Remote Sensing in FBLS
Content

• What is Remote Sensing?
• Applications in FBLS
• Workflow example
• Tools
• WaPOR
• Example Analysis – Gash Scheme
• RS as part of curricula
• Conclusions
WHAT IS REMOTE SENSING?

Obtain data through:

* Camera
* Drone
* Aircraft
* Satellite

Remote sensing is the science of obtaining information about objects or areas from a distance (NOAA)
WHAT IS REMOTE SENSING?

- Active/Passive sensors

**ACTIVE SENSING**

Remote Sensor emitting an energy source and detecting response off crop

**PASSIVE SENSING**

Remote Sensor collecting Red, Green, Blue, NIR spectrum
Opportunities of RS

• Data provision for areas with limited data availability/accessibility
• Historical and near-real time data to observe trends over time
• Open-access data so low costs for users
• A wide variety of parameters can be analyzed (e.g. evapotranspiration, soil moisture, biomass, groundwater)
Challenges of RS

- Technical skills
  - But user friendly tools now
- Data volume & computer power
  - Select Data, Hard Drives, Clouds
- Easy to misrepresent or misinterpret
  - Full cycle trainings
- Still require ground validation
- Limitations (e.g. cloud cover, resolution)
Applications RS in FBLS

Analyses over time & space
• Flood water distribution
• Biomass distribution
• Identification of natural vegetation
• Water Productivity
• Biomass Production
• Early Warning of Drought years
• M & E
• ...
Workflow Example

1. Quick WaPOR analysis
2. Verify in field (measurements & local knowledge)
3. Improve analysis
4. Use analysis for discussions with communities on:
   - Identification of target area
   - Identification of issues
   - Decision on interventions
5. Monitoring and evaluation
6. Feedback from community
Tools

OGIS

Google Earth Engine

WaPOR
WaPOR
What is WaPOR?

- **Water Productivity through Open access of Remotely sensed derived data**
- FAO-portal to monitor Water Productivity
- 10-year database
  - Evapotranspiration, Biomass, Precipitation and more.
- Pixel resolution of 250m, 100m and 30m
- Open and free access: [https://wapor.apps.fao.org/home/WAPOR_2/1](https://wapor.apps.fao.org/home/WAPOR_2/1)
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.
<table>
<thead>
<tr>
<th>THEME</th>
<th>Land Cover Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Biomass Production (Annual)</td>
<td>Reference EvapoTranspiration (Annual)</td>
</tr>
<tr>
<td>Gross Biomass Water Productivity</td>
<td>Precipitation (Annual)</td>
</tr>
<tr>
<td>Net Biomass Water Productivity</td>
<td>Reference EvapoTranspiration (Monthly)</td>
</tr>
<tr>
<td>Actual EvapoTranspiration and Interception (Annual)</td>
<td>Precipitation (Monthly)</td>
</tr>
<tr>
<td>Actual EvapoTranspiration and Interception (Monthly)</td>
<td>Reference EvapoTranspiration (Dekadal)</td>
</tr>
<tr>
<td>Actual EvapoTranspiration and Interception (Dekadal)</td>
<td>Precipitation (Dekadal)</td>
</tr>
<tr>
<td>Transpiration (Annual)</td>
<td>Reference EvapoTranspiration (Daily)</td>
</tr>
<tr>
<td>Evaporation (Annual)</td>
<td>Precipitation (Daily)</td>
</tr>
<tr>
<td>Interception (Annual)</td>
<td>Quality of Normalized Difference Vegetation Index (Dekadal)</td>
</tr>
<tr>
<td>Transpiration (Dekadal)</td>
<td>Quality Land Surface Temperature (Dekadal)</td>
</tr>
<tr>
<td>Evaporation (Dekadal)</td>
<td></td>
</tr>
<tr>
<td>Interception (Dekadal)</td>
<td></td>
</tr>
<tr>
<td>Net Primary Production</td>
<td></td>
</tr>
</tbody>
</table>
Examples of Applications

Analyses over time & space

• Water Distribution
• Biomass Production
• Water Productivity
• Etc.
WaPOR Translator

Level 1 data
- WaPOR
- SoilGrids
- GLDAS
- Other

Level 2 data
- Soil moisture related
- Radiation related
- Crop related
- Other related

Level 3 data
- Food Security
- Water Productivity
- Irrigation management
- Climate Smart Agriculture
Analysis example – Gash Scheme
WaPOR for Spate Irrigation

BIOMASS PRODUCTION & EVAPOTRANSPIRATION
THE GASH SPATE SYSTEM, SUDAN

NET PRIMARY PRODUCTION
EVAPORATION

Legend
- Canals & River
HPP [kg/m²/month]
- 0
- 500 - 1000
- 1000 - 1500
- 1500 - 2000
- 2000 - 2500
- 3000 - 4000
- 4000 - 5000

Legend
- Canals & River
AEI [mm/m²/month]
- < 12
- 12 - 22
- 22 - 30
- 30 - 35
- 35 - 40
- 40 - 45
- > 45
Natural Vegetation Mask
1. What do you see?

2. Based on this information, what questions may pop up for you which you would want to know to improve the Gash system?

3. How would you go about answering these questions?
Summary

• Open access
• Many analysis options
  • water distribution, WP, biomass distribution etc.
• Provides quick overview over large area
  • Assists in finding target areas
• Provides timeseries analysis to detect change
  • Can be used both for M&E and finding target areas
Use in curricula

• User friendly
• Suitable for many types of analyses
• High demand in analyses
• Contributes to targeted interventions
• Open access data

Ensures students obtain a skill which is in high demand and applicable to many water/agricultural applications
Thank you