Development of an Irrigation Management Advisory System with Satellite Technology

The Challenge

The Irrigation Scheduling App

The Opportunity

The Institute for Water Modeling (IWM) refined a river flow model to determine how much water can be safely used for irrigation. The model simulates the long-term effects of water withdrawal considering different climate change scenarios and sea level rise. IWM also generated a set of recommendations to bring surface water to as many crop fields as possible.

The irrigation scheduling algorithm takes into account field specific conditions. Studies conducted elsewhere have shown that remote sensing can be used to accurately estimate crop water use. CIMMYT therefore used an unmanned aerial vehicle (UAV) to monitor crop growth. Estimated crop water use is fed into a model that simulates a soil water balance that takes into account salinity, water holding capacity, and capillary uprise from the water table. Using forecasted weather data, the model then predicts field specific irrigation water requirements.

Working with BIID, CIMMYT developed a prototype of PANI, an app for smartphones, that informs farmers and irrigation service providers on a weekly basis whether a field needs to be irrigated. To ensure that IrMASaT fits well into the general context of agricultural research activities being conducted in Bangladesh, we closely collaborated with the Bangladesh Agricultural Research Council (BARC) and Bangladesh Agricultural Research Institute (BARI).

In addition, CEGIS, one of our partner organizations, developed an interactive web map server that can be used to identify areas in which surface water irrigation has the largest potential.

The Goal

Sustainable intensification of crop production in the southern delta of Bangladesh, through a field specific irrigation advisory system in conjunction with integrated services.

The Objectives

Development of a field-specific irrigation scheduling algorithm that takes into account salinity and potential contribution of the water table to crop growth.

Assessment of the impact of the withdrawal of surface water for irrigation at a large scale in the delta region on water quality and quantity.

The Approach

Large tracts of land are underutilized during the dry winter months. We estimated that 240,000 ha that are left fallow during the winter and 867,000 ha are under low production crop intensity. Out of this land, more than 100,000 ha can be addressed with surface water irrigation.

The model uses percent ground cover (GC), which is the fraction of area covered on the ground by green leaves when seen from above, to estimate crop water use. GC can be derived from satellite imagery. Another app to estimate GC from RGB photos taken with a smartphone is under development.

Estimation of ground cover (%)

Ground Cover (%)

Daily Weather

• Tmax
• Tmin
• Solar radiation
• Precipitation
Forecasted irrigation need (yes/no)

Water table depth

0

0.2

0.4

0.6

0.8

1

Ground Cover (%)

01/01/2015

01/03/2015

01/05/2015

Date

MODEL

STARS in South Asia: IrMASaT

I am a Farmer

LSP

BANGLA ENGLISH

splash screen

first screen

Ground Cover with classified RGB photo is under development.

Estimation of ground cover with satellite imagery.

PANI: The Irrigation Scheduling App

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