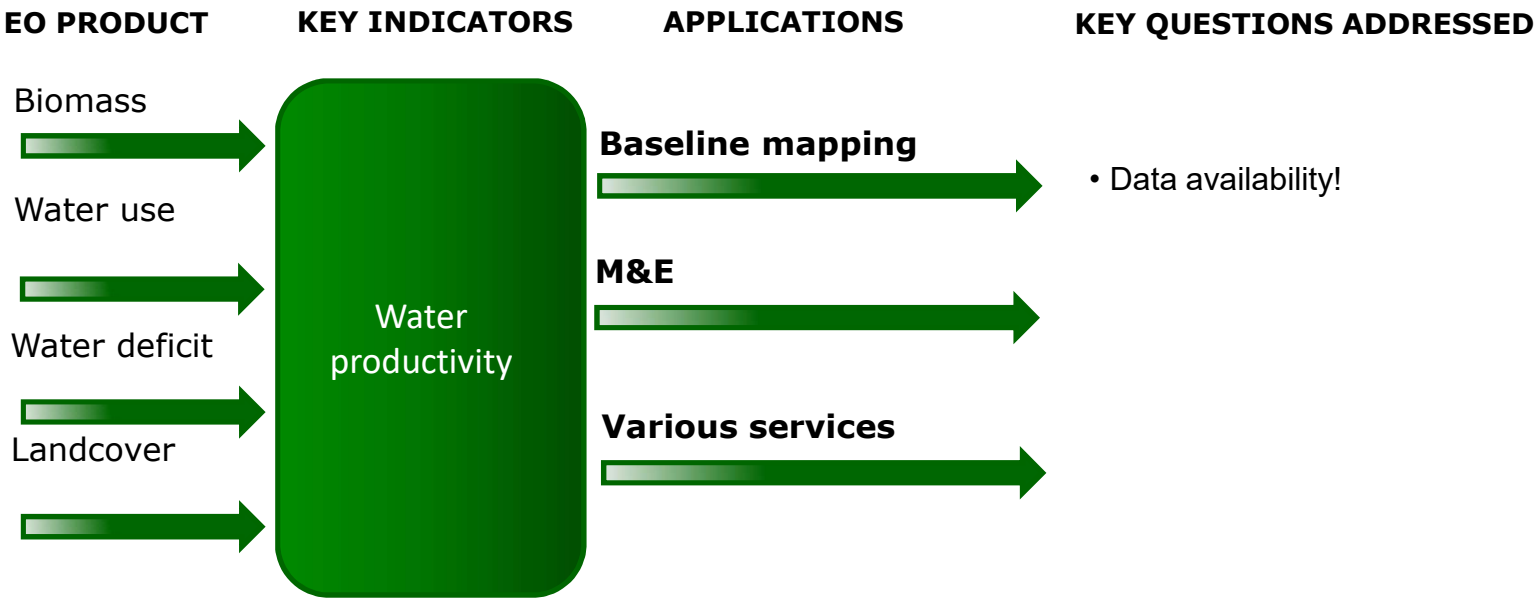


Service fact sheet

EO product	Cultivated area	Agricultural productivity
Detail	medium/high	Field level and regional
Period	Historic / NRT	Historic / NRT
Frequency	Yearly/custom	Daily/weekly/monthly/yearly /custom
Delivery type	Table/map/graph/report	Table/map/graph/report
Source	Open/Commercial	Open/Commercial
Cost range (USD)	0 - on request	0-10 USD/ha | 0.5-1.0 USD/km2, minimum order size 25,000 USD

EO indicator	Targeting criteria	Agricultural activity analysis	Advance planning
Detail	low/medium/high	low/medium/high	low/medium/high
Period	Historic / NRT	Historic / NRT	Historic / NRT
Frequency	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom	Daily/weekly/monthly/yearly/custom
Delivery type	Table/map/graph/report	Table/map/graph/report	Table/map/graph/report
Source	Institutional / Commercial	Institutional / Commercial	Institutional / Commercial
Cost range (USD)	2-75 US$/ha, on request	5-75 US$/ha, on request	2-75 US$/ha, on request

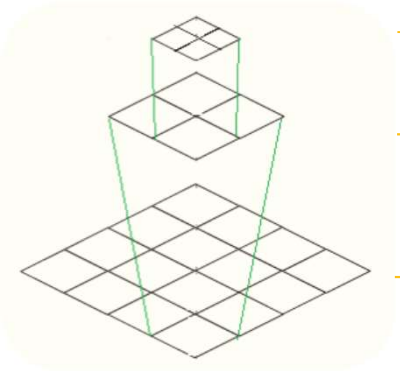
Large scale earth observation of water productivity



Related demonstrations:	
WaPOR	Full continent of Africa

Large scale earth observation of water productivity

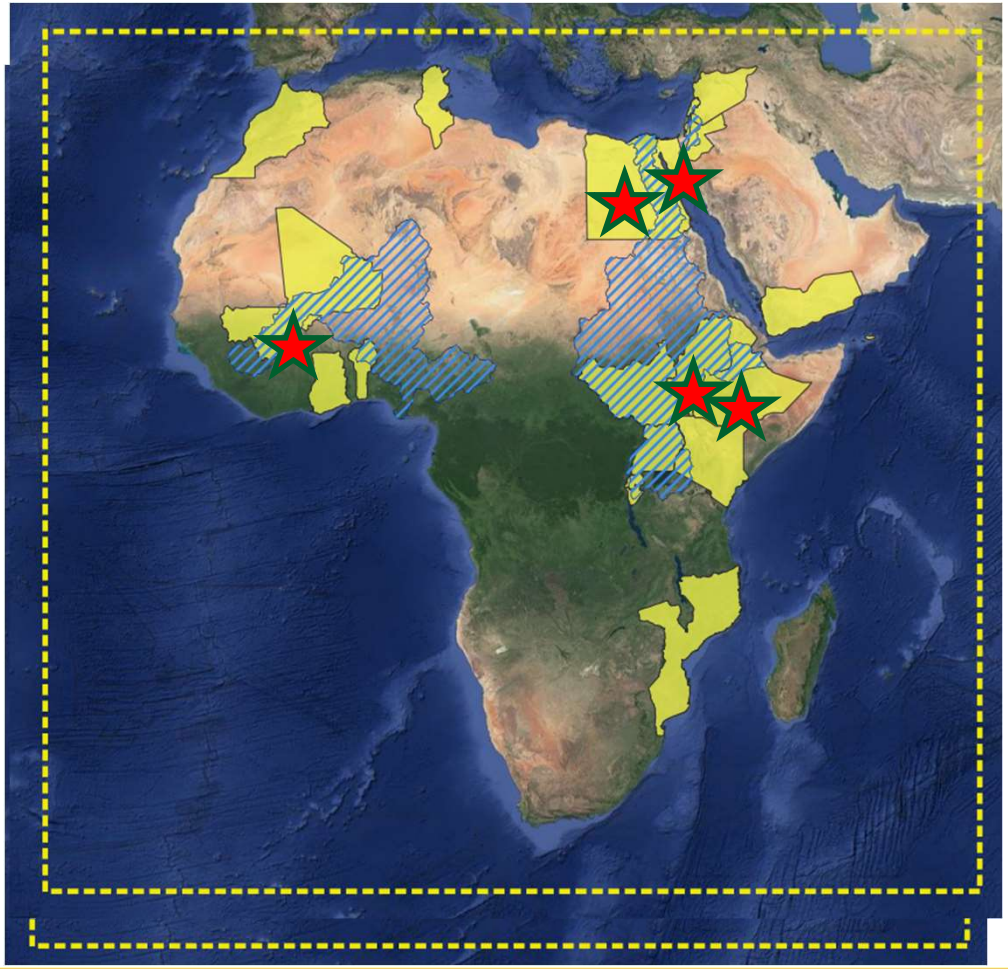
Ten years: 2009 - 2019



Level 3 – 30 m

Level 2 – 100 m

Level 1 – 250 m



Consortium:

eleaf vito

ITC UNIVERSITY OF TWENTE.

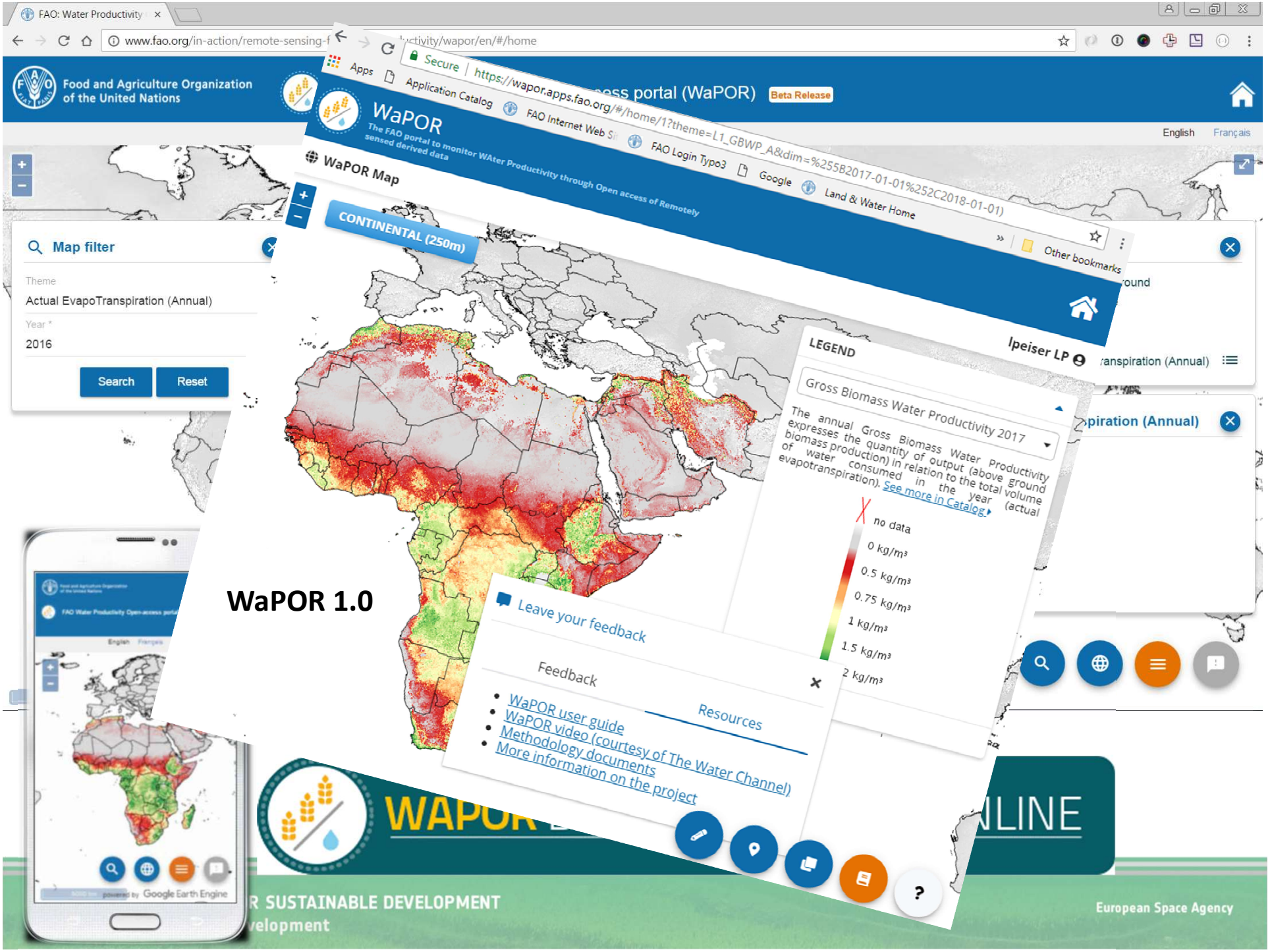
WATERWATCH FOUNDATION

Ministry of Foreign Affairs of the Netherlands

Food and Agriculture Organization of the United Nations

UNESCO-IHE Institute for Water Education

IWMI International Water Management Institute


FAO: Water Productivity
www.fao.org/in-action/remote-sensing-f
ctivity/wapor/en/#/home
Food and Agriculture Organization of the United Nations
Secure | https://wapor.apps.fao.org/#/home/1?theme=L1_GBWP_A&dim=%255B2017-01-01%252C2018-01-01)
Apps
Application Catalog
FAO Internet Web
FAO Login Typo3
Google
Land & Water Home
Other bookmarks
ess portal (WaPOR)
Beta Release
English
Français
WaPOR
The FAO portal to monitor WAter Productivity through Open access of Remotely sensed derived data
WaPOR Map
CONTINENTAL (250m)
Map filter
Theme
Actual EvapoTranspiration (Annual)
Year *
2016
Search
Reset
LEGEND
Ipeiser LP
Gross Biomass Water Productivity 2017
The annual Gross Biomass Water Productivity expresses the quantity of output (above ground biomass production) in relation to the total volume of water consumed in the year (actual evapotranspiration). See more in Catalog
no data
0 kg/m³
0.5 kg/m³
0.75 kg/m³
1 kg/m³
1.5 kg/m³
2 kg/m³
piration (Annual)
WaPOR 1.0
Leave your feedback
Feedback
Resources
WaPOR user guide
WaPOR video (courtesy of The Water Channel)
Methodology documents
More information on the project
?
NLINE
R SUSTAINABLE DEVELOPMENT
velopment
European Space Agency

Service fact sheet

EO product	Water productivity
Detail	Field level and regional
Period	Historic / NRT
Frequency	10 Daily - custom
Delivery type	Map
Source	Commercial
Cost range (USD)	2,5 – 5 million US$

Round table questions

- Evaluate requirements for successful embedment of EO services in the project cycle
- Discuss opportunities in upcoming projects and programmes for EO services
- Discuss what additional support from EO specialists is required
  - Access to (demo)services
  - Project preparation
  - Capacity building

agriculture and rural development
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Thank you!

For more information
http://eo4sd.esa.int/agriculture
http://eo4sd.Lizard.net