EcoStress Images for Farmers

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The life of a farmer is one with tough decisions
Canopy temperature is crucial, but requires advanced interpretation (modelling)
Thermal sharpening is part of the modelling.
10 m land surface temperature Sendli 27 March (India)
Pixel Model for Soil Water Crop Atmosphere processes

**Atmospheric Evaporative Demand**

**Stomatal response to water stress**

- Stomatal conductance ($g_s$)
- CO$_2$, O$_2$, H$_2$O

**Soil moisture**

- Saturated soil
- Field capacity
- Available
- Wilting point
- Management allowable depletion (Beginning of plant water stress)

**Net anthropogenic flux**

- (9)
- Photosynthesis (123)
- Atmosphere (760)
- Plant biomass (560)
- Respiration (120)
- Soil (2500)
- Microbial biomass (110)
- Net sequestration (3)

SEBAL energy balance model
10 m crop evapotranspiration Sendli 27 March (India)
Checking field conditions in India (last week)
10 m Soil Water Balance model for cloudy days
Irrigation per sprinkler line
Irrigation advise per pixel
### 39 IrriWatch tiles in California (7 April 2022)

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of Tiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>39</td>
</tr>
<tr>
<td>Netherlands</td>
<td>38</td>
</tr>
<tr>
<td>India</td>
<td>35</td>
</tr>
<tr>
<td>Chili</td>
<td>21</td>
</tr>
<tr>
<td>Egypt</td>
<td>19</td>
</tr>
<tr>
<td>South Africa</td>
<td>16</td>
</tr>
<tr>
<td>Portugal</td>
<td>15</td>
</tr>
<tr>
<td>Mexico</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td>100</td>
</tr>
<tr>
<td><strong>World TOTAL</strong></td>
<td><strong>324</strong></td>
</tr>
</tbody>
</table>
• On 7 April 2022 we execute 324 tiles across the world
• On average 4 good quality Ecostress images / month (range 1 to 8 images)
• On average 48 good quality Ecostress images / year
• Total downloads $324 \times 48 = 15,500$ images / yr

EcoStress is essential to create operational thermal measurements
Practical usage of EcoStress measurements for crops
Pressure on International Agriculture to perform better
Q: What is the source of precision agricultural data (sensors and drones are insufficient)?
A: It has to be a 2D image with sufficient spatial resolution, how do you measure your crop otherwise?
EcoStress helps farmers on following information:

- When does the crop need water? → Soil water potential
- How much water does the crop consume? → Actual evapotranspiration
- Where should I irrigate? → Variable Rate Irrigation
- What is crop (heat and water) stress? → Dry Matter Production (DMP)
- Alerts on local pest & diseases → Pockets with DMP changes
- When and amount of fertilizers → Leaf Nitrogen
- Maintaining & increasing soil health → Soil carbon pools
Irrigation requires a weekly plan

Yesterdays image on soil moisture and crop ET is the basis for forecasts
Less irrigations in Kazakhstan
Only apply Nitrogen when there is sufficient moisture.
Maize production 10 m x 10 m, Kazakhstan

Combine-harvester data

Partially based on EcoStress data

Legend
- Corn Yield
  - 12.0
  - 13.0
  - 14.0
  - 15.0 ton/ha
  - 16.4 ton/ha

Source: www.irriwatch.com (to support@irriwatch.com)
www.irriwatch.com
Portal.irriwatch.com
https://www.youtube.com/results?search_query=irriwatch
https://www.linkedin.com/company/64514520/admin/

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