**Supplementary information**

**A.1. The conversion of NDVI to** $f\_{PAR}$

A preliminary $f\_{PAR}$ ($F$) was calculated from the corrected NDVI ($V$) by rescaling the NDVI using maximum and minimum thresholds (Roderick et al., 1999; Donohue et al., 2008).

$F=\frac{V\left(F\_{max}-F\_{min}\right)}{\left(V\_{max}-V\_{min}\right)}+F\_{min}$ (A-1)

where $F\_{max}$ and $F\_{min}$ are the maximum and minimum possible $f\_{PAR}$ values which were set to 0.95 and 0.0, respectively. $V\_{max}$ and $V\_{min}$ are the corresponding maximum and minimum NDVI thresholds which were set to 0.80 and 0.05, respectively.

**A.2. The calculation formula of the climate seasonality index (*S*)**

The climate seasonality index (*S*), proposed by Milly (1994) and Woods (2003), can be calculated as:

$P\left(t\right)=\overbar{P}(1+δ\_{P}sin\frac{2π}{τ}\frac{t}{12})$ (A-2)

$E\_{0}\left(t\right)=\overbar{E\_{0}}(1+δ\_{E\_{0}}sin\frac{2π}{τ}\frac{t}{12})$ (A-3)

$S=\left|δ\_{P}-δ\_{E\_{0}}∅\right|$ (A-4)

where $δ\_{P}$ and $δ\_{E\_{0}}$ are the ratios of the amplitudes of the monthly harmonics to the monthly averages of precipitation ($\overbar{P}$) and potential evapotranspiration ($\overbar{E\_{0}}$), respectively. $τ$ is the cycle of seasonality, which is 0.5 (6 months) in the tropics and 1 (12 months) outside the tropics. $t$ is the time in months. $∅$ is the dryness index ($∅={\overbar{E\_{0}}}/{\overbar{P}}$).

**A.3. The calculation of the ratio of precipitation in the form of snow to total precipitation (**$f\_{s}$**)**

$f\_{s}$ for each sub-catchment in this study was calculated following Berghuijs et al. (2014). Precipitation on days with a mean temperature below 1 $℃$ was considered to be entirely snowfall, while it was considered to be rainfall on days with temperatures above 1 $℃$.

**A.4. The calculation of the ratio of engineering measure area to the total catchment area (**$REM$**)**

The engineering measures include terraces and check-dams in this study. However, the capacity of runoff interception by them is different (Zhang et al., 1994; Shi et al., 2013; 700.5 m3/ha and 4500 m3/ha for terraces and check-dams, respectively). In order to unify the area of terraces and check-dams, we assumed a weight of 1 for check-dams and 700.5/4500 for terraces. Then, we multiplied the area of terraces by 700.5/4500 to convert into an area equivalent to that of check-dams in the sense of runoff interception capacity. $REM$ is the total weighted area of the terraces and check-dams divided by the gross catchment area.

**A.5. The calculation formula of the sensitivity coefficients of runoff to changes in** $P$**,** $E\_{0}$ **and**$n$

Based on the definition of the elasticities of runoff to $P$, $E\_{0}$ and $n$ (Schaake, 1990; Xu et al., 2014), they are given as:

$\frac{∂R}{∂P}={\left\{1-\left[\frac{\left({E\_{0}}/{P}\right)^{n}}{1+\left({E\_{0}}/{P}\right)^{n}}\right]^{\frac{1}{n}+1}\right\}}/{\left\{1-\left[\frac{\left({E\_{0}}/{P}\right)^{n}}{1+\left({E\_{0}}/{P}\right)^{n}}\right]^{\frac{1}{n}}\right\}}$ (A-5)

$\frac{∂R}{∂E\_{0}}=\left\{\frac{1}{1+\left({E\_{0}}/{P}\right)^{n}}\right\}\left\{\frac{1}{1-\left[{\left(1+\left({E\_{0}}/{P}\right)^{n}\right)}/{\left({E\_{0}}/{P}\right)^{n}}\right]^{\frac{1}{n}}}\right\}$ (A-6)

$\frac{∂R}{∂n}=\frac{a-b}{\left[1+\left({P}/{E\_{0}}\right)^{n}\right]^{\frac{1}{n}}-1}, a=\frac{P^{n}ln\left(P\right)+E\_{0}^{n}ln\left(E\_{0}\right)}{P^{n}+E\_{0}^{n}}, b=\frac{ln\left(P^{n}+E\_{0}^{n}\right)}{n}$ (A-7)

where all the symbols have the same meaning as depicted above.

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