Table (S1). Details of Landsat 8 imageries used for ETa modelling

Path/Row	Date Acquired	Satellite pass time	Cloud cover %
	2019 September 09	08:15:19	0.01
	2019 September 25	08:15:25	0.1
	2019 October 27	08:15:28	0
	2019 November12	08:15:26	0.1
	2019 December 14	08:15:23	0.2
	2020 January 15	08:15:15	0.2
	2020 January 31	08:15:10	0
	2020 April 20	08:15:04	0.01
	2020 May 06	08:15:06	0
172/79	2020 June 07	08:15:13	0.04
	2020 June 23	08:15:16	0
	2020 July 09	08:15:14	0
	2020 July 25	08:15:03	0.03
	2020 August 10	08:15:03	0.01
	2020 September 11	08:15:18	0
	2020 September 27	08:15:23	0
	2020 October 13	08:15:25	0.05
	2021 January 17	08:15:14	0
	2021 February 18	08:15:08	0.01
	2021 March 22	08:14:53	0.2
	2021 April 23	08:14:42	0.02
	2021 May 09	08:14:36	0

The selected metrics used are given using Eqs. (S1)-(S6):

$$r = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{(\sum_{i=1}^{n}(x_i-\bar{x})^2)\sum_{i=1}^{n}(y_i-\bar{y})^2)^2}}$$ **Equation (S1)**

$$R^2 = 1 - \frac{\sum_{i=1}^{N}\times(y_i-y'_i)^2}{\sum_{i=1}^{N}\times(y_i-y'_i)^2}$$ **Equation (S2)**

$$RMSE = \sqrt{\frac{\sum_{i=1}^{N}\times(y_i-y'_i)^2}{N}}$$ **Equation (S3)**

$$MAE = \frac{1}{N}\sum_{i=1}^{N}\times$$ **Equation (S4)**

$$SE = \frac{s}{\sqrt{n}}$$ **Equation (S5)**

$$Bias = \bar{x} - \bar{y}$$ **Equation (S6)**

where N, y, y',y'' represent the number of observations, measured values, predicted values, and mean of measured values, respectively. The term "s" is the sample standard deviation, while "n" is the number of samples.

Table (S2). Kc-NDVI relationship for determining the variability of Kc throughout the study area

Model season	Kc model	R^2
Model 1 (2019)	Kc = 0.83×NDVI + 0.15	0.93
Model 2 (2020)	Kc = 0.84×NDVI +0.2	0.8
Model 3 (2019−2020)	Kc = 0.51×NDVI + 0.42	0.92
Model 4 (2021)	Kc = 1.02×NDVI − 0.07	0.88
Ensemble model	Kc = 0.8 × NDVI + 0.17	0.99
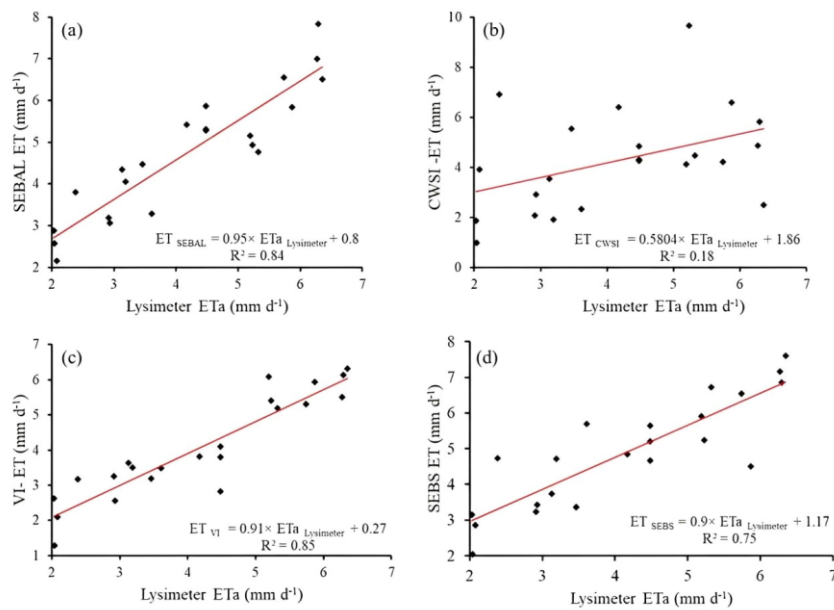
Figure (S1). Relationship between Measured and estimated ETa at field-scale.
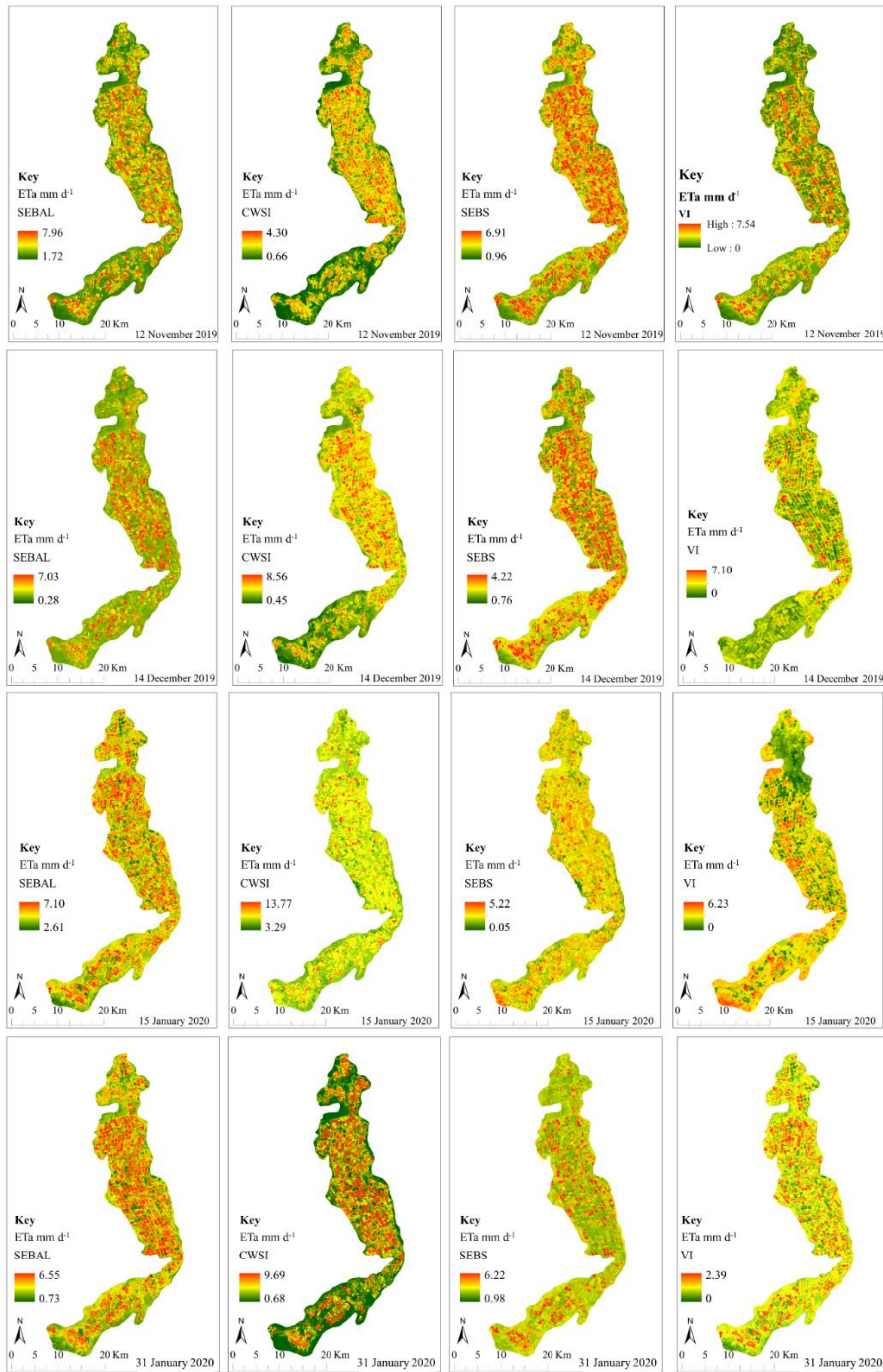
Figure (S2). Spatial distribution of ETa within the Vaalharts irrigation scheme for SEBAL, CWSI, SEBS and VI algorithms from 12 November 2019 to 31 January 2020.
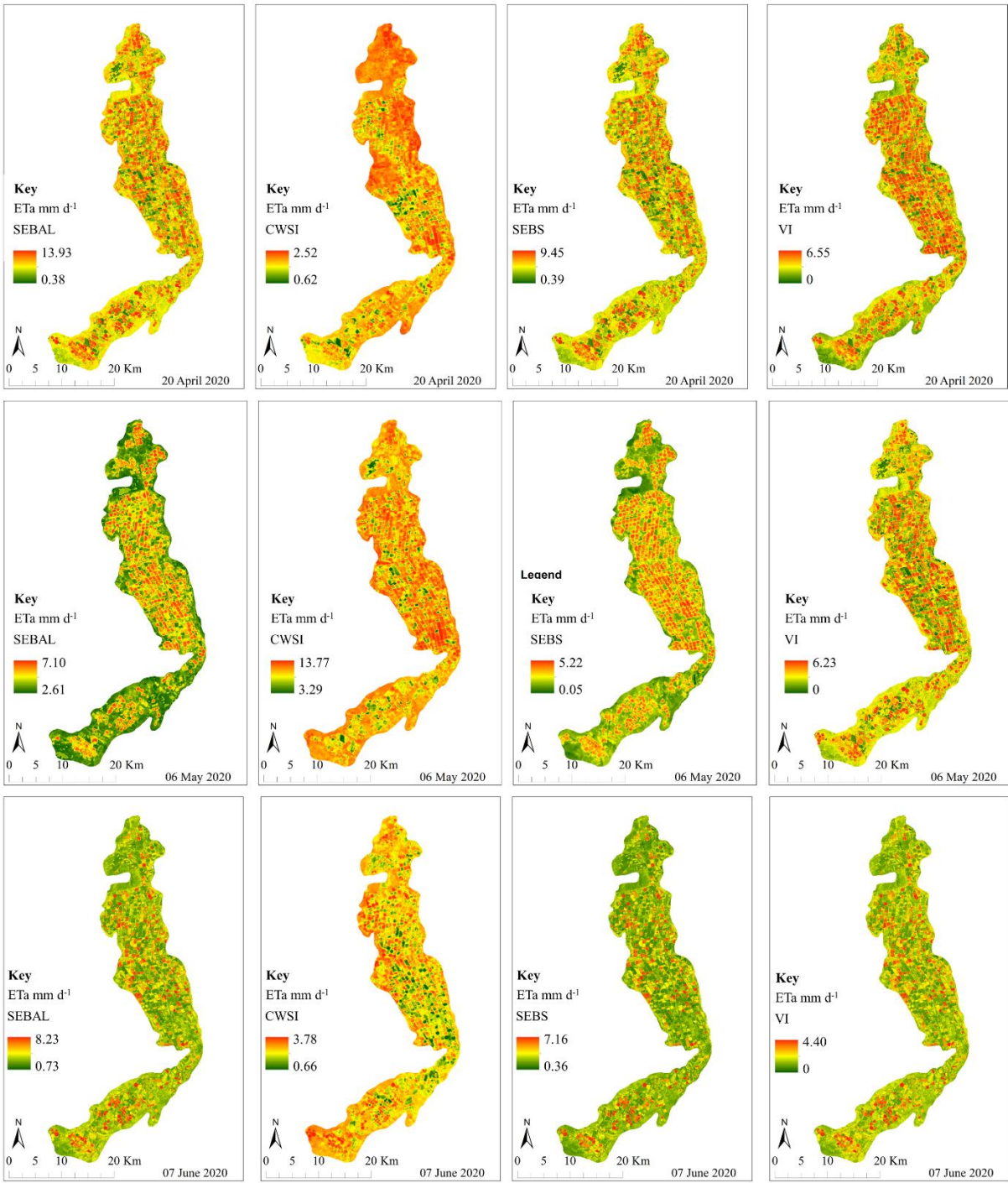
Figure (S3). Spatial distribution of ETa within the Vaalharts irrigation scheme for SEBAL, CWSI, SEBS and VI algorithms from 20 April 2020 to 07 June 2020.
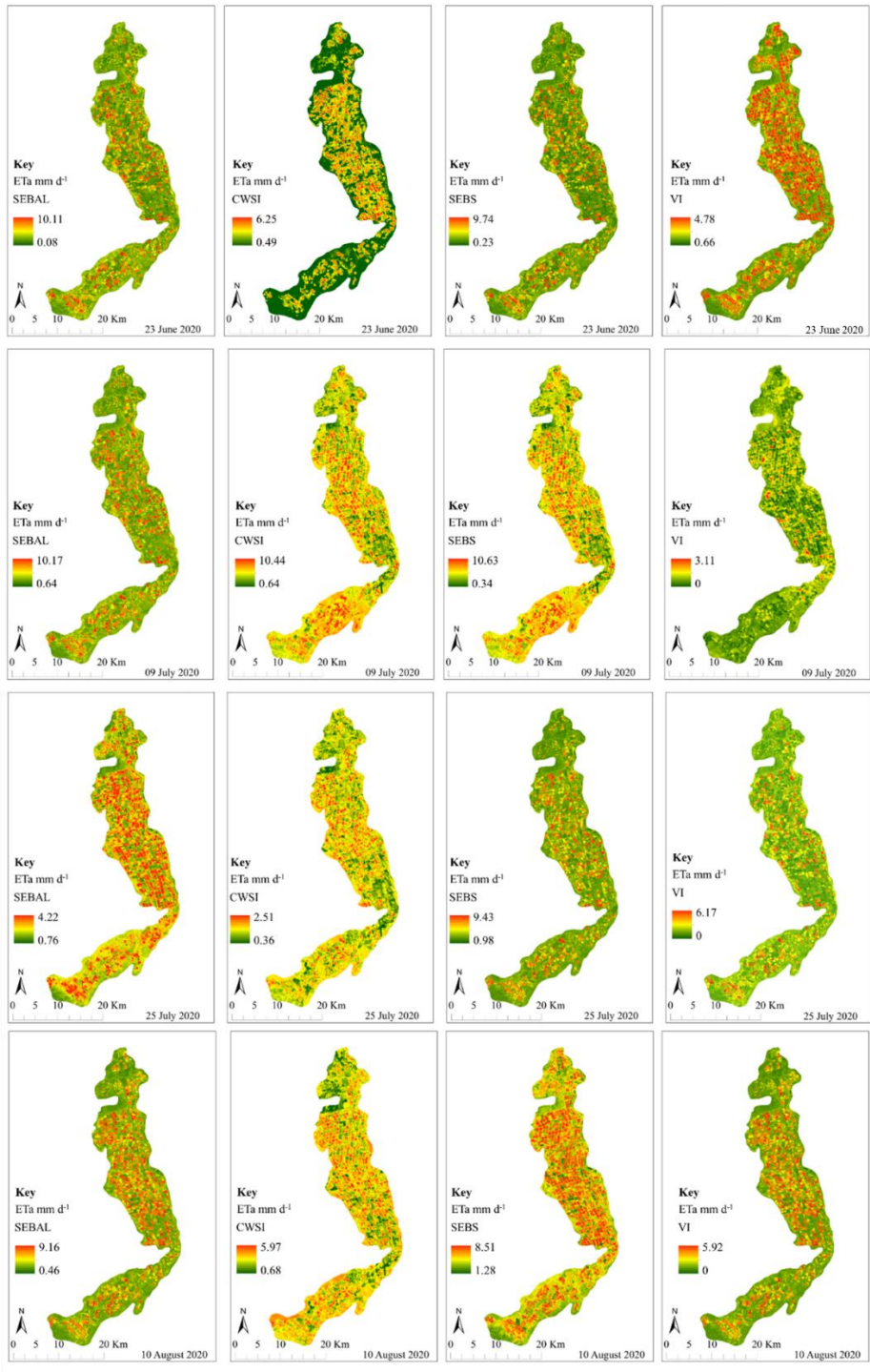
Figure (S4). Spatial distribution of ETa within the Vaalharts irrigation scheme for SEBAL, CWSI, SEBS and VI algorithms from 23 June 2020 to 10 August 2020.
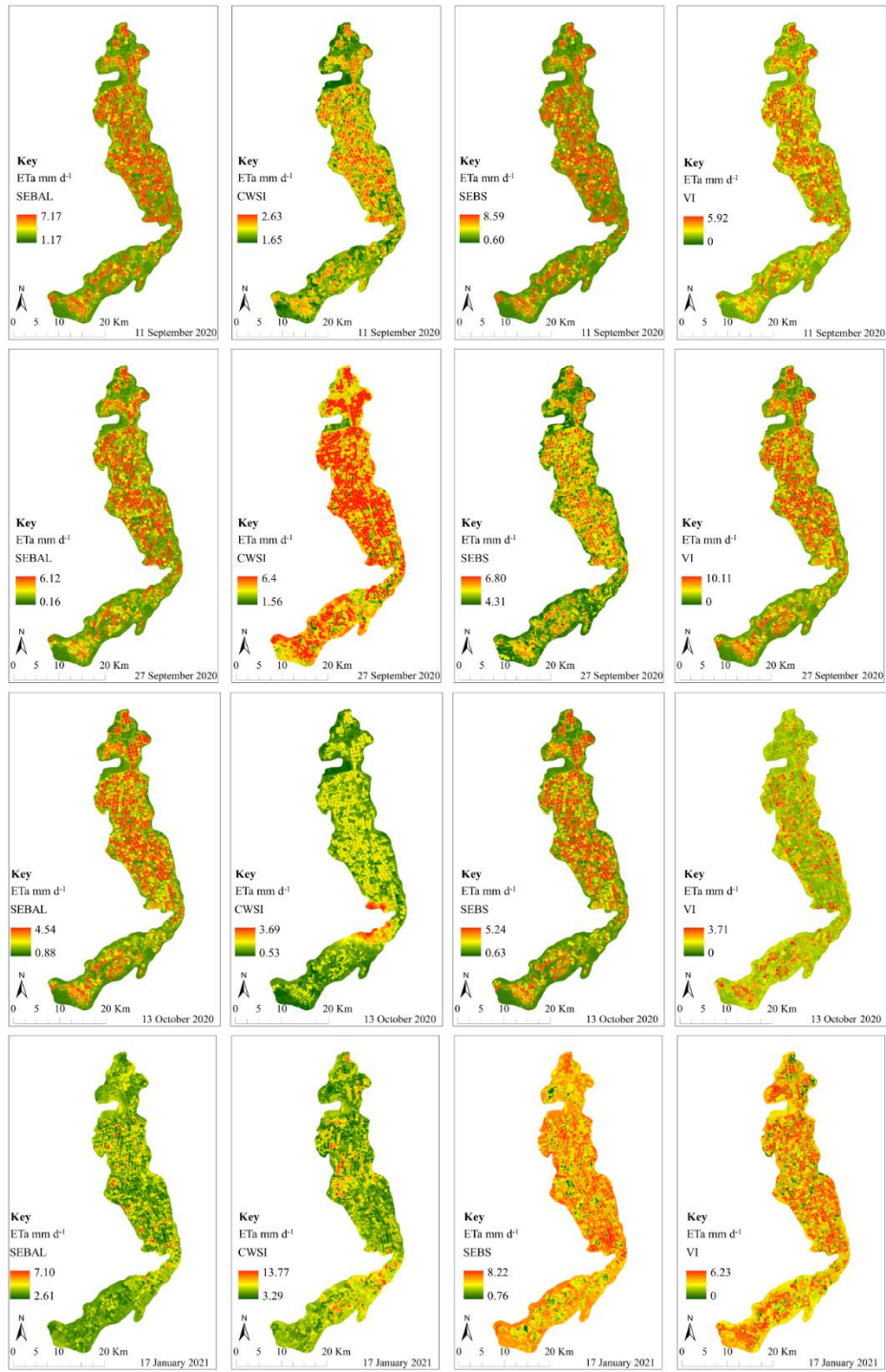
Figure (S5). Spatial distribution of ETa within the Vaalharts irrigation scheme for SEBAL, CWSI, SEBS and VI algorithms from 11 September 2020 to 17 January 2021.
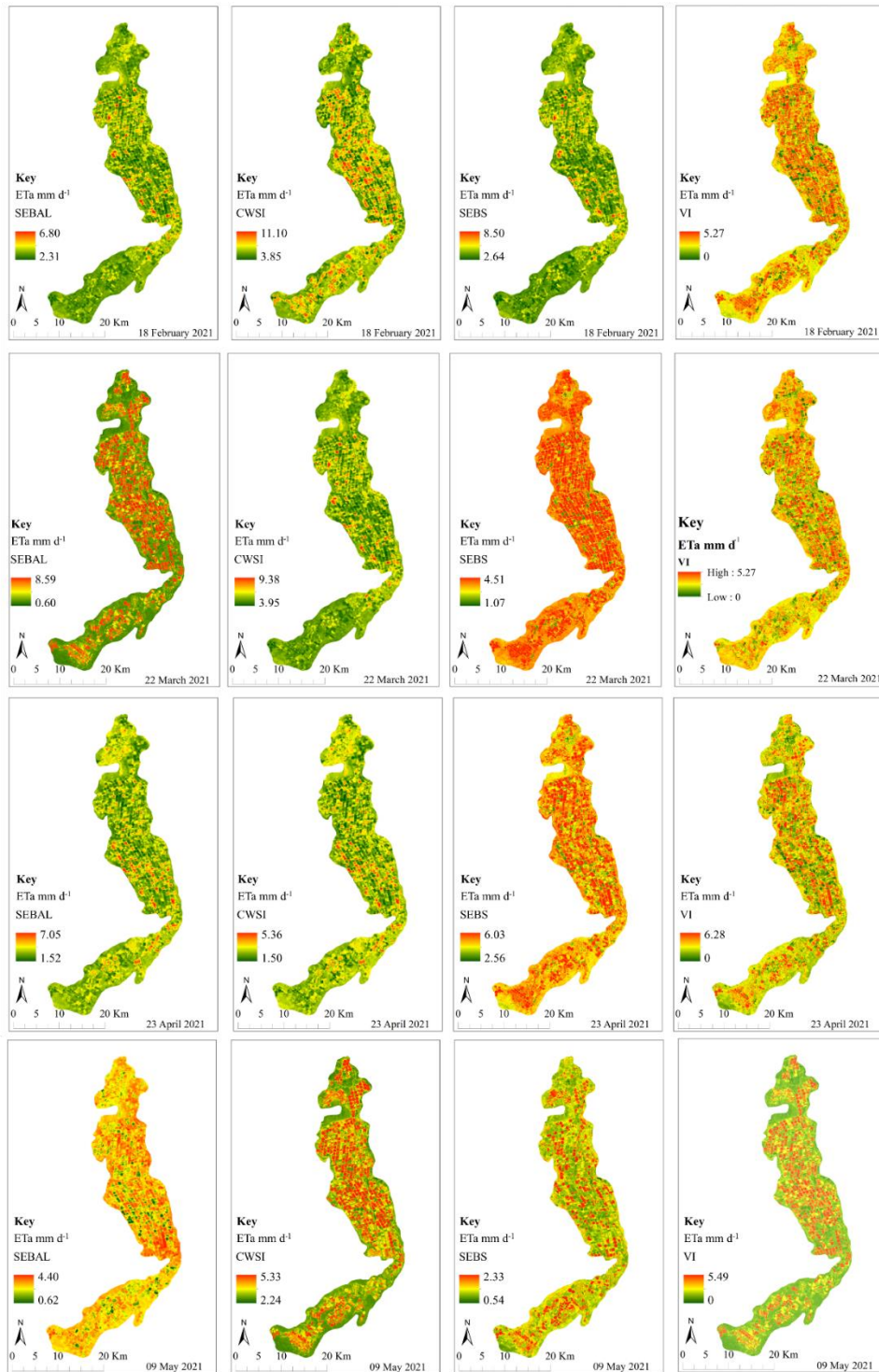
Figure (S6). Spatial distribution of ETa within the Vaalharts irrigation scheme for SEBAL, CWSI, SEBS and VI algorithms from 18 February 2021 to 9 May 2021.