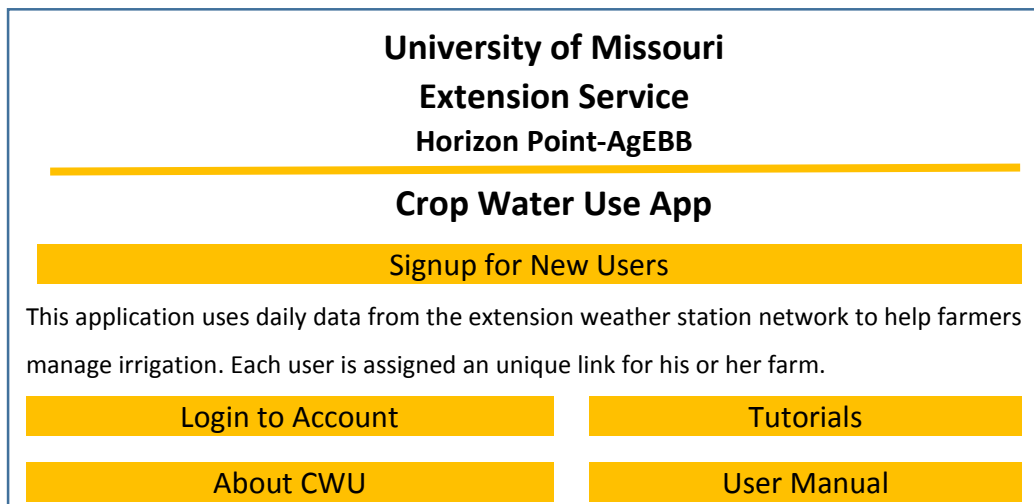


2. Navigating Functions in the App.

To register for the application, go to www.cropwater.org. You will see the screen below.



Screen for new users and login for existing accounts.

Read the Terms of Use. If you approve, click "I agree". Enter your email address, User Name, password in the boxes. Your name and phone number are not required.

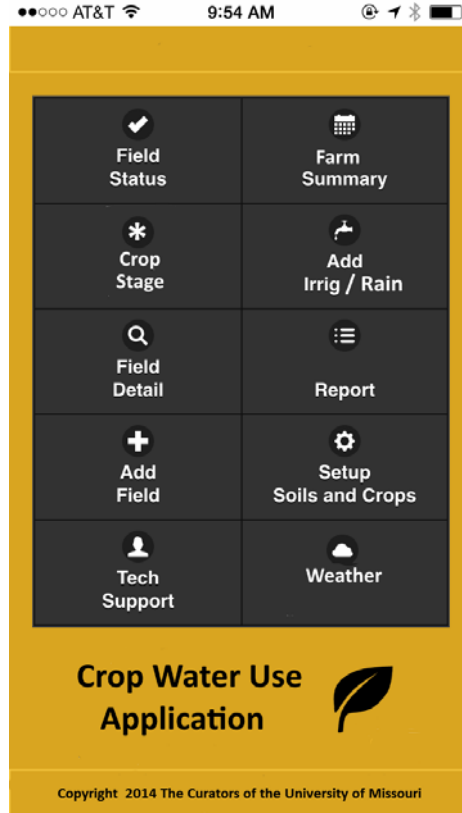
On the next screen, you will have the option to either launch the application and bookmark the link or request the address by email.

If you request email link, an address with 32 random numbers and letters will be generated. Only share your unique address with people that you trust. You can copy (Ctl C) and paste (Ctl V) the address of the link to your computer and mobile phone. This will save you time not having to type in a password every day to check your fields.

The Crop Water Use App requires daily weather from the Missouri weather station mesonet to function. Currently, the program only works when you have internet access by WiFi or a cellular data connection.

Main Screen. Click on the bookmarked website address for your farm in browser. The first screen that will appear in the app is *Main*. This is the starting place to add new fields, setting the soil and crop information, monitoring daily soil moisture, logging rainfall and irrigation amounts, and requesting field reports.

Field Setup. Now, click on *Add Field* in the third row. In the next screen, click on the top boxes and enter the field name and decimal degrees for north latitude and west longitude which are both positive real numbers. You will have the option to find your field using Google Maps. Example format: Lat: 36.4151365, Long: 89.7010119. CWU uses positive decimal degrees.



The main menu screen.

If they enter west longitude as a negative number the program will correct it without error. Be sure the correct GPS location for the field is entered before clicking *Submit*. The title at the top of the page will change to *Edit Field*. The location cannot be changed now but it is easy to delete and re-enter a field.

Enter the dominant five digit NRCS mapping unit for the field or select the dominant soil texture for the field. This is used to estimate available soil water holding capacity. For more information about soils go to <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.

Although the lat/long is locked in, soil texture for a field can be changed later to a finer or coarser texture if needed.

Click on *Submit* and *Back to Main Menu*. The next step is setting up crop information. In the Main Menu, click *Setup Soils and Crops* (fourth row, second column). Then scroll to the field name and click on *na* under Crops in the right column.

Menu Crop Water Use Application

Field/Crop Information

Field name: Soybeans Group V

Note: Crop and plant date cannot be changed once data processing for this field has begun. Please be sure to leave plant date set to a far-future date (e.g. 12/31/20nn) until you are certain of the crop planted and the exact plant date. Once H₂O deficit processing has begun, the planted crop and plant date will be locked and moved to a different location on this screen. If you need to change the crop planted or plant date after they become locked, please delete the crop year information and add it again.

Crop:

Choose Crop

Plant date: for direct input please use format mm/dd/ccyy or ccyy-mm-dd (e.g. Apr 15, 2014: 4/15/2014 or 2014-04-15)

12/31/2015

Soil water deficit on planting date:

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Field/Crop information page for entering field and crop information.

Select the planted crop in the field. The default planting date is 12/31. Important: If crop and planting date are not known yet, do not guess. Skip these boxes and come back later. Other boxes on this page can be entered even if crop and planting date are not known. Click *Submit* to save the information.

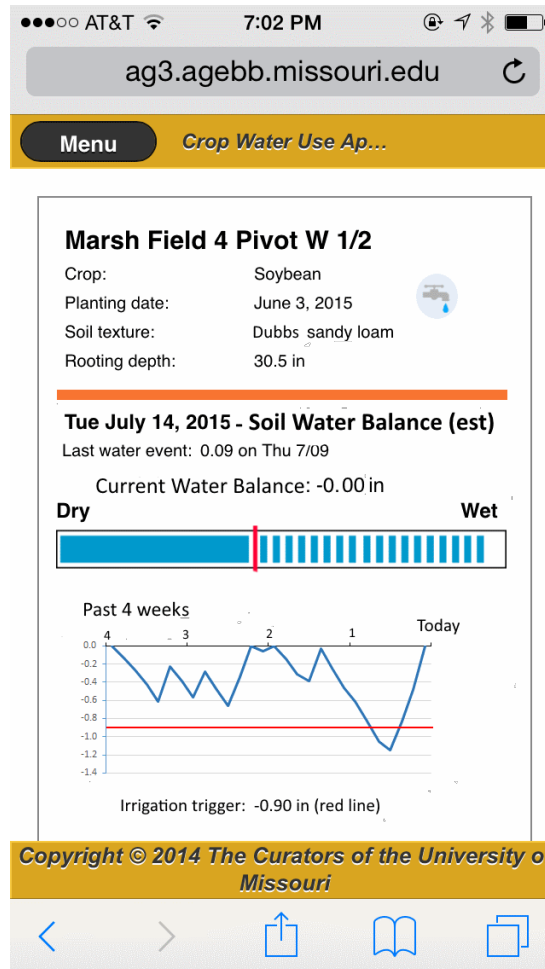
The next box on the page is *Soil water deficit on planting date* . Unless spring rainfall has been usually low, leave the default value on zero (field capacity) for initial soil moisture. A field method for estimating soil moisture by hand is at <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mt/newsroom/?cid=nrcs144p2%20056492>

Fill in the rest of the boxes on this page. The effective root depth for most crops in Missouri is in the range of 18 to 24 inches. If the soil has a restrictive layer from compaction, enter a shallower depth. During the season, the rooting depth can be modified. Select the irrigation method and default rate of water application. Leave the allowable field water depletion at the default 50% unless you want to be more liberal with making irrigation applications.

Then click “Yes” on NWS Rainfall if you want the program to automatically enter the estimated rainfall amounts based on GPS locations of the field. If you click yes, during the season, you will also have the option to substitute your rain gauge measurements for individual rainfall events or completely turn this feature off. Click “No” to never use NWS rainfall estimates. Now, repeat the Setup steps for other fields until all are entered in the app.

Monitoring Daily Soil Water in Fields. In the Main menu (top row), click *Field Status* or *Farm Summary* to check daily water status in each field. *Field Status* shows estimates for each field

individually for the current day and *Farm Summary* shows projected dryness indexes for all your fields for today and the next week assuming no rainfall occurs.



Field Status screen for checking daily soil water deficits in individual fields.

To navigate between fields in *Field Status*, swipe your finger right to left or left to right across the bottom of the screen. As the season progresses, your fields in *Field Status* will be sorted each day from driest to wettest soils.

In *Farm Summary*, today's soil water deficit is shown for each field with the dryness index for today and the next week. To see the most columns tilt the phone to landscape position. The Dryness Index warns you when the soil water deficit is coming close to the Management Allowed Depletion (MAD) level of the field which is the recommended trigger for irrigation. The symbols (*, **, ***, and XXX) represent 70%, 80%, 90%, and 100% of MAD, respectively. The value showing "Left to trigger" is the percentage remaining relative to MAD before the reserve water is used. The text will change from green to yellow then red as the soil dries.

Menu		Crop Water Use Application						
Name/Crop	Soil H... Def, in.	Dryness Index						
		Sun	Mon	Tue	Wed	Thu	Fri	Sat
Lee Field 12-1a Soybean	-1.05	**	XXX	OK	OK	OK	OK	OK
Lee Field 12-1b Corn	-0.96	**	***	XXX	OK	OK	OK	**
Lee Field 12-3 Cotton	-0.66	OK	OK	*	OK	OK	OK	OK
Lee Field 9-1 Cotton	-0.66	OK	OK	OK	OK	OK	OK	OK
Marsh Field 4 Pivot E Cotton	-0.84	*	**	***	OK	OK	OK	OK
Marsh Field 4 Pivot W Rice	-0.73	XXX	XXX	XXX	OK	OK	***	XX
Marsh Field 5 Pivot Corn	-1.40	XXX	*	***	OK	OK	OK	OK
Rhodes Field 12 Cotton	-0.86	XXX	XXX	XXX	XXX	XXX	XXX	XX
Soybeans Group V na	na	na	na	na	na	na	na	na

Refresh

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Main menu screen for checking soil water dryness indexes for the next week.

As the crop grows and periods of low rainfall occur, the values in the H₂O deficit inches will become more negative.

Soils have different water storage capacities, so no single soil water deficit value is acceptable across all soils. For example, crops growing on sandy soil stress for water faster than crops on silt loam soil. Factors used for calculating MAD are soil texture, crop rooting depth, and allowable depletion. Soil texture is used to estimate available water holding capacity (AWHC). The formula for MAD is AWHC x Root Depth x Percent Allowable Depletion.

More details about water credits and debits is found in the *Field Detail* screen. You can find this screen from the Main menu or clicking on a row in the *Farm Summary* table. This screen shows the daily values for crop ET, inches of rainfall and soil water deficit for the last week. To view more days, click on “All Days” at the bottom of the page. The second row of boxes will be for entering rainfall and irrigation amounts after the fields have been setup.

When soil water deficit values equals 70% of the MAD level, the Dryness Index column will display a single red asterisk. Without rain or irrigation more asterisks will appear in the following days. Avoid letting the index become red with XXX for several days. Once a field soil becomes dry, crop yield is lost.

When the dryness index does not match soil moisture sensors or visual crop water stress, fine-tune the field setup by adjusting the rooting depth or allowed depletion percentage.

Entering Rainfall and Irrigations. Two options are available for entering rainfall and irrigation events. Click on the water faucet symbol (first column) in a field row of *Farm Summary* to navigate to the *Add/Edit Precipitation and Irrigation* page. If “Yes” was selected for NWS rainfall in setup, the third column displayed will be “NWS Precip”. To override NWS for a

specific day, enter the correct value in the blue column labeled, “Field Precip”. The rainfall amounts will be underlined indicating the CWU is using the new value for that day. The NWS amount will still be displayed, but it will not be used by CWU.

Day	Date	NWS Precip (est)	Field Precip	Field Irrig
Mon	7-14	0.80	<u>1.53</u>	
Tue	7-15	0.61	<u>0.00</u>	
Wed	7-16	<u>0.00</u>		
Thu	7-17	<u>0.00</u>		
Fri	7-18	0.04	<u>0.01</u>	
Sat	7-19	<u>0.00</u>		
Sun	7-20	<u>0.00</u>		

Buttons: Change Field, Main Menu

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Page to edit precipitation (rain) and irrigation for amounts field.

To enter rainfall amounts in the program click on a cell in the light blue column (4th) corresponding the date that water was applied. Likewise for irrigation, click on the green column (far right). The irrigation default rate that was entered in the setup will appear. If needed, it can be modified before clicking Submit. When other fields receive the same amount of irrigation, click the check boxes beside their names at the bottom of the page.

Unfortunately, the 24 hour period for rainfall at the National Weather Service is not midnight to midnight. It is mid-morning to mid-morning so a late afternoon rainfall still will not be posted in the app at 6 am the next morning. If you know how much it rained in your rain gauge, enter it rather than wait for an NWS update. When NWS shows a rainfall amount but none actually occurred, enter 0 in the blue Field Precip column. When other fields on the farm also received the same amount of rainfall (or none), click the check boxes beside their names at the bottom of the page.

To access a report for printing go to *Report* (3rd row, right column) in the Main menu. Select the field to print and click “Print”.

Crop Water Use Application								
University of Missouri-Extension Horizon Point				Farmer: Gene Stevens				
Crop Water Use Application				Release Version: March, 2015				
Field	Lee Field 12-1a	36.3950N 89.6117W			Irig trigger MAD: -1.176			
Soybean	sandy loam			24in root depth	50% allow depletion			
Date	Cum GDD60	Rainfall inch	Irrigation inch	ET crop inch	Soil H ₂ O Balance	Mgt Allow Deficit %	Dry Index	
Thu	8-May	26	0	0.00	0.04	-0.04	3	OK
Fri	9-May	46	0.48	0.00	0.10	0.00	0	OK
Sat	10-May	69	0	0.00	0.03	-0.03	2	OK
Sun	11-May	96	0	0.00	0.04	-0.07	5	OK
Mon	12-May	121	0.25	0.00	0.10	0.00	0	OK
Tue	13-May	139	0.4	0.00	0.09	0.00	0	OK
Wed	14-May	142	0.9	0.00	0.03	0.00	0	OK
Thu	15-May	146	0.19	0.00	0.03	0.00	0	OK
Fri	16-May	153	0.01	0.00	0.04	-0.03	2	OK
Sat	17-May	161	0.01	0.00	0.03	-0.05	4	OK
Sun	18-May	172	0	0.00	0.06	-0.11	9	OK
Mon	19-May	191	0	0.00	0.06	-0.17	14	OK
Tue	20-May	217	0	0.00	0.09	-0.25	21	OK
Wed	21-May	243	0	0.00	0.08	-0.33	28	OK
Thu	22-May	272	0	0.00	0.09	-0.42	35	OK
Fri	23-May	299	0	0.00	0.09	-0.50	42	OK
Sat	24-May	324	0.02	0.00	0.09	-0.57	48	OK
Sun	25-May	350	0	0.00	0.09	-0.66	55	OK
Mon	26-May	379	0	0.00	0.10	-0.76	64	OK
Tue	27-May	404	0.29	0.00	0.14	-0.61	51	OK
Wed	28-May	427	0.01	0.00	0.06	-0.66	56	OK
Thu	29-May	450	0.19	0.00	0.07	-0.54	45	OK
Fri	30-May	475	0.17	0.00	0.09	-0.46	38	OK

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Example field reports showing daily rainfall, irrigations, and ET crop.

Crop Stage is a function which will allow you track the growing degree days of crops in your fields. For some crops, such as cotton, we are developing recommendations relative to the current growth stage. To access the recommendation, click on the black box on the right column.

Weather is a link to a real-time weather station in your region. The weather is undated several times in an hour and is useful for deciding things such as whether it is too windy to spray.

Tech Support is a help function which shows contact information for staff at the University of Missouri who can help you with irrigation management.