Appendix 1

Input	Landsat-8 Surface Reflectance (SR) and Brightness Temperature (BT) data
Step 1	Compute FVC (Carlson and Ripley, 1997), $$P_v = (\frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}})^2 \quad (1.1)$$ Where: $$NDVI = \frac{\rho B5 - \rho B4}{\rho B5 + \rho B4} \quad (1.2)$$ $NDVI_{min}$ is the minimum NDVI, $NDVI_{max}$ is the maximum NDVI, ρNIR (B5), and ρRed (B4) are surface reflectances in the near-infrared and red bands, respectively.
Step 2	Compute land surface emissivity ε_λ, $$\varepsilon_\lambda = \varepsilon_{v\lambda} P_{v+} \varepsilon_{s\lambda}(1 - P_v) + C_\lambda \quad (1.3)$$ Where: ε_v is the vegetation emissivity, while ε_s is the soil emissivity, and *C* is the surface roughness, where homogenous and flat surfaces takes constant *C* value of 0.005 (Sobrino and Raissouni, 2000)
Step 3	Compute LST, $$T_s = \frac{BT}{\{1 + [(\lambda BT/\rho) \text{In} \varepsilon_\lambda]\}} - 273.15 \quad (1.4)$$ Where: T_s denotes LST (°C), *BT* is the brightness temperature (K), ρ is 1.438 × 10^{-2} m K (i.e., calculated based on Eq. 5) $$\rho = h\frac{c}{\sigma} \quad (1.5)$$

	Where: h, c, and σ denote the Plank's constant (6.626×10^{-34} J s), velocity of light (2.998×10^{8} m s^{-1}), and Boltzmann constant (1.38×10^{-23} J K^{-1}), respectively.
Output	LST (°C)

Appendix 2

The Mann-Kendall test is based on the statistic S defined as follows:

$$S = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} sign\left(X_j - X_i\right) \tag{2.1}$$

where n is the number of data points, x_j and x_i are data values at time j and $i\left(j > i\right)$, respectively. Denoting $x = \left(x_j - x_i\right)$

$$sign(x) \begin{cases} +1, & if x > 1 \\ 0, & if\ x = 0 \\ -1, & if\ x < 1 \end{cases} \tag{2.2}$$

For large samples $\left(n > 10\right)$, the sampling distribution of S is assumed to be normally distributed with zero mean and variance as follows:

$$Var\left(S\right) = \frac{n\left(n-1\right)\left(2n+5\right) - \sum_{i}^{n} t_i\left(t_i - 1\right)\left(2t_i + 5\right)}{18} \tag{2.3}$$

where n is the number of tied (zero difference between compared values) groups and t_i is the number of data points in the i th tied group. The H-statistic or standard normal deviate is then computed by using equation:

$$Z = \begin{cases} \frac{S-1}{\sqrt{Var(S)}} & if\ S > 0 \\ 0 & if\ S = 0 \\ \frac{S+1}{\sqrt{Var(S)}} & if < 0 \end{cases} \tag{2.4}$$

If the computed value of $Z > Z_{\alpha/2}$, then the null hypothesis of no trend is rejected at α level of significance in a two-sided test (i.e. the trend is significant). In this study, the null hypothesis was tested at 5% significance level.

Appendix 3

The SQMK test steps are as follows:

I. At each comparison, the number of cases $x_i > x_j$ is counted and indicated by n_i, where $x_i (i = 1,2,...,n)$ and $x_j (j = 1,2,...,n)$ are the sequential values in a series, respectively.

II. The test statistic t_i is calculated by

$$t_i = \sum_{j=1}^{i} n_j \tag{3.1}$$

III. The mean $E(t)$ and the variance $\mathrm{var}(t_i)$ of the test statistic are calculated by

$$E(t) = \frac{n(n-1)}{4}, \tag{3.2}$$

$$\mathrm{var}(t_i) = \frac{i(i-1)(2i+5)}{72}. \tag{3.3}$$

IV. Sequential progressive value can be calculated as

$$u(t) = \frac{t_i - E(t)}{\sqrt{\mathrm{var}(t_i)}}. \tag{3.4}$$

Similarly, the values of $u'(t)$ are computed backward, starting from the end of series.