



Crop Water Use Application for Irrigation Management

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Introduction

Water is an important factor that affects crop yields. University of Missouri Extension developed an online application to help farmers manage irrigations (Fig. 1). The Crop Water Use app can be run on a computer or smartphone. To register, go to <http://cropwater.org>.

Farmers with irrigation are usually able to harvest consistent yields, even in times of drought. Irrigation helps in periods of short-term crop water stress, which are common in July and August. Farmers can prevent yield losses and conserve water resources with access to information on daily crop water use. The app helps growers see how much soil water is stored for root uptake between rainfall and irrigation events in specific fields on their farms.

Main Menu

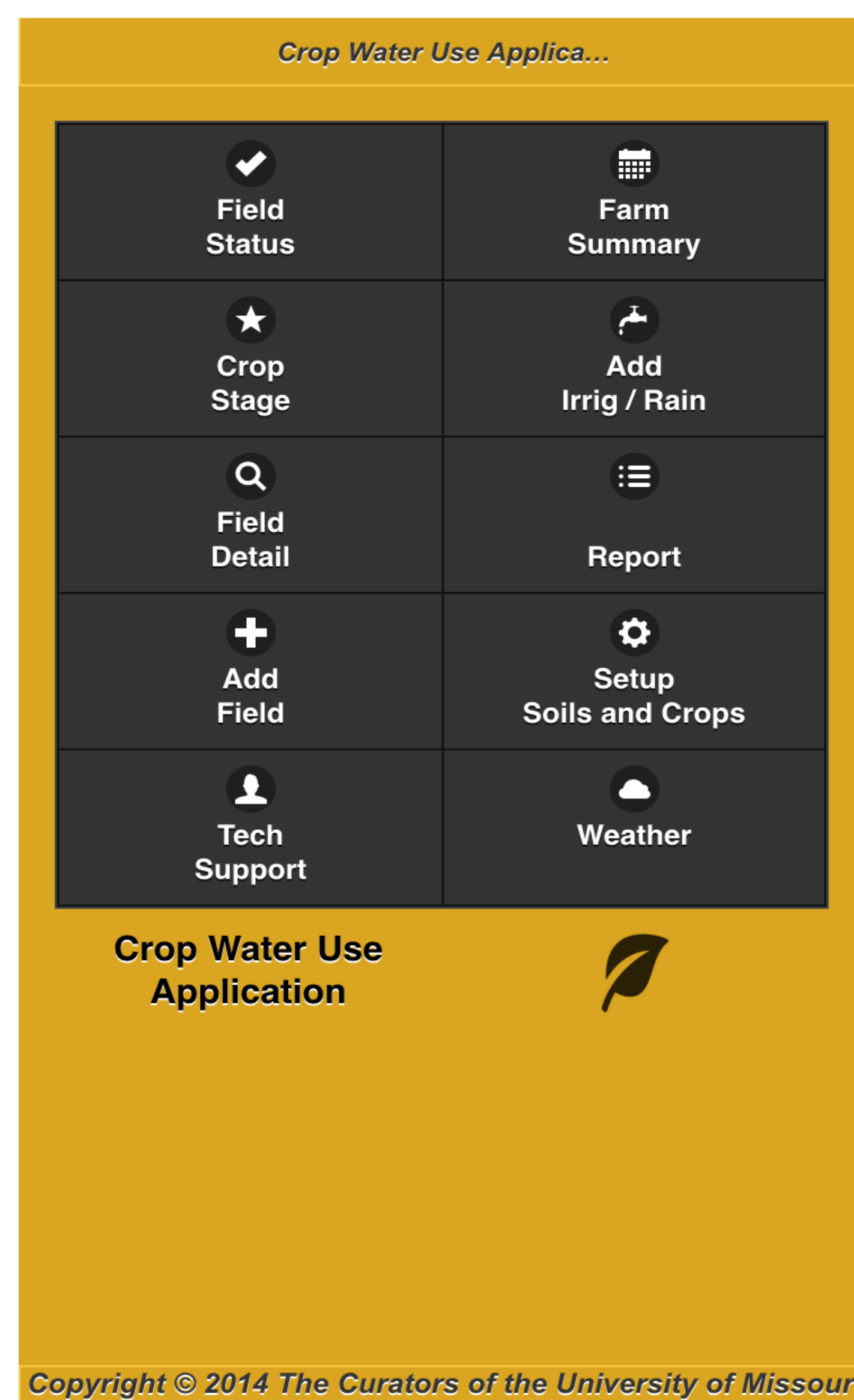


Figure 1. The main menu screen in the mobile app.

The application calculates daily soil water balances for each field. Reports include indexes to help farmers determine when to irrigate. University of Missouri Extension automatically downloads data each day from a network of agricultural weather stations across Missouri. ET is calculated from temperature, humidity, wind and solar radiation. This application uses the Standardized short crop Penman-Monteith Evapotranspiration equation, or ETo, which was developed by a committee of the American Society of Civil Engineers. ETo is the amount of combined water lost from a reference crop, such as grass, and soil evaporation. ETo is multiplied by a crop coefficient, which is specific for the crop and growth stage. Beginning at planting, growth stages are predicted from growing degree days for corn, rice, and cotton. This information is used to estimate daily crop water use, or Etc.

Adding New Fields

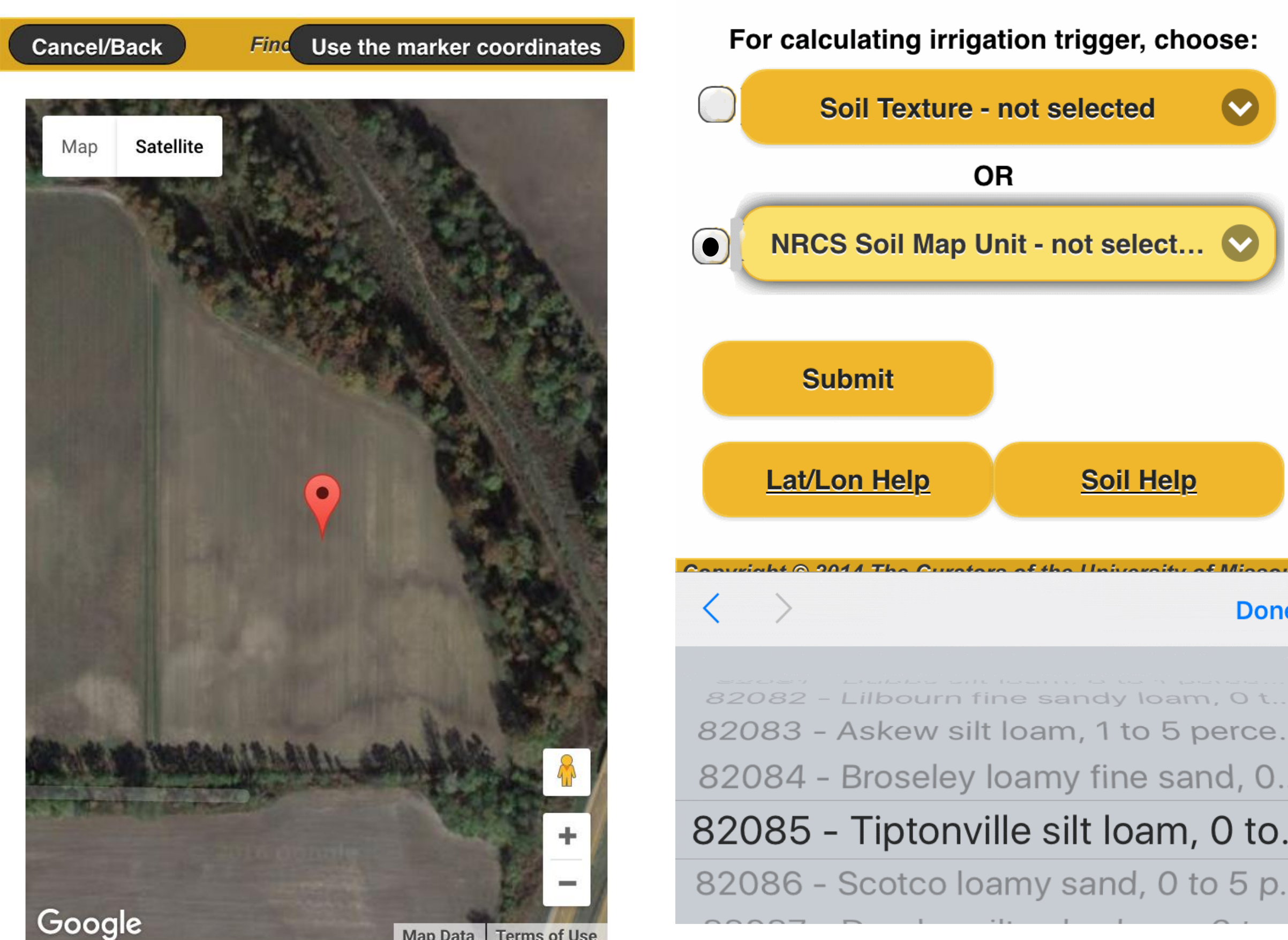


Figure 2. Two new features to the app in 2016 are the ability to mark fields coordinates with Google Maps and use Natural Resource Conservation Service soil mapping units for better estimation of available soil water holding capacity.

Monitor Daily Soil Water in Fields

When setting up new fields, farmers have a choice of entering soil texture or a five-digit mapping unit assigned to soil zones of fields by the NRCS (Fig 2).

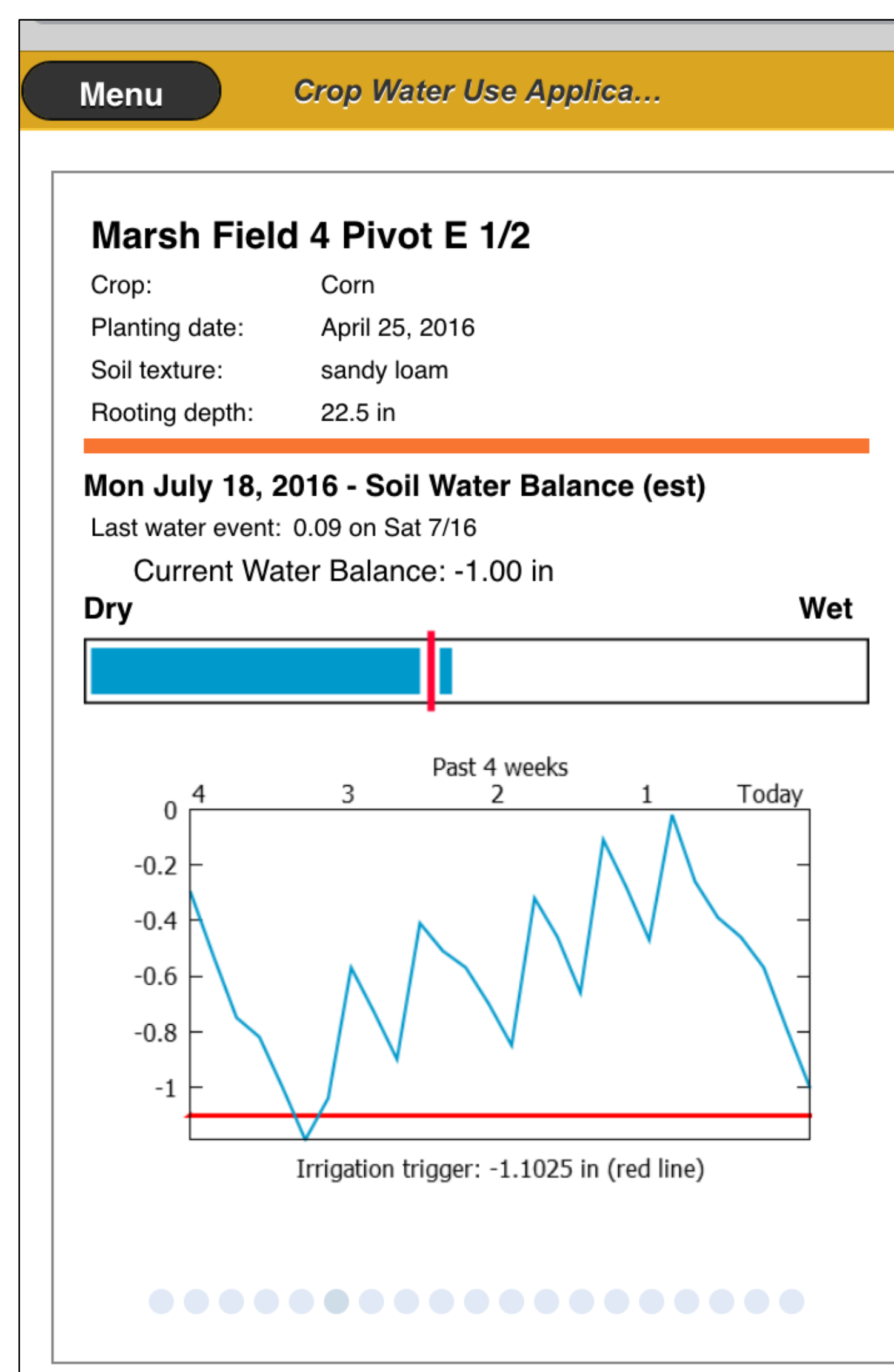


Figure 3. Fields are sorted driest to wettest. To navigate between fields use a finger to swipe left to right or right to left on a phone.

Daily soil water balances for fields can be viewed from *Field Status* or *Farm Summary*. In *Field Status*, as a field becomes drier between rainfalls or irrigations, fewer blue ticks are displayed on the right side of the bar graph (Fig. 3). A message is displayed when the irrigation trigger point has been reached. A line graph tracks daily changes in soil water balance over the last four weeks relative to the irrigation trigger.

Farm Summary helps farmers plan ahead for labor and equipment needs. The predicted dryness indexes for each field assume historical evapotranspiration, or ET, for the projected days and no rainfall will occur in the next week (Table 1). Field reports are can be printed to distribute to workers who control irrigation pumps.

Table 1. Field Summary example from Tuesday, July 14, 2015.

Name	Projected Dryness Index Without Rainfall							
	Today	Tue	Wed	Thu	Fri	Sat	Sun	Mon
Marsh Field 4 soybean	-0.84	OK	OK	*	***	XXX	XXX	XXX
Pivot Field 5 corn	-1.15	***	XXX	XXX	XXX	XXX	XXX	XXX
Rhodes Field 1 cotton	-0.17	OK	OK	OK	*	**	***	XXX
Rhodes Field 14 cotton	0	OK	OK	OK	OK	OK	**	***
Lee Field 12 soybean	-1.27	XXX	XXX	XXX	XXX	XXX	XXX	XXX
Lee Field 10 Corn	-1.16	**	***	XXX	XXX	XXX	XXX	XXX

The symbols *, **, ***, and XXX represent 70, 80, 90, and 100 percent of management allowed depletion (MAD) level.

Crop Stage and Scouting

The *Crop Stage* page allows farmers to track growing degree days based on max and min daily temperatures for crops in fields. (Fig. 4). To access scout recommendations, click the black box in the right column.

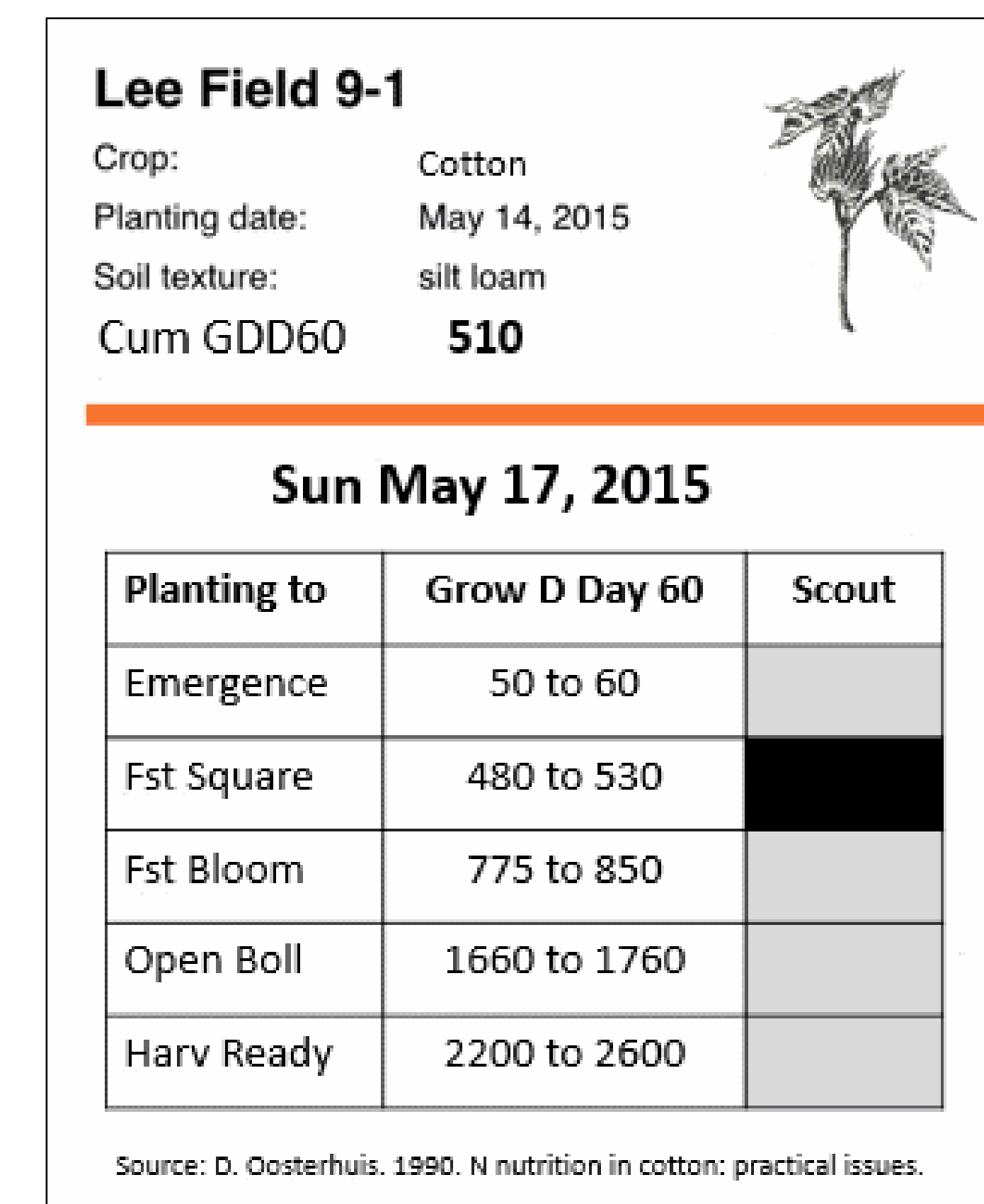


Figure 4. Example report.

- Square retention during this period should range from 70 to 80 %. Monitor retention during scouting.
- Irrigate to prevent water stress beginning at first square to establish plant structure and yield potential.
- Start PGR applications at 9 to 10 nodes-with a height-to-node ratio of no less than 2 on cotton that is stress-free and well-fertilized.
- Preserve beneficial insects. Avoid pesticide convenience applications.