**Table S2** Surface soil properties and management practices for model operation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Site name a | CS c | DY d | FQP e | SZf | YTAg |
| Soil Texture b | L | SC | SL | L | L |
| Bulk density (g cm–3) | 1.04 | 1.18 | 1.45 | 1.12 | 1.16 |
| Clay (%) | 20.6 | 42.3 | 10.0 | 19.5 | 18.0 |
| Sand (%) | 42.4 | 34.8 | 52.0 | 41.0 | 19.2 |
| pH | 7.1 | 5.4 | 8.8 | 6.1 | 5.8 |
| Soil organic carbon content (g C kg–1) | 25.5 | 17.0 | 4.9 | 20.8 | 18.0 |

a The sites are Changshu (CS), Danyang (DY), Fengqiu with paddy rice fields (FQP), Shenzhen (SZ), and Yingtan (YTA).

b The soil textures are loam (L), sandy clay (SC) and sandy loam(SL).

c Clay and sand fractions: 0–30 cm, cited from the Second National Soil Survey data (10×10 km2 grid) provided by the Institute of Soil Science, Chinese Academy of Sciences (SNSS); Soil pH: 0–20 cm, observed (Song et al., 2004); Soil organic carbon content (SOC): 0–20 cm, estimated from the observed soil organic matter content divided by 1.724; Bulk density (BD): 0–20 cm, estimated from SOC using the algorithm in Li (2016).

d Clay fraction and soil pH: topsoil, observed (Cai et al., 1986); Sand fraction: 0–30 cm, the SNSS; SOC: topsoil, estimated from the observed organic nitrogen (ON) multiplied by 10; BD: topsoil, estimated from SOC using the algorithm in Li (2016).

e Clay fraction and soil pH: topsoil, observed (Zhu et al., 1989); Sand fractions: 0–30 cm, the SNSS; SOC: 0–15 cm, estimated from the observed ON multiplied by 10; BD: 0–15 cm, estimated from SOC using the algorithm in Li (2016).

f Clay and sand fractions: 0–30 cm, the SNSS; SOC and soil pH: 0–30 cm, observed (Gong et al., 2013); BD: 0–30 cm, estimated from SOC using the algorithm in Li (2016).

g Clay fraction and soil pH: topsoil, observed (Cai et al., 1992); Sand fraction: 0–30 cm, the SNSS; SOC: 0–15 cm, estimated from the observed ON multiplied by 10; BD: 0–15 cm, estimated from SOC using the algorithm in Li (2016).