

## Water Indicators Annex

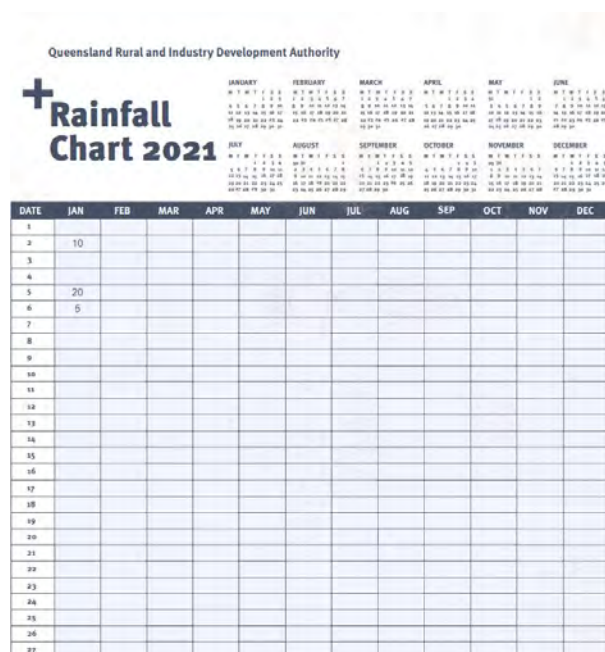
### Guidance for rainfall data and daily Kc values

#### 1. A guide to obtaining rainfall data

Rain gauges can be sourced from hardware or gardening supply stores, or even homemade (an internet search can provide a variety of prototypes, e.g., <https://www.education.com/science-fair/article/DIY-rain-gauge/> made from a drink bottle).



Volume of rain is recorded after each event (in millimetres) in a Rainfall chart (e.g., [https://qrida-files.s3.ap-southeast-2.amazonaws.com/s3fs-public/2020-10/QRIDA%20Rainfall%20Chart%202021\\_FILLABLE.pdf](https://qrida-files.s3.ap-southeast-2.amazonaws.com/s3fs-public/2020-10/QRIDA%20Rainfall%20Chart%202021_FILLABLE.pdf)). And summed over the growing season. In the example below, 10 mm was recorded on January 2<sup>nd</sup>, 20 mm on January 5<sup>th</sup> and 5 mm on January 6<sup>th</sup>, giving a total of 35 mm for the month to date.



Rainfall data can also be obtained from meteorological data. Official rainfall data from Meteorological Department for India can be found at [https://mausam.imd.gov.in/imd\\_latest/contents/rainfall\\_statistics\\_3.php](https://mausam.imd.gov.in/imd_latest/contents/rainfall_statistics_3.php)

## 2. A Guide to obtaining daily Kc values from IrriSAT

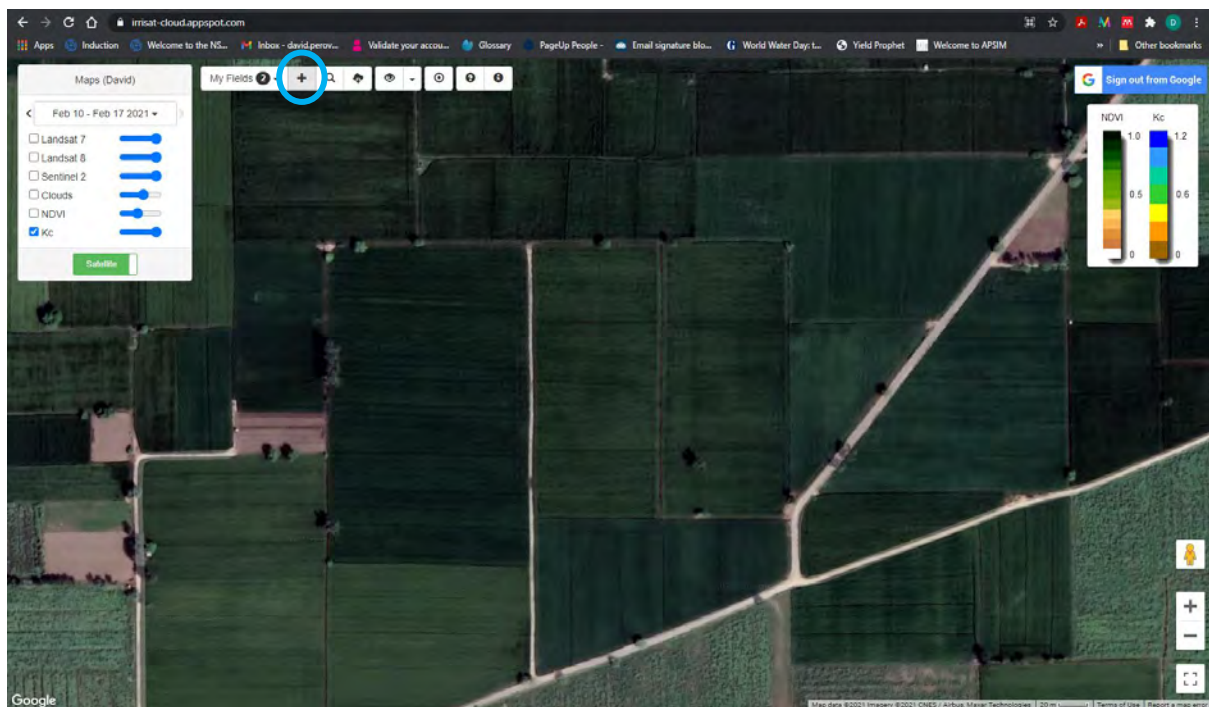
Open the IrriSAT page <https://irrisat-cloud.appspot.com/>

Create account and sign in

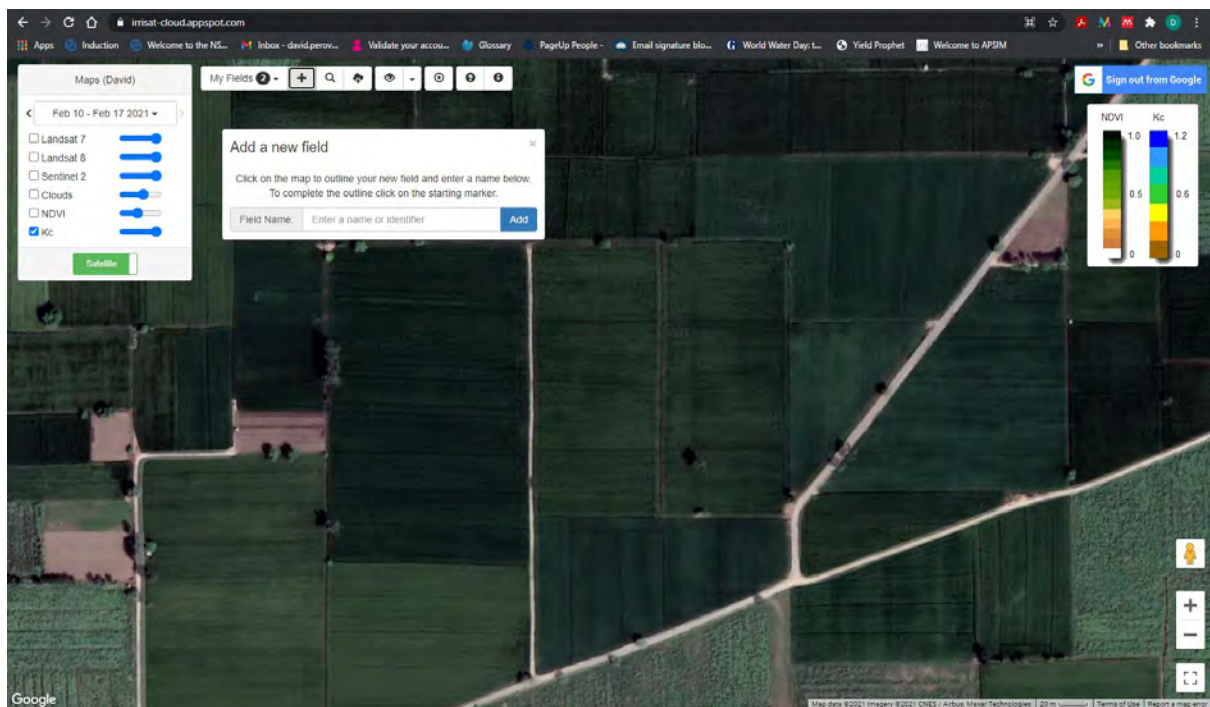
Navigate map to region of interest

Locate sample fields and zoom in

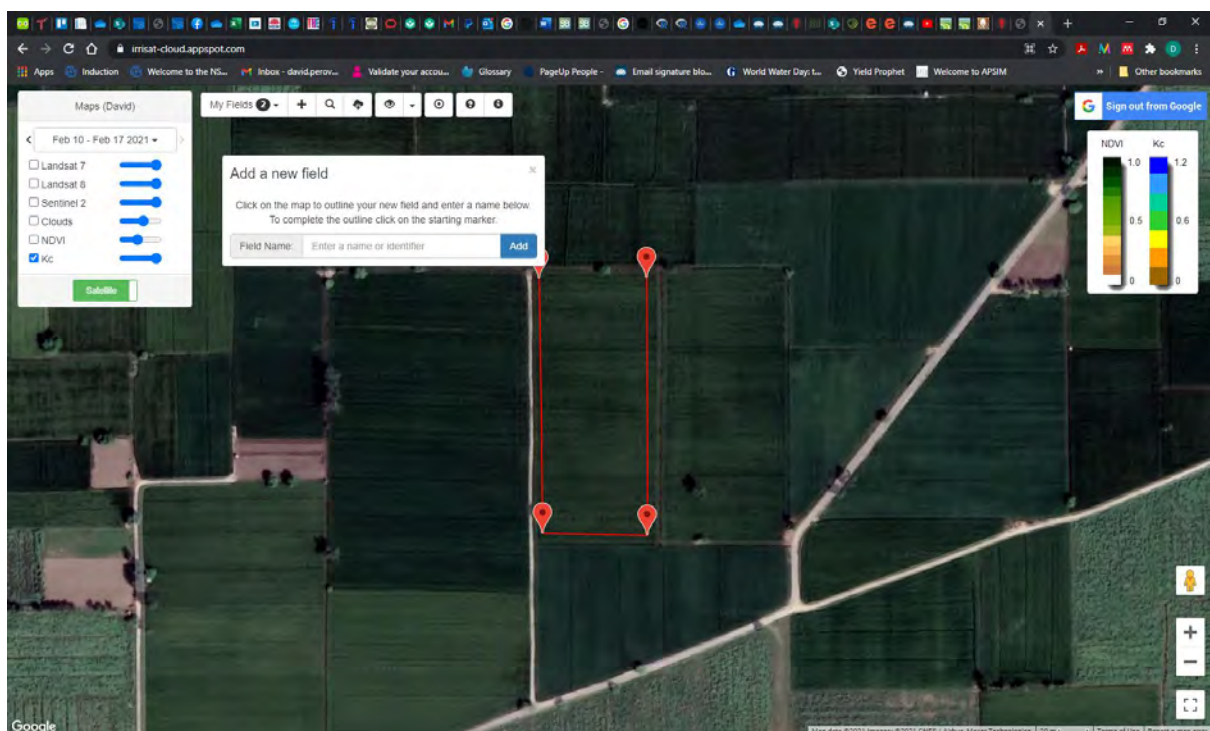
Create a polygon for each sample field by first pressing the plus sign (indicated below with light blue circle) from the control buttons at the top of the screen.



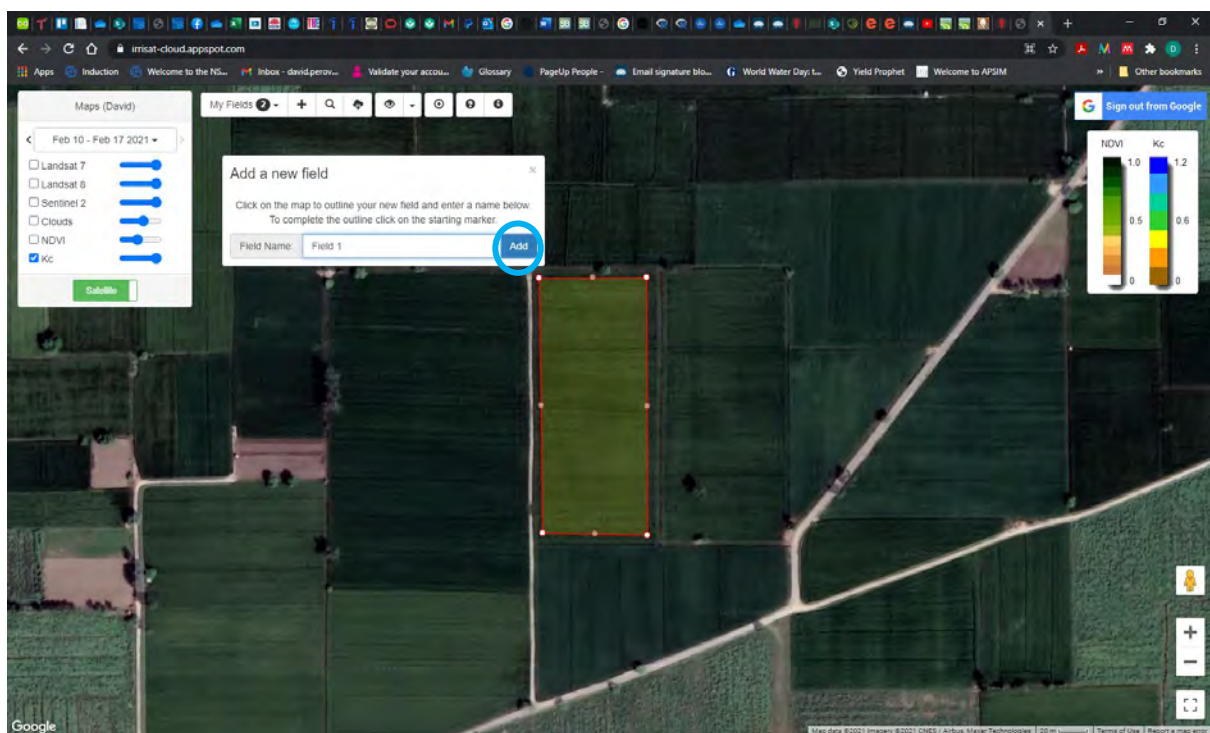
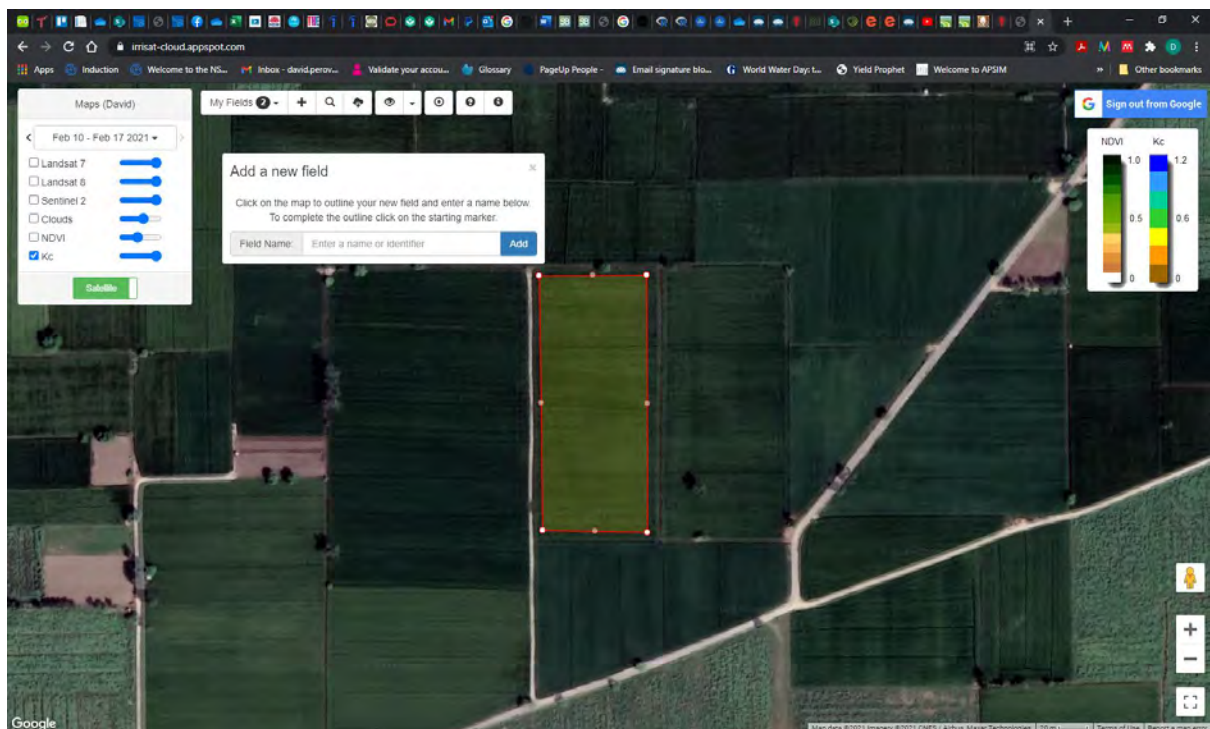
this will promote you to Add a new field



Click the cursor on each corner of the field to mark out the polygon





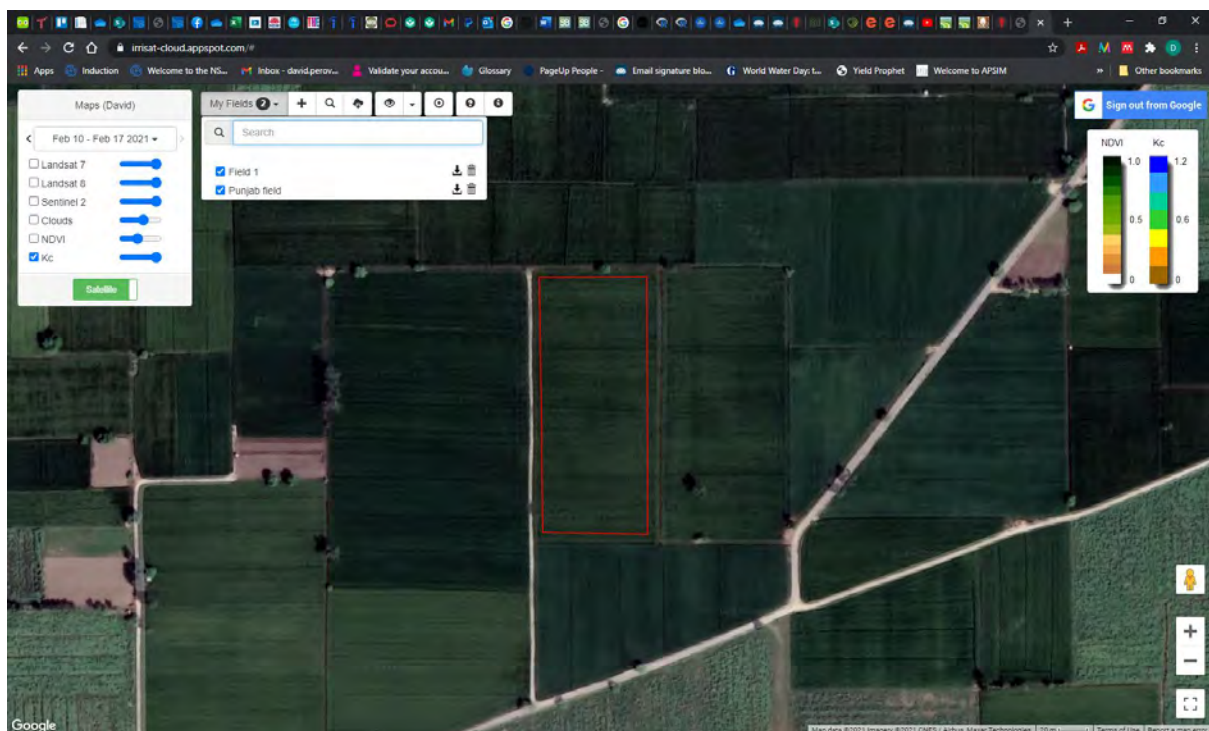
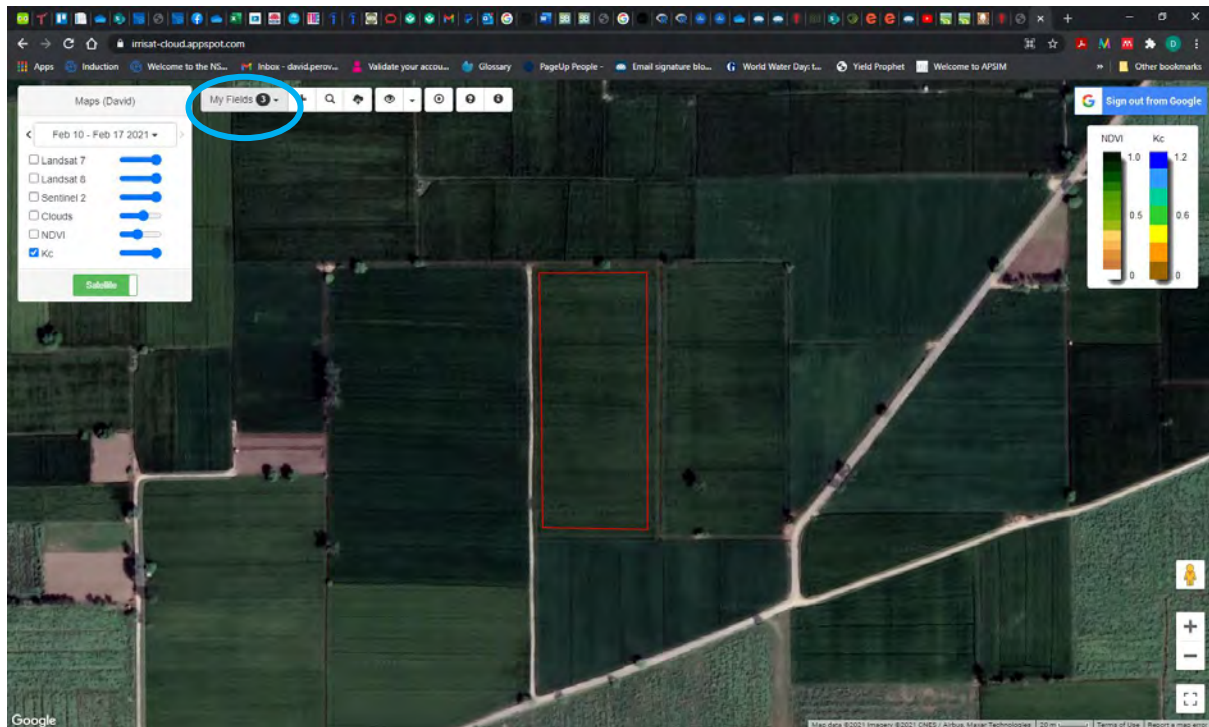


Enter a name for the field and click Add

Repeat for all sample fields

To access fields and extract  $K_c$  values

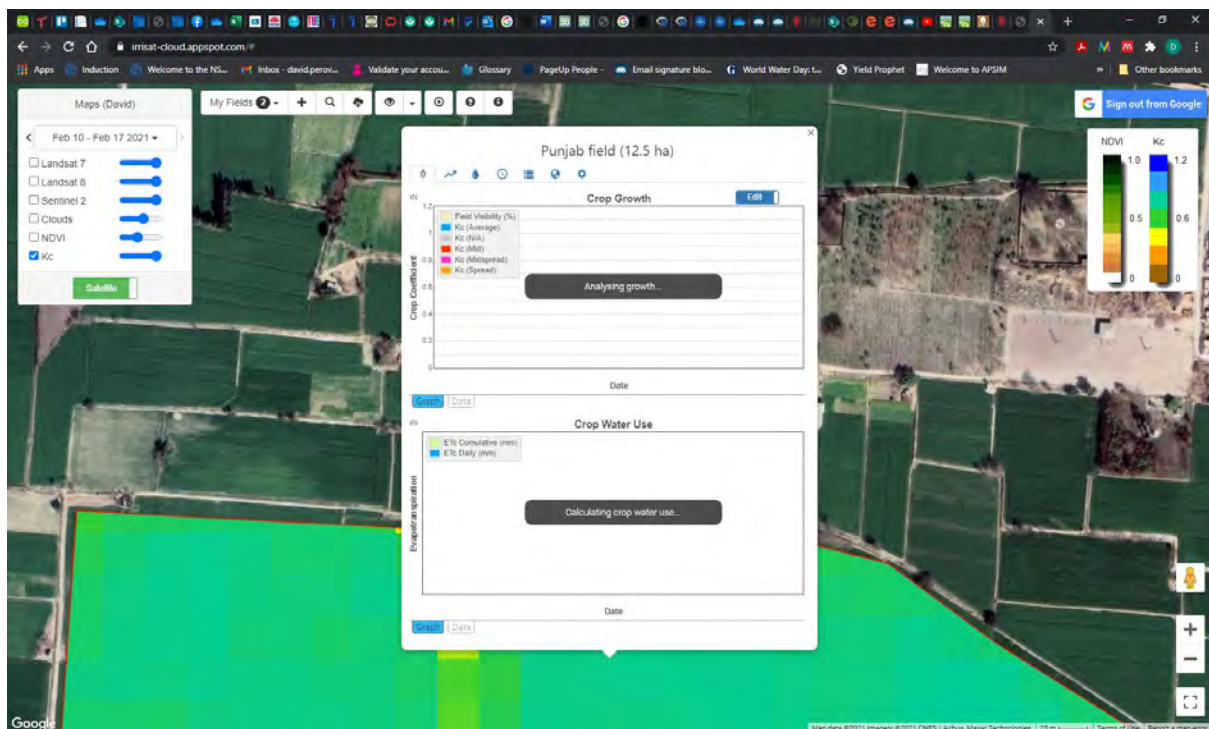
Click the My Field button



Chose a field by clicking on the name of the field and the map will zoom to that field.

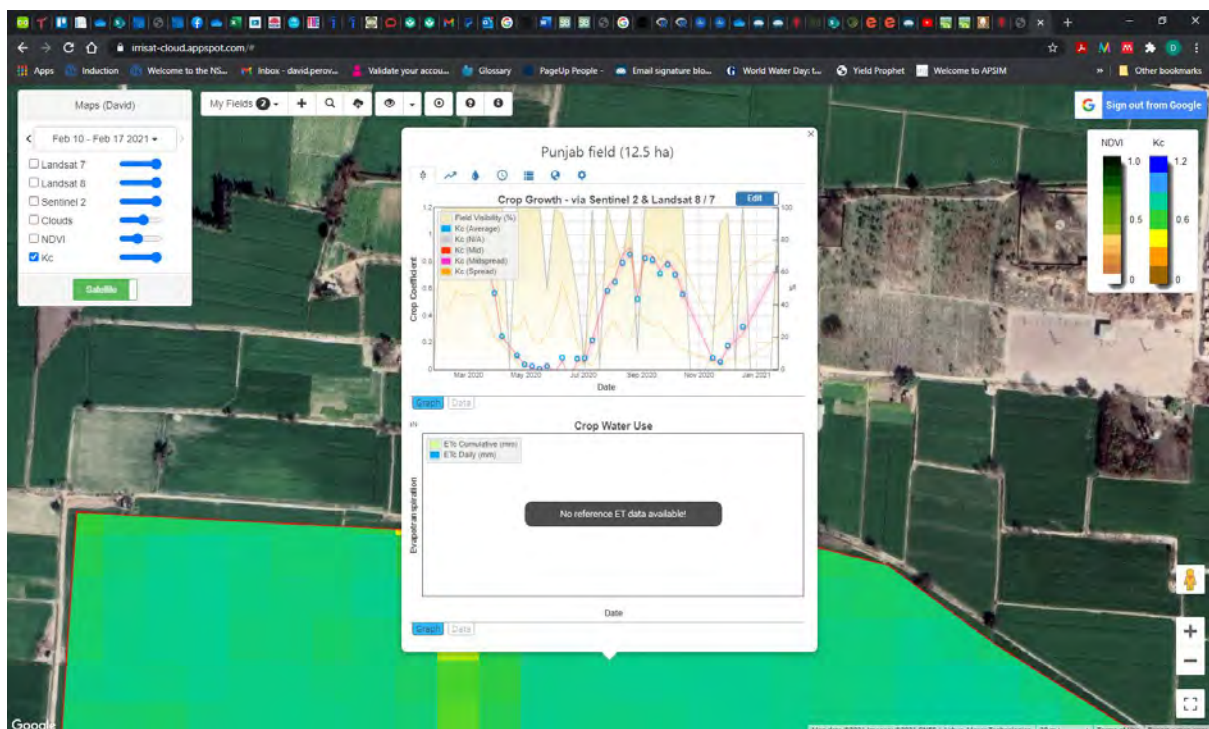
Click within the polygon





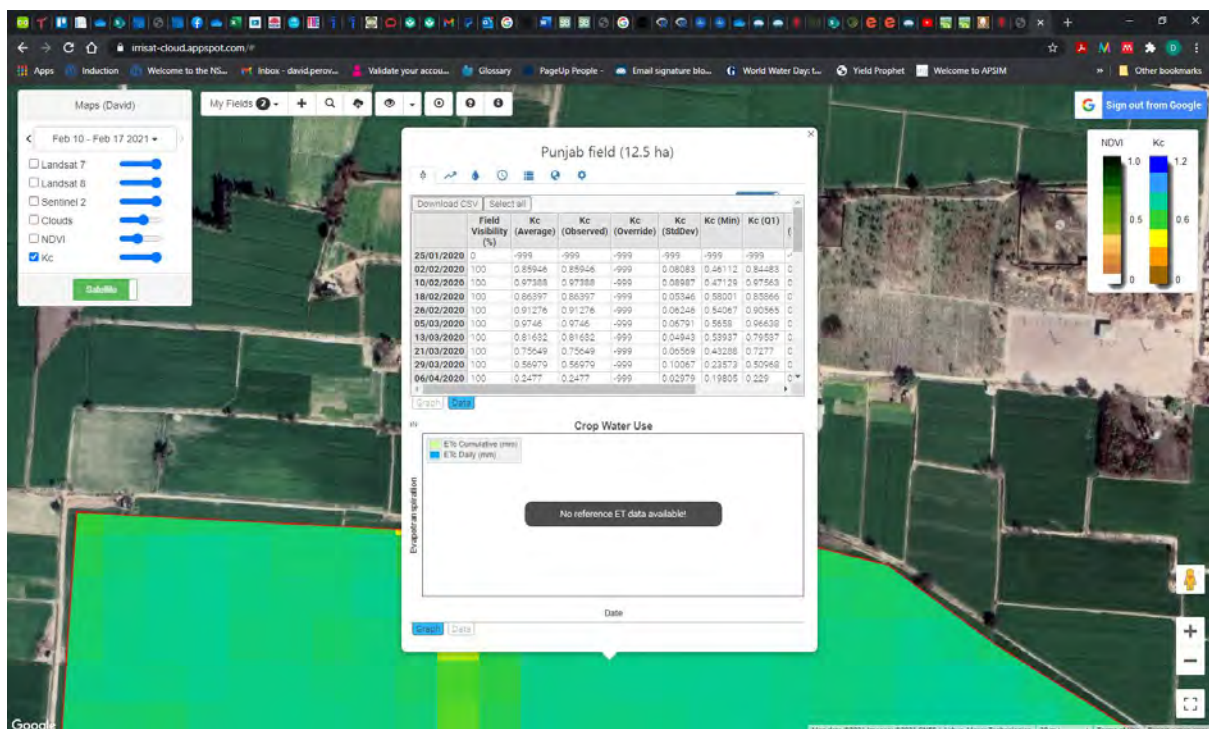
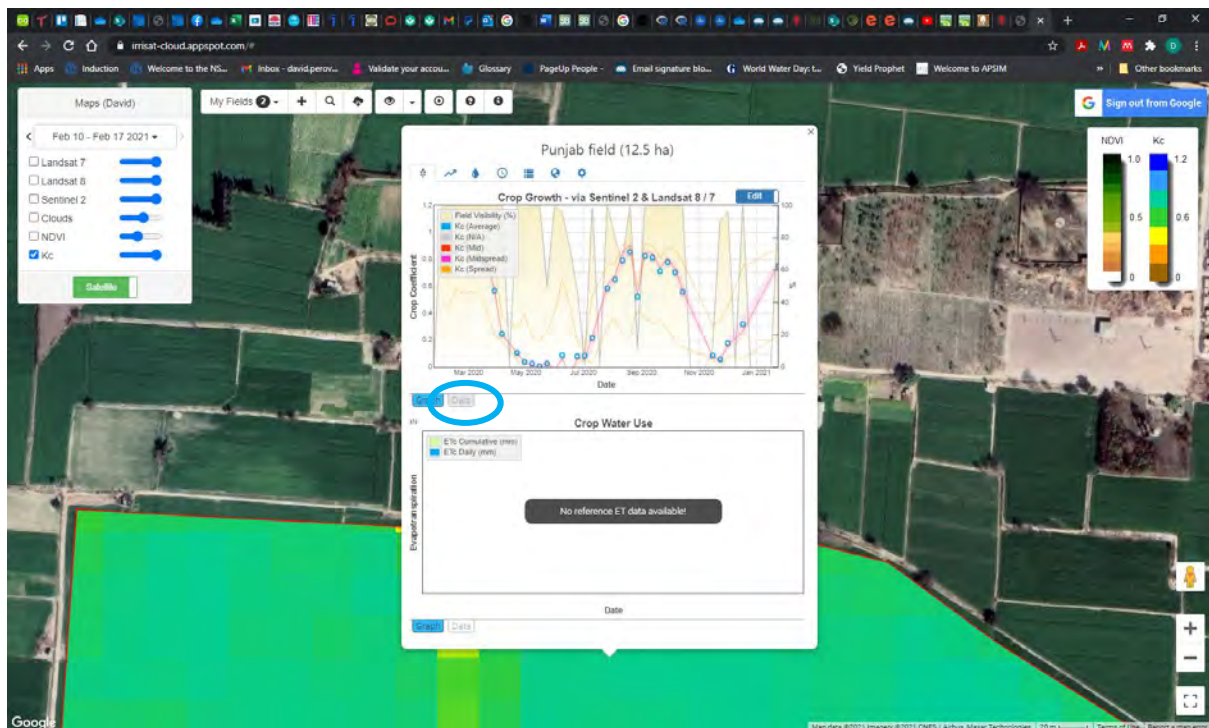
A dialogue box will come up for that field

Wait while it loads



IrrisAT will calculate the crop coefficient box at the top but the evapotranspiration box will fail as the reference ET is linked to the Australian Bureau of Meteorology, and no reference ET is available for areas outside Australia.

To extract the daily  $K_c$  values, click the Data tab at the bottom left of the Crop Coefficient box





Now click the Field Settings tab (cog icon)

irrisat-cloud.appspot.com

Maps (David)

Feb 10 - Feb 17 2021

LandSat 7

LandSat 8

Sentinel 2

Clouds

NDVI

Kc

Subsidiary

My Fields

Punjab field (12.5 ha)

Field Settings

Category: Uncategorised Apply

Field Name: Punjab field Apply

Reference ET: Nearest Available Source Apply

Rainfall: User Defined Apply

Planting Date: 01-02-2020 Apply

Harvest Date: 01-02-2021 Apply

I.S.W.D. (mm): 0 Apply

Refill Point (mm): 0 Apply

Share With: irrisat Users E-Mail Address Add

irrisat Owner: David.Perovic@gmail.com

Punjab field (12.5 ha)

Fill in the appropriate Planting Date and Harvest Date and remember to click the adjacent blue Apply button after completing both.

Now click on the Crop Health tab (plant icon)

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Maps (David)

Feb 10 - Feb 17 2021

LandSat 7

LandSat 8

Sentinel 2

Clouds

NDVI

Kc

Subsidiary

My Fields

Punjab field (12.5 ha)

Crop Health

Download CSV

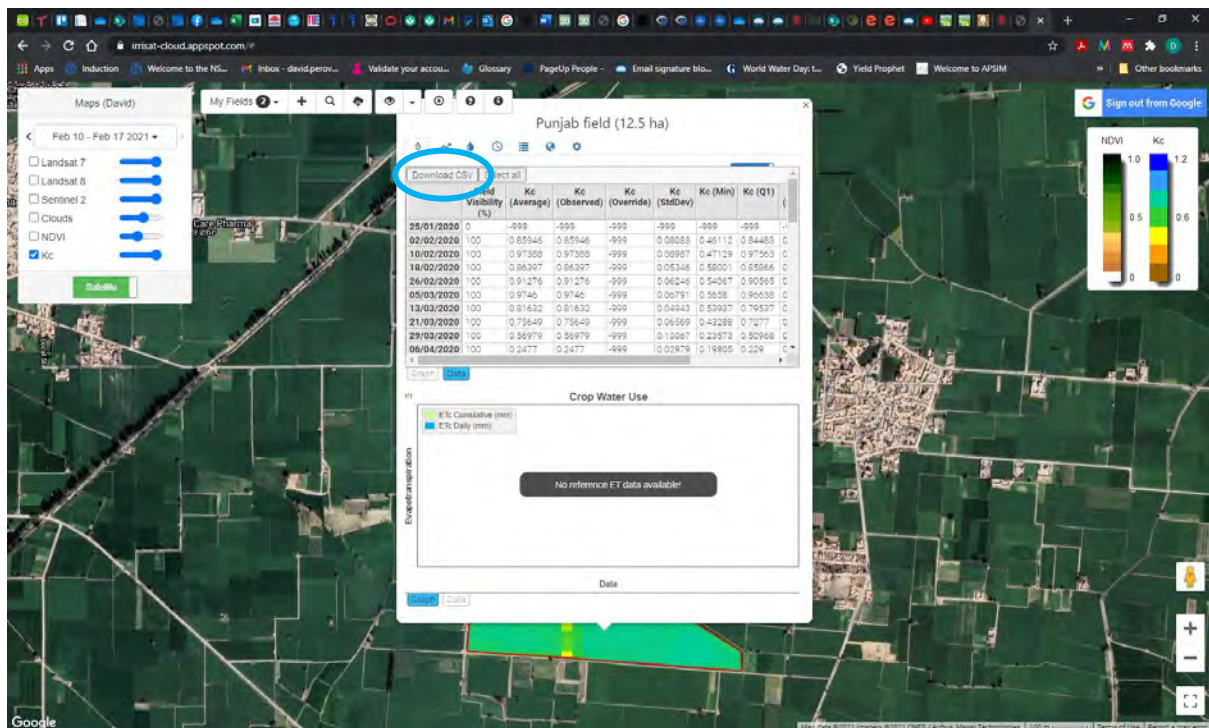
	Field Visibility (%)	Kc (Average)	Kc (Observed)	Kc (Override)	Kc (StdDev)	Kc (Min)	Kc (Q1)
25/01/2020	0	-999	-999	-999	-999	-999	-999
02/02/2020	100	0.85945	0.85945	-999	0.08053	0.46112	0.84483
10/02/2020	100	0.97388	0.97388	-999	0.08987	0.47129	0.97563
18/02/2020	100	0.86397	0.86397	-999	0.05348	0.58001	0.85866
26/02/2020	100	0.91276	0.91276	-999	0.06246	0.54047	0.90565
05/03/2020	100	0.97465	0.97465	-999	0.00791	0.5558	0.96538
13/03/2020	100	0.81632	0.81632	-999	0.04943	0.53927	0.79537
21/03/2020	100	0.75649	0.75649	-999	0.06569	0.43286	0.7277
29/03/2020	100	0.56979	0.56979	-999	0.10067	0.23573	0.50968
06/04/2020	100	0.2477	0.2477	-999	0.02979	0.19805	0.229

Crop Water Use

No reference ET data available



You can now extract the  $K_c$  data for the selected period by clicking the Download CSV tab



Once you have downloaded this file, open it in a spreadsheet

The screenshot shows a Microsoft Excel spreadsheet with the following columns: A (Date), B (Field Visibility (%)), C (Kc (Average)), D (Kc (Observed)), E (Kc (StdDev)), F (Kc (Min)), G (Kc (Q1)), H (Kc (Median)), I (Kc (Q3)), J (Kc (Max)), K (Kc (Q1)). The data is organized in rows corresponding to the dates in the table. The spreadsheet shows the following data:

A	B	C	D	E	F	G	H	I	J	K
Date	Field Visibility (%)	Kc (Average)	Kc (Observed)	Kc (StdDev)	Kc (Min)	Kc (Q1)	Kc (Median)	Kc (Q3)	Kc (Max)	Kc (Q1)
25/01/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
2/02/2020	100	0.859460238	0.859460238	-999	0.0808277161	0.461118962	0.844829723	0.876173831	0.897887212	0.927425035
10/02/2020	100	0.973885686	0.973885686	-999	0.080865051	0.471292215	0.97563164	0.980440731	1.06197158	1.20503283
18/02/2020	100	0.863971196	0.863971196	-999	0.053441002	0.580008219	0.858643054	0.872479916	0.883346822	0.917572162
26/02/2020	100	0.912759601	0.912759601	-999	0.062455772	0.540669631	0.905625267	0.924970566	0.916262571	0.963110775
5/03/2020	100	0.974599032	0.974599032	-999	0.067512364	0.505797245	0.966377327	0.98741585	1.001075042	1.022129611
13/03/2020	100	0.816320367	0.816320367	-999	0.049431206	0.539373077	0.795170752	0.823147233	0.840542108	0.8886851
21/03/2020	100	0.756488246	0.756488246	-999	0.065692781	0.432883822	0.727703743	0.771001839	0.797639484	0.863496942
29/03/2020	100	0.569794361	0.569794361	-999	0.100671779	0.235723458	0.509683248	0.576704429	0.63518294	0.704922113
6/04/2020	100	0.247702496	0.247702496	-999	0.029785606	0.158047709	0.229004488	0.241683027	0.257355762	0.365915804
14/04/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
22/04/2020	100	0.10801186	0.10801186	-999	0.034030785	0.05384576	0.09044188	0.108939074	0.123500338	0.295876699
30/04/2020	98.96907216	0.039331793	0.039331793	-999	0.049188902	0.027100617	0.024132633	0.038275849	0.049315879	0.388548125
8/05/2020	100	0.027032596	0.027032596	-999	0.051313227	-0.076781306	-0.006617077	0.010848414	0.0693991	0.227682572
16/05/2020	100	0.006113332	0.006113332	-999	0.033222886	-0.035476812	-0.012993251	-0.000497063	0.021204208	0.188896138
24/05/2020	49.48459608	0.027617386	0.027617386	-999	0.070151307	-0.082837969	0.012267128	0.038440701	0.065194164	0.286153467
1/06/2020	0	-0.00400772	-0.00400772	-999	0.07201729	-0.086	-0.042319952	0.022701321	0.001179282	0.401113352
9/06/2020	95.87628866	0.090417725	0.090417725	-999	0.133421164	-0.056701135	0.048448309	0.06455943	0.091852524	0.649332489
17/06/2020	73.71134021	-0.06615062	-0.06615062	-999	0.026695423	-0.086	-0.082917061	-0.068311776	-0.006993196	0.468708664
25/06/2020	47.42268041	0.082565118	0.082565118	-999	0.040104325	0.027188195	0.060649017	0.068670077	0.092034917	0.19403865
3/07/2020	1.039927833	0.086622235	0.086622235	-999	0.0292172	0.039993901	0.039993901	0.039993901	0.118428301	0.118428301
11/07/2020	98.96907316	0.219169972	0.219169972	-999	0.120872695	0.028243184	0.106510647	0.228730039	0.274922203	0.53645532
19/07/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
27/07/2020	100	0.598080557	0.598080557	-999	0.085807411	0.237747384	0.540212566	0.509626104	0.63570315	0.751843632
4/08/2020	80.92783505	0.651776791	0.651776791	-999	0.0730498	0.365011303	0.614538759	0.673778533	0.696250993	0.772504086
12/08/2020	63.91752577	0.79322475	0.79322475	-999	0.132074381	0.250925439	0.736785186	0.850649699	0.87304359	0.906941155
20/08/2020	100	0.856482024	0.856482024	-999	0.145532481	0.226499994	0.836575498	0.901819852	0.939969753	0.968032393
28/08/2020	10.82474227	0.524553713	0.524553713	-999	0.040175582	0.435930874	0.508346962	0.533236336	0.565777911	0.604653777
5/09/2020	0	0.826012893	0.826012893	-999	0.103453072	0.361306364	0.818136153	0.84974039	0.879951113	0.919053244
13/09/2020	0	0.814051175	0.814051175	-999	0.112875063	0.325247656	0.810730912	0.841535477	0.865048631	0.903800779
21/09/2020	100	0.714322607	0.714322607	-999	0.088751274	0.317896991	0.710063138	0.738832142	0.758552501	0.805079669
29/09/2020	0	0.780447552	0.780447552	-999	0.117649157	0.281518144	0.779532289	0.811055702	0.834218169	0.889279298
7/10/2020	100	0.705283915	0.705283915	-999	0.134821084	0.19241245	0.674353153	0.728069638	0.783095728	0.867438272
15/10/2020	0	0.500911939	0.500911939	-999	0.131685796	0.149281247	0.493773617	0.572494275	0.654820489	0.780257221
23/10/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
31/10/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
8/11/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999
16/11/2020	11.34020913	0.086245293	0.086245293	-999	0.058756416	0.061126139	0.068886934	0.078092817	0.094776526	0.312031743
24/11/2020	90.7218494	0.059667961	0.059667961	-999	0.056058768	-0.008399414	0.036195829	0.051733959	0.089231012	0.352874302
2/12/2020	96.90721649	0.179350337	0.179350337	-999	0.079021334	0.0815643	0.125824637	0.165267318	0.215012471	0.445040089
10/12/2020	0	-999	-999	-999	-999	-999	-999	-999	-999	-999

The  $K_c$  average and date (columns A and C) are all that is needed from this output

But please note that where Field Visibility (%) was zero (during the satellite pass), there will be no  $K_c$  estimate for the period until the next pass of the satellite. These will be indicated by a  $K_c$  value of negative 999. All negative  $K_c$  values will need to be corrected. Instead use the previous  $K_c$  value (row above) or an average of the previous and next values (average row above and row below).

The next step is to calculate the  $ET_c$  by multiplying the  $K_c$  by the corresponding  $ET_0$  values.

File	Home	Insert	Page Layout	Formulas	Data	Review	View	Developer	Help	Acrobat	Power Pivot	Share	Comments										
#2					=D2*E2																		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Date	Kc (Average)	reference	ETo	Days	cumulative Etc																	
2	16/02/2020	0.8294602248		2.5	2.148650595	8	17.189284781																
3	2/02/2020	0.8294602248		3.5	3.008110833	8	24.064888666																
4	10/02/2020	0.973883688		3.5	3.408592901	8	27.26874321																
5	18/02/2020	0.863971196		3.5	3.023899185	8	24.19119348																
6	26/02/2020	0.912759601		3.5	3.194659604	8	25.5726884																
7	5/03/2020	0.974599032		4.5	4.385635042	8	35.0856514																
8	13/03/2020	0.816302067		4.5	3.67441603	8	29.35753322																
9	21/03/2020	0.796482346		4.5	3.404197107	8	27.23357888																
10	29/03/2020	0.569794361		5	2.564073424	8	20.512597																
11	6/04/2020	0.247702498		6.5	1.610066236	8	12.88052989																
12	14/04/2020	0.356503684		6.5	2.317273948	8	18.53819158																
13	22/04/2020	0.108801186		6.5	0.707207712	8	5.657661694																
14	30/04/2020	0.09331793		6.5	0.255656653	8	2.045253227																
15	8/05/2020	0.027012596		9.0	0.433293166	8	1.946346925																
16	16/05/2020	0.006113332		9.0	0.055019984	8	0.440319566																
17	24/05/2020	0.027617186		9.0	0.248554676	8	1.988437406																
18	1/06/2020	0.118034911		9.5	1.121331653	8	8.970853235																
19	9/06/2020	0.090417725		9.5	0.658968384	8	6.871747075																
20	17/06/2020	0.172962843		9.5	1.643337009	8	13.14669607																
21	25/06/2020	0.08256118		9.5	0.784368024	8	6.279489994																
22	3/07/2020	0.086622235		5.0	0.433111177	8	3.464688415																
23	11/07/2020	0.219169972		5.0	1.095849861	8	8.266798885																
24	19/07/2020	0.805975542		5.0	4.029877708	8	32.23902167																
25	27/07/2020	0.308805057																					