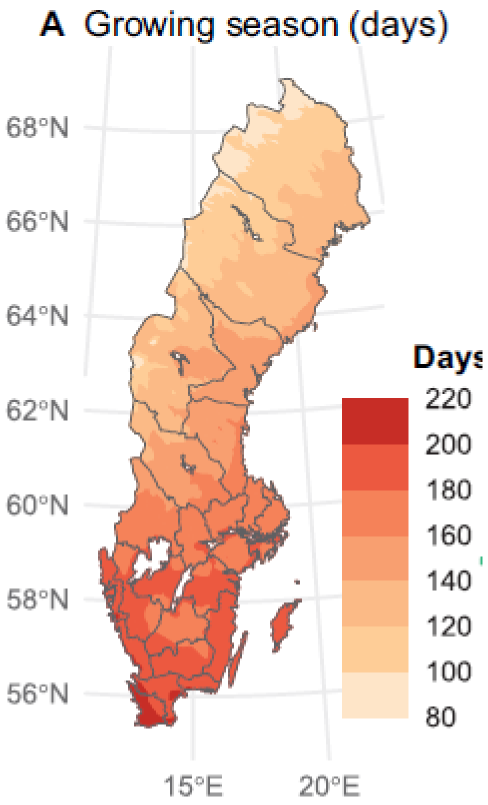
I appreciate the authors response to my previous comment, however I do still have some remaining concerns. In the following, I have marked the authors reply to my comments in red (note I have only chosen to include parts of the authors reply that I still deem relevant for my concerns).

"The climatic indices we considered refer to the main growing season or the 30-60-90 days preceding that. Although annual climate averages differ substantially across Sweden, the temperature conditions relevant to crop development show less spatial variation. This is because the growing season occurs in partially different periods, depending on the location.

This is the case not only in Sweden, but also across larger latitudinal gradients: for example, the growing season average temperature from northern Sweden to southern Italy and Spain has been shown to be substantially aligned (Costa et al., 2024), despite the clear difference in annual average temperature. Lacking specific information on sowing date for spring crops and the release of dormancy for winter crops, we have used a Growing Degree Day (GDD)–based growing season. This approach explicitly adjusts the start and end of the main growing season according to the local temperature conditions. The GDD adjustment therefore normalizes much of the climatic contrast between north and south."

I agree that cropping-season temperatures can appear similar across distant latitudes, e.g., northern Sweden vs. southern Italy. This is because the comparable main cropping season occurs in fundamentally different parts of the year (winter–spring/early summer vs spring–summer). Within Sweden, however, the differences in cropping season are far less dramatic, and thus the analogy is not entirely appropriate. I also agree that, locally, agriculture is adapted to the particular seasonal window of the growing season. But what is important here is that the *length* of the growing season varies substantially within Sweden. See this figure below based on data from SMHI on the length of the growing season (1961–1990).



Besides at merely looking at seasonal temperatures or using a GDD-approach, we should also consider that in northern Sweden, the ground thaw occurs much later than in southern Sweden. Furthermore, the combination of rapidly reduced daylight hours and increased risk of early frosts in late summer and early autumn presents another definitive end to the actual growing season. These factors constitute *hard* limits to the growing season that are difficult to adapt to by merely adjusting the (nominal or real) sowing and harvesting dates. If this was not the case, grain production in northern Sweden would obviously be much larger.

Nonetheless, the main point of my comment was not that the climatic varies within Sweden, or that regions can experience different temperatures from year-to-year (temperatures of course correlates at quite large spatial scales at a seasonal resolution). Rather, it was that the response of harvest yields to temperatures, particularly in the summer, differs (where I would argue that the differences in the length of the *actual* growing season plays an important part).

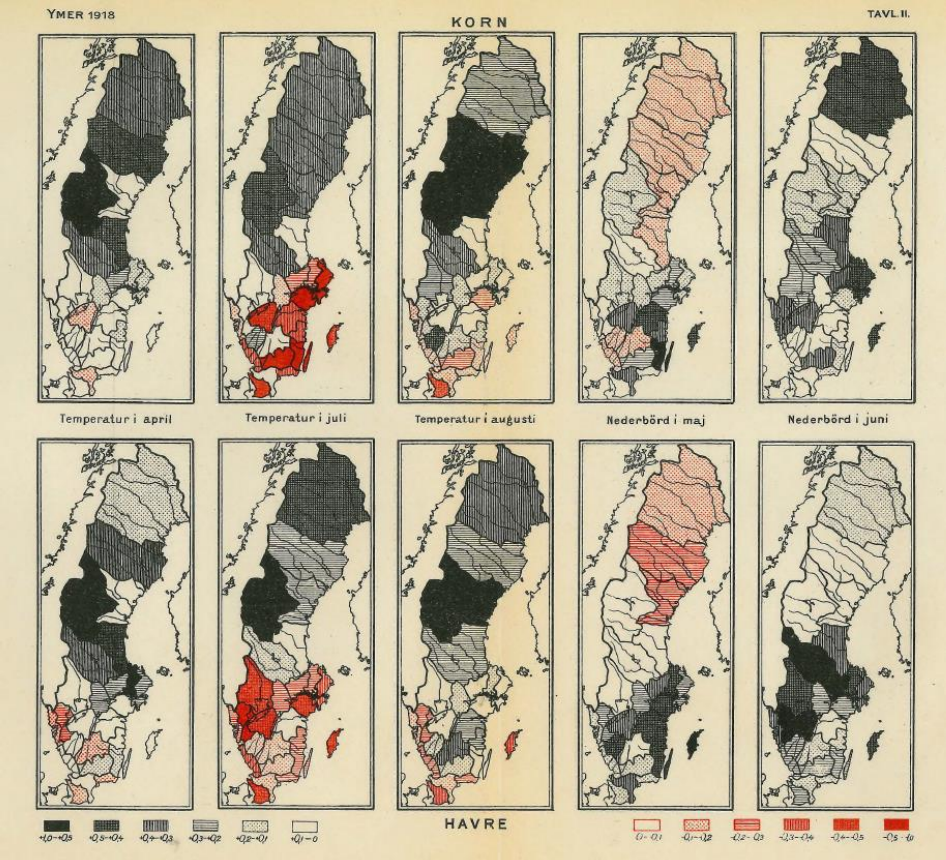
The authors argue in their reply that:

"However, motivated by the comment received, we have now evaluated an alternative structure for the random factor, and specifically: Yield ~ ClimateVars + (Temperature ｜ County). This allows each region to have its own temperature–yield slope. This model including the random slopes did not improve model fit i.e., AIC did not decrease, and the estimated random slopes for temperature were very close to zero for most regions. This indicates that the effect of temperature on yield does not vary meaningfully across counties. In other words, the model itself provides evidence against the idea that climate–yield relationships are region specific, thus calling for separate models. A similar conclusion is reached if considering a random slope for the precipitation variable, i.e., Yield ~ ClimateVars + (Precipitation ｜ County)."

I want to underscore this part: **"This indicates that the effect of temperature on yield does not vary meaningfully across counties."** Taken at face value, this would imply that growing season temperatures exert the same influence on barley yields in Norrbotten, Västerbotten, and Jämtland as it does in Skåne, Gotland, and Blekinge. This is an extremely consequential conclusion, since it effectively contradicts over a century of empirical work using independent datasets spanning different periods.

Previous research, admittedly mainly using simple linear correlations and not regression models where other factors can be included and controlled for, have found that the yield response to temperature *do* meaning vary by county, as I mentioned in my first comment. Below I list five such studies, all covering different periods and using independent data.

1. **First, we have Axel Wallén (1917, 1918) who correlated barley yields from official statistics with instrumentally observed monthly summer temperatures during the period 1880–1910:**



Note the red color signifying negative correlations in response to mean July temperatures in large parts of southern Sweden, and dark black colors in the northernmost counties. For precipitation, we see the opposite pattern, albeit less significant.

2. **Edvinsson et al (2009) looked at subjective harvest assessments (of all the main grain crops combined) in the period 1723–1870:**

May–July precipitation correlates positively with harvest in southern Sweden (r = 0.58*), but not in northern Sweden (r = –0.21).

June–July temperature correlates negatively with harvest in the south (r = –0.37*) but positively in the north (r = 0.47*).

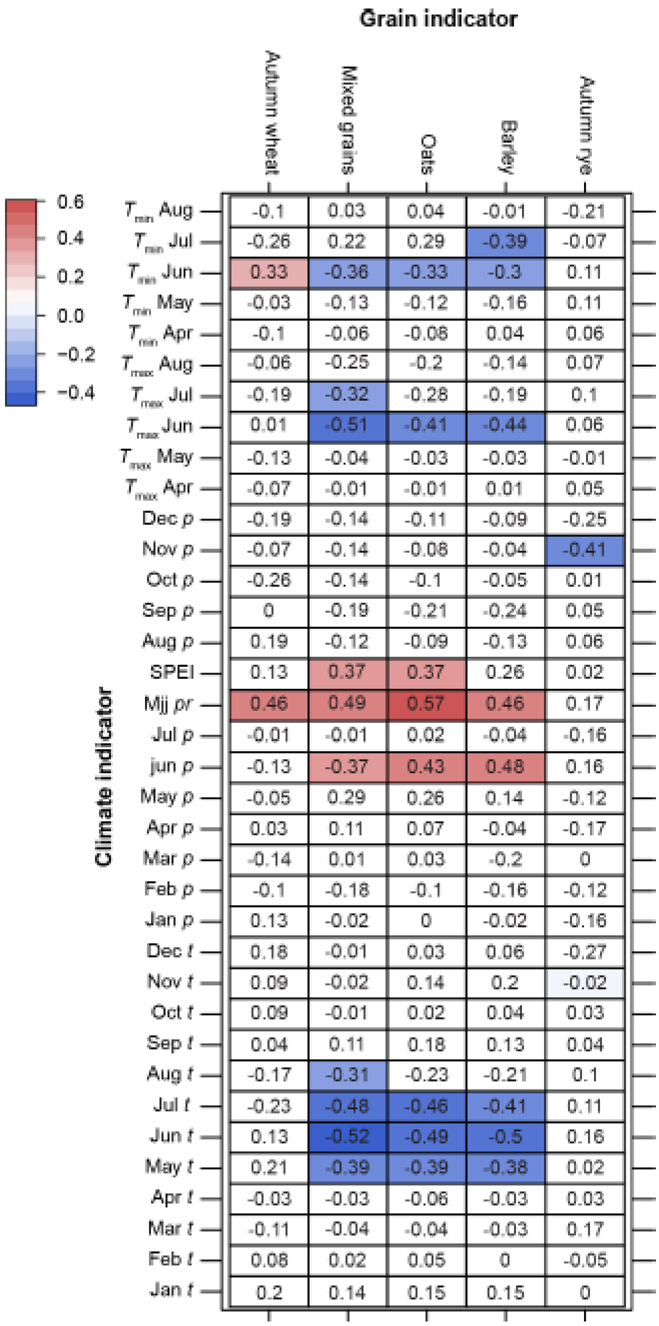
*significant at the $p < 0.05$ level.

3. **Skoglund (2022) (Harvest–climate relationships in Scania (Skåne), 1702–1911):**

Summer temperature correlates negatively with total grain tithes (r ≈ − 0.23* to − 0.26*).

Summer precipitation correlates positively (r ≈ 0.19* − 0.36*).

Comparable patterns are seen for individual grains and in particularly so during the 1865–1911 period for spring cereals (see figure below).



Climate indicator	Autumn wheat	Mixed grains	Oats	Barley	Autumn rye
T_{min} Aug	-0.1	0.03	0.04	-0.01	-0.21
T_{min} Jul	-0.26	0.22	0.29	-0.39	-0.07
T_{min} Jun	0.33	-0.36	-0.33	-0.3	0.11
T_{min} May	-0.03	-0.13	-0.12	-0.16	0.11
T_{min} Apr	-0.1	-0.06	-0.08	0.04	0.06
T_{max} Aug	-0.06	-0.25	-0.2	-0.14	0.07
T_{max} Jul	-0.19	-0.32	-0.28	-0.19	0.1
T_{max} Jun	0.01	-0.51	-0.41	-0.44	0.06
T_{max} May	-0.13	-0.04	-0.03	-0.03	-0.01
T_{max} Apr	-0.07	-0.01	-0.01	0.01	0.05
Dec *p*	-0.19	-0.14	-0.11	-0.09	-0.25
Nov *p*	-0.07	-0.14	-0.08	-0.04	-0.41
Oct *p*	-0.26	-0.14	-0.1	-0.05	0.01
Sep *p*	0	-0.19	-0.21	-0.24	0.05
Aug *p*	0.19	-0.12	-0.09	-0.13	0.06
SPEI	0.13	0.37	0.37	0.26	0.02
Mjj *pr*	0.46	0.49	0.57	0.46	0.17
Jul *p*	-0.01	-0.01	0.02	-0.04	-0.16
jun *p*	-0.13	-0.37	0.43	0.48	0.16
May *p*	-0.05	0.29	0.26	0.14	-0.12
Apr *p*	0.03	0.11	0.07	-0.04	-0.17
Mar *p*	-0.14	0.01	0.03	-0.2	0
Feb *p*	-0.1	-0.18	-0.1	-0.16	-0.12
Jan *p*	0.13	-0.02	0	-0.02	-0.16
Dec *t*	0.18	-0.01	0.03	0.06	-0.27
Nov *t*	0.09	-0.02	0.14	0.2	-0.02
Oct *t*	0.09	-0.01	0.02	0.04	0.03
Sep *t*	0.04	0.11	0.18	0.13	0.04
Aug *t*	-0.17	-0.31	-0.23	-0.21	0.1
Jul *t*	-0.23	-0.48	-0.46	-0.41	0.11
Jun *t*	0.13	-0.52	-0.49	-0.5	0.16
May *t*	0.21	-0.39	-0.39	-0.38	0.02
Apr *t*	-0.03	-0.03	-0.06	-0.03	0.03
Mar *t*	-0.11	-0.04	-0.04	-0.03	0.17
Feb *t*	0.08	0.02	0.05	0	-0.05
Jan *t*	0.2	0.14	0.15	0.15	0

Figure 11. Correlations of grain series vs. climate indicators 1865–1911. Note: Only statistically significant ($p \leq 0.05$) correlations are colored. Sources: SCB (2021), Seftigen et al. (2017, 2020), and SMHI (2021).

4. **Skoglund (2023) (Harvest–climate relationships in Jämtland, 1565–1911):**

Barley yields correlate strongly and positively with growing-season temperature (r = 0.51 and 0.61 in two periods), and the effect persists in regression models controlling for annually variant sowing/harvest dates.

5. **Sjulgård et al. (2023) (Harvest–climate relationships 1965–2020 using apparently the same harvest data as the present study):**

Again supports a dipolar response pattern with clear regional/county differences.

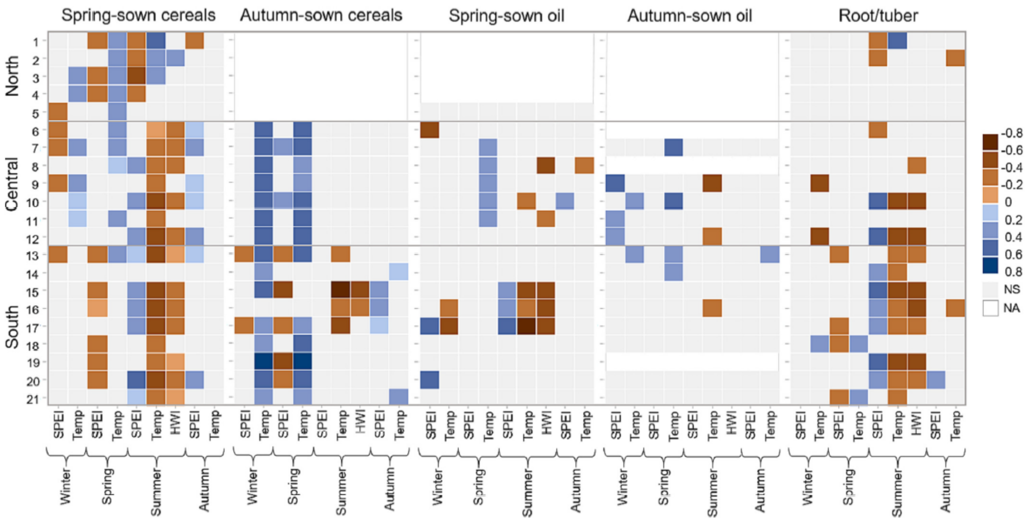


Fig. 2. Pearson's correlation coefficients between yield anomalies of each crop group and Standardized Precipitation Evaporation Index (SPEI), heat wave index (HWI) and temperature anomalies (Temp) for each county based on crop yield and climate data from 1965 to 2020. The counties are sorted by decreasing latitude with the corresponding number from Fig. 1 and grouped into the northern, central or southern regions of Sweden. The brown colour shows a negative relationship to crop yield anomaly while blue colour represents a positive relationship. Non-significant (NS; $p > 0.05$) correlations are denoted by grey colour. White areas indicate counties with little or no cropping area of a certain crop group (NA). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

In sum, since at least 1917, studies have got the same dipolar harvest yield response in relation to summer/growing season temperatures (at least for spring cereals), showing that the response *does* meaningfully differ between counties. This is why I find the authors conclusion to be so consequential, as it means all these previous studies, all using independent data and studying different periods (from the 16th century until the present day), are wrong. At the very least, I would hope that the authors can expand upon this and explain in more detail why all these previous studies need to be revised. Referring to AIC is not enough here, I think, as models can be specified and evaluated by many different means, AIC being just one popular, and for the most part robust, option. Alternatively, it could be that the models in the authors study are still not properly specified to account for these differences.

"We see that it is production, not productivity, having the ultimate implication in terms of locally produced cereal availability. However, we have chosen to focus on productivity, because we are primarily interested in the ecophysiological response of the different crops to a range of climatic conditions. In this way we can separate this effect from the combined effects of ecophysiological response and past and current spatial distribution of cultivated areas. We also note that the latter is less impacted by the year to year variation in climatic conditions compared with the productivity."

In your models, you are essentially giving the same weight to spring barley yields in Norrbotten (<0.01 % of the total in Sweden, based on averages 2000–2024), Västerbotten (0.02 % of the total in Sweden), and Skåne (30.42 % of the total) counties. This is, as you write, not a problem if you are just interesting the ecophysiological responses of different crops to climate. However, the problem arises in the interpretation of the results when you are taking the results from your models to draw conclusions for Sweden as a whole, and how future climate changes will affect yields. Obviously, there are huge differences between grain production between counties that needs to be taken into account in such an interpretation.