## Data Availability Statement

The processed data is available on the Jülich DATA platform: <https://doi.org/10.26165/JUELICH-DATA/QJIY7C>

## Appendix

Table A1 Cultivar characteristics with German release years and phenological, yield and quality scoring under ambient CO2 conditions.



**Table A2:** Data acquisition time and environmental conditions during the field measurements.

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**Table A3:** Absolute values for various yield parameters.



**![A diagram of a diagram

Description automatically generated]()Figure A1:** Visualisation of an ideal LIFT transient with the saturation (SQA) and relaxation sequence (RQA) showing the initial (F'), maximal (Fm') and variable fluorescence (Fq') yield from light-adapted plants as well as the reoxidation efficiency of QA¯ up to ~0.65 ms after Fm' is reached, i.e., the kinetics of electron transfer from QA to PQ pool from light-adapted plants Fr1' and the reoxidation efficiency of QA¯ up to ~6.64 ms after Fr1', i.e., the kinetics of electron transfer from PQ pool to PSI from light-adapted plants Fr2'.

A graph showing the number of the same number of data

Description automatically generated with medium confidence

**Figure A2:** Mean ambient (~434 ppm) in blue and elevated (~622 ppm) atmospheric CO2 concentration in red, measured in the structures of the BreedFACE during the vegetation period in 2020/2021, from 8 a.m. to 5 p.m. Each dot represents the mean value of five measurements taken at ten-second intervals. The blue dashed line indicates the global mean annual CO2 concentration measured at the NOAA Global Monitoring Lab, Mauna Loa, [www.gml.noaa.gov](http://www.gml.noaa.gov). The red dashed line represents the target CO2 concentration (550 ppm). The left grey area indicates a safety break during the Christmas/New Year period when the system shut down for safety reasons, and the second indicates a period of unreliable elevated CO2 data due to an electrical problem.