

## Responses to the review by Fredrik Charpentier Ljungqvist

I can strongly recommend the article “Effects of weather and climate on fluctuations of grain prices in southwestern Bohemia, 1725–1824 CE” by Brázdil et al. for publication after only minor revision. It is clearly written, contains interesting results and are based, in part, on novel data. The structure of the article is clear. I have, however, recommendations for some additional references. Furthermore, I would like to see all material now placed in an Appendix included in the main article. It is only two tables and to include the in the main article would facilitate easier reading. My comments to individual things in the article as well as suggested additional references as are listed below.

**RESPONSE:** We would like to thank Fredrik Charpentier Ljungqvist for careful reviewing of our manuscript and minor critical comments which we are trying to respond below.

### Minor comments:

Abstract, line 8 (and other places): Here the term “weather is used”. How is this term used in relation to the term “climate”. In my opinion, “climate” is a more suitable term in this article than “weather”.

**RESPONSE:** Accepted and corrected as follows: “Grain prices in early modern Europe reflected the effects of weather and climate on crop yields and a complex array of societal and socio-economic factors.”

Abstract, line 9: Would it be possible to be more precise than just writing “societal and socio-economic factors”?

**RESPONSE:** In the starting sentence of abstract we suppose that this general identification “societal and socio-economic factors” has its explanatory value and need not to be specified in detail here.

Abstract, line 13: The term “mean annual variation” is not very clear to me. Maybe it can be expressed in another way?

**RESPONSE:** Accepted and corrected as follows: “The mean highest prices during the year typically occurred from May to July ...”

Line 21: I would even recommend the authors to state that grain was the single-most important food source and cite Scott (2017) to support this.

**RESPONSE:** Accepted, we added citation by Scott (2017). On the other hand, the expression “a vital food source” is strong enough to express importance of grain as a food source.

Line 22, after Person (1999), cite also Leijonhufvud (2001).

**RESPONSE:** Accepted and complemented.

Line 29: Cite also Skoglund (2024) here.

**RESPONSE:** Accepted and complemented.

Line 34: Maybe here also cite Ljungqvist et al. (2024).

**RESPONSE:** Accepted and complemented.

Line 39: It should be Edvinsson et al. (2009).

**RESPONSE:** Accepted and complemented.

Line 40: Cite also Huhtamaa et al. (2022).

**RESPONSE:** Accepted and complemented.

Line 104: This is a surprisingly low July temperature for Central Europe. Please discuss the effect of elevation here and state the elevation of the measurements.

**RESPONSE:** The first sentence in Sect. 2.1 reports position of Sušice “at the foothills of the Šumava Mountains ... at an altitude of approximately 470 meters above sea level”, i.e. from climatological point of view there is not “a surprisingly low July temperature for Central Europe” and it needs not to be discussed separately.

Line 115 (and elsewhere): Be clear why 1951–1980 is chosen as a reference period here.

**RESPONSE:** We used this period, because phenological data in CHMI database FENODATA were available only for this time. We believe that there is not necessary to explain it, because it is not further used in the paper. We used 1961–1990 reference, which is clearly explained in Sect. 3.2 by the following sentence: “Climate variables were expressed as series of deviations from the 1961–1990 reference period, which was preferred over the more recent 1991–2020 period, already significantly influenced by global warming (see Brázdil et al., 2022b).”

Lines 133–134: I think this can be part of the paragraph above.

**RESPONSE:** We believe that this sentence is on an appropriate place. The preceding part of this section concerns only of price data used for the creation of Sušice series, while on lines 133–134 we reported other grain price series from Prague.

Line 142: Please provide a reference to scPDSI as a metric.

**RESPONSE:** **RESPONSE:** Accepted and corrected as follows: “...the self-calibrated Palmer Drought Severity Index (scPDSI; Wells et al., 2004) was used.”

**Reference:**

Wells, N., Goddard, S., and Hayes, M.: A self-calibrating Palmer Drought Severity Index, *Journal of Climate*, 17, 2335–2351, [https://doi.org/10.1175/1520-0442\(2004\)017<2335:ASPDSI>2.0.CO;2](https://doi.org/10.1175/1520-0442(2004)017<2335:ASPDSI>2.0.CO;2), 2004.

Line 193: Please provide standard references to SEA.

**RESPONSE:** Accepted and corrected as follows: “SEA, originally proposed by Chree (1913) and later improved for the use (e.g., in paleoclimatology by Rao et al. 2019), is commonly employed to evaluate the mean response of climate variables to specific events ...”

**References:**

Chree, C.: Some phenomena of sunspots and of terrestrial magnetism at Kew Observatory, *Philosophical Transactions of the Royal Society of London, Series A, Containing Papers of a Mathematical or Physical Character*, 212, 75–116, <https://doi.org/10.1098/rsta.1913.0003>, 1913.

Rao, M.P., Cook, E., Cook, B., Anchukaitis, K., D'Arrigo, R. Krusic, P., and LeGrande, A.: A double bootstrap approach to Superposed Epoch Analysis to evaluate response uncertainty. *Dendrochronologia*, 55, 119–124, <https://doi.org/10.1016/j.dendro.2019.05.001>, 2019.

Fig. 8: The panels in the figure are too small. I would suggest to redraw the figure so that “A” comes above “B” instead of having “A” and “B” side by side.

**RESPONSE:** Accepted and corrected as requested.

Line 500: I find “Western Europe” a somewhat problematic term here, especially as the reference Collet (2010) refers to Germany, as both Germany and Czechia can be said to be part of Central Europe.

**RESPONSE:** Accepted and corrected. The corresponding sentence was changed as follows: “For example, while in Prussia (Germany) granaries were typically organized at the village level (e.g., Collet, 2010), ...”

Line 520: Ljungqvist et al. (2022) excluded Czechia because of the grain price series at hand were too short to fit the inclusion criteria. Maybe that should be stated.

**RESPONSE:** Accepted and corrected as follows: “(excluding Czech Lands due to the shorter grain price series available)”.

Lines 525–527: Maybe state the direction of the correlations?

**RESPONSE:** Accepted and corrected as follows: “This regional variation was further confirmed by Ljungqvist et al. (2023), who identified in climate–harvest yield associations positive significant signals in JJA soil moisture for Sweden and warmer and drier DJF patterns for Switzerland, but negative in MAM and annual mean temperatures for Spain in their climate–harvest yield associations.”

Line 542. Something is wrong, it seems, with the formulation “significantly stronger signal of cooler”.

**RESPONSE:** Accepted. To clarify the related expression, the sentence was corrected as follows: “Pearson correlation coefficients between Sušice grain prices and three Czech climate variables indicated a statistically significant signal of cooler springs and wetter patterns from winter to summer in years with higher grain prices.”

Page 23 and 24: Include in main article instead.

**RESPONSE:** Accepted, Tables A1–A3 were moved into the main text and Appendix A was cancelled.

Line 587 (and other places): Better to write “grain price” than “grain-price” with “-“.

**RESPONSE:** We follow writing “grain-price” as done in English style corrections by our native speaker.

Line 602: Funding agency is lacking: only grant number and grant title provided.

**RESPONSE:** Accepted and complemented as: “This research has been partly supported by the Johannes Amos Comenius Programme and the Ministry of Education, Youth and Sports of the Czech Republic for the project "AdAgriF – Advanced methods of greenhouse gases emission reduction and sequestration in agriculture and forest landscape for climate change mitigation" (CZ.02.01.01/00/22\_008/0004635).”

References:

Edvinsson, R., Leijonhufvud, L., and Söderberg, J.: Väder, skördar och priser i Sverige, in: Agrarhistoria på många sätt: 28 studier om människan och jorden. Festskrift till Janken Myrdal på hans 60-årsdag, edited by: Liljewall, B., Flygare, I. A., Lange, U., Ljunggren, L., and Söderberg, J., 115–136, The Royal Swedish Academy of Agriculture and Forestry, Stockholm, ISBN 978-91-85205-91-2, 2009.

Huhtamaa, H., Stoffel, M., and Corona, C.: Recession or resilience? Long-range socioeconomic consequences of the 17th century volcanic eruptions in northern Fennoscandia, *Clim. Past*, 18, 2077–2092, <https://doi.org/10.5194/cp-18-2077-2022>, 2022.

Leijonhufvud, L.: Grain Tithes and Manorial Yields in Early Modern Sweden: Trends and Patterns of Production and Productivity c. 1540–1680, PhD thesis, Swedish University of Agricultural Sciences, Ulltuna, ISBN 9157658293, 2001.

Ljungqvist, F. C., Seim, A., and Collet, D.: Famines in medieval and early modern Europe – Connecting climate and society, *WIREs Clim. Change*, 15, e859, <https://doi.org/10.1002/wcc.859>, 2024

Scott, J. C.: *Against the Grain: A Deep History of the Earliest States*, Yale University Press, New Haven, ISBN 9780300182910, 2017.

Skoglund, M. K.: The impact of drought on northern European pre-industrial agriculture, *The Holocene*, 34, 120–135, <https://doi.org/10.1177/0959683623120>, 2024.