Supplementary

Table S1. Basic introduction to the selected GGCMs.

GGCMs	Model types	Management scenarios	Irrigation method	Resolution
CLM-CROP	Ecosystem	D/F/H	Irr/Noirr	0.5°×0.5°
GEPIC	Site-based	D/F/H	Irr/Noirr	0.5°×0.5°
EPIC-TAMU	Site-based	F/H	Irr/Noirr	0.5°×0.5°
EPIC-IIASA	Site-based	F/H	Irr/Noirr	0.5°×0.5°
EPIC-BOKU	Site-based	D/F/H	Irr/Noirr	0.5°×0.5°
PAPSIM	Site-based	D/F/H	Irr/Noirr	0.5°×0.5°
PDSSAT	Site-based	D/F/H	Irr/Noirr	0.5°×0.5°
PEGASUS	Ecosystem	D/F/H	Irr/Noirr	0.5°×0.5°

Notes: D, F, and H represent the "Default" scenario, the "Fullharm" scenario, and the "Harmnon" scenario, respectively.

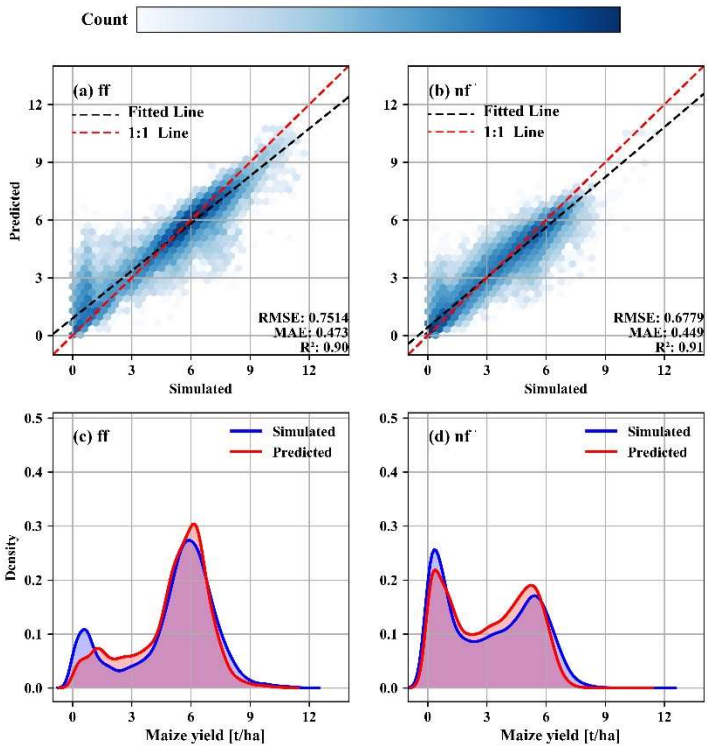

Figure S1. Scatter and density plots for EPIC-IIASA simulations and RF-predicted maize yields in the valida-tion dataset. Notes: "ff" represents the irrigated condition, while "nf" represents the rain-fed con-dition. (a) Maize yield under irrigated conditions; (b) maize yield under rain-fed conditions; (c) density distribution of maize

yield under irrigated conditions; (d) density distribution of maize yield under rain-fed conditions.

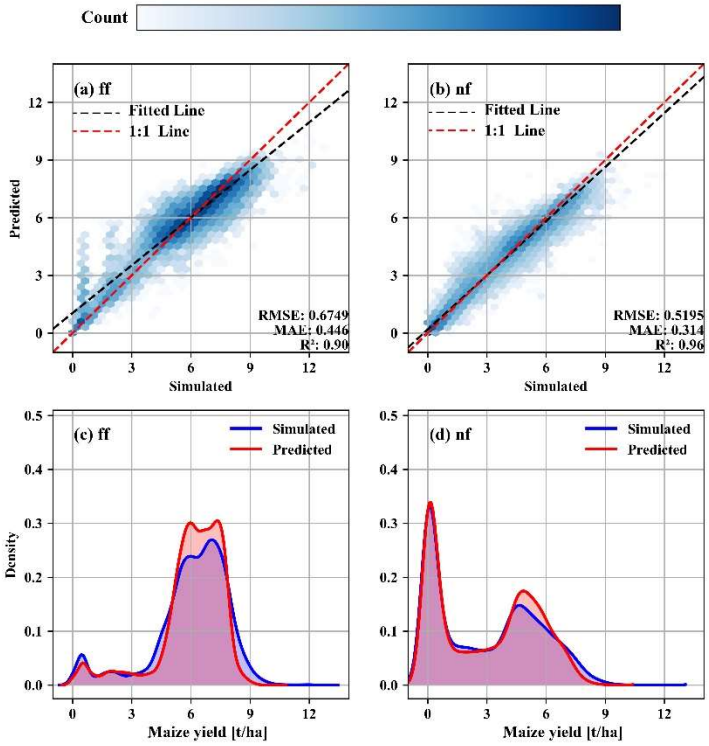

Figure S2. Scatter and density plots for EPIC-TAMU simulations and RF-predicted maize yields in the validation dataset.

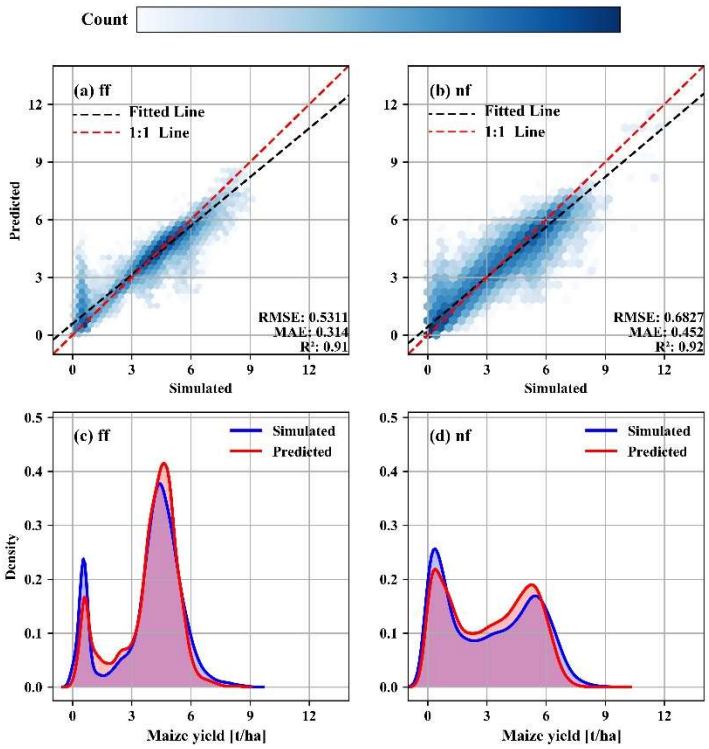

Figure S3. Scatter and density plots for PDSSAT simulations and RF-predicted maize yields in the validation dataset.

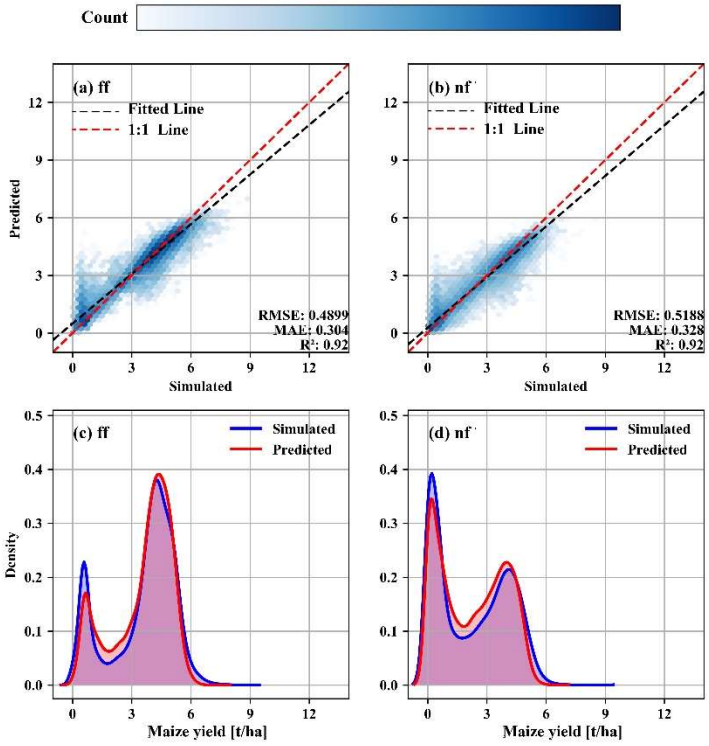

Figure S4. Scatter and density plots for GEPIC simulations and RF-predicted maize yields in the validation dataset.

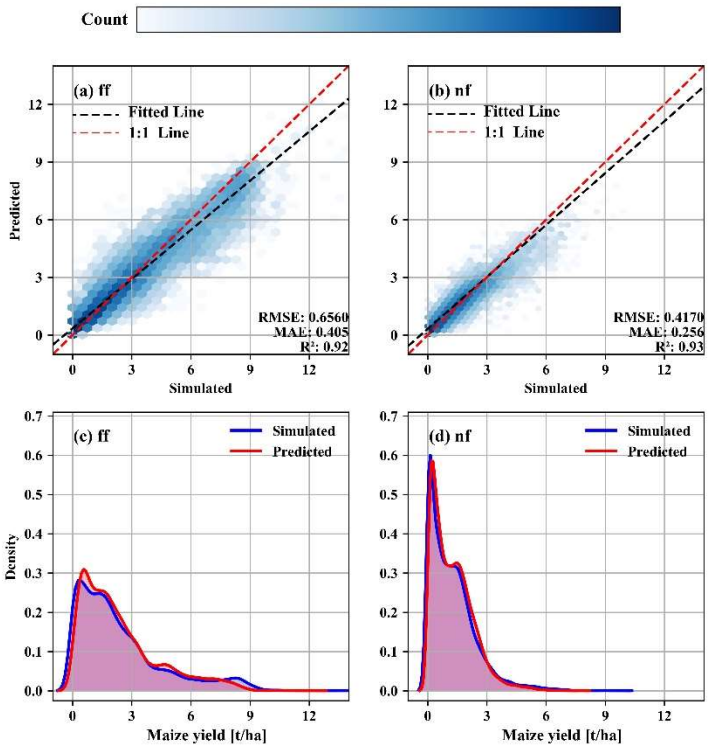

Figure S5. Scatter and density plots for PEGASUS simulations and RF-predicted maize yields in the validation dataset.

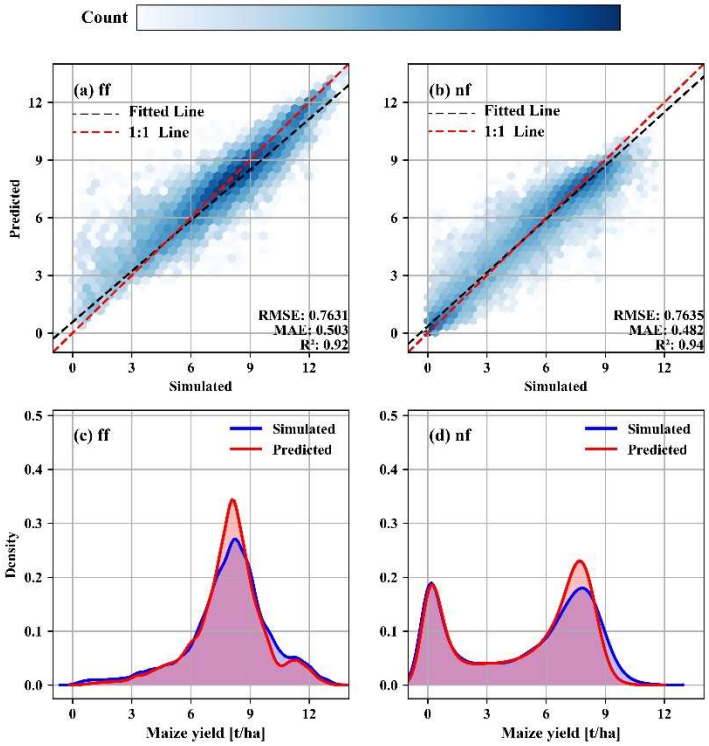

Figure S6. Scatter and density plots for CLM-CROP simulations and RF-predicted maize yields in the validation dataset.

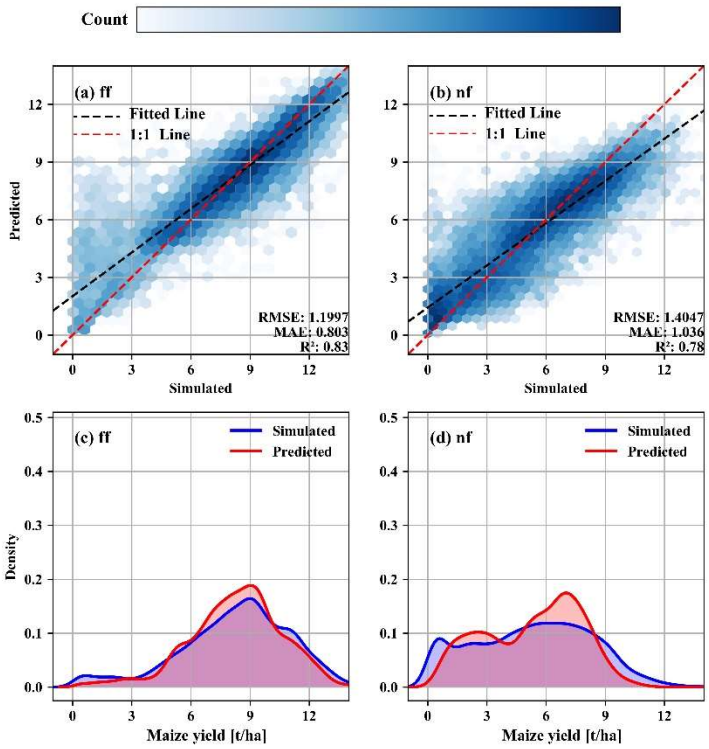

Figure S7. Scatter and density plots for PAPSIM simulations and RF-predicted maize yields in the validation dataset.

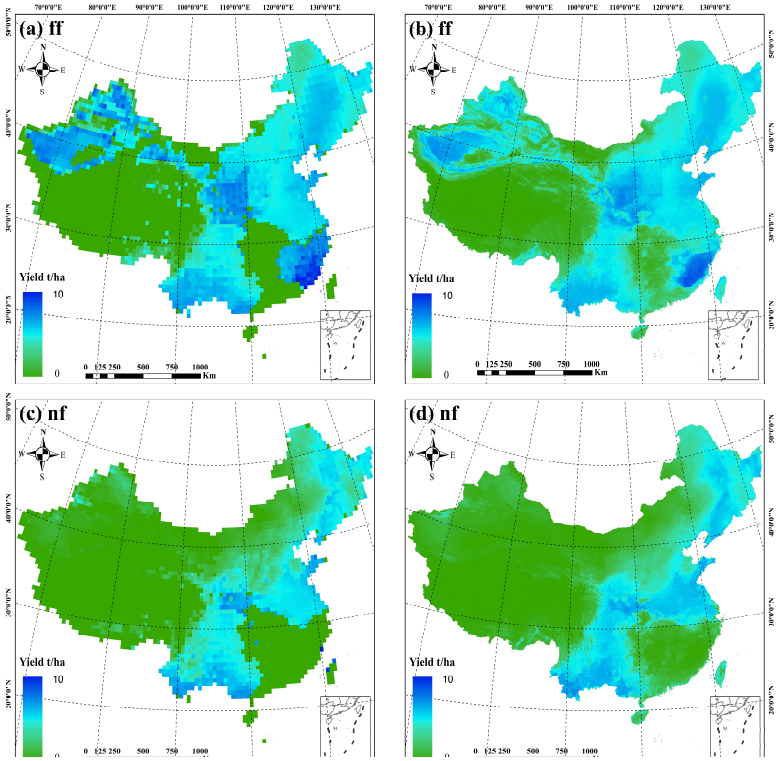

Figure S8. Spatial distributions of maize yield in China before and after downscaling for EPIC-IIASA. (a) Ir-rigated maize yield at a spatial resolution of 50 km; (b) irrigated maize yield at a spatial resolution of 1 km; (c) rain-fed maize yield at a spatial resolution of 50 km; and (d) rain-fed maize yield at a spatial resolution of 1 km.

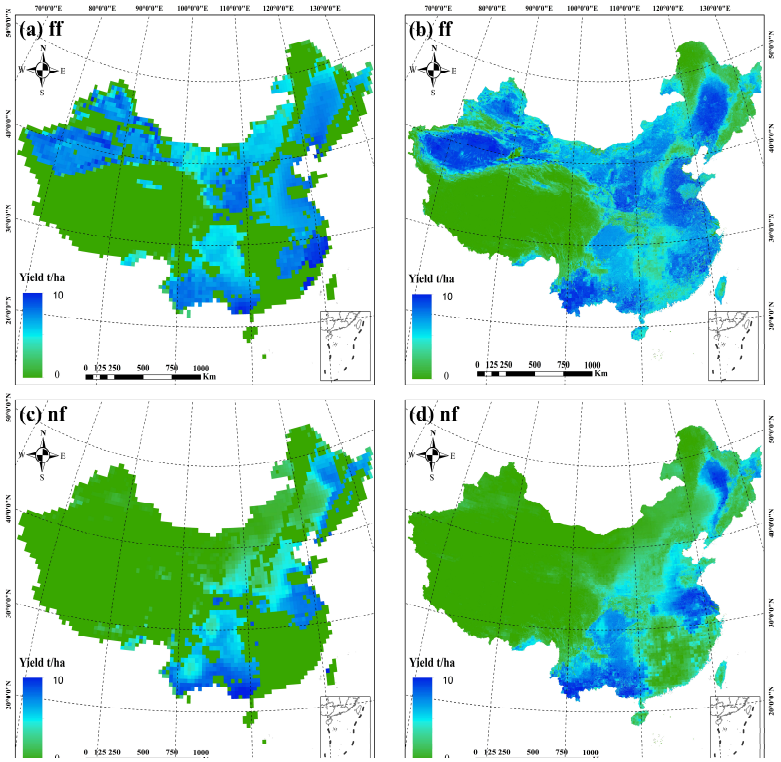

Figure S9. Spatial distributions of maize yield in China before and after downscaling for EPIC-TAMU.

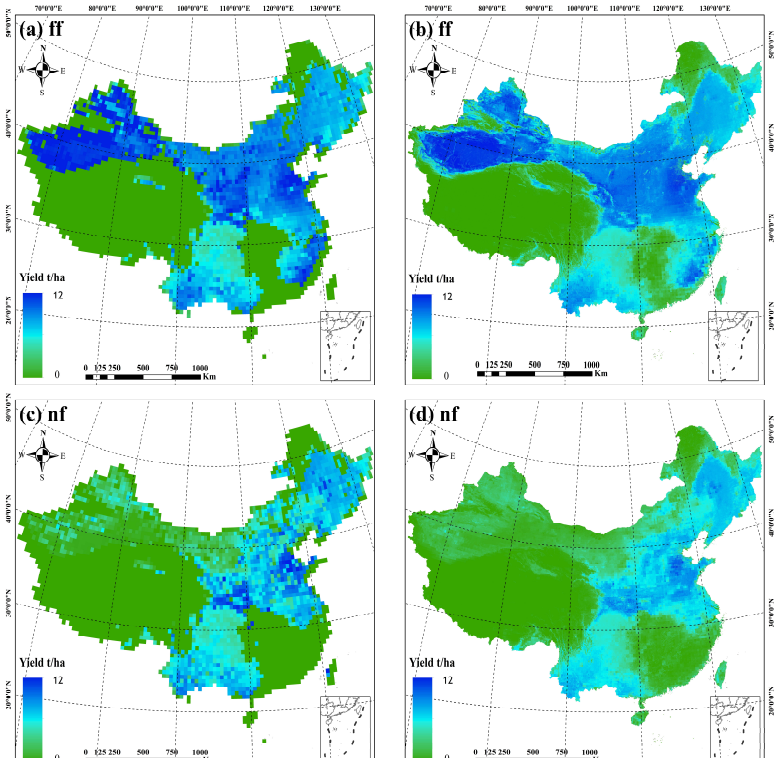

Figure S10. Spatial distributions of maize yield in China before and after downscaling for PDSSAT.

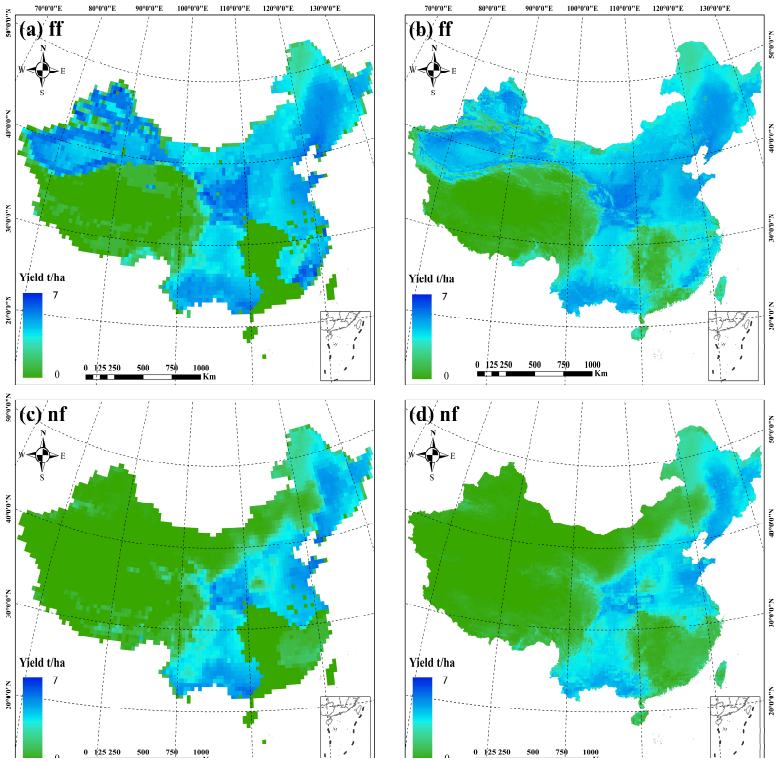

Figure S11. Spatial distributions of maize yield in China before and after downscaling for GEPIC.

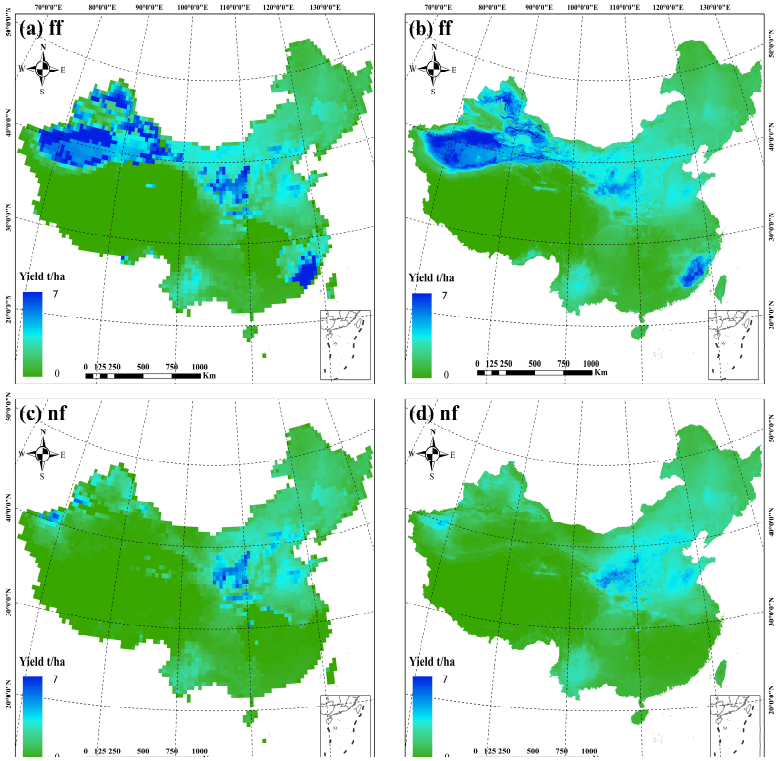

Figure S12. Spatial distributions of maize yield in China before and after downscaling for PEGASUS.

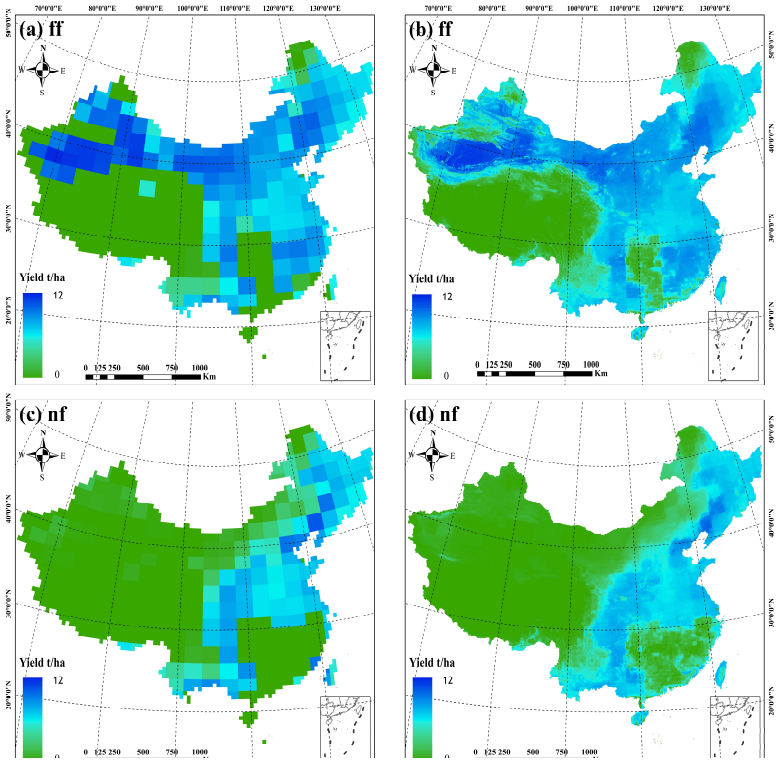

Figure S13. Spatial distributions of maize yield in China before and after downscaling for CLM-CROP.

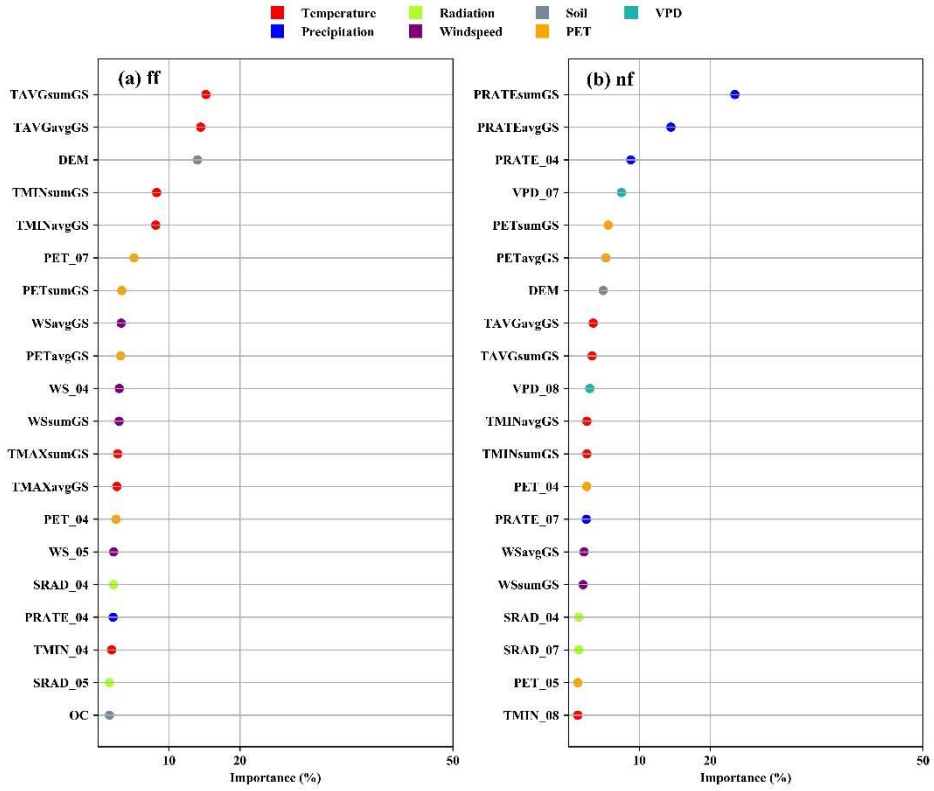

Figure S14. Ranking of feature importance for EPIC-IIASA. (a) Feature importance under irrigated conditions; (b) feature importance under rain-fed conditions.

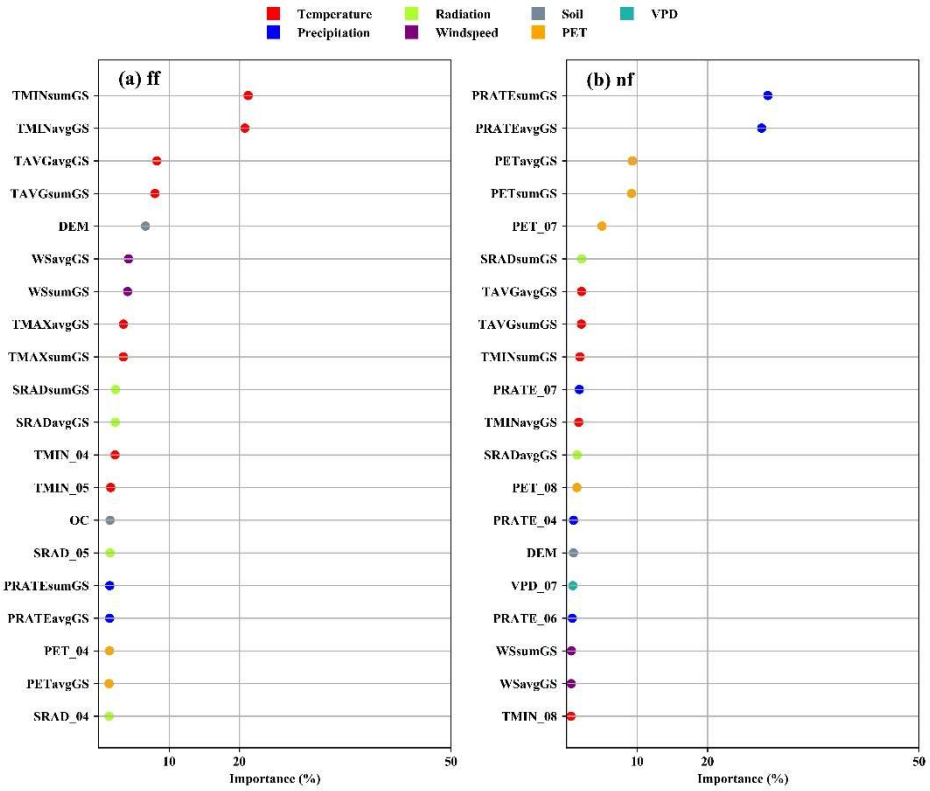

Figure S15. Ranking of feature importance for EPIC-TAMU.

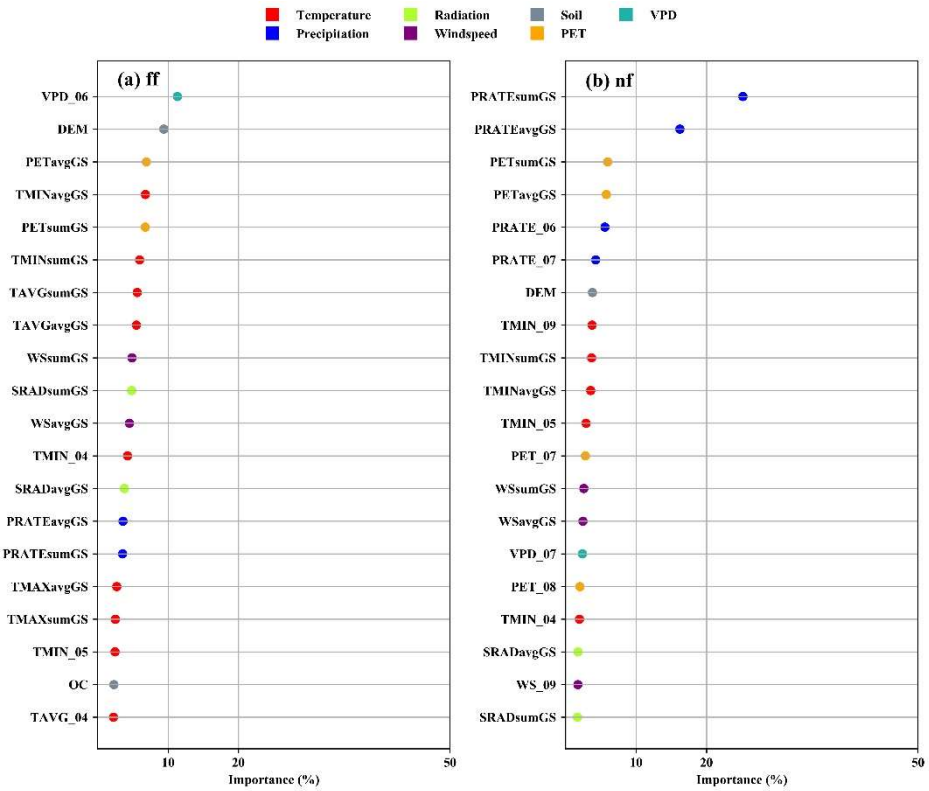

Figure S16. Ranking of feature importance for PDSSAT.

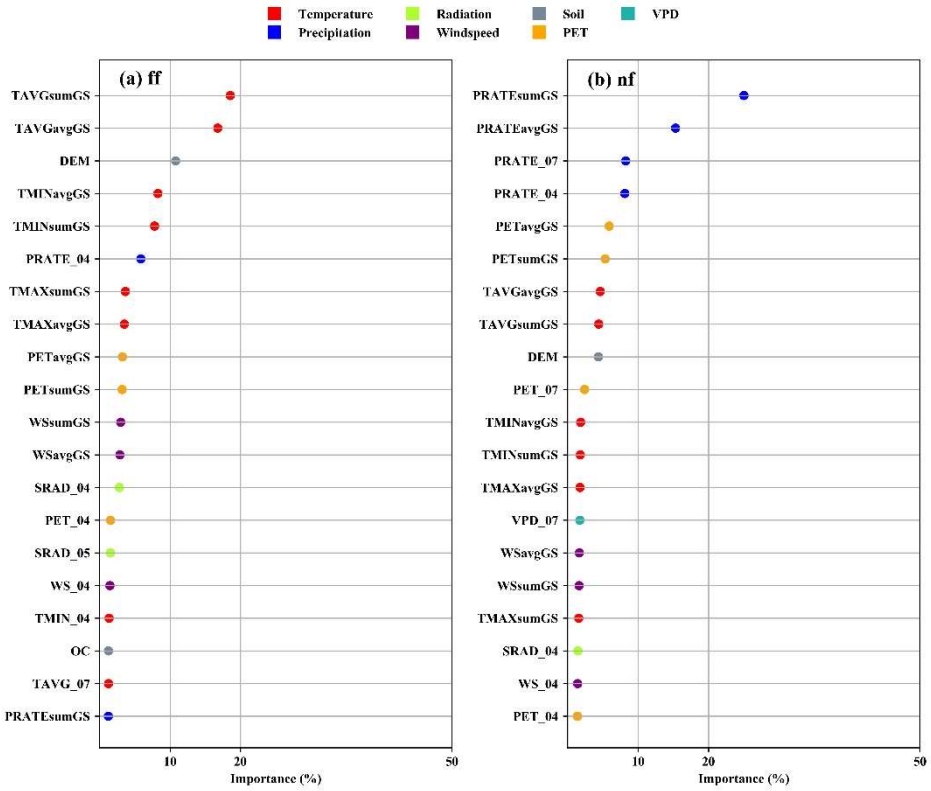

Figure S17. Ranking of feature importance for GEPIC.

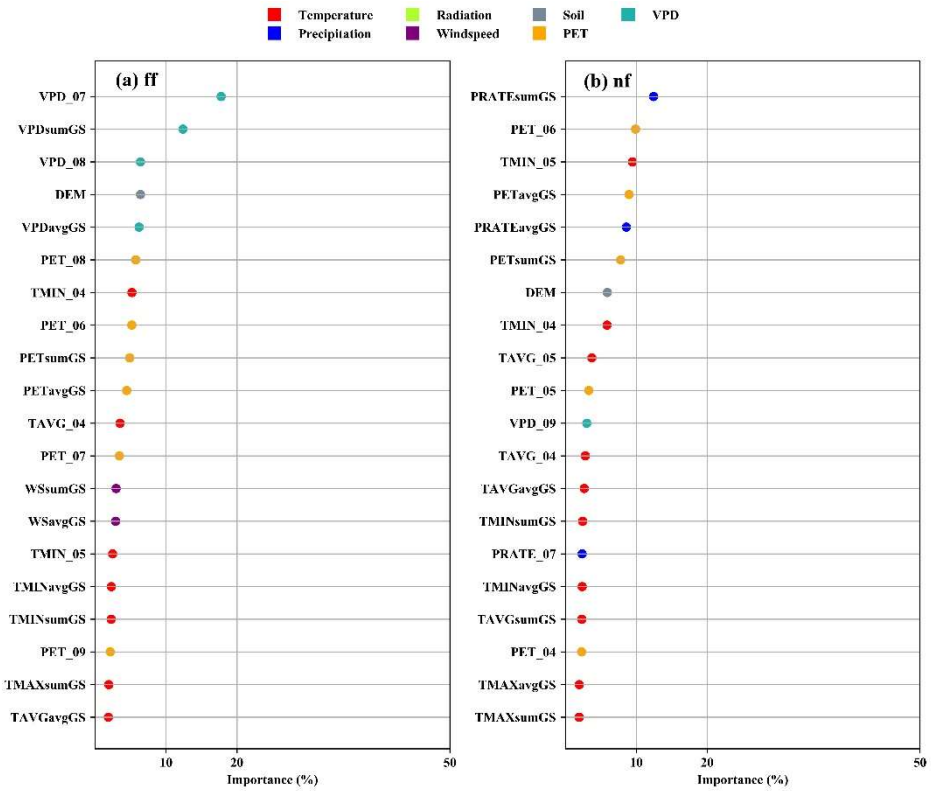

Figure S18. Ranking of feature importance for PEGASUS.

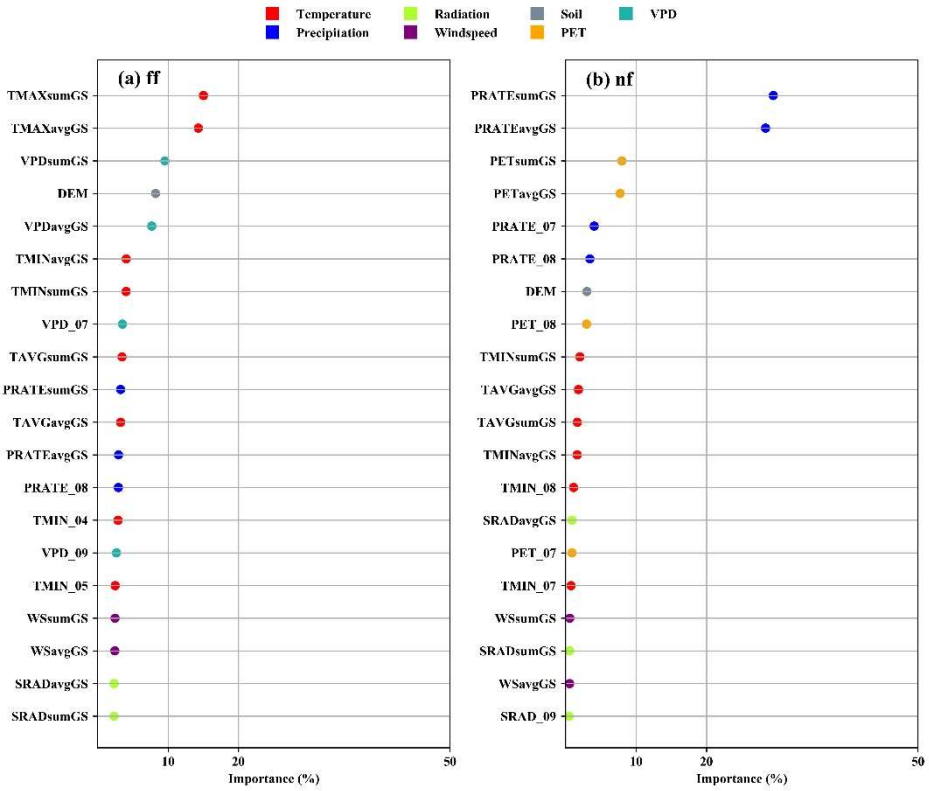

Figure S19. Ranking of feature importance for CLM-CROP.