Workshop

Digital applications in small-scale irrigation

Rationale

Digital applications for improving efficiency and for monitoring agricultural water use play an increasing role in the debate on small-scale irrigation in international cooperation. On one hand, technical processes for minimizing irrigation water and reducing the use of fertilizers as well as for energy savings in irrigation technology can be supported. On the other hand, apps can often facilitate management processes and the monitoring of irrigation and operating systems. However, up to now, digital applications that specifically target small-scale irrigation have only been used sporadically and pilot-like in GIZ projects.

As part of a market analysis*, we are investigating the potential of digital applications for small-scale irrigation. The aim is to identify and structure existing experiences and, based on current developments and challenges, to define further requirements for digital applications in this area.

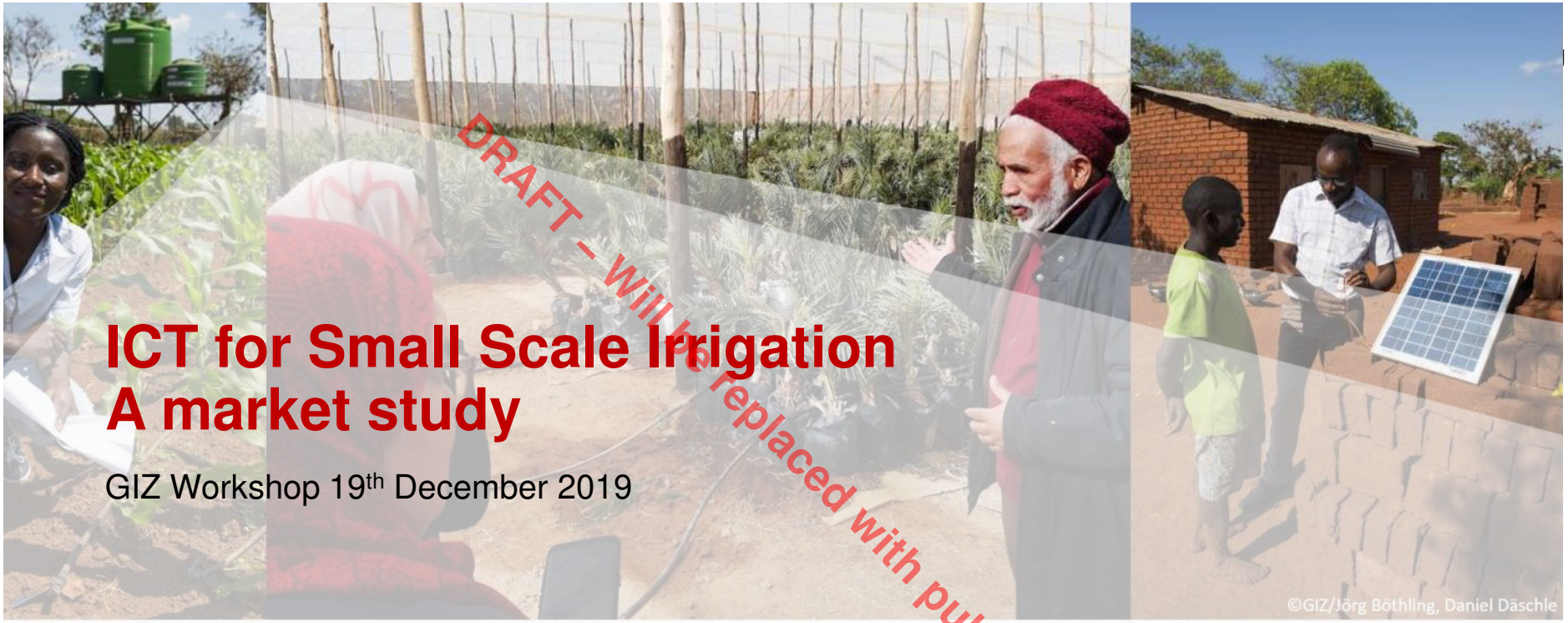
DATE AND PLACE Thursday, December 19th, 2019 9.30 to 12.45 at GIZ Eschborn, meeting room ED20014 and GIZ Bonn meeting room BM13086
Skype for Business Link: https://join.giz.de/meet/matthias.berthold/QS9D9LG6
PARTICIPANTS Members of the GIZ working group water and agriculture, experts from GIZ agriculture and water sector projects, freelance consultants, companies working on the interface water and agriculture, experts from the GIZ sector networks *Mediterranean Environmental Network, Sector Network Rural Development* and *Services on Water and Sanitation*

! Please consider the declaration of data protection attached to the Outlook appointment. The Skype Conference is going to be recorded and by participating (in person or via skype) you are giving you consent.

* The market analysis is supported through the Competence Centers for Agriculture and for Water, SV Sustainable Agriculture, SV Sustainable Waterpolicy, Green Innovation Centres for the Agriculture and Food Sector and the Project Promotion of the productive agriculture, Niger

Agenda

9:30 – 10:00	**Welcome and Introduction**	Marc Nolting (GIZ – G530 Fundamentals of the Rural Future and Food)
10:00-10:45	**Market analysis for digital applications in small-scale irrigation** Presentation of the findings of the market analysis – *What applications are available and where are needs and gaps*	Ralph Elsäßer (Geo Solutions) Moderation: Matthias Berthold (GIZ – SV Sustainable Agriculture)
10:45-11:15	**Stories from the projects** Short flash lights from selected projects - *Things to consider when implementing digital applications in small-scale irrigation*	Julia Jung (GIZ Green Innovation Centres – India) Marc Haering (tbc) (GIZ Integrated water resources management – Morocco) Detlef Klein (KfW Water and Irrigation – West Africa) Lucie Pluschke (GIZ Powering Agriculture – Kenya)
11:15-12:00	**Group Discussion** Reflecting on presented ideas and examples: *What are challenges for up-scaling?* *What can they contribute to small-scale irrigation?* *Which gaps should be filled?*	Your input needed
12:00-12:15	**Where do we go from here? - Hackathon on Water and Agriculture** Highlights from the Hackathon "Trop d'eau, trop peu d'eau" in Marrakech – *What can be done to make smart irrigation more accessible*	Daniel Däschle (GIZ - Competence Centre Water, Wastewater, Waste Management) Pauline Hönnel (GIZ – SV Sustainable Agriculture)
12:15-12:45	**Next Steps** Discussion of a (joint) follow-up	Matthias Berthold (GIZ)
From 12:45	**Snacks and Drinks**	



ICT for Small Scale Irrigation
A market study

GIZ Workshop 19th December 2019

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Agenda

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LTE
ID CARDS
NETWORK EDGE
SENSORS
KNOWLEDGE MANAGEMENT
DIGITAL SCALES
CELLPHONE
WEBSITE
GIGABYTE
ROUTERS
INFORMATION
DATABASES
WIFI
BROWSERS
GPS
VOICE OVER IP
SPREADSHEETS
PROCESSING
SMARTPHONE
APPLICATION
SOFTWARE
INFORMATION SYSTEMS
DECISION SUPPORT SYSTEM
BACKUP
USSD
SERVERS
AND
FLASH DRIVE
UMTS
DATA
UMTS
NOTEBOOK
INTERNET
NAS
ERM
BIG DATA
WIRELESS
VIDEO
NAS
REMOTE SENSING
E-LEARNING
BLUETOOTH
WEB SERVICES
GLONASS
COMMUNICATIONS
PROTOCOLS
PRODUCERS REGISTRY
GPRS
SMS
MMS
CAMERAS
DRONES
COMPUTERS
SENSORS
TOOLS
TABLETS
CLOUD
GALLILEO
PROGRAMMING
HTML
TECHNOLOGY
GSM
4G
GIS
RADIO
HTTP
3G
MODEMS
SCANNERS
BARCODES
INTERACTIVE VOICE RESPONSE
SATELLITE IMAGES
ERP
DRAFT - Will be replaced with publication

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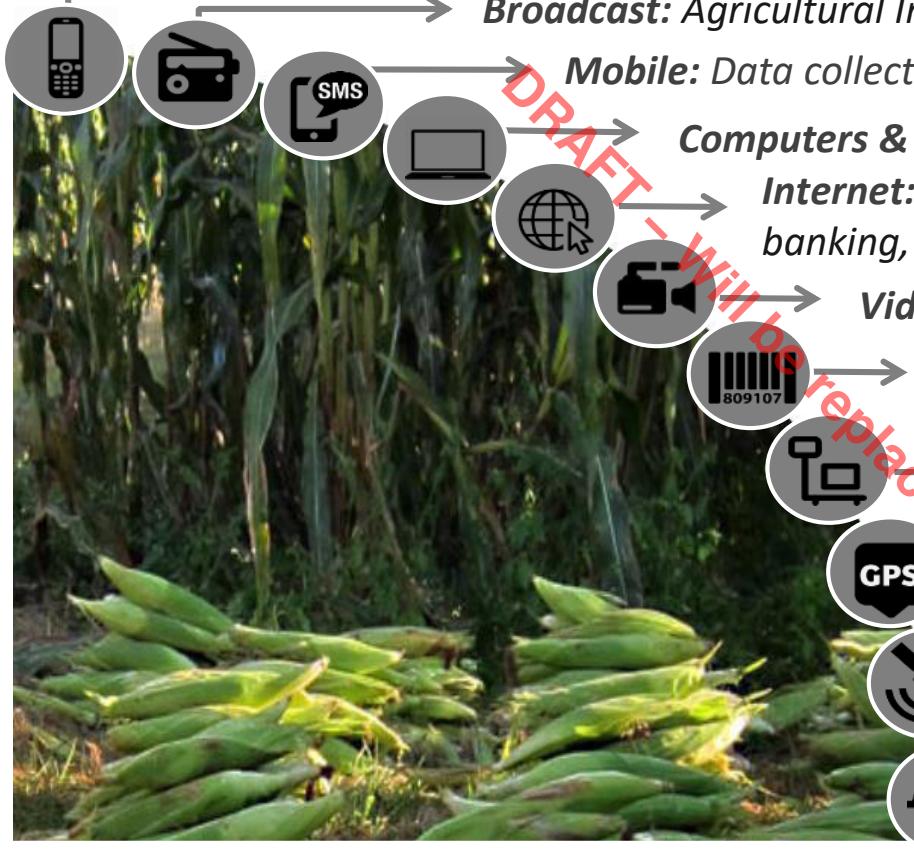

Telephone: *Interactive Voice Response, USSD: Agricultural Information*

Broadcast: *Agricultural Information, markets, advisory, community*

Mobile: *Data collection, Advisory, sales, banking*

Computers & servers: *management, data storage, analysis*

Internet: *Knowledge sharing, market information, banking, training, advisory*

Videos: *Training, advisory*

Barcodes & scanners: *Traceability, automation*

Digital scales: *Traceability, automation*

GPS: *production monitoring, yield estimations*

Satellites: *Weather, soil, NVDI, parcel location and area*

Sensors, networks & transmission: *Modelling, control & automation real time information*

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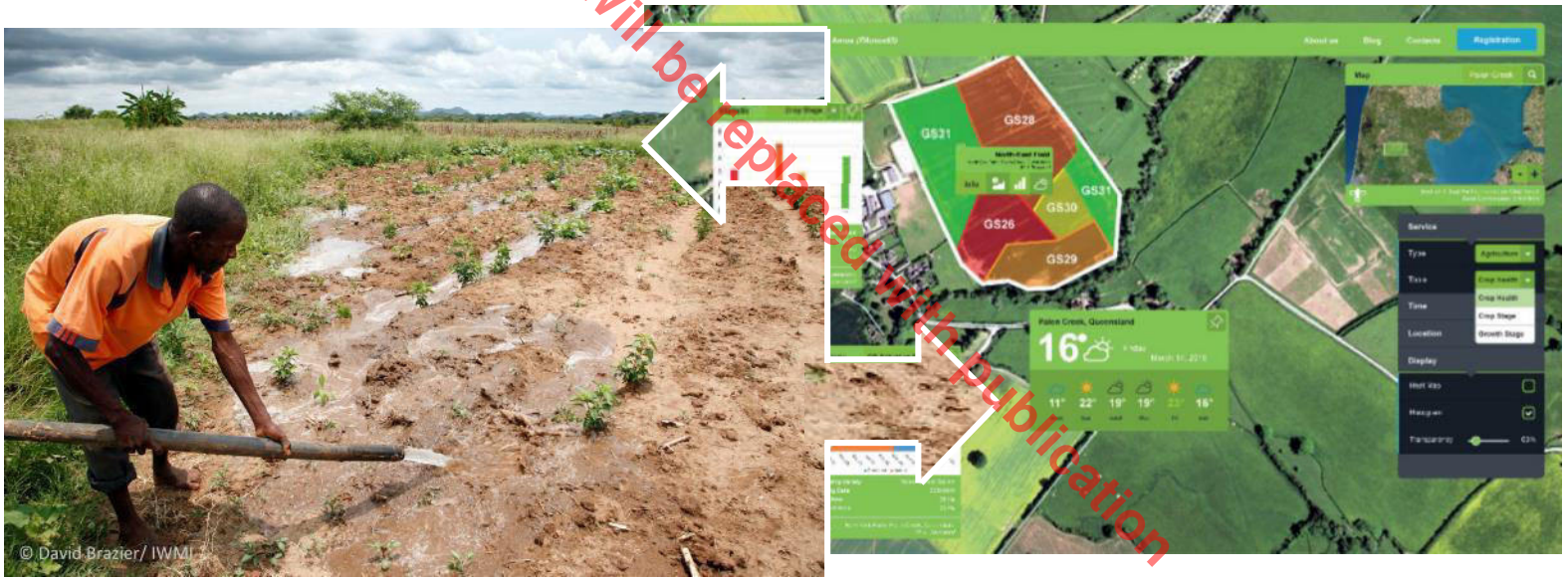
ICT for small-scale irrigation

ICT offers a wide range of technologies…

…but how to select the right technology level?



ICT for small-scale irrigation

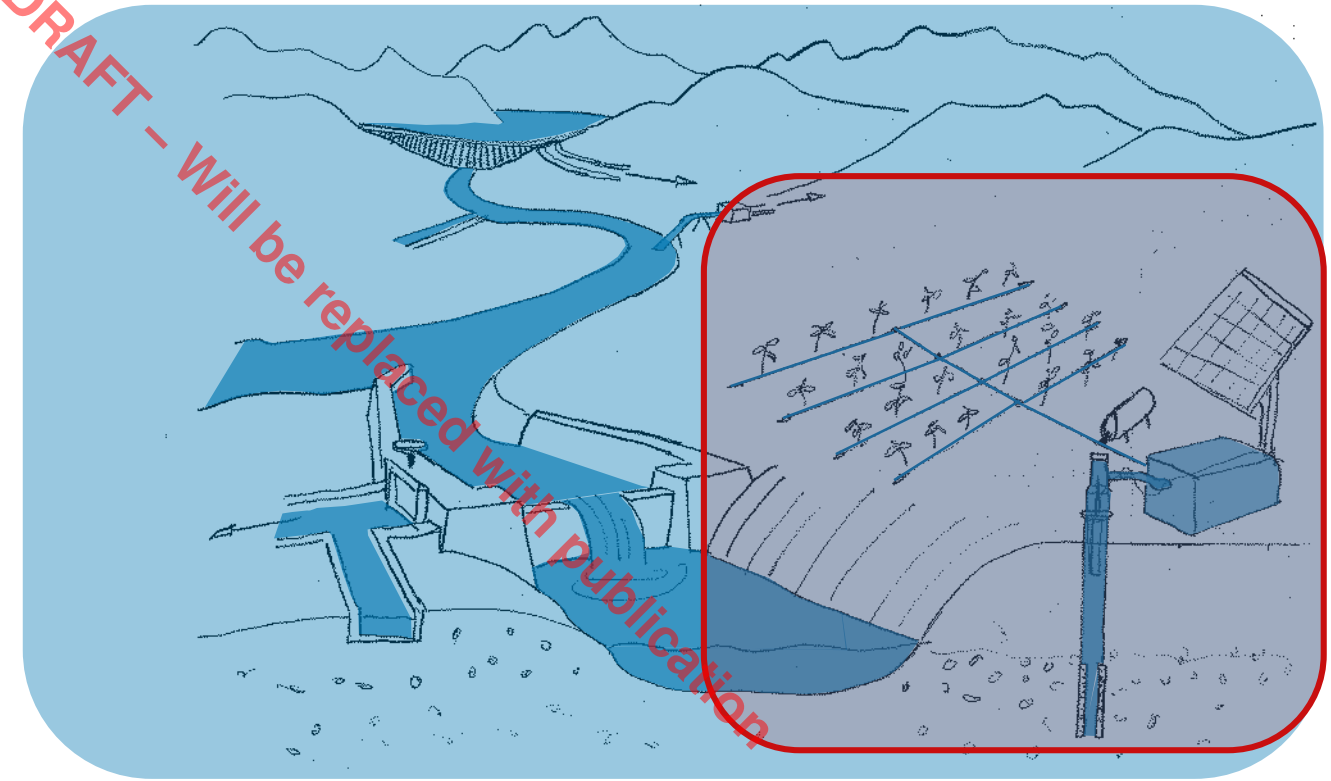
Management & Application

Irrigation System

Pumping & distribution system

Transport system

Water resource



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ICT for small-scale irrigation

Management & Application

Irrigation System

Pumping & distribution system

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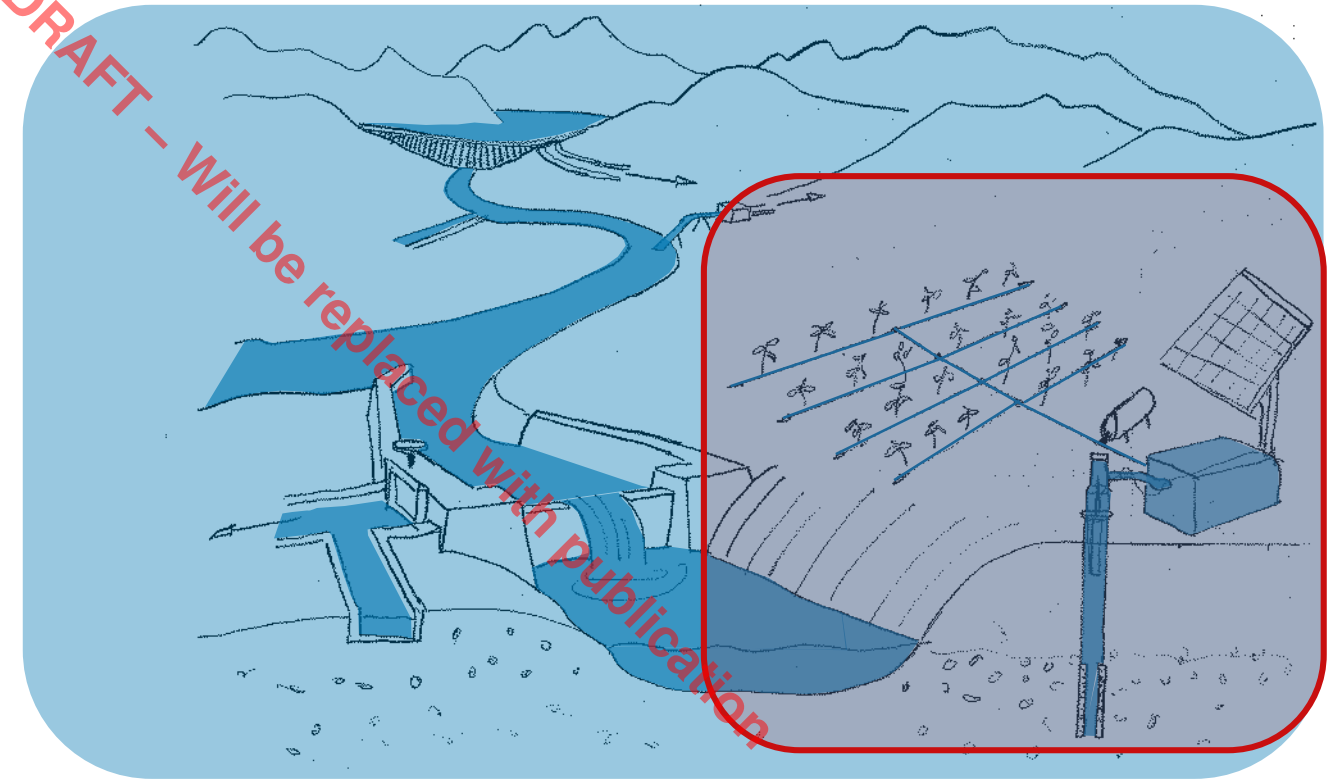

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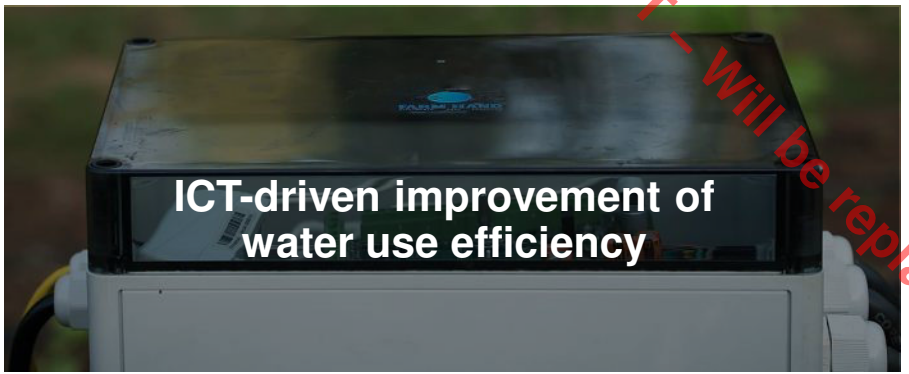
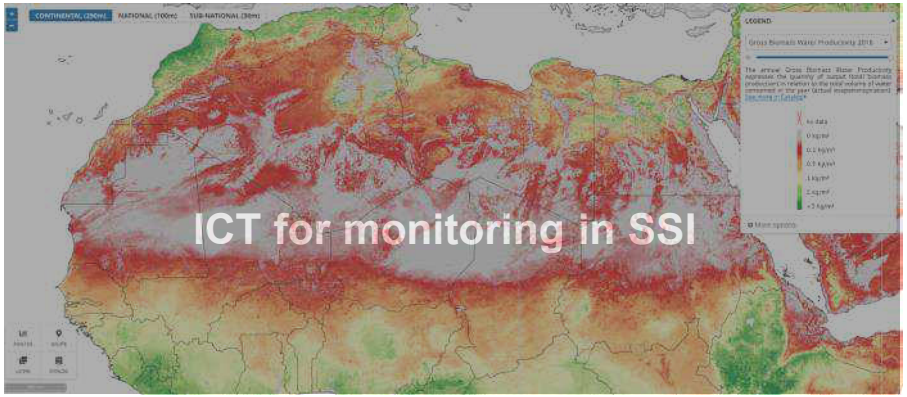
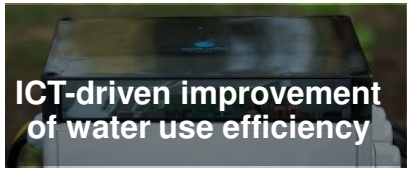
ICT for small-scale irrigation

Identification/Specification of four application fields





ICT for small-scale irrigation



Objectives

Potentials

Technologies

Challenges

Each of the four fields is illuminated with regard to goals, opportunities, technologies and challenges.

A few showcases are listed, selected projects/products presented.

The final report will have extensive lists for each section.

The audience is invited to contribute…

Field 1

DRAFT – Will be replaced with publication

ICT-driven improvement of water use efficiency

ICT-driven improvement of water use efficiency

Objectives:

Optimizing water use through better management practices and automation.

For this, we need:

- Up-to date, localized/customized weather forecasts for the farmer.
- Real-time updates on current crop and soil conditions.
- Real-time information on water availability and consumption.
- Real-time decision support (e.g. when to irrigate).

Overall objective:

Optimization of yields, sustainability of farmers' livelihoods, protection of environment.

ICT-driven improvement of water use efficiency

Potentials:

Technology is available to measure all sorts of parameters and to automatize irrigation. Efficient solar pumps can help saving energy.

- Hyper-localized weather forecasts can be modelled.
- Improved irrigation management through sensors.
- Water savings through efficient irrigation equipment.
- Saving of working time through automatized irrigation.

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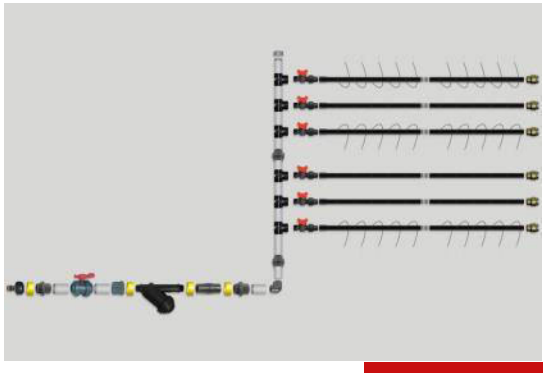
ICT-driven improvement of water use efficiency

Technologies:

- Solar pumps.
- Earth Observation (EO) sensors (Optical/Infrared/Radar/Lidar/GPS).
- Satellites, airborne, drones.
- Terrestrial sensors.
- Transmission (GSM, LTE, 5G, LPWAN, LORAWAN).
- Modern irrigation equipment.
- Microcomputers and servers.



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ICT-driven improvement of water use efficiency

Challenges:

- High costs for data acquisition.
- Difficult to find a feasible business model.
- Difficult upscaling.
- Accessibility of technology for SSI farmers.
- Availability of basic services (grid, Internet …).
- Solar pumping does not provide incentives for saving water.
- Collected data needs capacity for interpretation.

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ICT-driven improvement of water use efficiency

Showcase Hardware

SunCulture - solar pumping meets IoT

Solar energy and lithium ion energy storage technology.

Integrated sensors (GW level and pump performance).

Optional wire-less on-farm soil and weather sensors.

Farmers can remotely monitor irrigation.

Affordable to deploy for up to 2 acres.

http://www.sunculture.com/ lucie.pluschke@giz.de GIZ Kenia

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Showcase Hardware

SunCulture - solar pumping meets IoT

By combining this technology with an Internet of Things (IoT) platform and advance machine learning algorithms, the system is able to predict trends to optimize performance in real-time.

That way, affordable easy-to-understand precision farming tools are available that were previously unimaginable for a smallholder farmers.

http://www.sunculture.com/ lucie.pluschke@giz.de GIZ Kenia

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Showcase Hardware

ICT-driven improvement of water use efficiency

SunCulture - solar pumping meets IoT

Challenges:

- Basic services required (Internet, GSM…).
- High investments – difficult to afford for African smallholders.
- Technical skills required.
- Solar pumping does not provide incentives for saving water.

http://www.sunculture.com/ lucie.pluschke@giz.de GIZ Kenia

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ICT-driven improvement of water use efficiency

Showcase Hardware

SunCulture - solar pumping meets IoT

Answers:

SunCulture offers a pay-as-you-grow revenue model. Small, monthly payments until farmers own their precision sensor-based irrigation system outright, empowering even the region's poorest smallholder farmers to take control of their environment.

At a price point of $1.25/day for the RainMaker2 with ClimateSmart™, a farmer's investment is recouped quickly, and profit starts flowing from increased agricultural productivity.

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ICT-driven improvement of water use efficiency

Other showcases

Irrigation hardware

- CLASP Water Pump Outlook 2019 (Global Trends and Market Opportunities)
  https://clasp.ngo/publications/solar-water-pump-outlook-2019-global-trends-and-market-opportunities
- Calibrating of WaterMark soil moisture sensor with Delta-T'a Equitensiomener (GIAE India)
  http://www.freedesign.co.in/
- Chameleon soil water sensor
  https://www.csiro.au/en/Research/AF/Areas/Food-security/Chameleon-soil-water-sensorSunCulture
- Solar Pumps meet IoT (GIZ Kenia)
  http://www.sunculture.com/

Available product

- SWAR : Saving water with underground irrigation
  https://snrd-asia.org/wp-content/uploads/2019/05/GIC-India-Newsletter-Volume-3.pdf (page 5)

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Showcase Automation

ICT-driven improvement of water use efficiency

Show Case: SeaBex (IT Grapes & GIZ Tunisia)

E-monitoring and smart automation system that helps farmers find the right balance of water consumption needed to get the better quality and quantity production.

Able to monitor and control in real time the key environmental parameters of a farm, interacts and reacts autonomously and appropriately to any environmental parameter variation with minimum level of human intervention.

http://www.seabex.com/ nele.gloy@giz.de GIZ Tunisia

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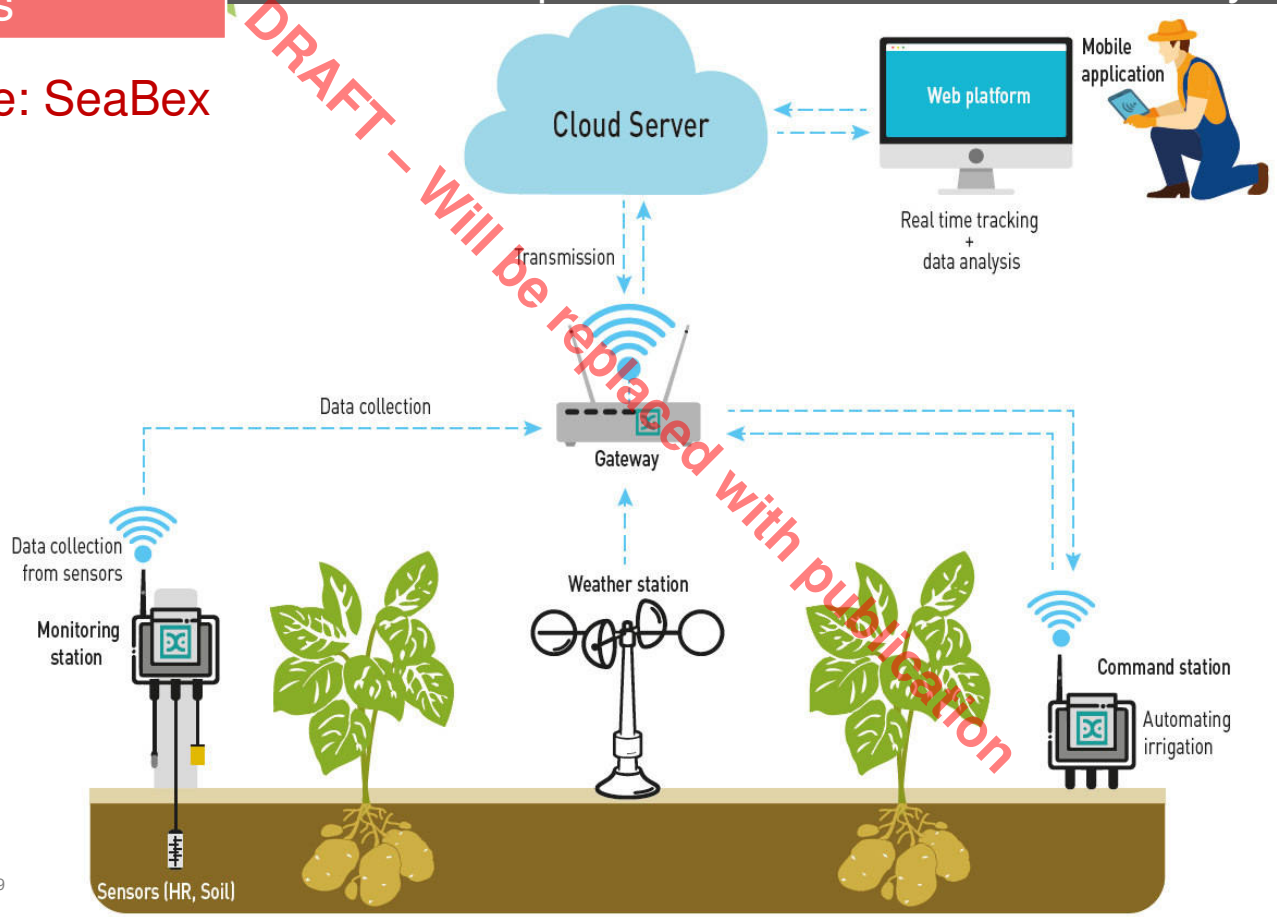
Showcases

ICT-driven improvement of water use efficiency - Automation

Show Case: SeaBex



Showcases

ICT-driven improvement of water use efficiency - Automation

SeaBex for the farmers:

- Manages farmers' sites, parcels and sectors incl. mapping.
- Track changes in climatic and soil variables in real-time by site/plot.
- Trigger irrigation automatically by planning an unlimited number of plans and automation scenarios.
- Keep a history.
- Be notified of any event (opening/closing of valves/pumps..etc).
- Subscribe to several consulting agencies by field of expertise, by type of advice (alert and/or advice and/or specific advice) and by price (free or paid).

SeaBex for agricultural advisors:

- Manage affiliated farmers (by region, by product type).
- Send general alerts and tips.
- Send specific advice.
- Follow the performance of your agents and the effectiveness of their advice by keeping track of the history of their activities.
- A consultant can track the real-time variation in weather and soil parameters of an affiliated farmer in real-time using Seabex stations.

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Showcases

ICT-driven improvement of water use efficiency - Automation

Show Case: SeaBex (IT Grapes & GIZ Tunisia)

http://www.seabex.com/ nele.gloy@giz.de GIZ Tunisia

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Showcases

ICT-driven improvement of water use efficiency - Automation

Show Case: SeaBex (IT Grapes & GIZ Tunisia)

Challenges:

- High investments – difficult to afford for African smallholders.
- Internet access required.
- Technical skills required.

http://www.seabex.com/ nele.gloy@giz.de GIZ Tunisia

ICT-driven improvement of water use efficiency

Other showcases

Automation

- MikeOperations & MikeShe (DHI & Irrimode Germany/Denmark)
  https://www.mikepoweredbydhi.com/products/mike-operations
- Irriport Irrigation Control (Germany)
  http://www.irriport.de/
- Tele-Irrigation (Tech-Innov Niamey)
  http://tele-irrigation.net/
- Water-Hand (Auroville Consulting & GIAE India)
  https://www.farm-hand.in/products
- Sat-Irr: Satellite for Irrigation Scheduling (GIZ Marocco)
  https://labo.obs-mip.fr/multitemp/sat-irr-satellite-for-irrigation-scheduling/
- SeaBex (IT Grapes & GIZ Tunisia)
  https://seabex.com/

Available product

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ICT supported learning for behavioral change in SSI

ICT supported learning for behavioral change in SSI

Objectives:

Through ICT supported learning, farmers understand, how the common resource can be protected and how inappropriate management practices can harm sustainability of their businesses.

Overall objective:

Sustainability of farmers' livelihoods through the protection of resources and environment.

ICT supported learning for behavioral change in SSI

Potentials:

ICT supported learning:

- Videos can easily be spread by Facebook and other social media.
- Audio sequences can be broadcasted by community radio AND social media.
- Complex relationships can be understood by games, both board games and apps.
- Crowd-sourcing information in combination with machine-learing.

ICT supported learning for behavioral change in SSI

Technologies:

- Videos for download and streaming.
- Audios for broadcasting via Facebook and other platforms.
- E-Learning via web and app.
- Serious games both offered as traditional game and app.

Stakeholders of Tensift Basin play the River Basin Game.
Image credit: GIZ

ICT supported learning for behavioral change in SSI

Challenges:

- How to deal with high illiteracy rates?
- Learning material has to be available in local idioms.
- Learning material has to be adopted to the local setting.
- Video streaming needs good internet.
- How to tackle high costs for streaming.
- What if basic services are not available for all (grid, internet …)?

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Showcase ‘Let it rain’

ICT supported learning for behavioral change in SSI

Gamifying weather forecasting: “Let it rain” campaign (iShamba / CIAT Kenya)
https://bigdata.cgiar.org/inspire/inspire-challenge-2019/gamifying-weather-forecasting-let-it-rain-campaign/

Project stage

ICT supported learning for behavioral change in SSI

Showcase ‘Let it rain’

Opportunity:

Farmers usually are experienced in forecasting local weather.

Challenge:

How can the community benefit from this knowledge?

Solution:

A platform that will gamify weather prediction to incentivize farmers uptake of localized agro-advisories and help crowdsource weather information, which, when run through machine learning, will further improve weather forecasts.

Showcase ‘Let it rain’

ICT supported learning for behavioral change in SSI

Shamba ShapeUp:

Using Mediae’s popular farm make-over TV show Shamba Shape Up, the campaign will draw farmers to “guess the start of the rains,” stirring up a national discussion on the relevance of weather forecast and helping build farmer profiles for later providing customized climate info.

TV

When you think of farming television, think no further than Shamba Shape Up. As the first of it’s kind in Africa, it is a “make-over” style reality show that meets the informational needs of farmers and entertains them at the same time.

CGIAR Platform for Big Data in Agriculture

CIAT International Center for Tropical Agriculture Since 1967 Science to cultivate change

THE MEDIAE COMPANY

MercyCorps

aWhere

iShamba iShamba

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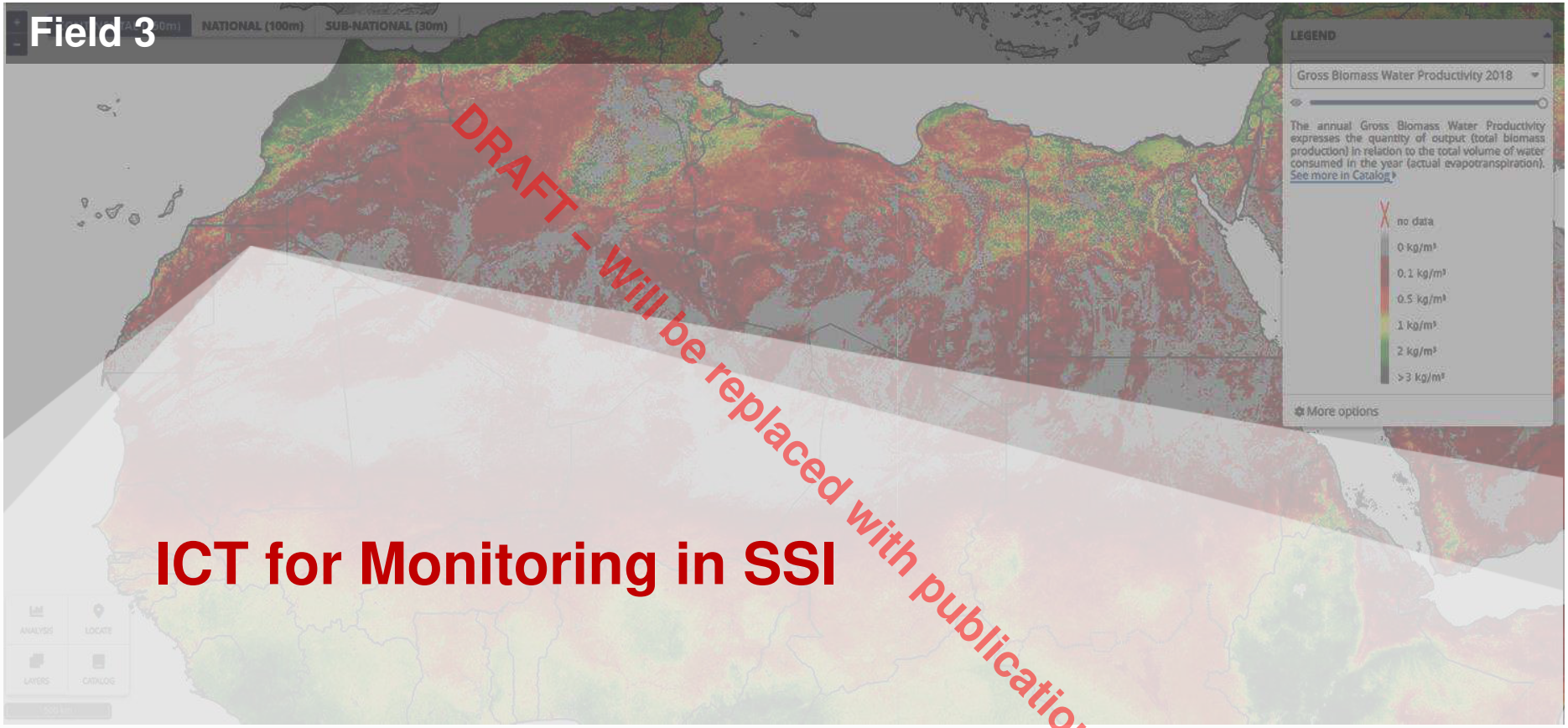
Other showcases

ICT supported learning for behavioral change in SSI

- 3D animation as a powerful extension tool (GIAE Ghana)
  https://www.ssab-africa.net/our-work#3danimation
- Gamifying weather forecasting: “Let it rain” campaign (iShamba / CIAT Kenya)
  https://bigdata.cgiar.org/inspire/inspire-challenge-2019/gamifying-weather-forecasting-let-it-rain-
- AccessAgriculture
  https://www.accessagriculture.org/
- River Basin Game (IRSTEA/LISODE/GIZ Morocco)
- Water Hackathons
  http://thewaterchannel.tv/dossiers/water-productivity/events/507-hackathon

Project stage

Field 3



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ICT for Monitoring in SSI

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ICT for monitoring in SSI

Objectives:

For the optimization of irrigation practices, we need to monitor several parameters:

- water use,
- yield,
- environmental parameters such as vegetation, soil, erosion and residuals.

From this, we can derive real-time updates on current field and crop conditions and real-time decision support (e.g. when to irrigate).

ICT for monitoring in SSI

Potentials:

Procedures are available, to measure and monitor SSI-relevant parameters such as

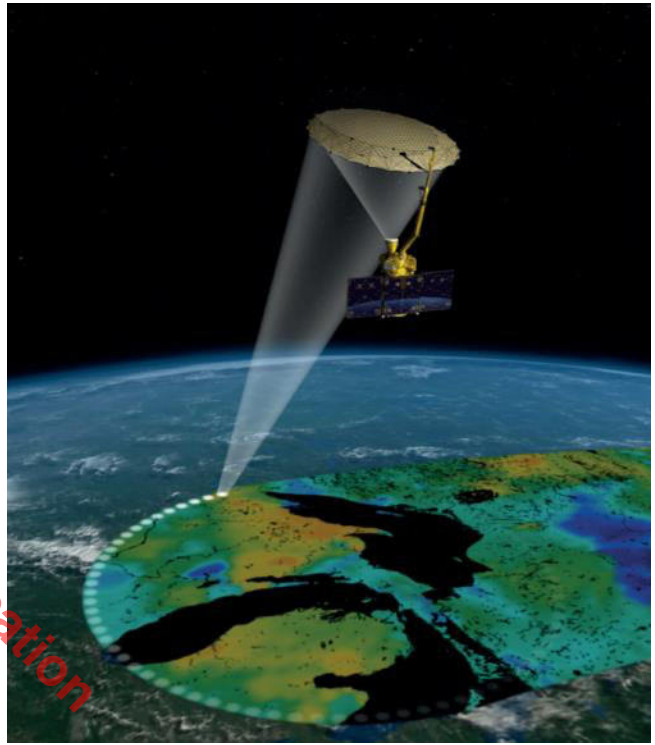
- Detailed Digital Surface Models (DSM) and Digital Elevation Models (DEM).
- Climate & weather parameters.
- Water resources (surface & ground water, grey water, water quality)
- Soil parameters, evaporation, evapotranspiration,
- Normalized Difference Vegetation Index (NDVI),
- Crop height, crop health, crop water stress, Leaf Area Index (LAI)
- Secondary products such as crop classification, land use

ICT for monitoring in SSI

Technologies:

Technologies are available, to measure and monitor SSI-relevant parameters such as

- Earth observation (satellite, airborne, drones).,
- Earth Observation (EO) sensors (Optical/Infrared/Radar/Lidar/GPS).
- Remote Sensing software, GIS, modelling.
- Terrestrial sensors.
- Transmission (GSM, LTE, 5G, LPWAN, LORAWAN).
- Databases, GIS, modelling .

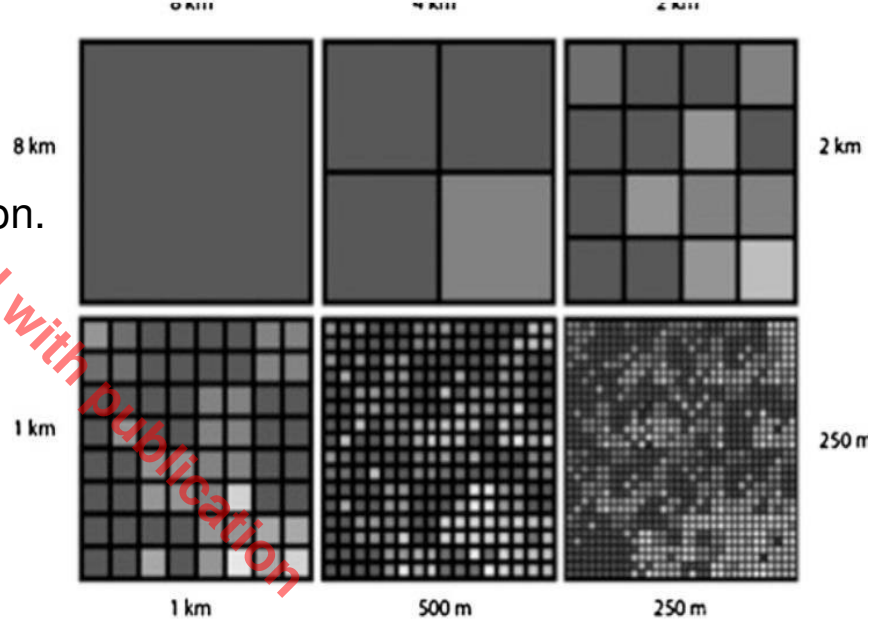


NASA's Soil Moisture Active Passive (SMAP) satellite, collecting global soil moisture data.
Image credit: NASA

ICT for monitoring in SSI

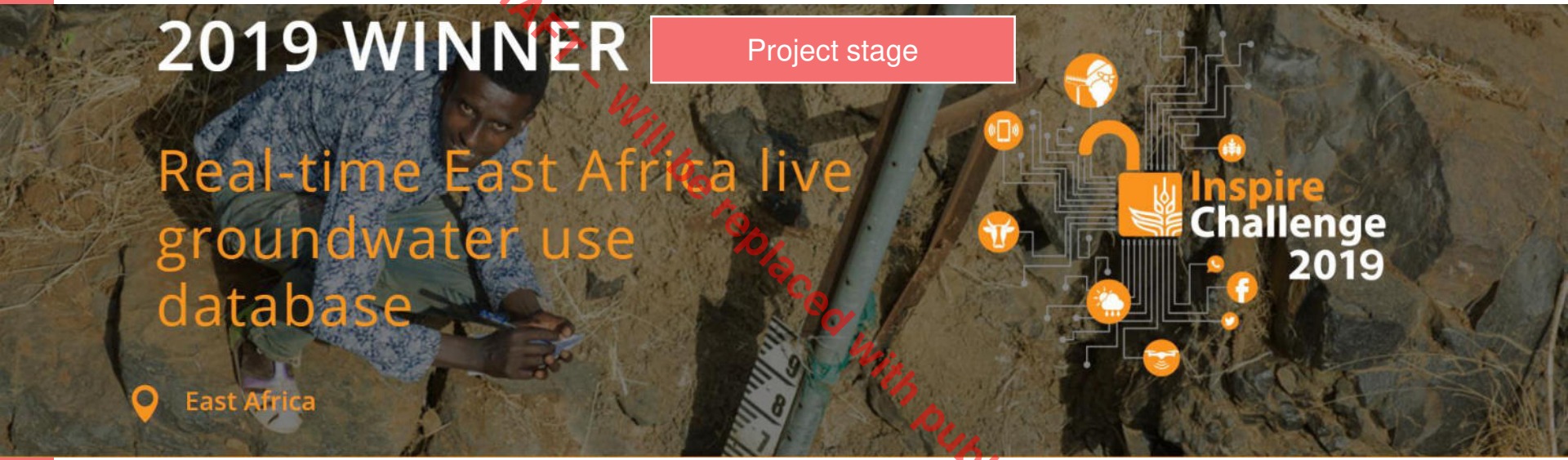
Challenges:

- Missing standards, missing regulation.
- High costs prevent upscaling.
- Capacities for data processing and interpretation.
- How can decisions be derived fro analysis?
- Low resolution of EO imagery for SSI.
- Availability of basic services (grid, Internet …)
- How can SSI farmers access the information?



ICT for monitoring in SSI

Showcases



IWMI International Water Management Institute

Futurepump

University of Nairobi

Water Resources Authority

CGIAR Platform for Big Data in Agriculture

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ICT for monitoring in SSI

Showcases

Real-time East Africa live groundwater use database

Opportunity:

Low-cost solar pumps are accessible for East Africa's farmers.

Challenge:

Data is not available to judge the sustainability of these solutions and plan appropriate policies.

Solution:

Reduction of information gaps by turning the network of solar pumps into IoT devices linked to an open, online water information platform at IWMI.

The system would then be able to provide real-time information on water withdrawal, area irrigated, and energy use.

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University of Nairobi

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CGIAR Platform for Big Data in Agriculture

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ICT for monitoring in SSI

Showcases

Real-time East Africa live groundwater use database

Challenges:

- Only SunCulture offers this technology. How to make it a standard?
- Data property rights. Who owns the data?
- Who is running the platform? Who gets access to the data?
- Who derives the necessary management directives?
- Technical skills required. System maintenance currently in East Africa only.

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ICT for monitoring in SSI

Other showcases

- FAO WaPOR - portal to monitor water productivity through open access of remotely sensed data
  https://wapor.apps.fao.org/home/WAPOR_2/1
- FieldLook Irrigation Planner (eleaf / GIZ Morocco)
  https://eleaf.com/?page_id=3293
- Kfw: ICT Applications for SSI in West Africa.
- Real-time East Africa live groundwater use database (IWMI / FuturePump / WRA Kenya)
  https://bigdata.cgiar.org/inspire/inspire-challenge-2019/real-time-east-africa-live-groundwater-use-database/

Project stage

- Astral Aerial – affordably priced drone services (GIZ Kenia)
  https://astral-aerial.com/
- SEBA-ribeka: water resources information and irrigation water management for mobile devices (SEBA/ribeka/ITT)
  http://www.hidro-limari.info/images/technical_solution/SEBA_ribeka_English.pdf

Smallholders' access to SSI-related information

Smallholders' access to SSI-related information

Objectives:

Farmers get access to SSI-relevant data such as localized weather forecasts and water resources related data and appropriate management support. Based on this data, farmers can improve their irrigation practices. Better irrigation practices will achieve higher yields, reduced water and energy consumption, protection of the resources and better sustainability of farmers' livelihoods.

Smallholders' access to SSI-related information

Potentials:

- Modern mobile technologies enable the provision of localized and customized information.
- Modern mobile technology can be used to collect data.
- Modern mobile technology can be used to remotely control and monitor.
- Audio sequences can be broadcasted by community radio AND social media.
- A large audience can be reached via TV and radio shows.

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Smallholders' access to SSI-related information

Technologies:

- Smartphone apps for data collection and transmission.
- Internet and servers for analysis and machine learning.
- Smartphones for the reception of custom-tailored, localized information.
- Simple feature phones for receiving custom-tailored information.
- Radio and TV.

Stakeholders of Tensift Basin play the River Basin Game.
Image credit: GIZ

Smallholders' access to SSI-related information

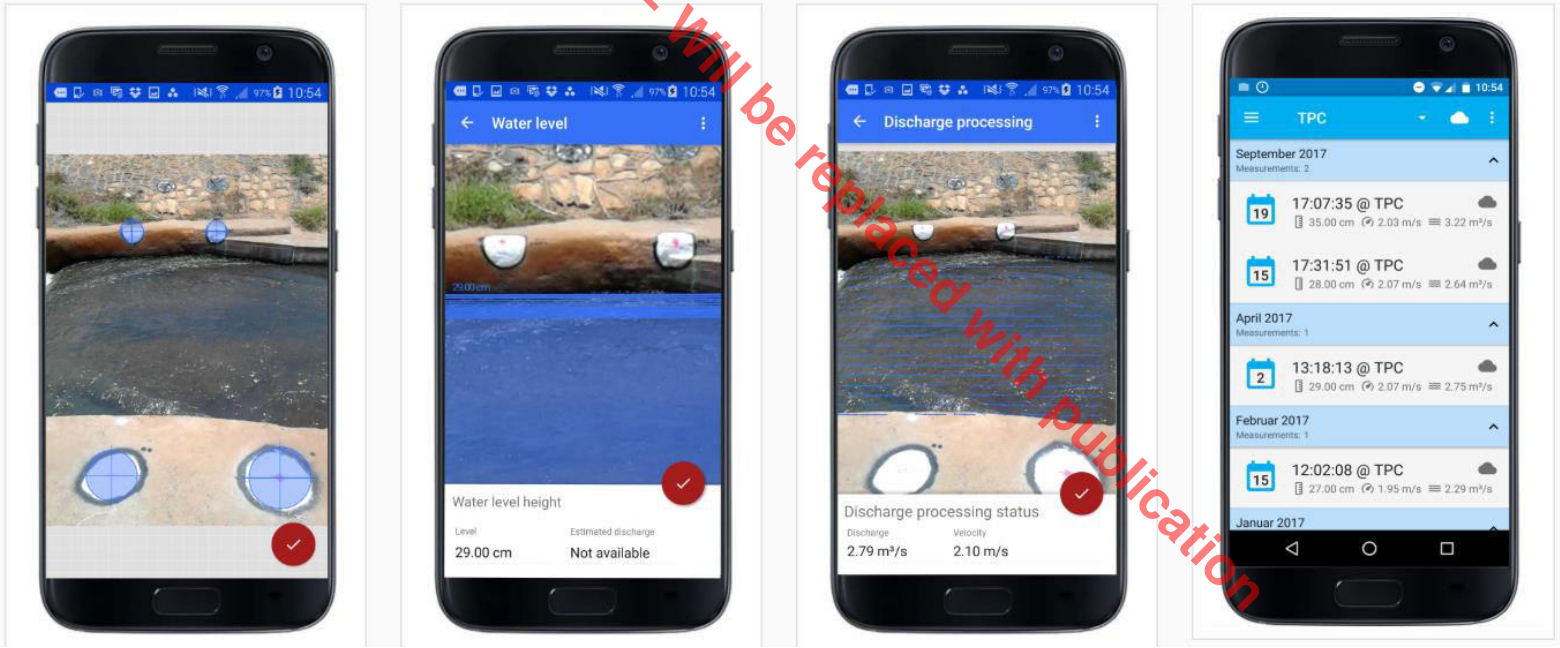
Challenges:

- Information provision in local idioms!
- How to deal with illiteracy?
- Non-availability of basic services in remote areas (grid, Internet …).
- Affordability of technology and services.
- How to reconcile "leaving no one behind and introduction of ICT?
- Difficult to find sustainable business models.

Showcases

Smallholders' access to SSI-related information

Discharge – Non-intrusive optical flow measurement for water streams & irrigation channels (SEBA)



Showcases

Smallholders' access to SSI-related information

Discharge – Non-intrusive optical flow measurement for water streams & irrigation channels (SEBA)

- Non-intrusive approach: SSIV (Surface Structure Image Velocimetry)
- A patented algorithm provides the velocity profile at the surface of the water body
- The vertical velocity distribution is calculated from the surface velocity field, using a physical model, which uses the roughness of the bed as a boundary condition.
- In order to perform such a measurement, it is first necessary to set up a site

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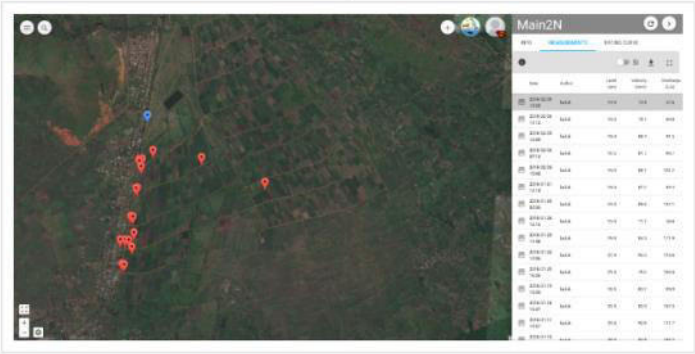
Smallholders' access to SSI-related information

Showcases

Discharge – Non-intrusive optical flow measurement for water streams & irrigation channels (SEBA)

- At a given site, a measurement can be performed in less than 2 minutes with the DischargeApp.
- Using the app, the user needs to record a short movie, select the location of the markers and then set the water level manually.
- Once a measurement is performed, it can be uploaded to the DischargeWeb platform.



Smallholders' access to SSI-related information

Showcases

Discharge – Non-intrusive optical flow measurement for water streams & irrigation channels (SEBA)

Challenges:

- In most SSA countries, smallholders don't have smartphones.
- Smallholders usually don't have Internet.
- Who's responsible and has technology and capacity for data interpretation?

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Smallholders' access to SSI-related information

Other showcases

- The Digitalisation of African Agriculture Report, 2018-2019
  https://www.cta.int/en/digitalisation-agriculture-africa
- FarmHand's Water-Hand providing right-volume right-time irrigation
  https://www.farm-hand.in/products
- Climate information services to manage climate risk
  https://bigdata.cgiar.org/inspire/inspire-challenge-2019/climate-information-services-to-manage-climate-risk/
- Discharge – Non-intrusive optical flow measurement for water streams & irrigation channels (SEBA) https://discharge.ch/index.html — Available product
- UjuziKilimo - Climate Smart Farming- Know your weather
  https://www.ujuzikilimo.com/climatesmart.html
- Global Data Ecosystem (Waterwatch cooperative)
  https://waterwatchcooperative.com/global-data-ecosystem/

ICT for small-scale irrigation – gaps and opportunities

- Make SSI information accessible for the farmers.
- Make farmers understand their environment.
- Access to finance for smallholders.
- Access to technology for smallholders.

Thank you for listening!

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Keys to success

There are many stumbling blocks in the identification, specification and implementation of ICT solutions. It is very difficult to find generally applicable answers as countries, regions and social structures differ in many ways. Access to basic services, technology and financial services is one aspect. Literacy as well as IT knowledge of the target groups is another. Financial sustainability frequently is difficult to achieve as SSI farmers have no resources to invest.

However, a few general keys to success can be given on the following two slides:

Keys to success

Keep it simple!
ICT solutions have to be as simple and user-friendly as possible.

Create sustainable and affordable solutions!
Wherever possible, create free basic services for the farmers with additional paid advanced service levels.

Consider the local setting!
Consider access to basic services, consider literacy and local idioms.

Attract the youth to modern farming!
Modern technologies can be an incentive for young people to stay in rural areas and to engage in farming.

Mobilize local ICT capacities!
Local and regional ICT capacity can be developed and mobilized.

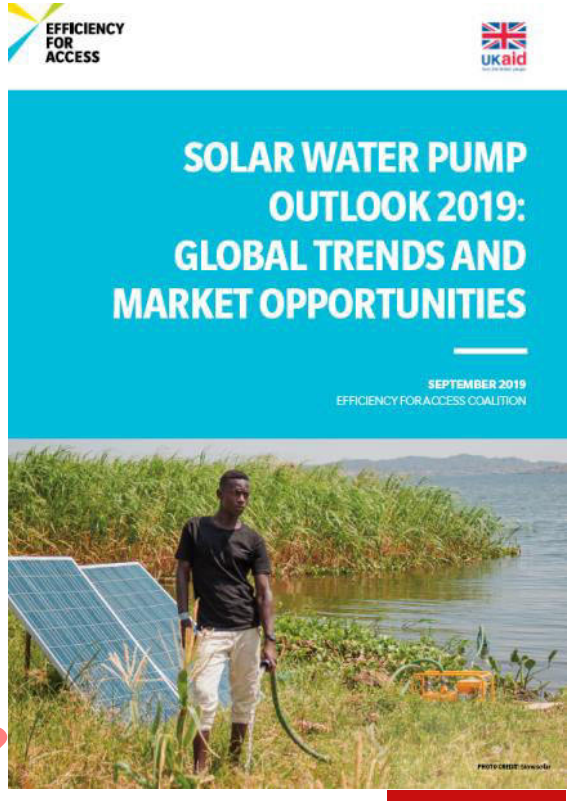
Keys to success

- **Make use of existing solutions wherever possible!**
  Make use of readily available hard- and software where possible. Try to cooperate with local IT firms.
- **Use local products with local support!**
  For sustainability reasons, use local products, where possible.
- **Learn from successful projects!**
  Try to learn from the successful projects as well as from the lessons learnt of the failures.
- **Develop a feasible business model!**
  For sustainability of the solutions, a business model has to be developed before implementation.

Showcases

CLASP Market Analysis: Solar pumps

This report offers recent insights on the solar water pump market in sub-Saharan Africa and South Asia. Analysis underscores a growing business case for promotion and adoption—with an addressable market estimated at USD 15.6 billion—and identifies solutions to barriers preventing market scale.



https://clasp.ngo/publications/solar-water-pump-outlook-2019-global-trends-and-market-opportunities

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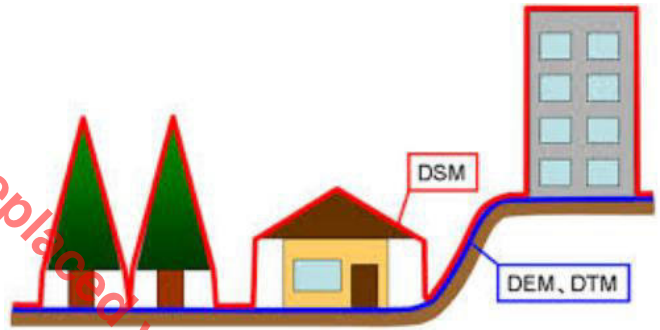
Showcases

ICT supported learning for behavioral change in SSI

3D animation as a powerful extension tool (GIAE Ghana)
https://www.ssab-africa.net/our-work#3danimation

Support slide : DTM, DSM, DEM

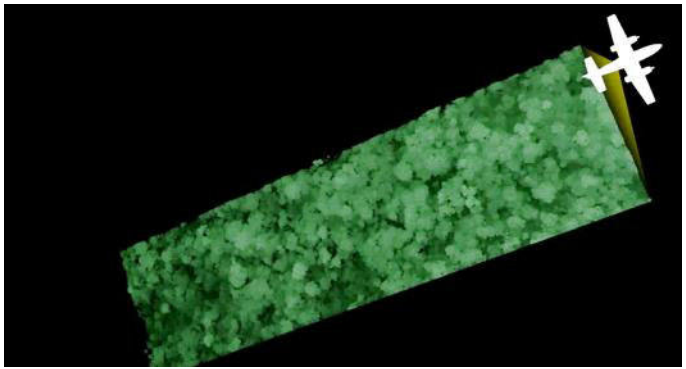
- DTM : Digital Terrain Model
- DSM : Digital Surface Model
- DEM : Digital Elevation Model ?

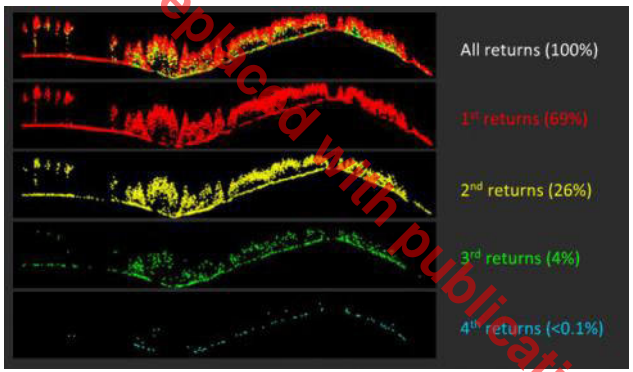


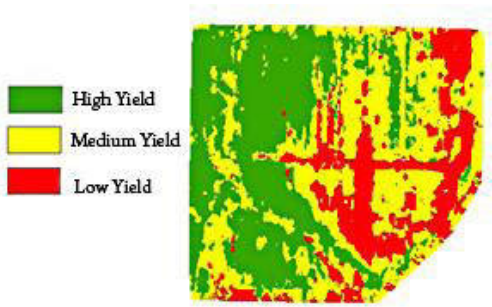
Support slide : LIDAR

LIDAR: Light Detection and Ranging

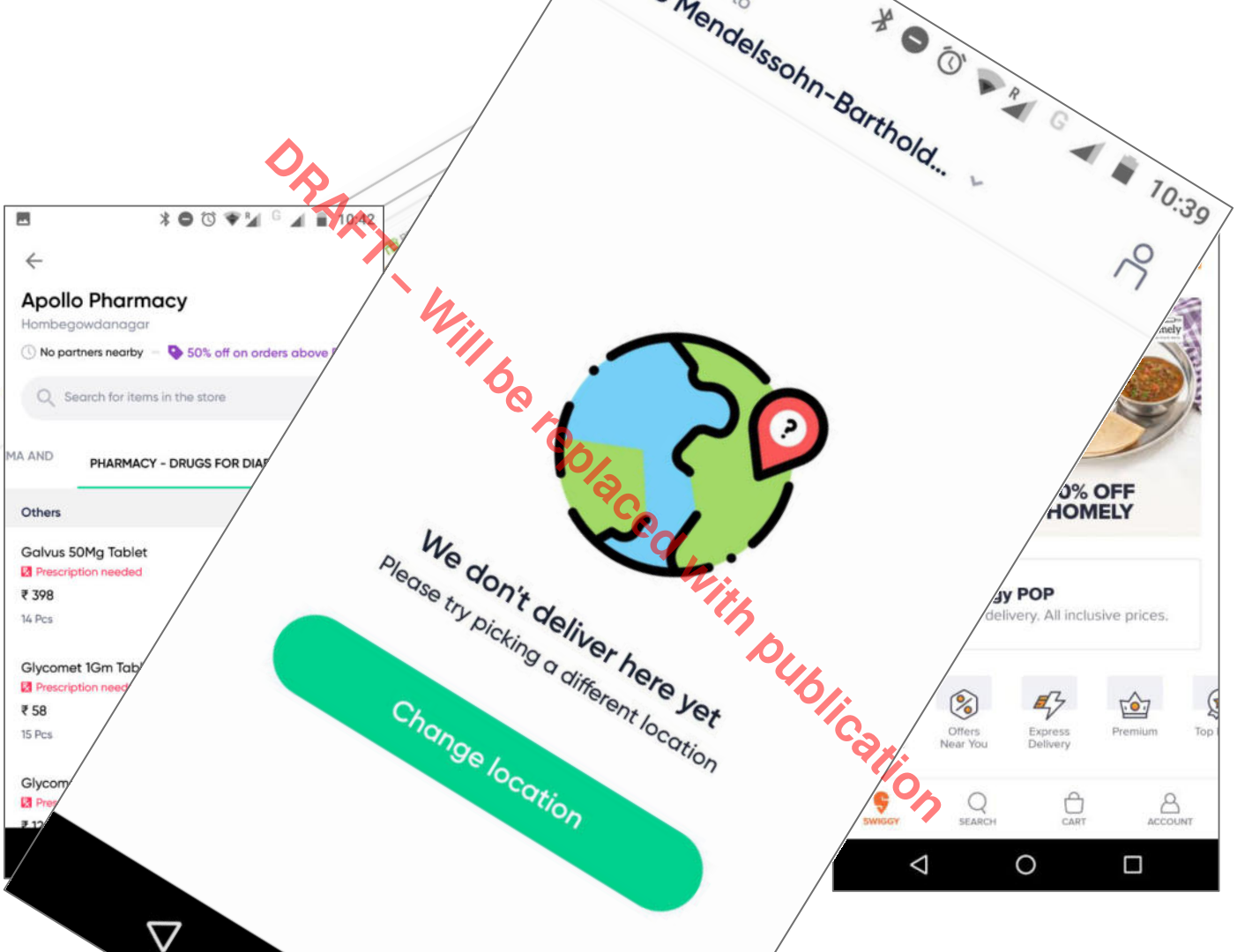
Lidar (also called LIDAR, LiDAR, and LADAR) is a surveying method that measures distance to a target by illuminating that target with a pulsed laser light, and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3D-representations of the target.







Green Innovation Centre for the Agriculture and Food Sector – India



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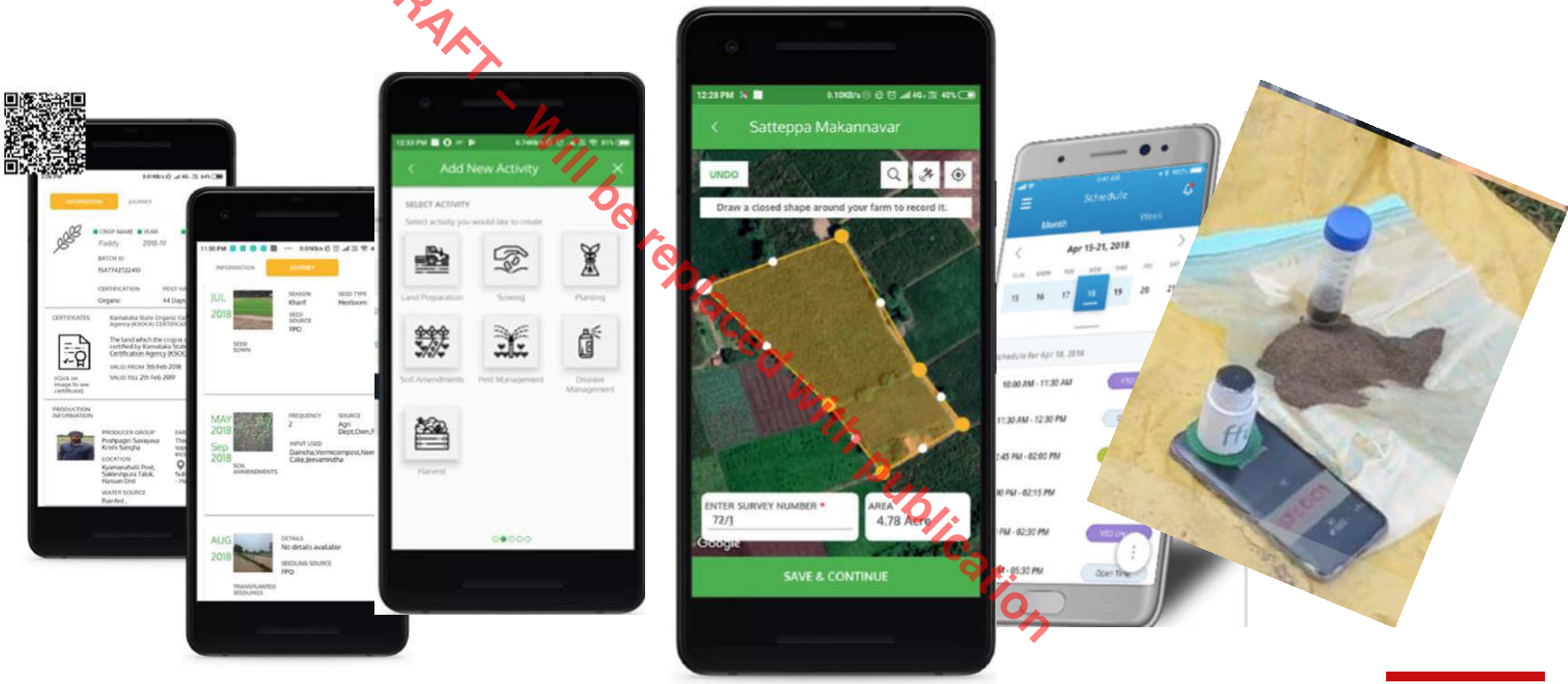

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1. 4G coverage and smartphone penetration
2. IT literacy
3. Low costs

ICT and Irrigation

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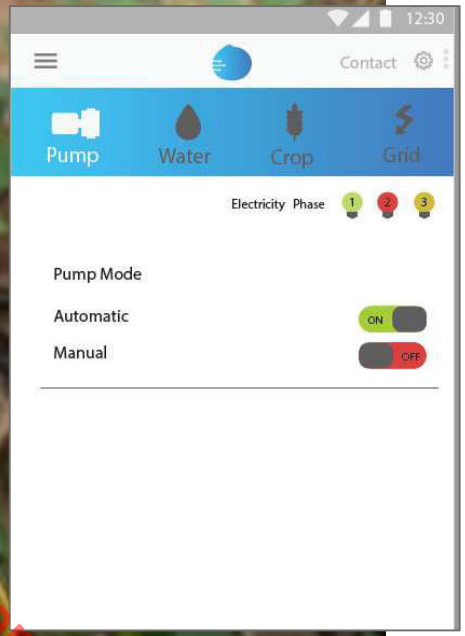
Precision Irrigation System “Water-Hand” with Auroville Consulting



Farmer benefits compared to flood irrigation (estimations):

- 30% increase in yield
- 60% decrease in water and energy consumption
- 50% decrease in fertilizer
- 10% decrease in labour costs
- Reduction of damage to the water pumps

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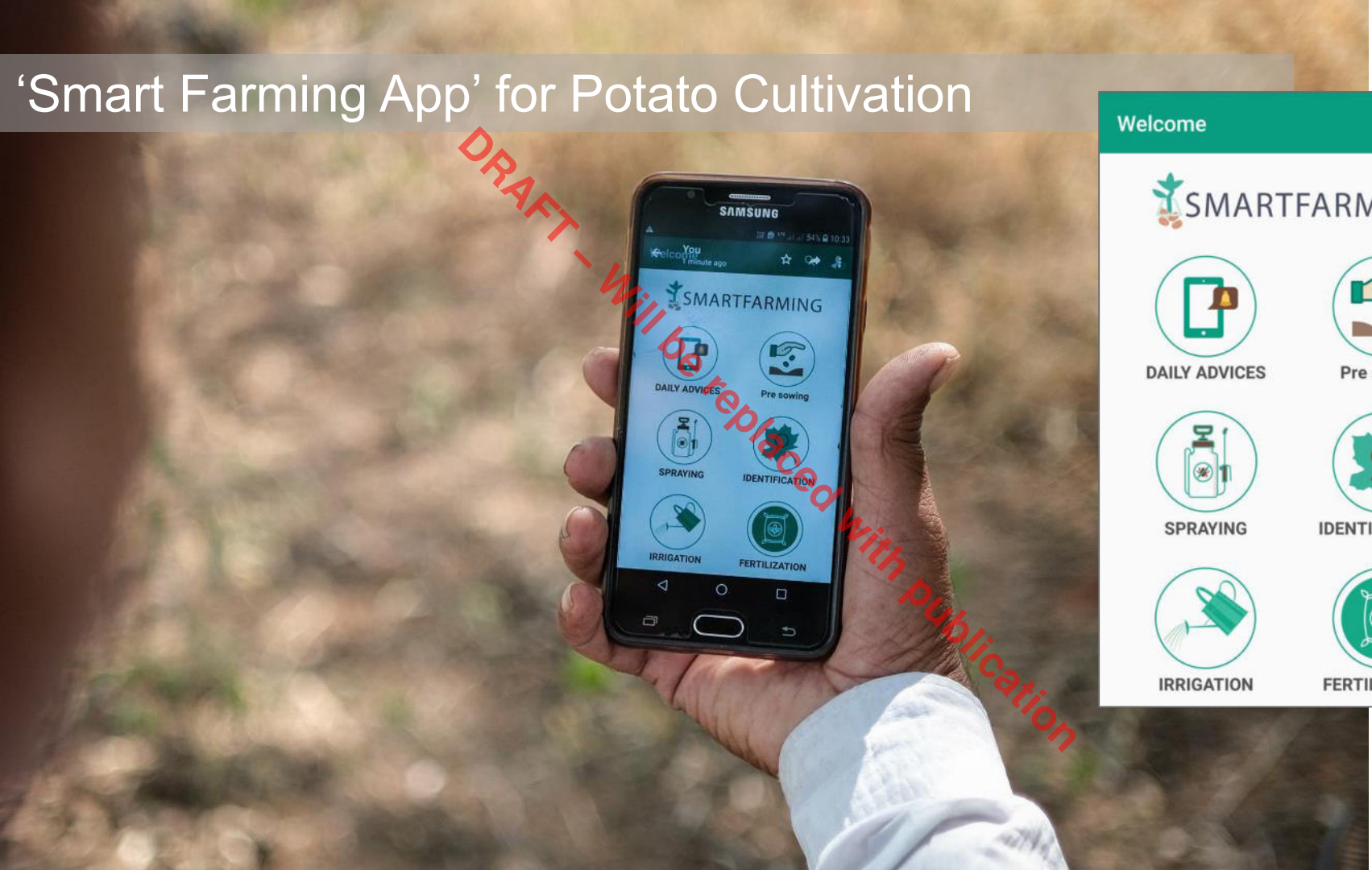
‘Smart Farming App’ for Potato Cultivation



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Thank you!

Serious games for participatory planning and management of water ressources

Marc Haering, Programme AGIRE Morocco

WHY / CHALLENGES

- The overexploitation of groundwater threatens socio-economic development and increases social disparities between user groups
- The Moroccan water law 36-15 introduces a new approach to through participatory management contracts
- The need of innovative participatory tools, allowing to combine the knowledge of stakeholders before involving them in decision-making processes
- The need to understand the whole system recognizing the expertise of each stakeholder is a prerequisite for a structured dialogue for consensus and sustainable solutions.

WHAT IS A SERIOUS GAME?

« Combining modeling and participation with the aim of improving knowledge and/or aiding decisionmaking »

Range of applications:

SCENARIO SIMULATION
- Identify desirable and undesirable scenarios and test actions / rules for a better future
- Define areas for improvement of public policies

EDUCATION
- Interactive, problem-based learning
- Understand a complex system

KNOWLEDE CO-CONSTRUCTION
- Build an image of the system by combining the complementary knowledge of stakeholders
- Get new knowledge

ROLE PLAY
- Make stakeholders switch roles and understand the others perspective
- Meet the conditions for a multi-stakeholder dialogue

CONCEPTUAL BASE: THE ARDI Method

Jointly develop a diagram on the interactions between natures and societies in 4 stages: A = Agents R = Resources D = Dynamics I = Interactions

A
1 Agent

Management entity?
Time scale?
Spatial scale?

Exemples:
- Farmer
- Basin Agency
- Agricultural Department

R
1 ressource

(materiel or immateriel)
Indicators ?

Exemples:
- Dam water
- Groundwater
- Wastewater
- Money

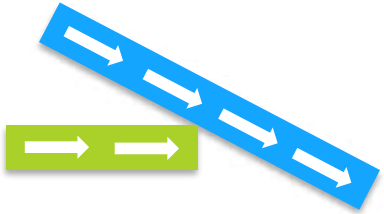
D
1 Dynamic

(ecological, économical, sociological, political)

Exemples:
- Drought frequency
- Market price for olives
- Social cohérence between small farmers
- Agricultural subcidies

I
1 Interaction

(Simple usage, usage that transforms a resource, commercial exchange, natural dynamic)



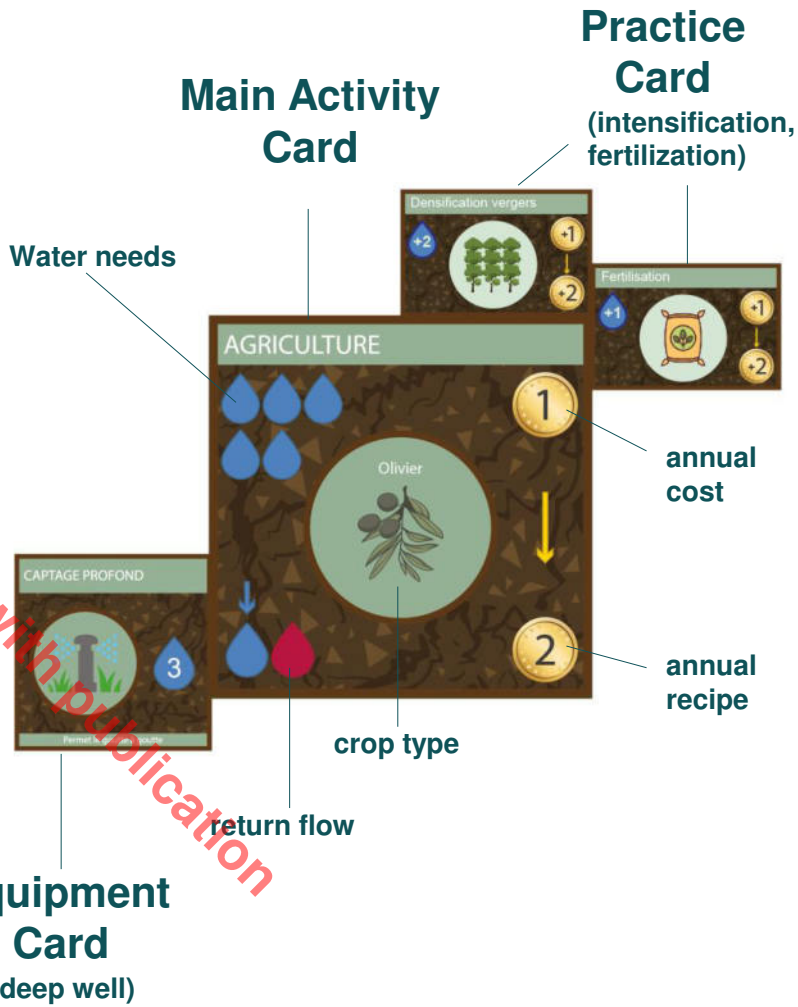
Exemples:
- using
- poluting
- trading
- GW recharge

Role play « maa nappe » on overexploitation of groundwater – national steering group on participatory water management (GIZ/LISODE)

Roleplay « Simul'Eau » with stakeholders of the Houz-Mejjate Water Convention (GIZ/LISODE)

Conception of the Wadi Naffis Basin Water Game (GIZ/IRSTEA)

Preview of the Wadi Naffis Basin Water Game (GIZ/IRSTEA)



PRO & CONS

- Distance from personal situations
- Motivation / pleasure / fun
- Actively involve the participants
- Measure the interest of cooperating with others
- Support mutual understanding, transparency of process
- Bridge the gab between the local users, “experts” and decision-makers
- Define acceptable and inclusive solutions

- Time
- Means
- Need for physical presence
- Need to have an external facilitator
- Some may not take it seriously
- Some will fear that their strategy / hidden information will be revealed

PERSPECTIVES

Serious games are an interesting way to explore to meet certain development challenges:

- understand each other better
- Recognize local expertise of users

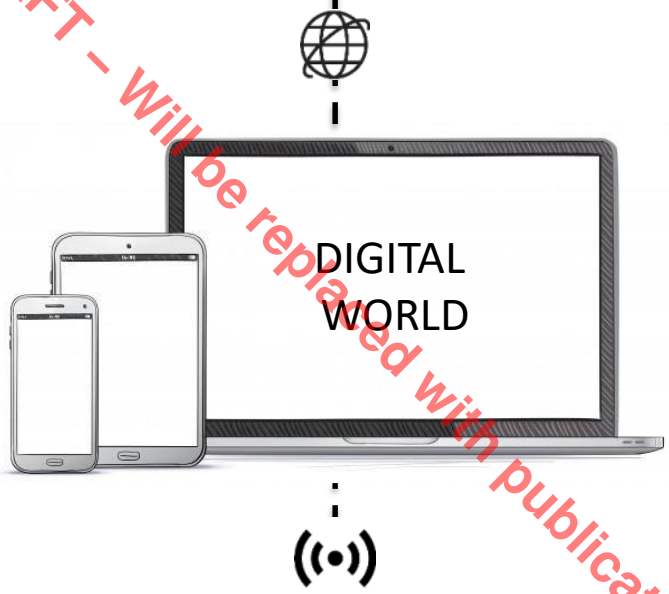
- get feedback from users on public policies
- measure the impact of a planned action or policy

- Know who contributes to what in environmental matters
- Target actions to be undertaken to reduce the impact

DIGTALIZATION OF SMART GAMES ?

Opportunities

- Use informatics in the conception of the game
- Use models during serious gaming
- Create or improve models with results from serious game
- Create virtual games for education purposes
- Use tablets/smart tables for participatory simulations



- Digital pénétration in rural areas ?
- Debriefing ?
- Collective décision making ?
- Human interaction & trust building ?

Contraints

TECH PARTNERS:

lisode
lien social et décision

consulting for real decision-making process

www.lisode.com

irstea
Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture

applied research on serious games

www.irstea.fr

ComMod

user community for the companion modeling approach

www.commod.org

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Published by:

KFW USAID IPRO - IRRIGAR

Government of Canada / Gouvernement du Canada

Counteracting the crisis in Mali with decentralised irrigation

The country is able to expand its agricultural production and help to provide food security for the Sahel states in the long term.

The challenge

Mali is one of the poorest nations on earth and has been dealing with violent conflicts throughout the northern and central parts of the country since 2012. The situation has since improved slightly, not least due to an extensive international presence there. The German Armed Forces are – among others – with 1,000 soldiers on the ground to contain acute conflicts. But this cannot permanently stabilise the fragile areas. Therefore, it is all the more important to improve local people's living conditions for the long term, thus reducing poverty, opening up new perspectives and increasing resilience against external influences. This is why KfW is promoting an extensive small-scale irrigation programme in Mali on behalf of the German Federal Government and other international donors. Mali has the potential to help ensure food security in the Sahel states in the long run – if farming is expanded and becomes more productive. Water plays a key role in this approach, especially in light of increasing climate extremes.

Current situation

Mali is still far from exhausting its potential: it ranked 182nd out of 189 countries on the United Nations' Human Development Index in 2018. Over half of the population lives below the poverty line; a third is chronically undernourished. At the same time, Mali recently achieved economic growth of around five per cent.

Nevertheless, the country is only making slow progress in reducing poverty, not least because of institutional weaknesses at the local, regional and national levels. Another reason is that the rural population is growing at over three per cent per year. And the number of illiterate adults recently rose to over six million. Women are particularly affected, comprising almost 60 per cent of them.

Project title	Supporting the National Programme for Sustainable Small-scale Irrigation.
Commissioned by	The German Federal Ministry for Economic Cooperation and Development (BMZ), the European Union (EU), Global Affairs Canada (GAC), United States Agency for International Development (USAID).
Country/Region	The Republic of Mali.
Lead executing agency	Ministère de l´Agriculture.
Project partner	Direction Nationale du Génie Rural (DNGR).

Despite the fact that a peace treaty was signed in 2015, the situation in the country continues to be tense. It ended the conflict with the Tuareg people in the northern part who wanted to separate and had declared independence in 2012. However, the situation remains complicated; there have been repeated acts of violence, primarily in the northern and central parts of the country.

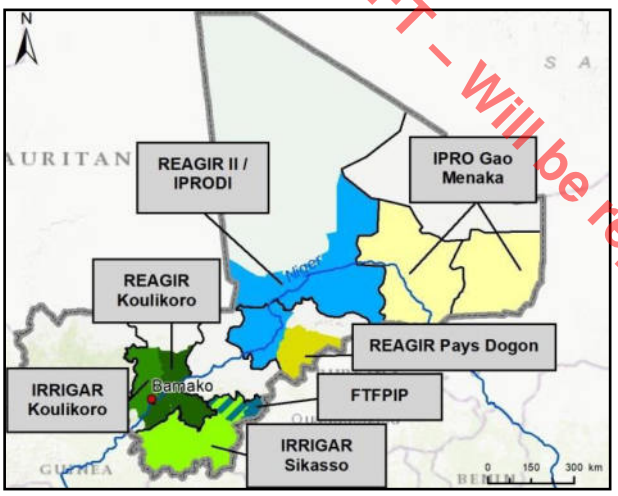
Photo 1: Harvests are rich when there is water.

Photo 2: Walls hold back the water to make irrigation possible.

Photo 3: New warehouses improve shelf life and make it easier to market agricultural products.

Photo 4: A wide range of food can be grown in Mali when the conditions are right. Here, they are presented at a local market.

So improving the living conditions throughout all sections of the population is an important prerequisite for permanent peace. Mali's most important industry is agriculture, employing three quarters of the people. However, due to climate conditions and strong population growth rainfed agriculture is not able to ensure sufficient income and food for small farmers. But Mali has large water reserves that can be used to expand, stabilise and diversify agricultural production and improve nutrition.



The dry northern and central areas of the country in particular can significantly increase yields using irrigation along the powerful Niger River. Of the estimated 2.2 million hectares of agricultural land, only about 20 per cent is being farmed. Targeted irrigation has the potential to increase this area fivefold.

At the beginning of 2012 Mali's government adopted the "National Programme for Sustainable Small-scale Irrigation" (*Programme National d'Irrigation de Proximté - PNIP*), which was created with support from German development cooperation. Agricultural land will be expanded considerably within this framework. KfW is financing regional modules in several phases that build upon and complement each other. They make up the core of the PNIP. The overarching goal of these measures is: to increase food production in the long term, improve living conditions for rural populations and generate trust in local, regional and national structures, which is critical for stable conditions.

Project approach

The approach of using simple but robust systems for irrigation has proved its worth over the years. It is adjusted to fit the local hydrological and agricultural conditions in various phases and in cooperation with different donors. The different contributions are all part of the PNIP and aligned with one another.

A whole range of irrigation systems is implemented. The irrigation perimeters are often small areas of 40 to 60 hectares. Pumps and canals are used to increase targeted irrigation of the fields. New inundation areas serve as retention mechanisms to ensure the water remains and augments groundwater levels when the river recedes or the rains stop. Floodplains, dams and vegetable gardens up to 10 hectares in size that are irrigated with shallow wells are also included in the measures. Complementary infrastructure measures comprise erosion protection to prevent fertile soil from being washed away by rain, and for building roads, trails and warehouses to improve the ability to market agricultural goods.

In the barren Dogon region near the city of Mopti, the activities look like this: most of the area there was deforested a long time ago. In addition to the construction of small dams that collect surface water run-off, the area surrounding the dams is being reforested to improve soil stability. And new roads are being built to enable people in participating villages to bring their products to markets. The same basic principle – expanding irrigation – is applied in other areas but, depending on the conditions, other complementary measures are added.

In some places, the new irrigation infrastructure is also used for fish farming, for example; this helps farmers diversify their production. Other regions lend themselves to livestock breeding if animal feed can be cultivated on the new farmland. The implemented measures initially depend on local demand. The population is closely involved in the changes. The recipients take responsibility within the project through personal financial contributions and by assisting in building the new structures. This ensures that the promotional measures match the actual needs and at the same time fit the country's complex reality, thus facilitating acceptance over the long term. Due to the tense situation, support is also provided for local and regional councils that help to allocate usable areas and prevent or solve conflicts as much as possible.

Photo 3: New warehouses improve shelf life and make it easier to market agricultural products.

Photo 4: A wide range of food can be grown in Mali when the conditions are right. Here, they are presented at a local market.

Decisions about construction measures thus not only follow technical, socio-economic and hydrological criteria; instead they are also based on what the people want. An open application system helps to determine what those desires are in the affected municipalities. Cultural idiosyncrasies and customs as well as aspects of gender relations also play a role in this.

Because, even though women play a key role in Mali's agriculture, they are traditionally disadvantaged compared to men. They usually have less access to and control of land, markets and finances. This is why women in particular are taken into account in the parts of the programme that KfW is financing, and they receive support with defined target values. They are represented in all decision-making bodies and, in each case, receive a previously defined portion of the newly irrigated areas. This amount was initially set at 10 per cent, has now been increased to 15 per cent, and is going to increase again in future project phases. In addition, the promotion of vegetable gardens is directly targeted towards women as vegetable farming in Mali is traditionally their responsibility. Increasing women's participation not only strengthens their position in society but also usually increases the available household income, so it benefits the entire family.

To take all this into account, agreements are systematically made in the respective regions between the project participants, the population and those legally responsible for operation in the municipalities. These agreements define the parties, their responsibilities and how the investment is to be managed later. All this takes place before the actual construction begins.

To ensure that the people are also able to truly fulfil their part, supplementary training is offered in areas like irrigation management, cultivation techniques or maintenance of structures and motor-driven pumps. This has an additional effect of promoting literacy among adults.

Detailed overview of financing activities

Within the scope of the PNIP, EUR 170 million in grants have been implemented or committed. Germany is one of the key partners thereby. In addition to FC financing and a TC component implemented by GIZ on behalf of the German Federal Government, mandates from the European Union, Canada and the USA also contribute to the payments. KfW's financing in particular applies a longstanding, proven technical and organisational approach and its commitment includes several components from various donors:

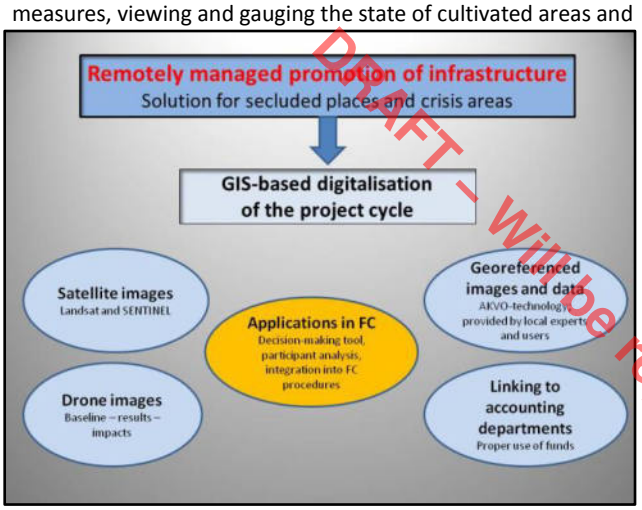
- **IRRIGAR:** Is a German-European co-financing programme in the west of the Koulikoro region (north of the capital Bamako) and in the Sikasso region (south of Bambako). The German share during the period of 2014 to 2019 totals EUR 15 million; the EU is contributing EUR 19.6 million. An additional EUR 5.0 million increase by 2021 is in the pipeline.
- **FTFPIP:** This comprises mandated funds amounting to EUR 3.6 million from the United States (USAID). The project began in February 2017 and is planned to run for four years. It is being implemented in the Sikasso region on the border to Burkina Faso and in close coordination with IRRIGAR.
- **REAGIR inland delta:** Is a coordinated parallel financing project comprising German and Canadian funds amounting to a total of EUR 48 million, EUR 40 million of which is from funds mandated by Canada. While Germany is funding irrigation measures in the Timbuktu / inland delta region (formerly IPRODI), the Canadian funds are allocated to the eastern part of Koulikoro, the Dogon region and Mopti. In a second phase (REAGIR II), the German Federal Ministry for Economic Cooperation and Development (BMZ) will increase its funding by an additional EUR 24.5 million until 2022 for the inland delta area in the Timbuktu and Mopti regions. Canada is also considering an additional mandate.
- **GAO and MÉNAKA:** In 2018 a further project element was added in the northern part of the country in the Gao and Ménaka regions. KfW is financing this part on behalf of the German Federal Government with a total of EUR 17.0 million.

Photo 3: New warehouses improve shelf life and make it easier to market agricultural products.

Photo 4: A wide range of food can be grown in Mali when the conditions are right. Here, they are presented at a local market.

Innovations

Digital technology is also being used by now. Satellite technology and drones have great potential uses for decentralised small-scale irrigation. Among them is monitoring progress of construction measures, viewing and gauging the state of cultivated areas and



evaluating harvesting operations. In particular, this applies to the country's unstable northern region. Using satellite images (SENTINEL and Landsat) is an important and inherent part of the project in the inland delta region. Drones are regularly used in the other PNIP regions, one per area (usually the ones most difficult to access) – to cover regions of up to 150 hectares. The drones supply valuable information and data from the project areas. The new projects also integrate the use of mobile-communication-based data and image processing in real time.

Impact

Between 2014 and 2019, the newly gained or rehabilitated agricultural area grew by close to 57,000 hectares with the financing from KfW. The largest areas are in the inland delta region with 33,900 hectares in Timbuktu and 15,900 hectares in Mopti. Close to 150,000 smallholder family operations and over 700,000 people have directly benefited from the new areas, which include village perimeters, inundation areas, vegetable gardens, fish farming, warehouses and new trails. This has enabled them to plant more rice, potatoes and vegetables and to increase their annual income by 30 per cent.

KfW-supported rice production in the inland delta region makes up around 50 to 60 per cent of the nation's production with small-scale irrigation. When compared to previous years, the yield per hectare generally increased around two- to threefold after the measures were implemented. In combination with the expansion of the agricultural area, overall production is rising three- to four-fold.

Through the small-scale irrigation programme, KfW, on behalf of the German Federal Government, is contributing to increasing Mali's food production and to diminishing still prevalent malnourishment. Due to the great potential of Mali´s agriculture, the need for financing here will remain high in the foreseeable future.

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Digital applications in small-scale irrigation

Applications numériques dans l'irrigation à petite échelle

Workshop @ GIZ Eschborn on 19 December 2019

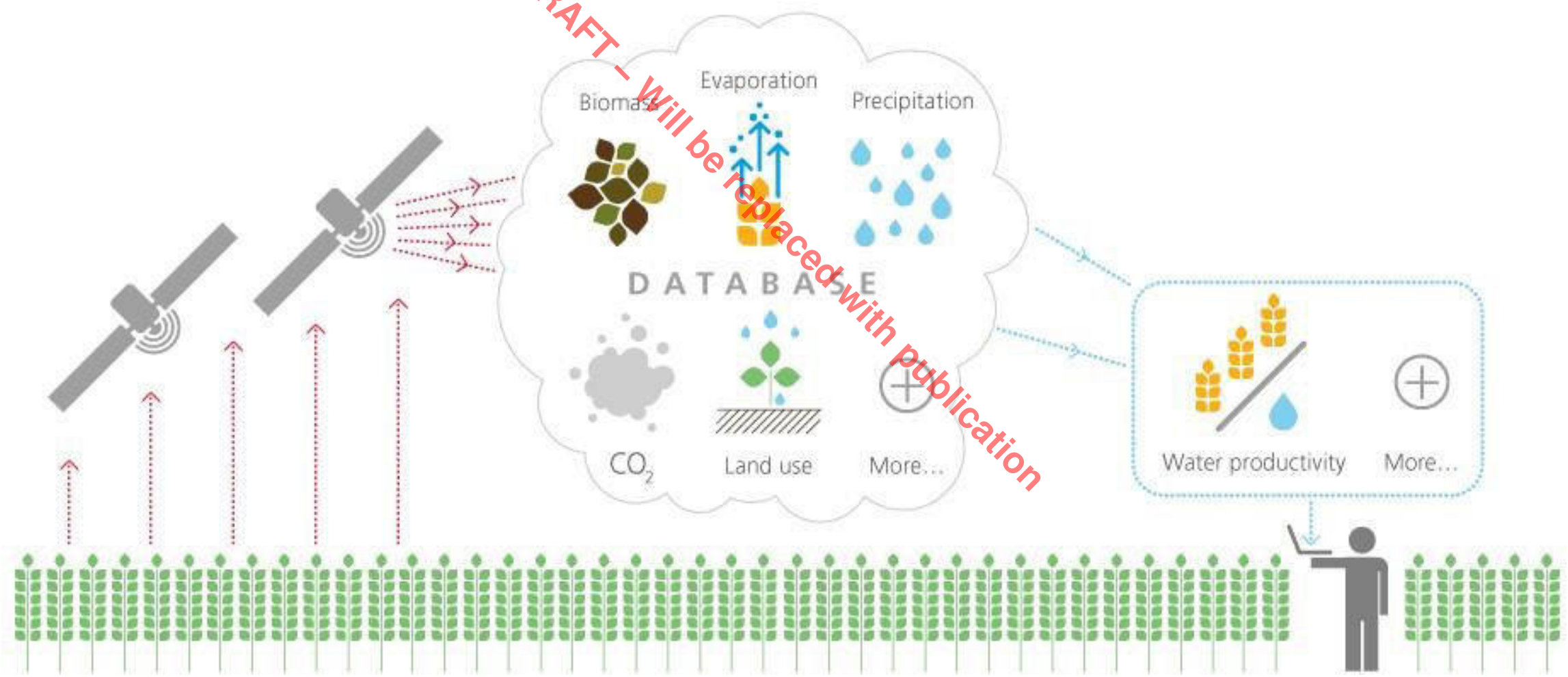
Food and Agriculture Organization of the United Nations

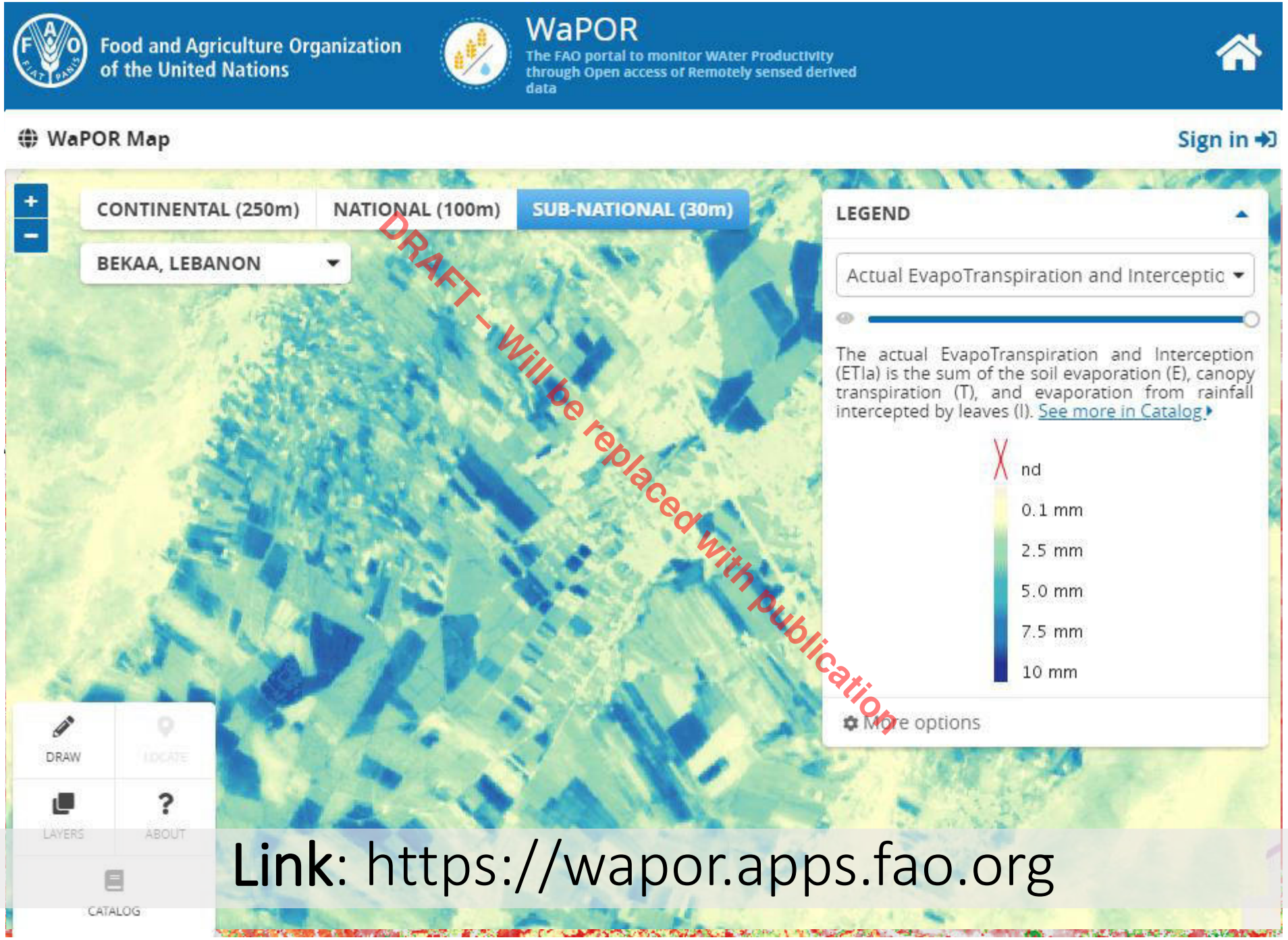
IWMI International Water Management Institute

UNESCO IHE DELFT

Ministry of Foreign Affairs of the Netherlands

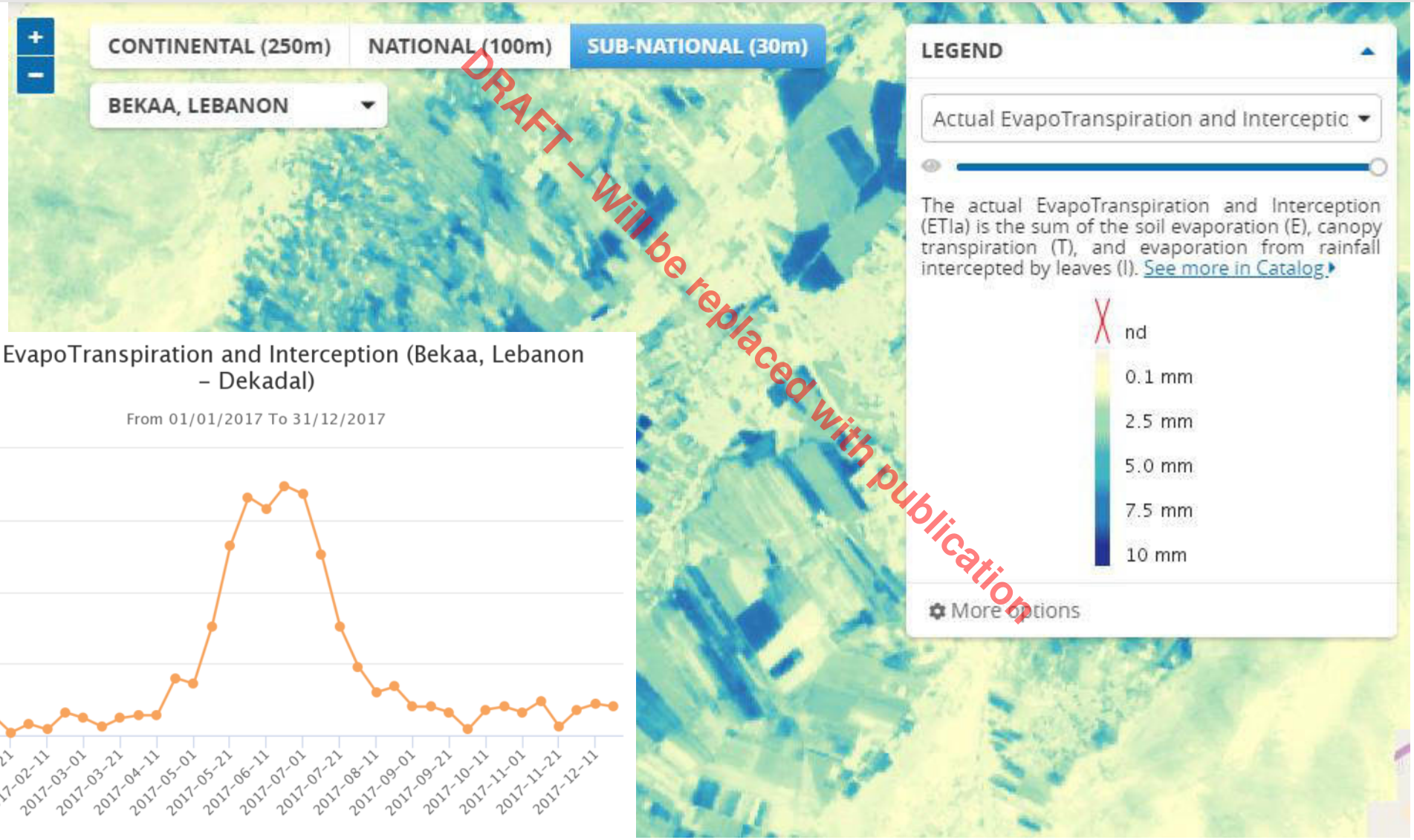
WaPOR Database



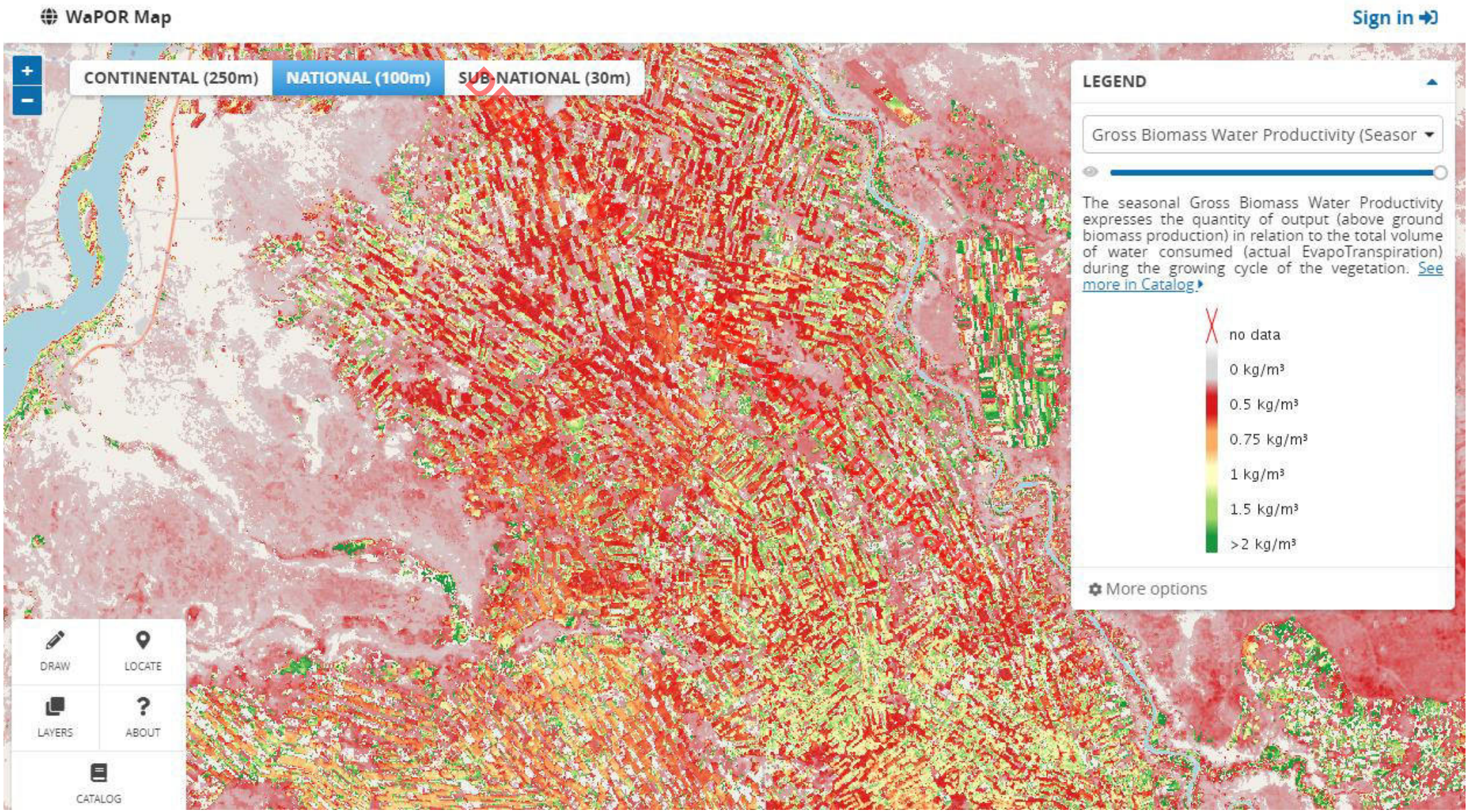


Link: https://wapor.apps.fao.org

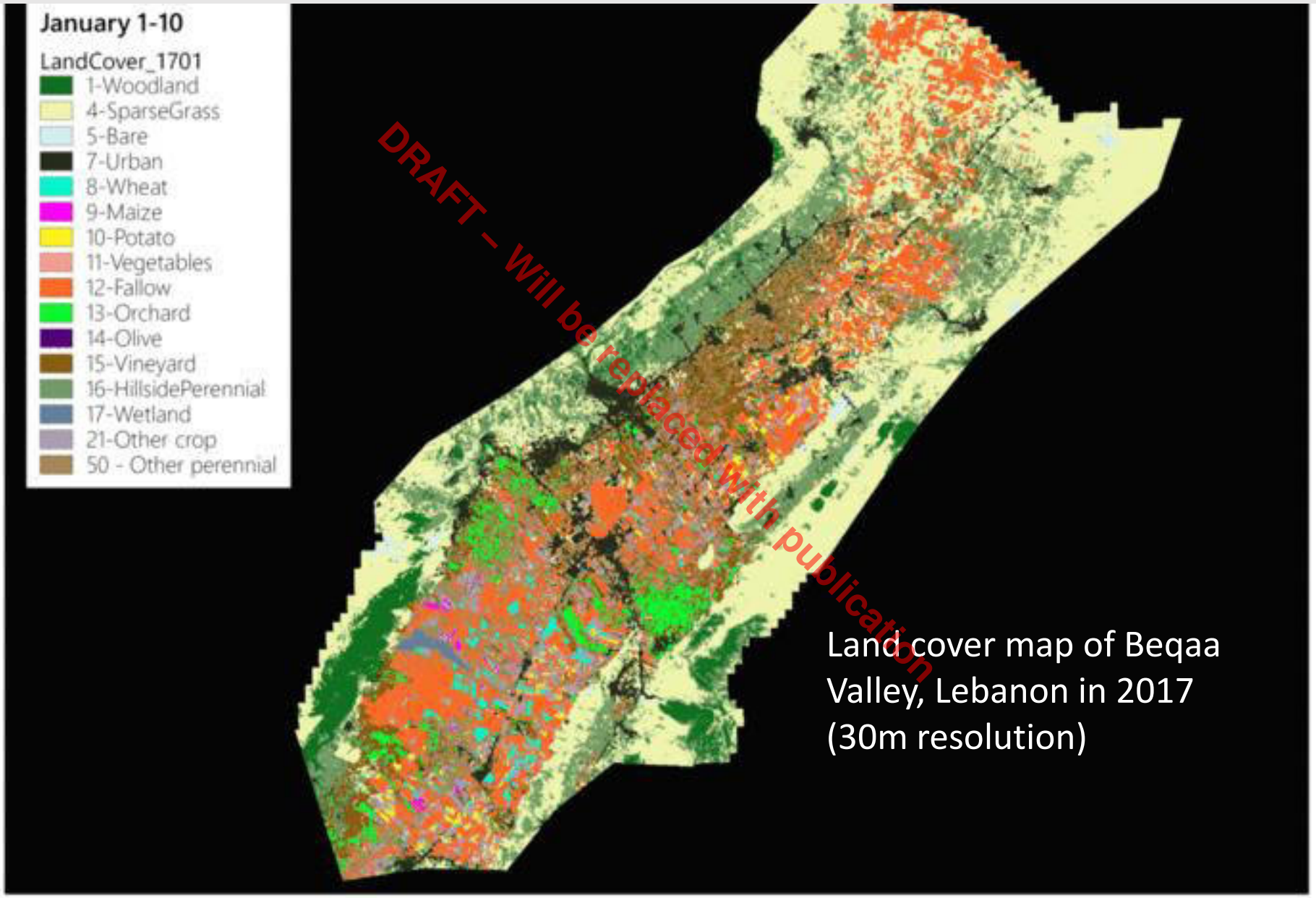
Tell me, how much water is consumed?
Monitoring evapotranspiration



More crop, per drop: How productive is agricultural water use?



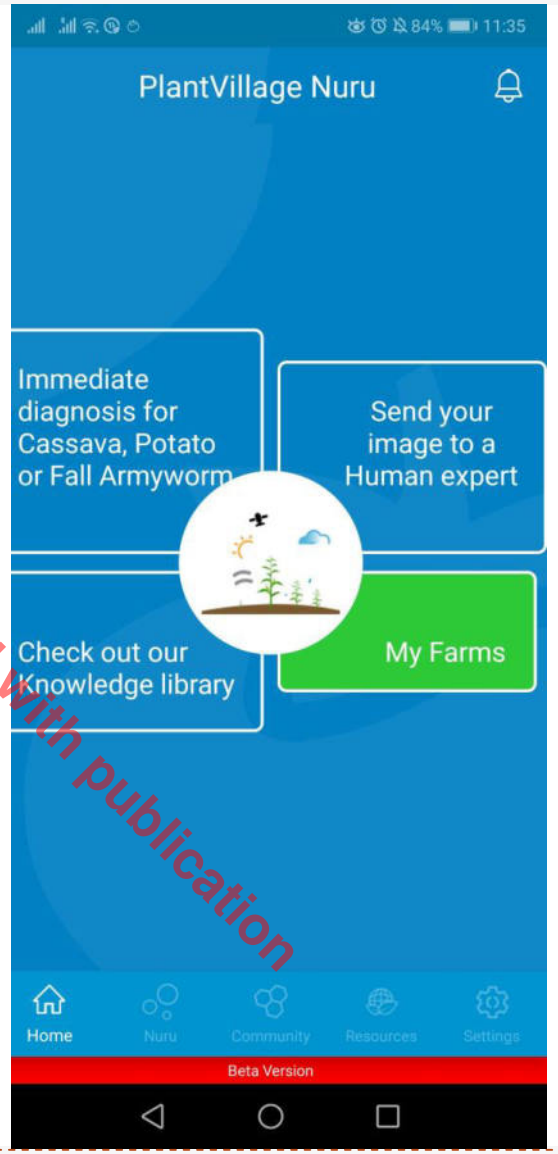
Land cover maps to calculate crop water use efficiency

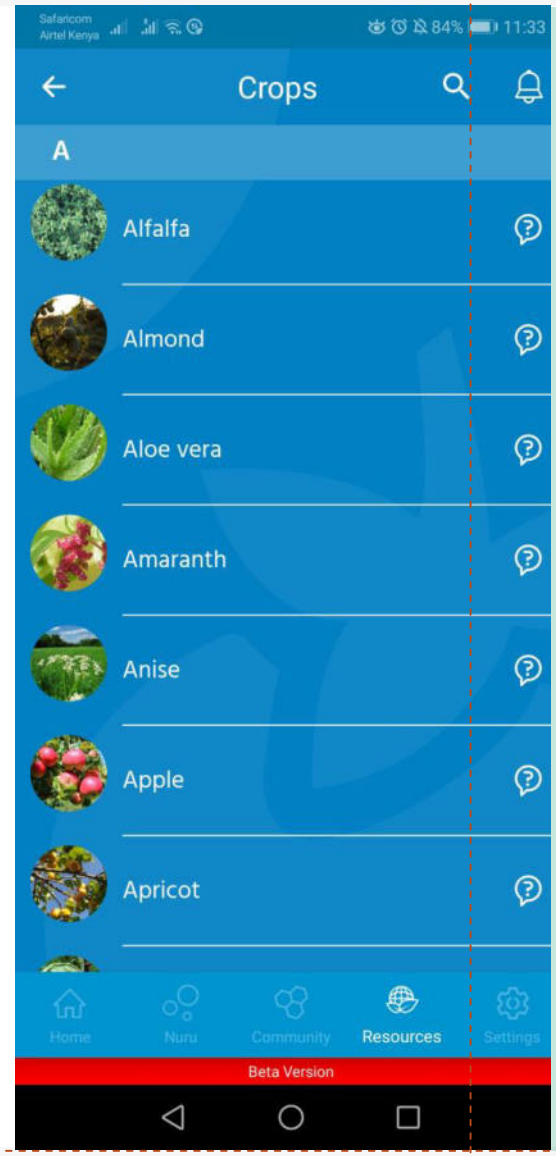


Plant Village *app-based advisory services*

The **PlantVillage Nuru app** provides farmers with local information on plant pests & diseases, and crop productivity.

In Busia, Western Kenya, PlantVilage is piloting an information system that integrates WaPOR data with other metrics (e.g. weather ad soil data) to advise farmers on **climate adaptation** practices.





WaPOR data in the background, accessible for all through open source APIs