



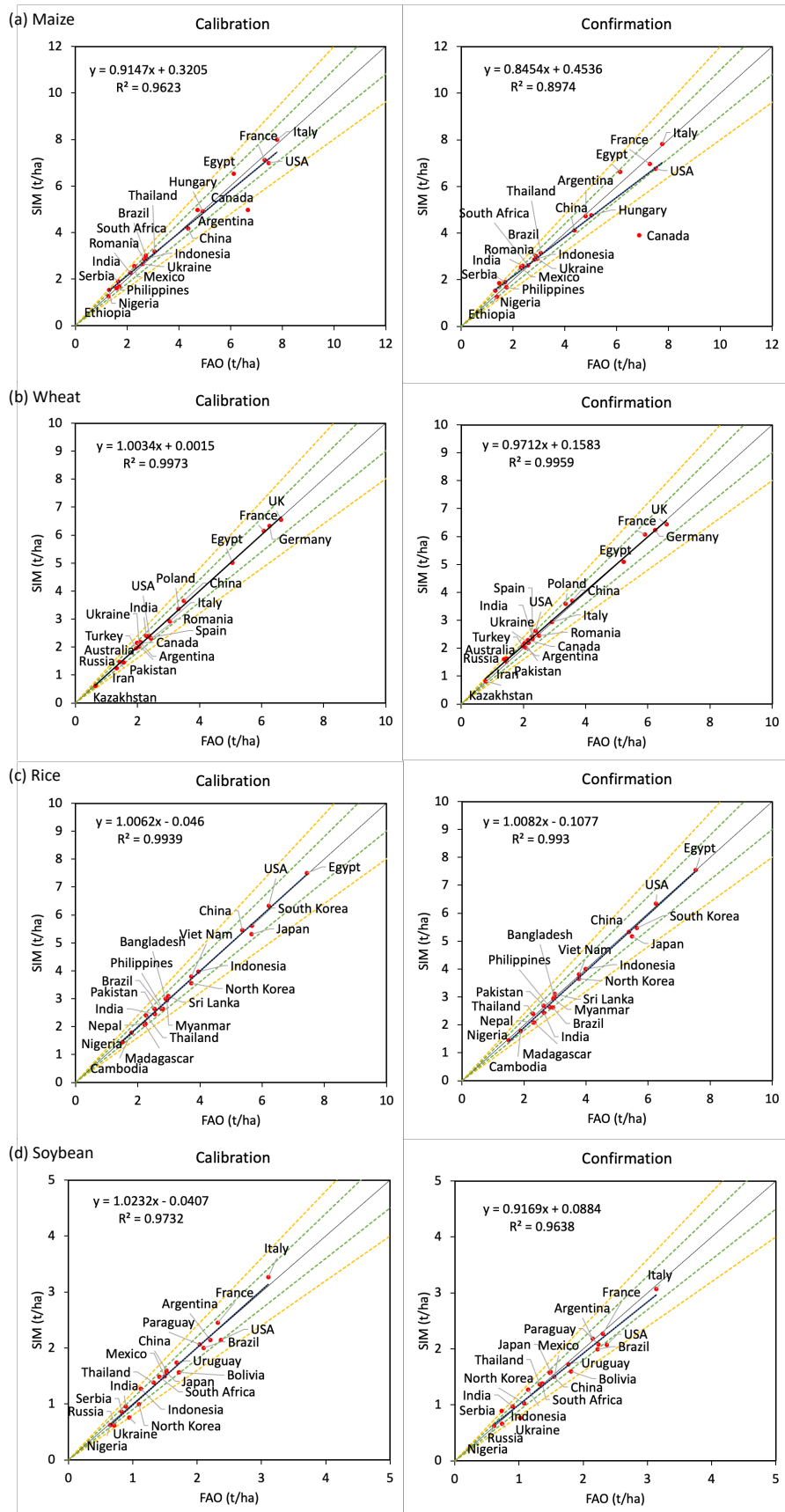
*Supplement of*

## **Simulation of crop yield using the global hydrological model H08 (crp.v1)**

**Zhipin Ai and Naota Hanasaki**

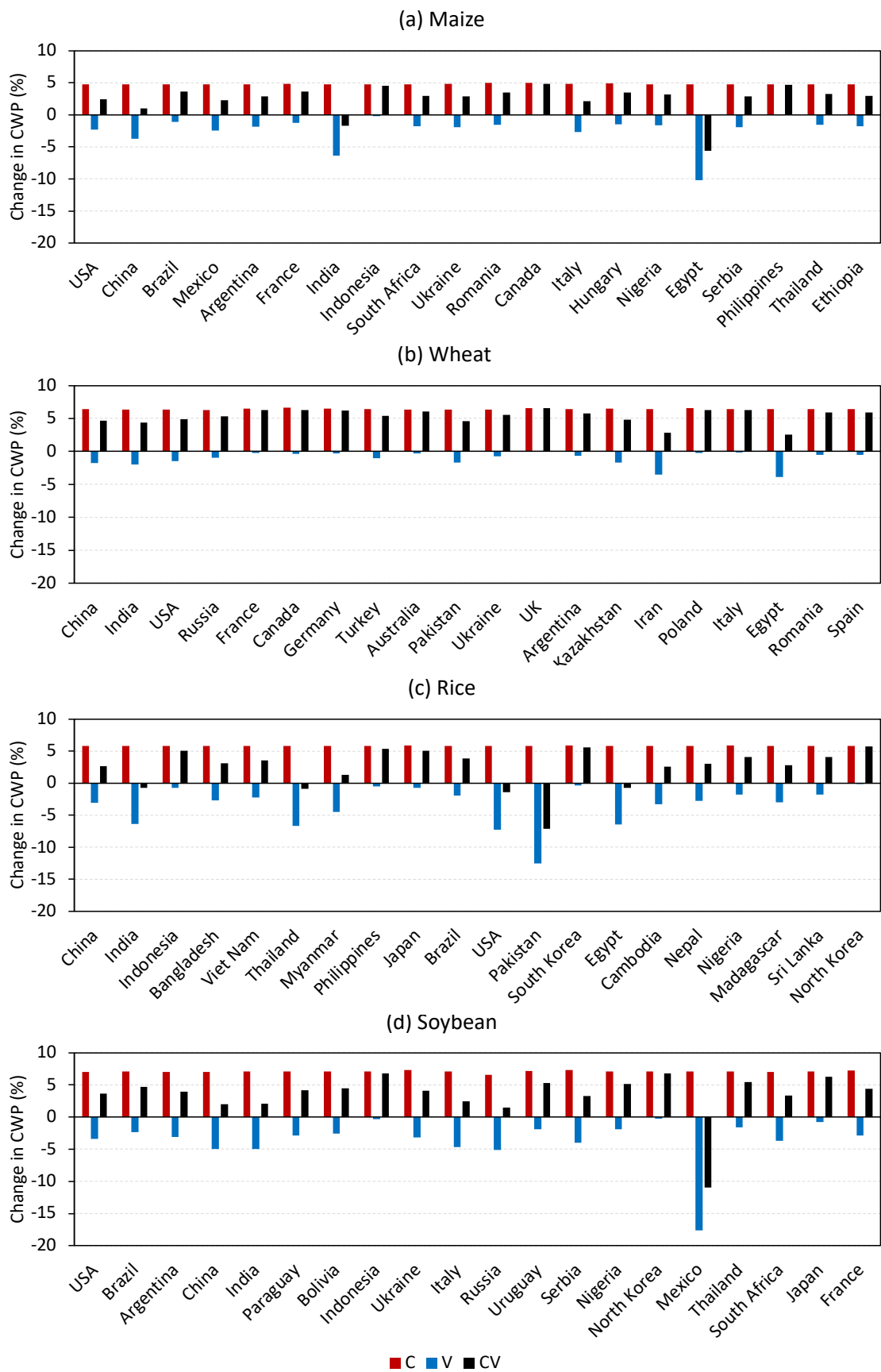
*Correspondence to:* Zhipin Ai (aizhipin@igsnr.ac.cn)

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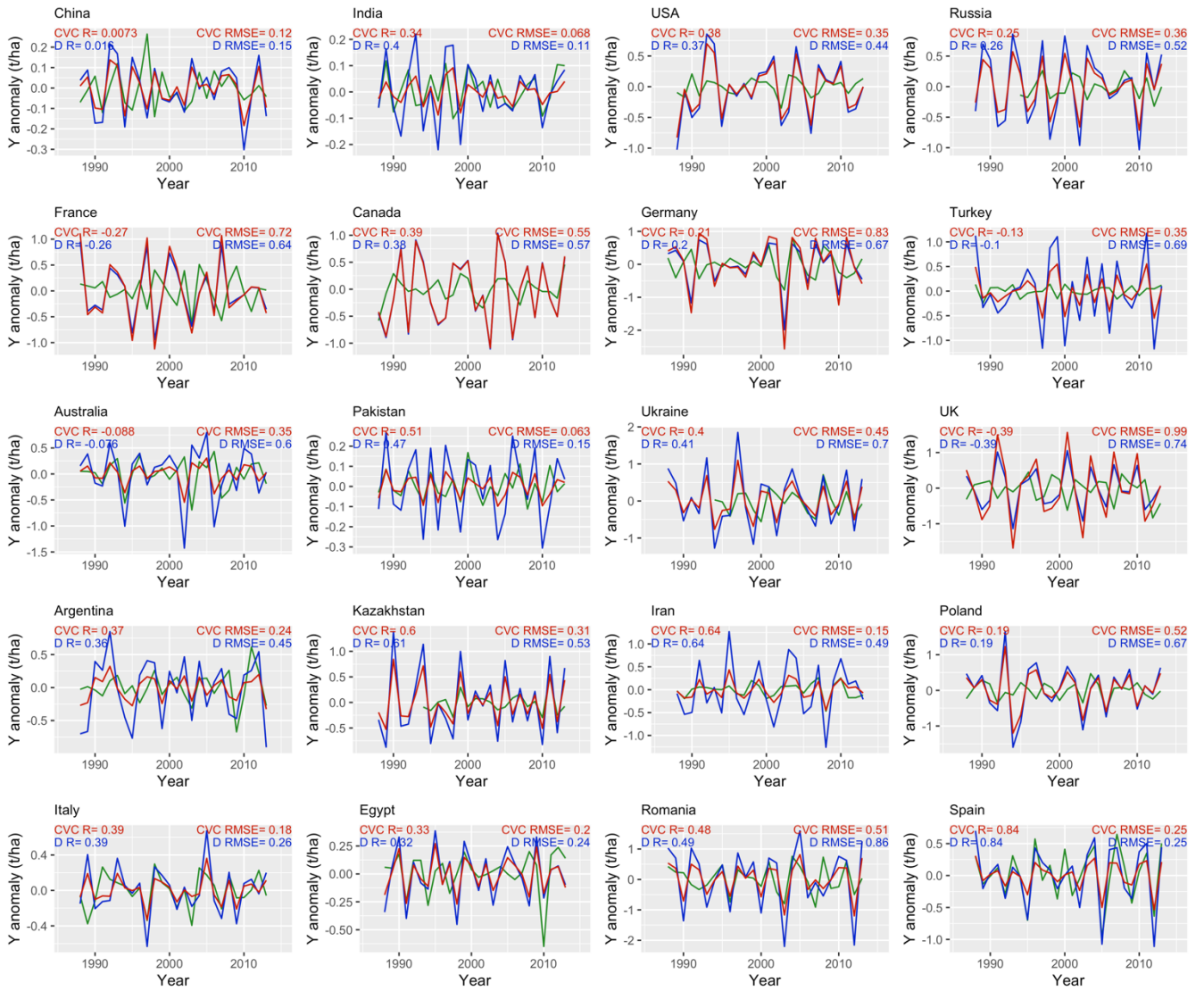
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Fig. S1 Comparison of mean simulated yield and mean FAO yield for the top 20 largest producer countries for the calibration (even year) and confirmation (odd year) period, respectively. Dashed green and yellow lines indicate  $\pm 10\%$  and  $\pm 20\%$  differences, respectively. SIM denotes simulated yield and FAO denotes reported yield from FAO. (a) maize, (b) wheat, (c) rice, and (d) soybean.



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Fig. S2 Comparison of changes in CWP due to CO<sub>2</sub> fertilization and vapor pressure deficit. (a) maize, (b) wheat, (c) rice, and (d) soybean. Further details on three utilized simulations (C, V, and CV) are listed in Table 1



15 Fig. S3 Time series detrended wheat yield anomalies from simulation CVC (red), simulation D (blue), and FAO (green) for the top 20 largest producer countries. Y, yield; R, correlation coefficient; RMSE, root mean square error.



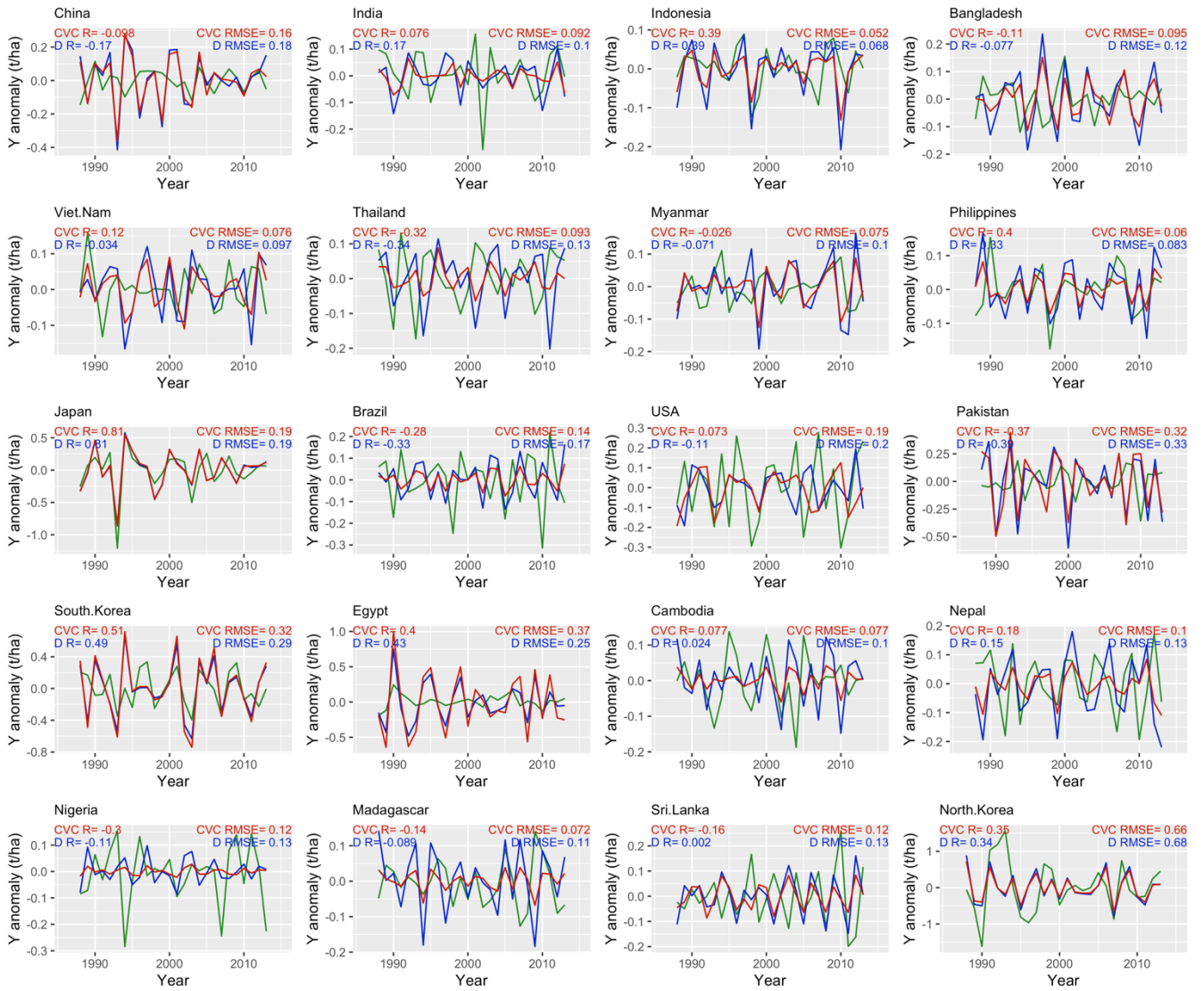


Fig. S4 Time series detrended rice yield anomalies from simulation CVC (red), simulation D (blue), and FAO (green) for the top 20 largest producer countries. Y, yield; R, correlation coefficient; RMSE, root mean square error.

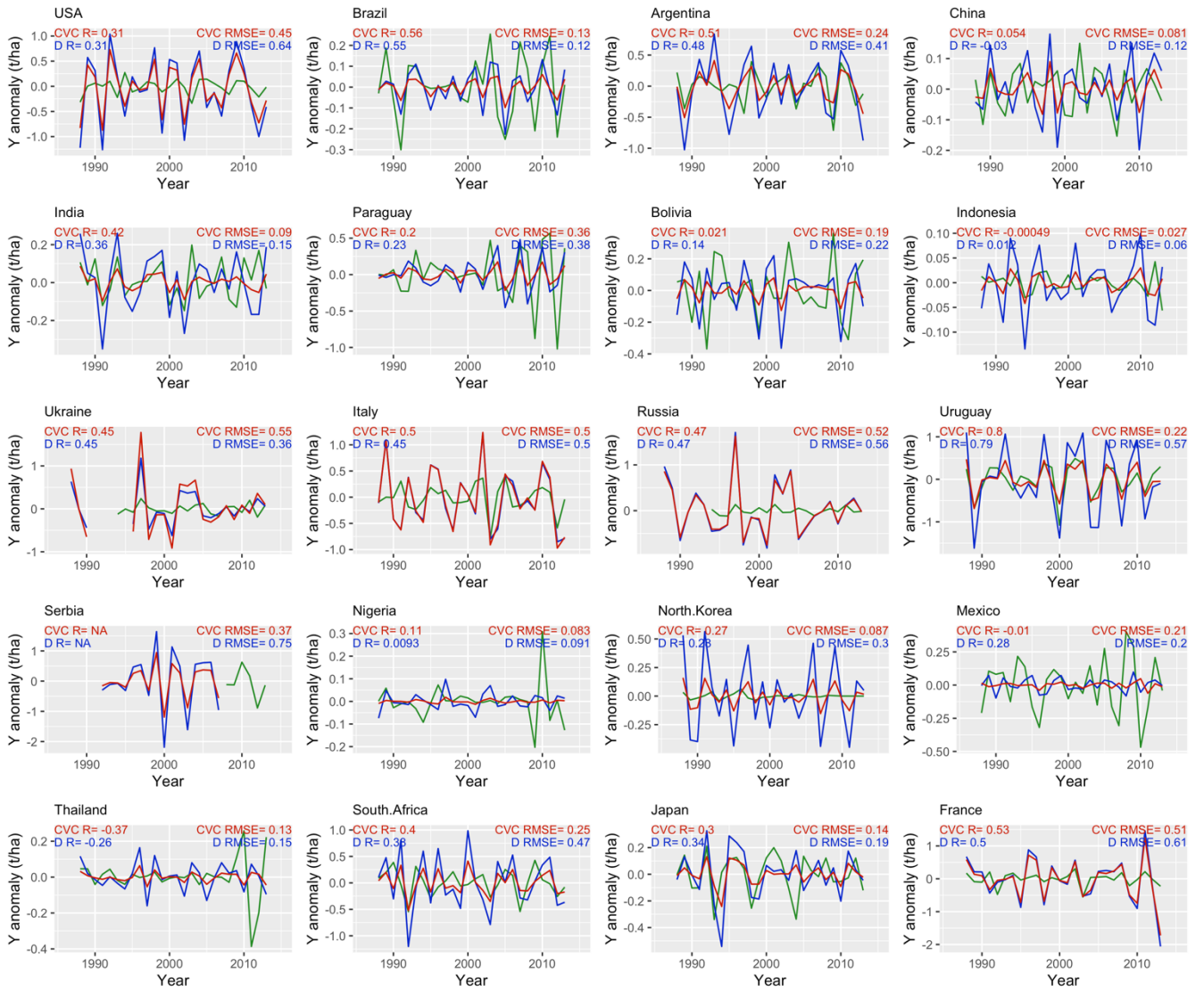


Fig. S5 Time series detrended soybean yield anomalies from simulation CVC (red), simulation D (blue), and FAO (green) for the top 20 largest producer countries. Y, yield; R, correlation coefficient; RMSE, root mean square error

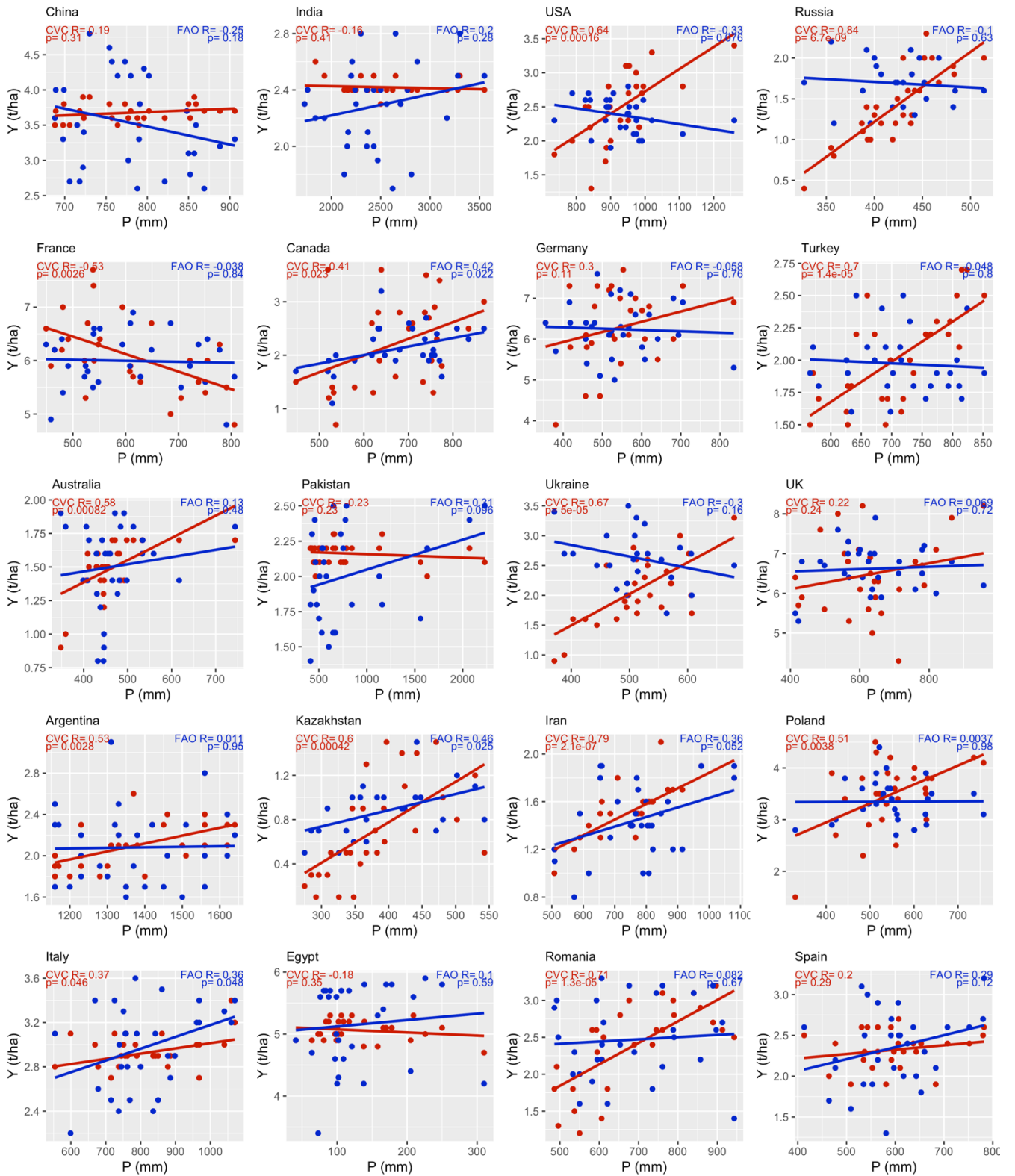


Fig. S6 Relationship between wheat yield (red: simulation CVC; blue: FAO) and total precipitation in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield; P, precipitation; R, correlation coefficient.

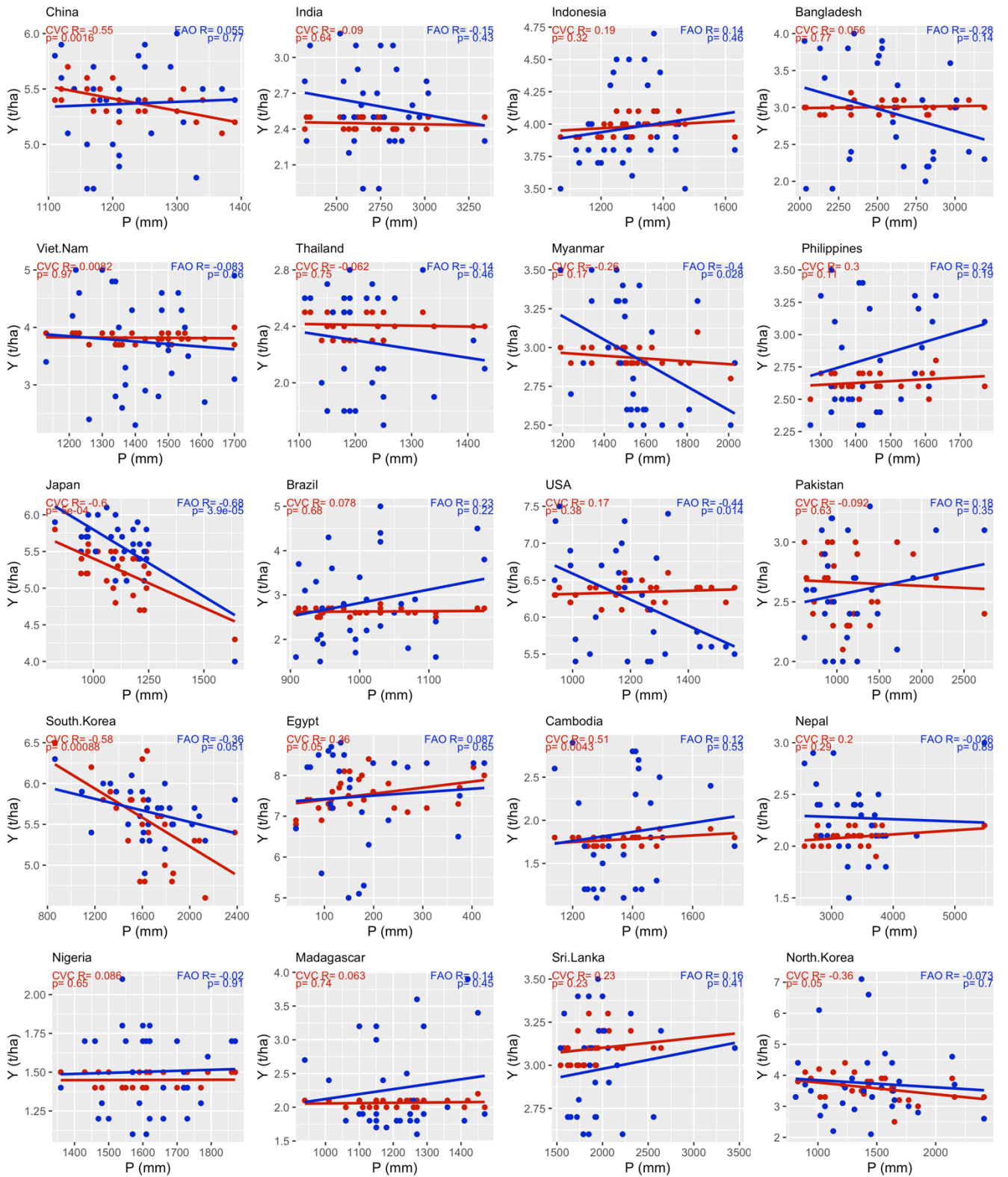
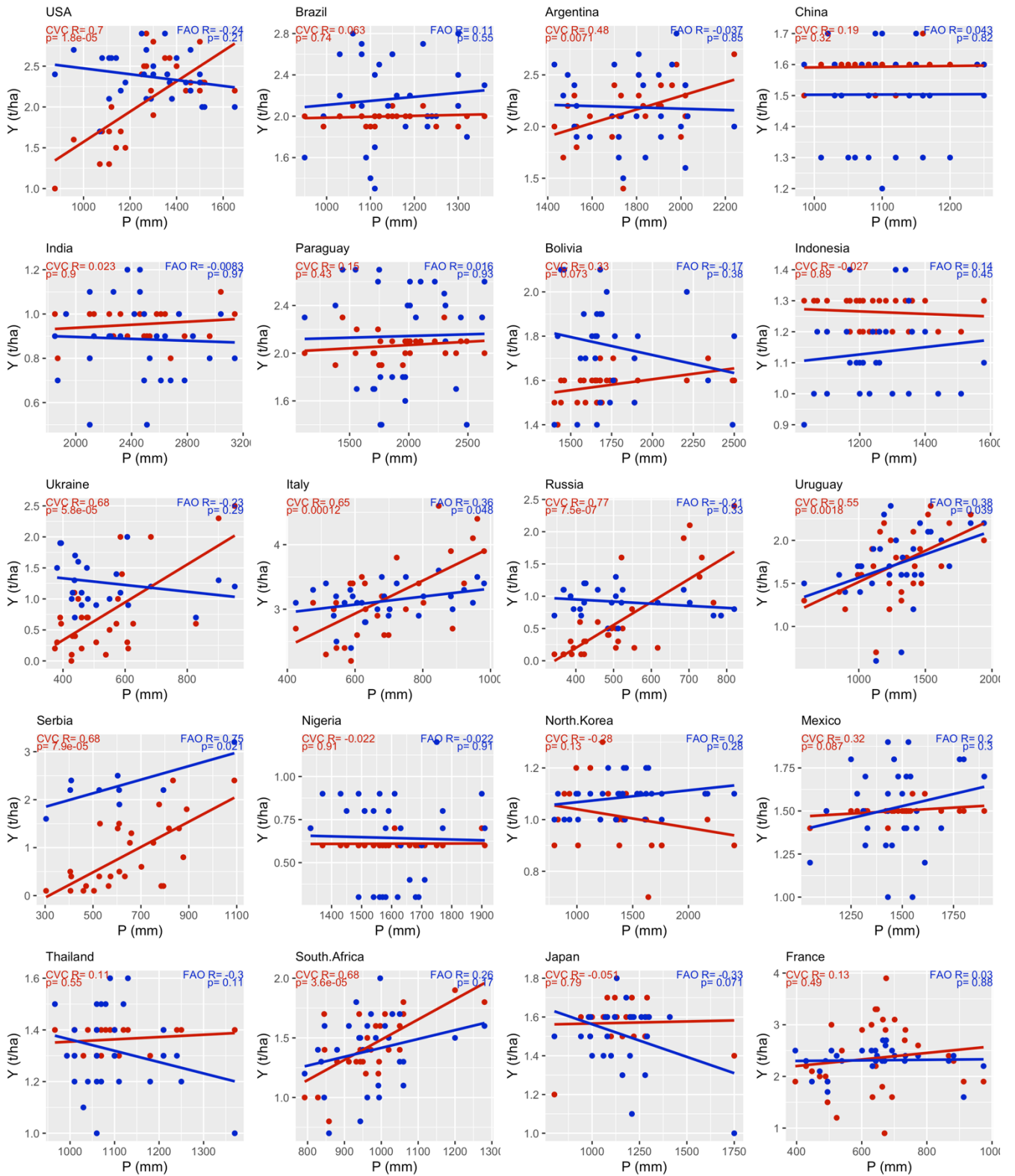


Fig. S7 Relationship between rice yield (red: simulation CVC; blue: FAO) and total precipitation in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield; P, precipitation; R, correlation coefficient.





30 Fig. S8 Relationship between soybean yield (red: simulation CVC; blue: FAO) and total precipitation in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield; P, precipitation; R, correlation coefficient.

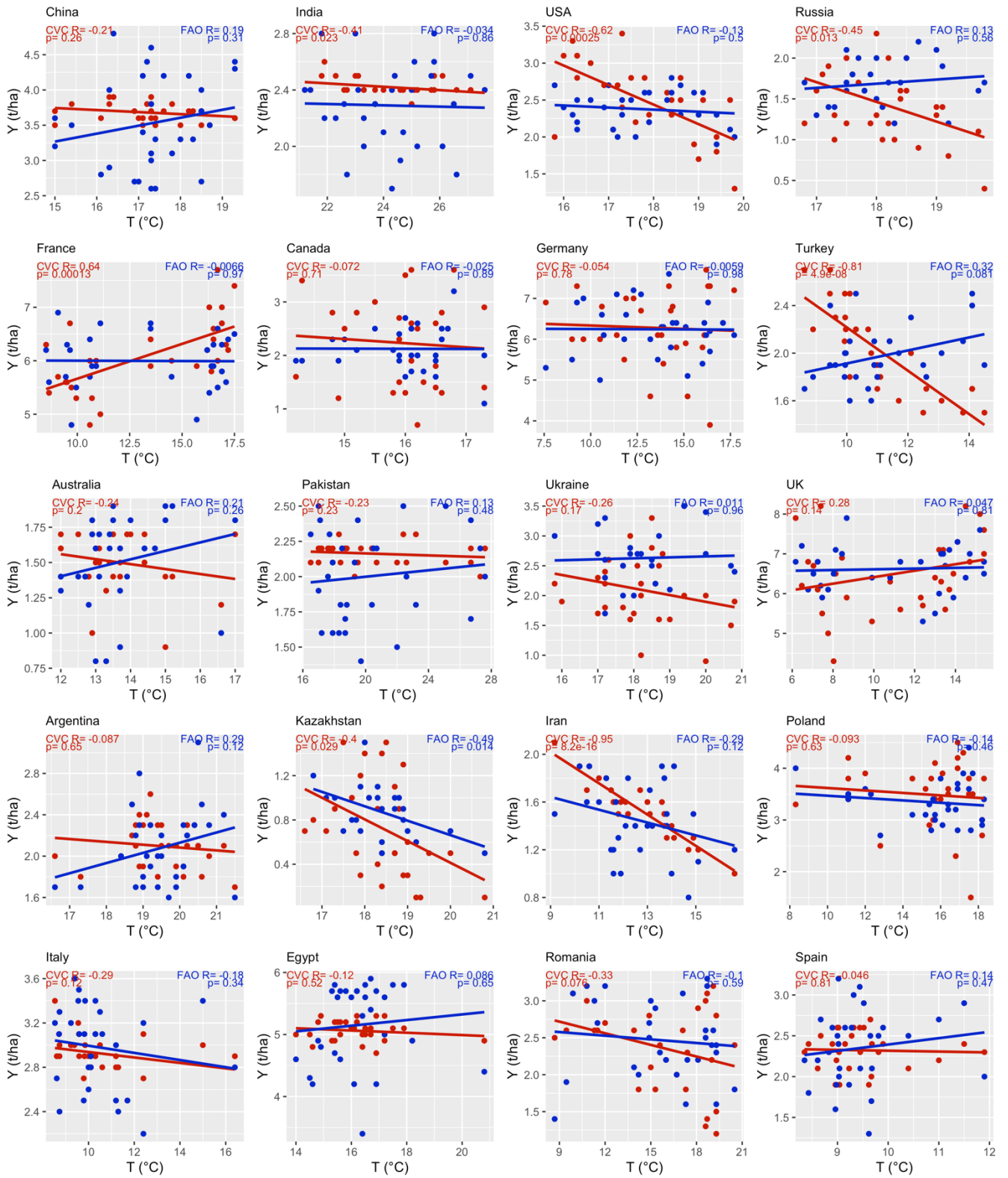


Fig. S9 Relationship between wheat yield (red: simulation CVC; blue: FAO) and mean air temperature in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield, T, air temperature; R, correlation coefficient.

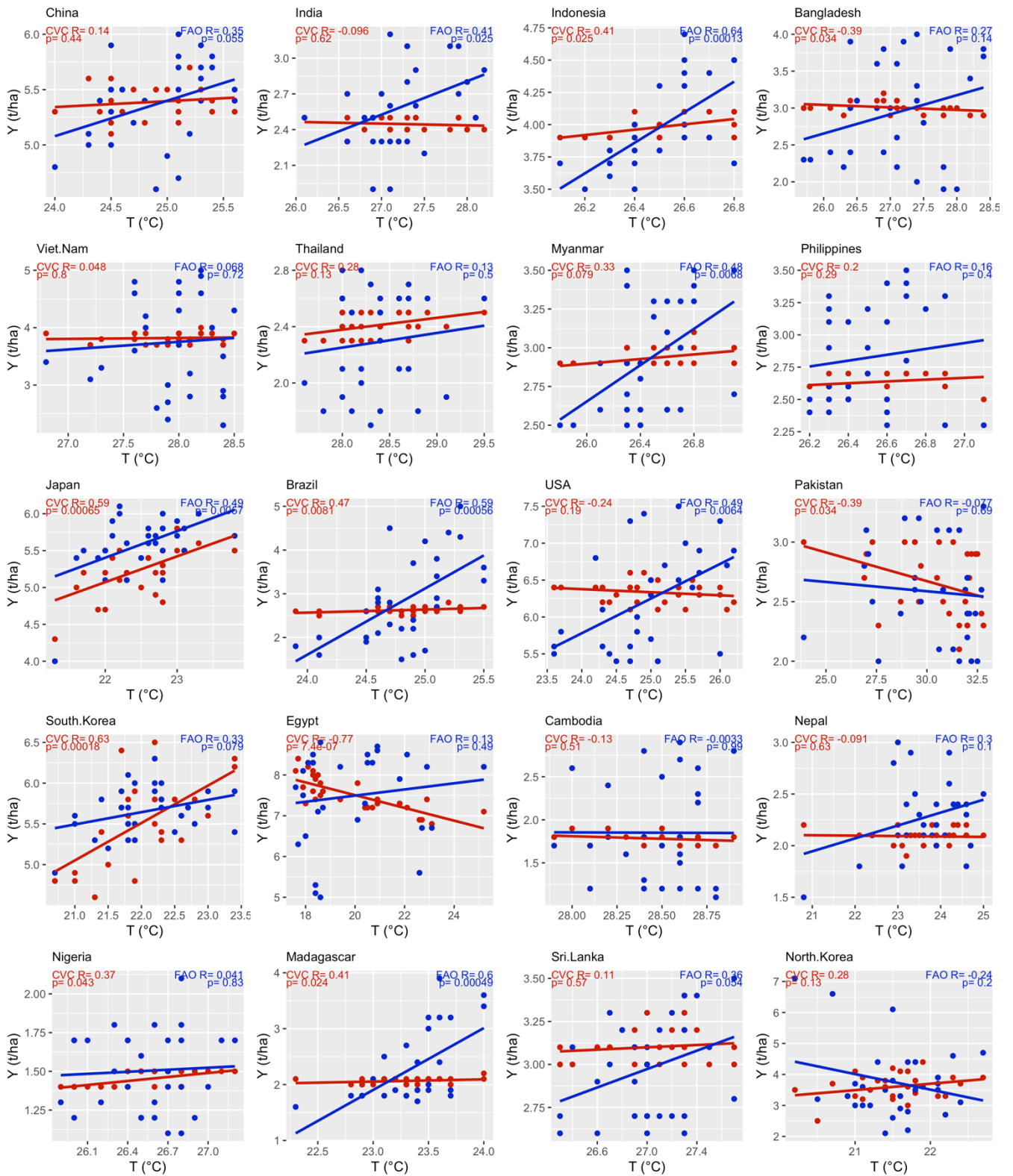
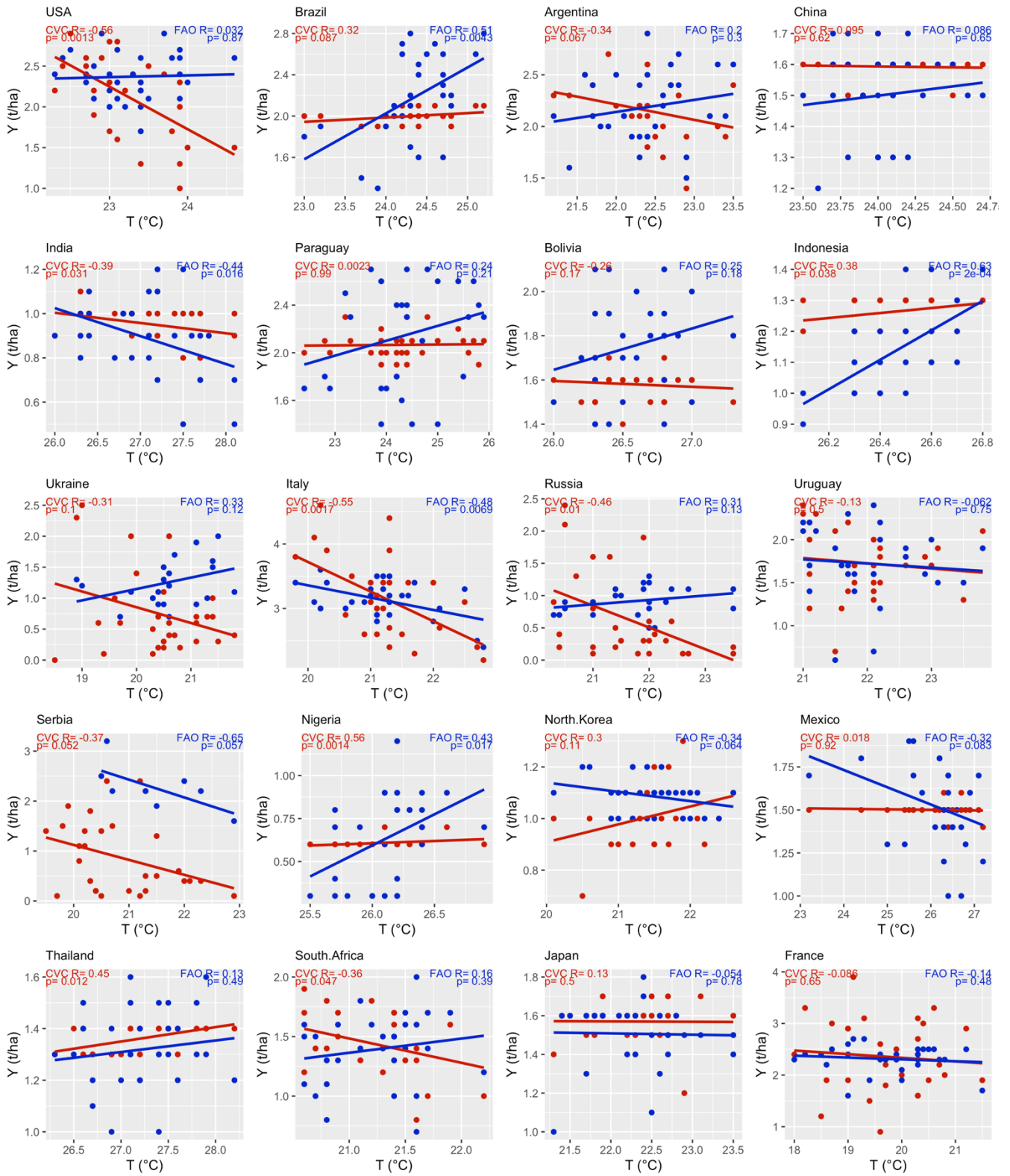


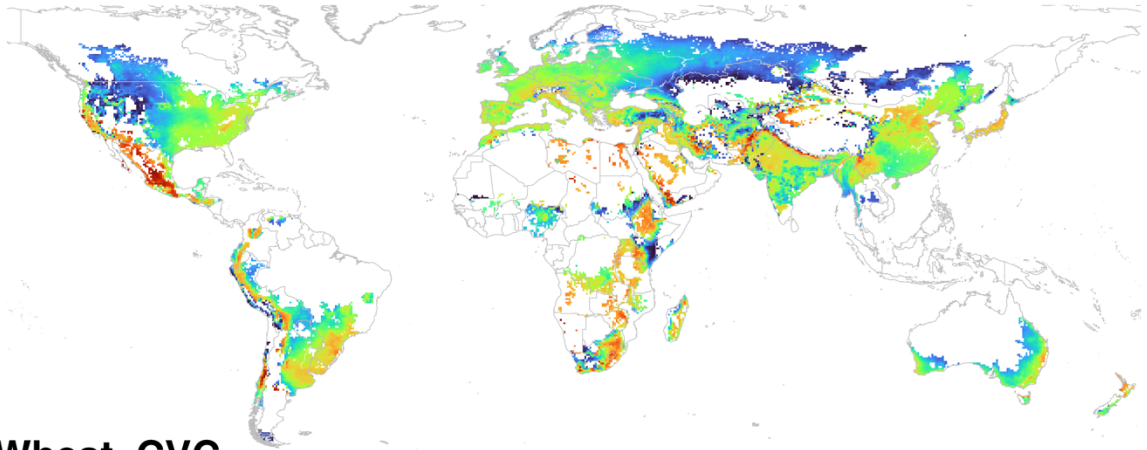
Fig. S10 Relationship between rice yield (red: simulation CVC; blue: FAO) and mean air temperature in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield, T, air temperature; R, correlation coefficient.



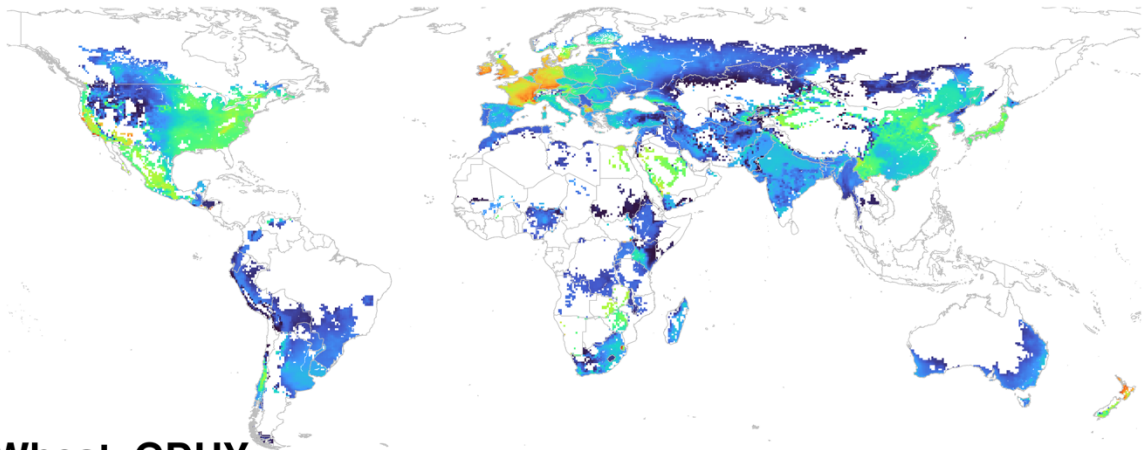
40 Fig. S11 Relationship between soybean yield (red: simulation CVC; blue: FAO) and mean air temperature in the growing season from 1986 to 2015 for the top 20 largest producer countries. Y, yield, T, air temperature; R, correlation coefficient.



**(a) Wheat\_D**



**(b) Wheat\_CVC**



**(c) Wheat\_GDHY**

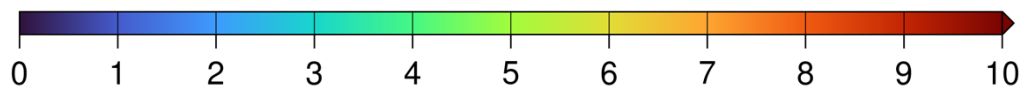
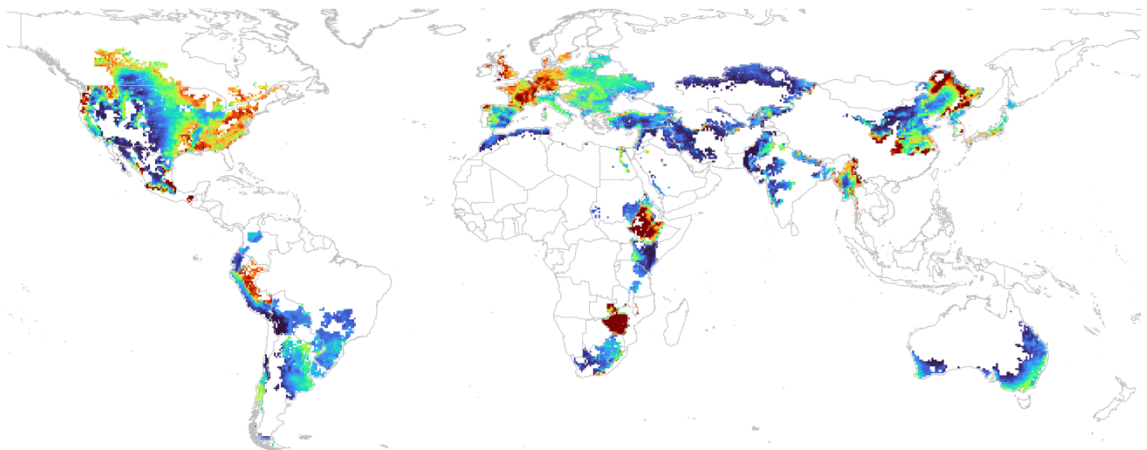
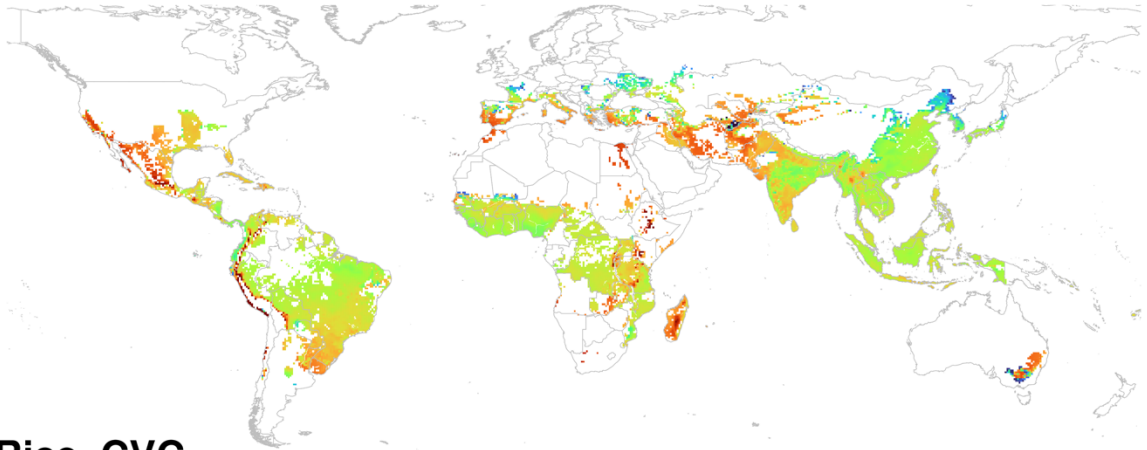
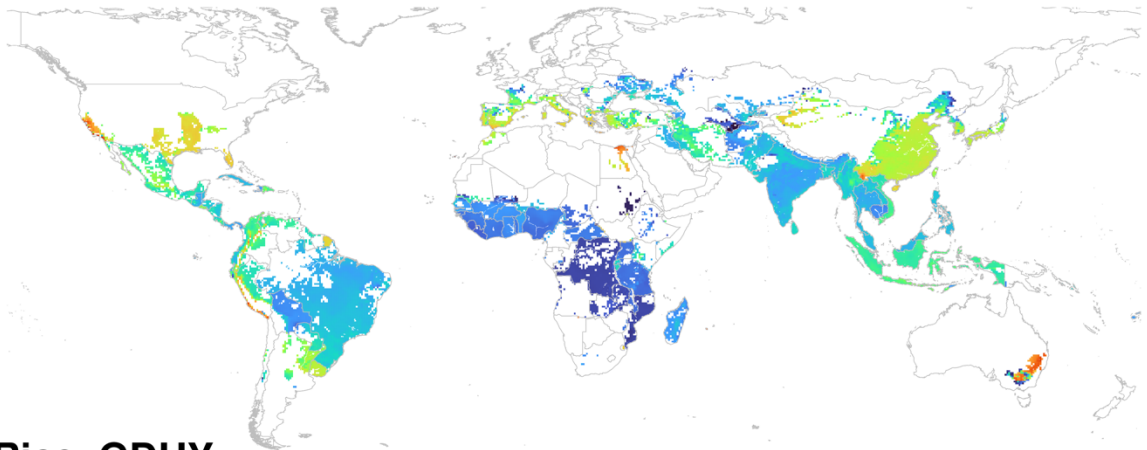


Fig. S12 Spatial distribution of the mean (1986–2015) simulated yield of wheat. a, simulation D; b, simulation CVC; c, GDHY yield. Units in the legend are t/ha.

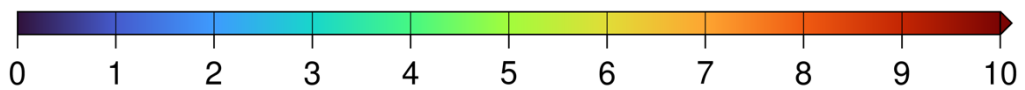
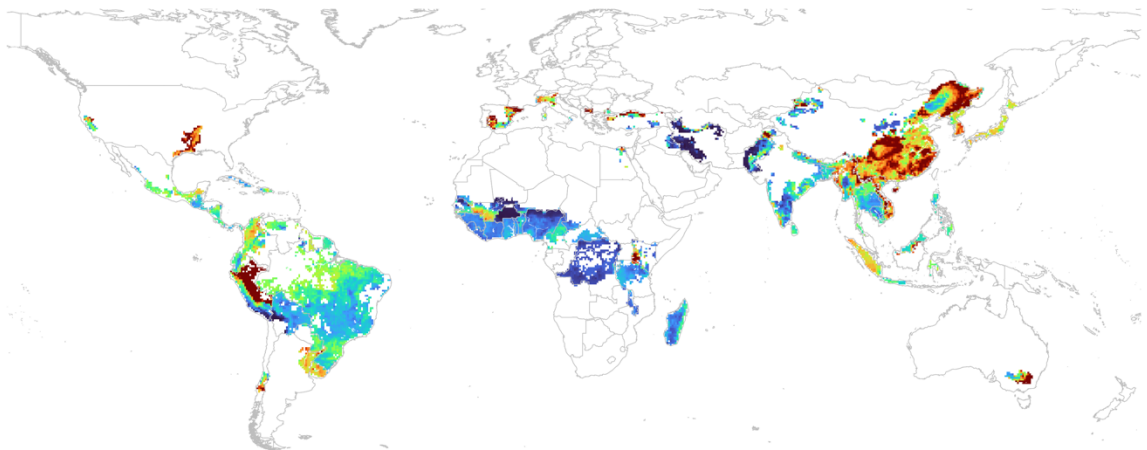
**(a) Rice\_D**



**(b) Rice\_CVC**



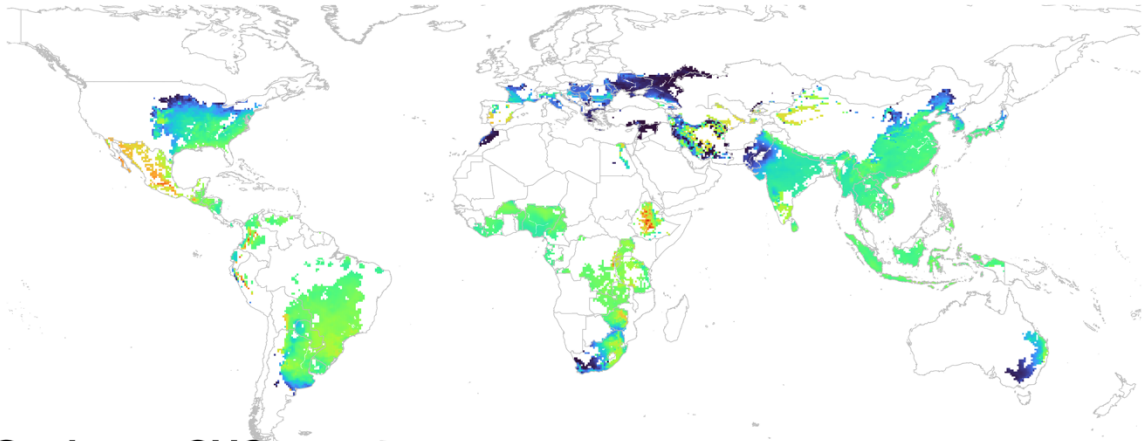
**(c) Rice\_GDHY**



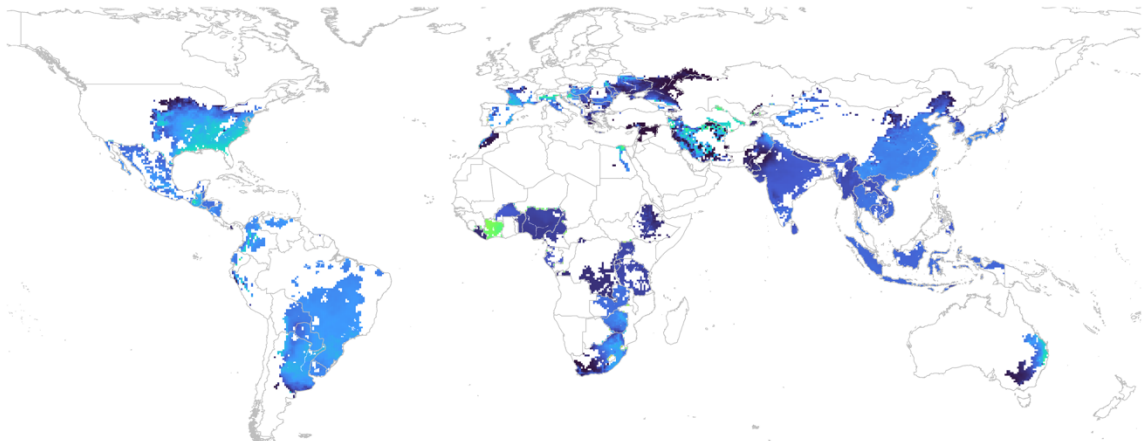
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Fig. S13 Spatial distribution of the mean (1986–2015) simulated yield of rice. a, simulation D; b, simulation CVC; c, GDHY yield. Units in the legend are t/ha.

**(a) Soybean\_D**



**(b) Soybean\_CVC**



**(c) Soybean\_GDHY**

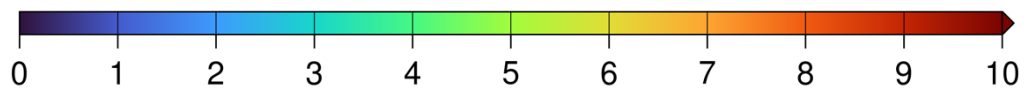
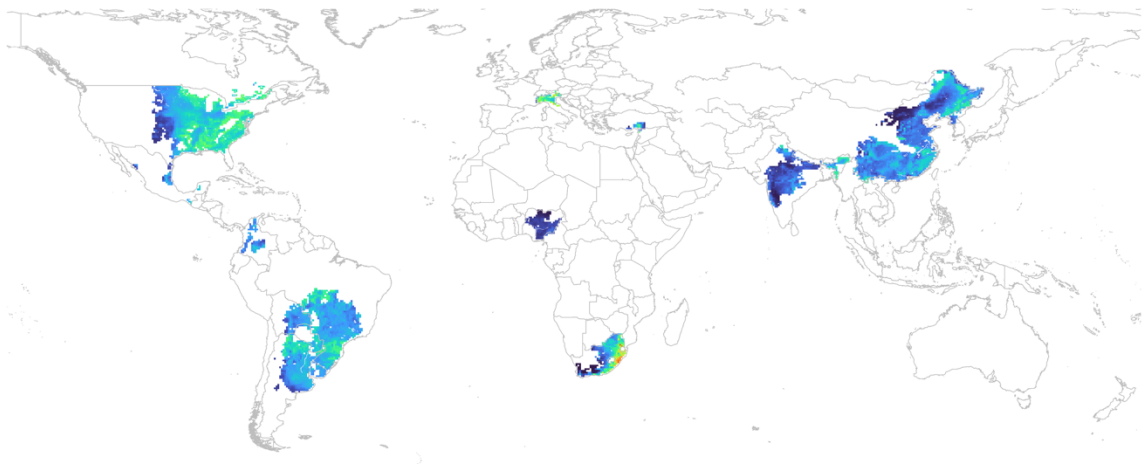


Fig. S14 Spatial distribution of the mean (1986–2015) simulated yield of soybean. a, simulation D; b, simulation CVC; c, GDHY yield. Units in the legend are t/ha.

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**Table S1. Adjusted harvest index**

<b>Crop</b>	<b>Harvest index</b>
Maize	$0.1+0.5*(blai-0.3)/6.8$
Wheat	$0.1+0.5*(blai-0.3)/6.8$
Rice	$0.1+0.5*(blai-0.3)/6.8$
Soybean	$0.1+0.3*(blai-0.3)/6.8$

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**Table S2. Main input data used in this study**

<b>Item</b>	<b>Source Dataset</b>	<b>Link/References</b>
Meteorological data	ISIMIP3a GSWP3-W5E5	<a href="https://data.isimip.org/search/tree/ISIMIP3a/InputData/climate/atmosphere/gswp3-w5e5/">https://data.isimip.org/search/tree/ISIMIP3a/InputData/climate/atmosphere/gswp3-w5e5/</a>
Reference yield data	FAO statistical yield GDHY yield	<a href="https://www.fao.org/faostat/en/#data">https://www.fao.org/faostat/en/#data</a> <a href="https://doi.pangaea.de/10.1594/PANGAEA.909132">https://doi.pangaea.de/10.1594/PANGAEA.909132</a>
Harvest data	MIRCA2000	<a href="https://www.uni-frankfurt.de/45218031/Data_download_center_for_MIRCA2000">https://www.uni-frankfurt.de/45218031/Data_download_center_for_MIRCA2000</a>

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