**Supplementary explanations for “Materials and methods”**

Chenu, Deihimfard [1] ran the simulations for the 60 sites (Supplementary Figure S2) using the Agricultural Production Systems Simulator (APSIM) crop model [2, 3] based on the local practices of farmers, soil characteristics and preceding rainfall.



**Fig. S2** The 22 regions (coloured and named in each box) and 60 sites used in Chenu, Deihimfard [1] study across the Australian wheatbelt: the ‘West’ area (green colours); ‘South’ (blue); ‘South-east’ (purple); ‘East’ (orange). State abbreviations: QLD, Queensland; NSW, New South Wales; SA, South Australia; WA, Western Australia. Figure obtained from New Phytologist (2013) 198: 801–820

After performing a cluster analysis at national level, Chenu, Deihimfard [1] identified four main Environment types (ETs) as representative of drought patterns that wheat crops experience in the wheat-belt of Australia (Supplementary Figure S3).



**Fig. S3** Simulated water-stress index for four environment types (ETs) identified in all regions combined across the Australian wheat-belt in Chenu, Deihimfard [1] study. The stress index corresponds to the ratio of soil water supply to crop water demand and is shown as a function of cumulative thermal time relative to flowering, from the emergence of crop to 450 degree days (°Cd), which is after flowering. Figure obtained from New Phytologist (2013) 198: 801–820

In our study, sites were categorized with their 1st dominant ETs based on the map of the frequencies of each ET shown in Supplementary Figure S4.



**Fig. S4** The pie chart map of the frequencies of each environment type (ET) across the Australian wheat-belt. Chenu, Deihimfard [1] simulated the data for the check variety ‘Hartog’ over 123 years of historical data for the 22 regions of the wheat-belt (shown in Figure S2). The size of the pie charts is proportional to the wheat-planted area in the associated region. The ETs are shown in Supplementary Figure S3. State abbreviations: QLD, Queensland; NSW, New South Wales; SA, South Australia; WA, Western Australia. Figure obtained from New Phytologist (2013) 198: 801–820

Some regions had more than one dominant ET. Therefore, ET1/2, ET2/3 and ET 3/4 were added to the list of ETs based on the map in Supplementary Figure S4.

One of the aims of this study was to examine the stability of GPC in low and high yielding environments. Most of the Australian wheat is produced in mainland regions frequently subjected to severe stress [1]. Accordingly, Tasmania, which produces higher grain yield compared with mainland Australia, was selected as a high yielding region in our study. However, Tasmania was not between the 22 regions of Chenu, Deihimfard [1] study. Characterization of drought patterns in Tasmania was beyond the scope of this study. However, the average grain yield of 9.2 t/ha and the 600 mm average annual participation [4] implied the different weather conditions of the Tasmanian site from mainland Australia. Therefore, Tasmania was categorized with a different name (ET0) in this study.

References

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