

Figure S1. Density plots of crop water stress index in phytotron conditions under flooded and aerobic water regime for two rice genotypes (IRAT109 and Takanari) based on two (a) reference baseline parameter assumptions (CBL and GBL) in combination with (b) substitute constant water stressed baseline (WSB) of 5 °C. CBL: common reference baseline; GBL genotype reference baseline. The suffix (\_5) denotes the constant WSB of 5 °C. The dashed (colour) lines denote the mean for each water regime.

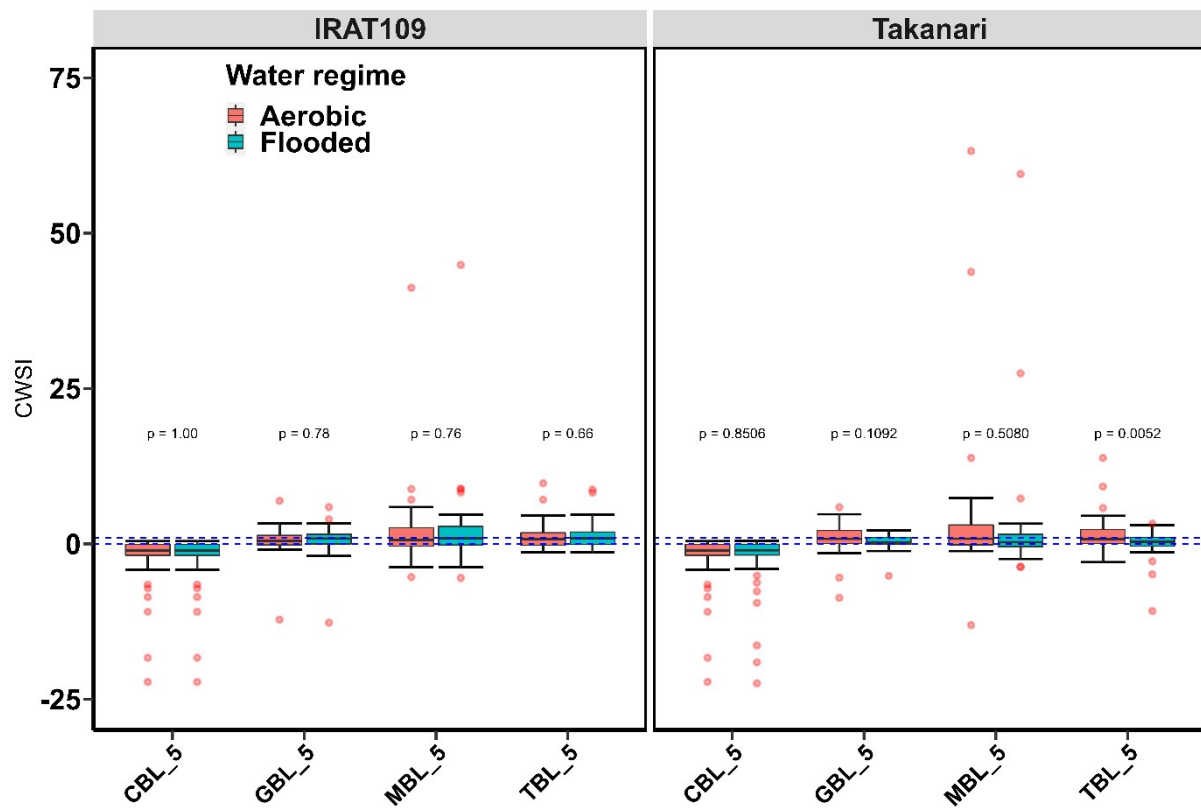


Figure S2. Boxplots of unconstrained crop water stress index (CWSI) values in field environment conditions under flooded and aerobic water regime for two rice genotypes (IRAT109 and Takanari). The blue dashed lines indicate the bounds 0–1 for CWSI in widely reported literature. Categories on the x-axis indicates the reference baseline parameter assumptions (CBL, GBL, MBL, TBL). The suffix (\_5) denotes the substitution of estimated water stressed baseline (WSB) with a constant of 5 °C. Boxes indicate 25th and 75th percentiles and tails indicate 5th and 95th percentiles. The red points are outliers. The p-value < 0.05 indicates significant differences between water regimes. CBL: common reference baseline; GBL: genotype reference baseline; MBL: midday reference baseline (12–13 JST); TBL: time variant baseline. JST: Japan Standard Time.

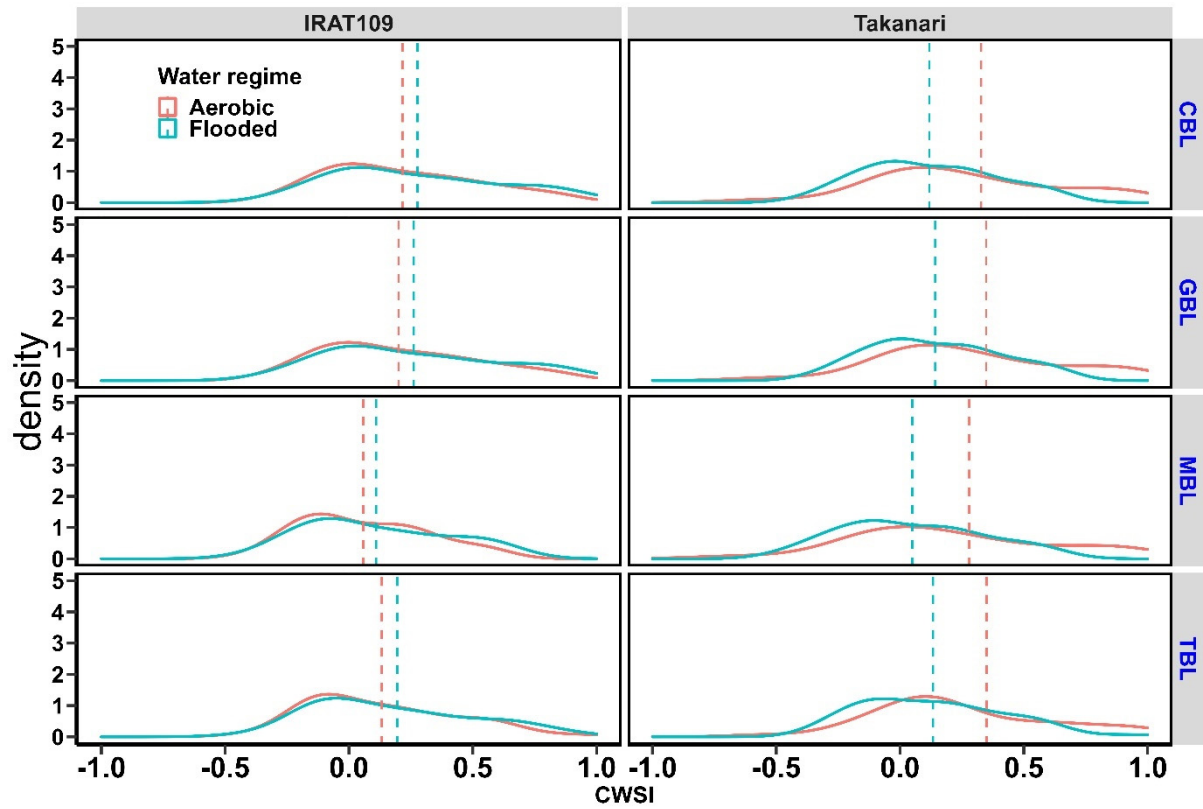


Figure S3. Density plots of constrained crop water stress index (CWSI) values in field environment conditions under flooded and aerobic water regime for two rice genotypes (IRAT109 and Takanari) based on four reference baseline parameter assumptions (CBL, GBL, MBL and TBL). The dashed (colour) lines denote the mean for each water regime. CBL: common reference baseline; GBL genotype reference baseline; MBL: midday reference baseline (12–13 JST); TBL: time variant baseline. JST: Japan Standard Time.

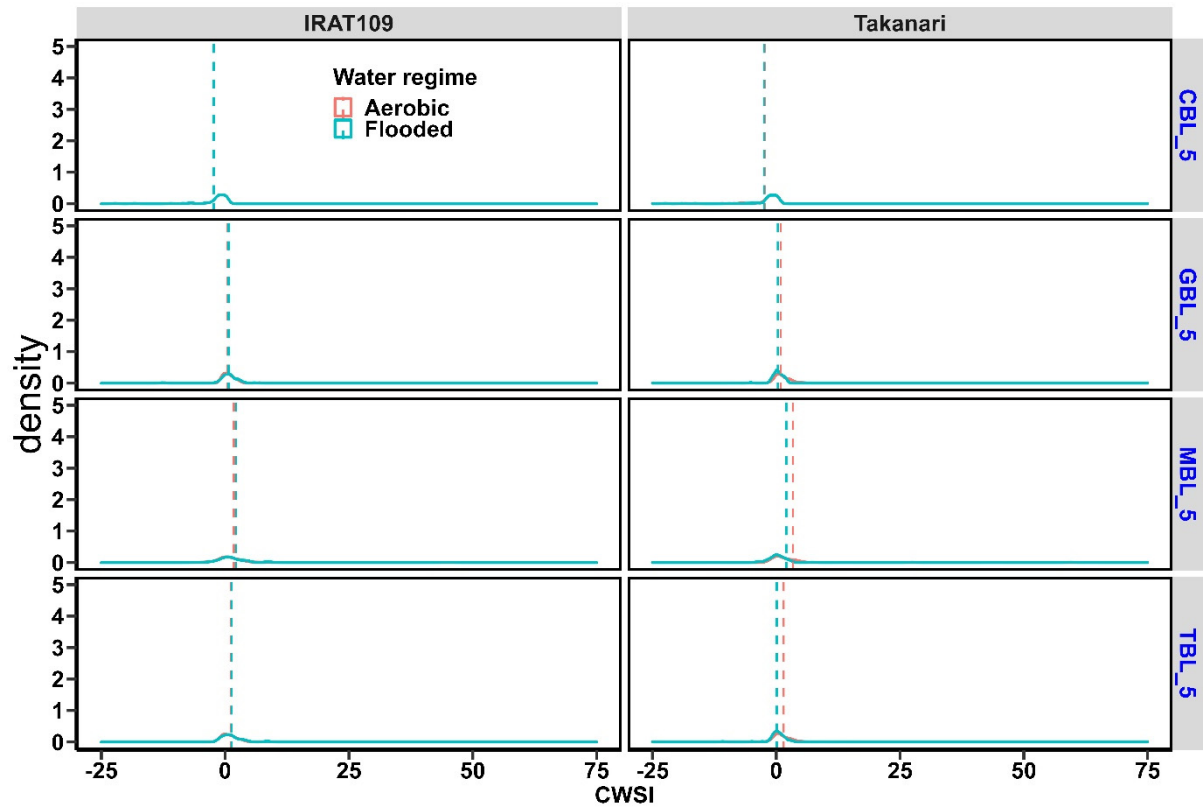
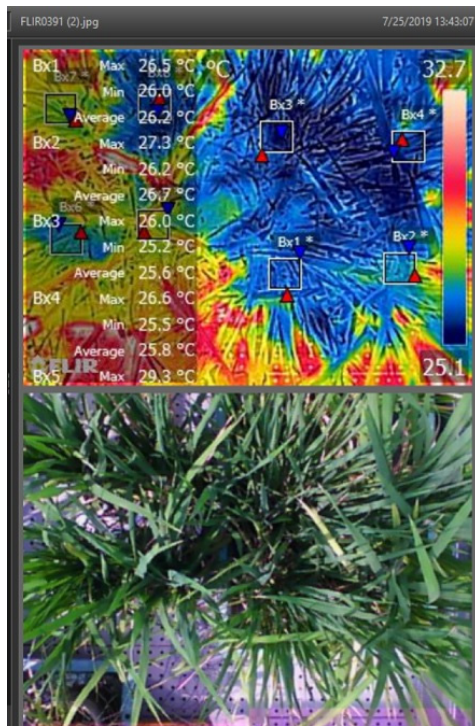


Figure S4. Density plots of unconstrained crop water stress index (CWSI) values in field environment conditions under flooded and aerobic water regime for two rice genotypes (IRAT109 and Takanari) based on four reference baseline parameter assumptions (CBL, GBL, MBL and TBL) in combination with a constant water stressed baseline (WSB) of 5 °C. The suffix (\_5) denotes the constant WSB of 5 °C. The dashed (colour) lines denote the mean for each water regime. In case of single dashed (colour) line showing, mean between water regimes are same. CBL: common reference baseline; GBL genotype reference baseline; MBL: midday reference baseline (12–13 JST); TBL: time variant baseline. JST: Japan Standard Time.



(a)



(b)

Figure S5. Example of plant canopy temperature post processing in FLIR tool v.6.4 on 70 days after sowing showing the thermal and visible image taken at nadir view with polygons showing areas extracted for mean temperature and (b) continuous monitoring of plant canopy temperature in field environment using temperature sensor MX2303 (Onset Computer Corp, Bourne, MA, USA) enclosed in handmade shield wrapped with aluminium foil placed within the rice panicle region.

Table S1. Summary statistics of significance testing of plant canopy-air temperature difference ( $T_c - T_a$ ) vs VPD parameters (slope and intercept) for the time periods (08–17 JST) for each genotype (IRAT109 and Takanari) in field environment condition. JST: Japan Standard Time; CI: Confidence interval. 08–09 JST is the reference for slope and intercept estimates.

Coefficients (Time, JST)	$T_c - T_a$			
	IRAT109		Takanari	
	Estimates	CI (95%)	Estimates	CI (95%)
<b>Intercept</b>				
08–09	3.24 **	1.22 – 5.26	4.22 **	1.58 – 6.85
09–10	2.89	-0.22 – 6.00	2.07	-1.68 – 5.82
10–11	2.59	-0.19 – 5.36	-0.61	-3.88 – 2.66
11–12	1.85	-0.75 – 4.44	0.78	-2.43 – 4.00
12–13	2.85 *	0.31 – 5.39	1.00	-2.11 – 4.11
13–14	1.75	-0.71 – 4.21	1.35	-1.82 – 4.51
14–15	2.33	-0.23 – 4.88	0.50	-2.67 – 3.67
15–16	1.93	-0.58 – 4.45	0.92	-2.31 – 4.14
16–17	0.79	-1.84 – 3.42	0.57	-2.82 – 3.95
<b>Slope (VPD*Time)</b>				
VPD*08–09	-6.82 ***	-9.46 – -4.18	-8.14 ***	-11.04 – -5.24
VPD*09–10	-1.32	-5.10 – 2.46	-0.74	-4.81 – 3.33
VPD*10–11	1.29	-1.97 – 4.55	3.12	-0.44 – 6.68
VPD*11–12	2.35	-0.73 – 5.43	2.75	-0.70 – 6.21
VPD*12–13	1.18	-1.84 – 4.19	3.18	-0.07 – 6.44
VPD*13–14	1.83	-1.22 – 4.88	2.56	-0.96 – 6.08
VPD*14–15	0.77	-2.79 – 4.33	2.49	-1.33 – 6.31
VPD*15–16	0.34	-3.06 – 3.75	1.94	-1.82 – 5.70
VPD*16–17	0.08	-3.21 – 3.36	1.61	-1.93 – 5.14
<i>N</i>	226		162	

\*  $p < 0.05$  \*\*  $p < 0.01$  \*\*\*  $p < 0.001$ .