REVISOR 1:

Dear Revisor,

We are deeply grateful for your extremely valuable suggestions, corrections and highly valuable scientific questions.
We are absolutely certain that this work changed fundamentally due to your input.
We are enormously grateful and we hope we answered your requests in this revised form.
Please note that section 3.3 and 4 where completely re-written.

We add to each of your question, our answer (A):

"This paper develops a modelling system for adaptation support that can clarify the optimal genotype and cultivation management for maize cultivation under climate change in Romania. In recent years, research into climate change impact and its adaptation has advanced highly, and it has been becoming increasingly important to consider how to implement the findings of this research into society. The system developed in this paper is expected to be effectively used by the related stakeholders in Romania. However, there are some significant points that should be improved in this paper. Firstly, although a sensitivity analysis was carried out on various factors in relation to yield, the developed system's predictive reality and effectiveness could not be fully convinced me due to the lack of explanation of the details of the processes considered by the crop model and the lack of sufficient biological background to the results. Secondly, there are many basic mistakes throughout the paper, so I hope the authors will check it carefully."

[Specific comments]

Q: 3.a.1:How general is the index used in this study?

A: It is an index that characterizes the impact of large-scale (temperature) on regional scale (it accounts for the regional annual gradient, expressed by the maximal range of monthly temperature), detailed now at lines 215-221

Q: 3.a.2:Without an explanation of the agrometeorological background in Romania, the importance of these indices is not understood.

A: The choice of the three indices was explained largely in the regional context, in the revised version. The aim was to analyse the two main climate variables implied in the region's agro-climate: Temperature (JCI) and Precipitation (IM) , and also to represent the regional aspects, choosing a main index considered in local agro-meteorological analysiss: the H32 Scoarching that involves total number of degrees over 32C accumulated in JJA, (lines: 222-230).

Q: Fig.5: Please write the vertical axis of the graph. Though the meteorological data since 1976 were used, from what year were yield data obtained? Please illustrate the missing years so that they are clear (it seems that at least the years 1992, 93 and 94 are missing).

A: the plot has been redone, following the Revisor's indication: we included missing data and specified axes. The plot is in now in Supplementary S1, lines 805-810, after we revised the document in order to considered the requirement of restraining it.

Q: The prediction in 1995 does not seem to match the observations. What is the reason for this? The variability of the predictions seems to be greater than that of the observations. This would lead to over-underestimation in future predictions. Which of the 12 management scenarios is the closest to reality?

A: we detailed the harvest result of 1995 in lines 286-291

Q: L423-425: I doubt whether it can be explained by rainfall. Yield is affected by various weather factors. For example, when the photosynthesis period is shortened due to a shortened growing season, the increase in biomass may not be sufficient.
A: Your statement helps us correcting an important issue. The "attributed" word was replaced by "reated to" at line 315.

Q: L426-428:From Fig. 7c, it was not possible to confirm whether fertilizer efficiency decreases due to global warming. This may be due to an increase in photosynthetic products.

A: We re-formulated that the efficiency gets lower in the simulations when coupled with climate scenarios, not excluding other causes. (lines 23, 315-320)
Since we compare simulations radiatively forced versus the same simulations without radiative forcing, the difference can be attributed to the difference in forcing (but indeed, this is including there all the non-linear interactions and feedback with other components). Second, this feature appears robust, found in each model of the ensemble.

Q: 3.b.3:Is it practically possible to change N and C without adding fertilizer?
A: Nitrogen and organic carbon contents may vary for a given type of soil not only due to fertilization from the current year, but in a much smaller extent, also due to natural heterogeneity, previous crops (especially in case leguminous crops), conservative agriculture practices, microorganism activity etc. In our case, we performed this sensitivity test aiming at the application of the system to other locations. The impact of these soil characteristics is significant and should be addressed in dedicated study.

Q: L483-4:Why does soil fertility delay maturity? corelat cu stresul din perioada reprodictiva.
A: An explanation is given at 304-306 , correlated with the stress along reproductive stages.

Q: L492-3:I can't understand the sentence.
A: The paragraph was re-written

Q: L516-520:Why were these six parameters chosen? What are the values of each? What is the validity of the values that were adopted?
A: We explained the reason (these are main parameters in the DSSAT model) and each parameter was explained as meaning, previous research and the values use din this study at lines: 131-159.

[Minor comments]

It is better to explain what an abbreviation stands for when it first appears.
We have corrected, and verified in the revised version

RCP45 and RCP85 → RCP4.5 and RCP8.5:
now is corrected

Please standardize terminology (e.g. yield and harvest, sowing and planting)
- planting was replaced with sowing
- Yield and harvest were maintained different in just few cases: yield in cases with agro-climate meaning and "harvest" mainly in cases for model output result.

L 28:RCP scenario is an emission scenario, not a climate scenario.
Was corrected

L51:")" is needed after Hatfield et al, 2021.
the parenthesis was corrected

L56:"," before Xie et al, 2023 is needed to be corrected to ";".
was corrected
L319:";" after Miyawaki, 2024 is needed to be removed.
was corrected
L361:peack → peak
was corrected
L375:Yield → yield
was corrected
L651:tis → this
was corrected

Table1:I think that Fx0 is correct for Fertilazation in TR2 and 3.
Table 1 was corrected, lines 206-208

Table1:I think that for the sowing date in TR2, 6 and 10 15.04 is correct.
Table 1 was corrected, lines 206-208

REVISOR 2

Dear Revisor,

We are deeply grateful for your extremely valuable suggestions, corrections and highly valuable scientific questions.
We are absolutely certain that this work changed fundamentally due to your input.
We are enormously grateful and we hope we answered your requests in this revised form.
Please note that section 3.3 and 4 where completely re-written.

Q: What are the genotype parameters that are getting modified? What do they represent in terms of processes?
o This is only explained deep into the Results section (L516-519). This should be in the Methods instead.
A: *We corrected this. There is now detailed description of parameters in the "Methods" part, lines: 131-159*

Q If P4 was kept constant, why is it even mentioned?
A: *Yes, P4 was constant. Since results are depending on the value, we specified for the reader the value used in simulations at lines 145-147.*

Q: Treatment naming is very confusing, which results in figures that are hard to understand.
A: *we corrected this, we specified the sowing date instead of treatment number in all figures.*

Q: Looking at Table 1, what is the difference between Fertilization (3N) and Fertilization (1N)? How can, e.g., TR2 get both 60 and 23 kgN/ha? I think, from reading the rest of the paper, that this is not how they're distinguished. But it makes the table very confusing.
A: *We denote two experiments: exper "1N" and exper "3N", and fertilisations Fx0, Fx1, Fx2 have values dependent on the experiment: Fx0 is no fertlisation, Fx1 is the unit fertilisation of the experiment and Fx2 is the double unit fertilisation of the experiment. We define the unit fertilisation of the exper "1N" equal to 23 N/kg and the unit fertilisation of the exper "3N" as 60 kg/ha. (lines 204-209)*

Q: Instead of having to refer to, e.g., TR5 3N, it would be much clearer to name the treatment like "Apr1_60kgN."
A: *yes, is a good possibility also. But we wanted to emphasize the ratio (e.g. no or doubling fertilization.. etc.) for easier connection with result interpretation.*

Q: Figures like Fig. 6 should have fully meaningful axes and labels. So instead of "treatment" on the X axis, have sowing date or fertilization level. And instead of "Fx#" in the titles, have actual numbers.
A: *We have corrected this as required by the Reviewer for both: tratmnet number was replaced by the sowing date; instead of "Fx#" in the titles, we have now actual numbers.*

Q: In figures like Fig. 7, treatments 1-4 are marked as Fx0, but according to Table 1,

TR2 is Fx1 and TR3 is Fx2.
A: *we corrected this error in the Table1. Treatments 1-4 have zero fertilisation (Fx0).*

Q: Why say things like “Fx1” when you could just say the actual amount of N applied?
A: *we tried to correct and avoid along the text now. The aim of this is to point to ratios the interpretation of results, equal spacing connects easier with linearity/ non-linearity.*

• Agro-climate indicators and extremes
o These should be introduced and explained in Methods, not Results. What does the continentality index mean as far as maize is concerned?
A: *This part is an assessment section, work that has been done to to justify the necessity of the paper. To show that this is a hot-spot region of Europe (also confirmed by Copernicus 2023 report), warming more than surroundings and faster. Is not a direct part of the Methods related to main results, but rather an introduction work, justificatory. Continentality index shows us the percent and speed of change. towards a new climatic class, so the risk of seeing in the near-future a fully different shape of crop-use in the region (warmer summers in the agricultural area), linked to new climate sub-class, as stated in lines 2019-201.*

Q: Why are the scorching index results not in the Extremes section?
A: *This is an operational field, its values are used for crop characterization (there are operational thresholds), not only for extreme cases.*

Q: Why are the total precipitation results in the Extremes section?
A: *total precipitation is needed here together with severe R10mm precipitation. Only analyzing both field, together, one can conclude if it will rain less but more extreme or it will rain more and also more extreme.*

Q: It probably would be better to separate these into subsections for temperature and precipitation, rather than “indicators” and “extremes.” Because aren’t the extremes also measured using indicators?
A: *Separation was hard upon Temperature and Precipitation because there are indices involving both variables (e.g. de Martonne). Yes, indeed, extremes are measured with indicators, meanwhile also direct variables’ extreme is here discussed (e.g. RR).*

Q. L 359-361: In contrast to what this text says, none of these actually had significant trends.
A: *In dekade 3 of April, FD has significance at 5% level while RR10 and RR have significance at 10% level. This change is emphasised, with its statistical significance values, as it can be very important for future adaptation.*

Q: What is the purpose of the analysis in Sect. 3.b.3 (“Sensitivity to changes to nutrients”)?
A: *This section is now moved in the supplementary material*

Q: How can farmers choose inherent characteristics of their soil? Because the paper is rather long, every analysis should be well-justified. This one seems like it could be removed, both because its usefulness is unclear and because it distracts from the

actually-interesting bit of the paper (genotype identification).
A: *Indeed, this section is now moved in supplementary material, shortened and focused. Its usefulness is for further portation of the pilot system over different regions.*

Q: Sect. 3.c ("Optimal genotype identification") needs a complete rewrite. It is nearly impossible to understand due to the extensive use of abbreviations; I don't have the time needed to do the deciphering necessary for a review of its content.

A. *This section has been completely re-written, re-organised, and focused*

Q: L 611-2: "the slopes of Pi variation as a function of G-ranged index"??
A: *was re-formulated in lines 466-469*

L662-70: How do the two methods compare in terms of computational time? It's not sufficient to just say how good the genetic method is after a certain number of iterations.
A. *Quantification of computational time differences is now included at lines: 477-479*

According to GMD guidelines, code must be associated with a DOI, e.g. with Zenodo. The code was uploded on Zenodo, DOI 10.5281/zenodo.13145522 (DSSAT code used in PREPCLIM project)

and
10.5281/zenodo.13132588
(PREPCLIM software - additional material for publication in "Geoscientific Model Development" 2024)

Miscellaneous comments / corrections

*) L 142-6: L 142 says it's 3 models, but then there are five listed at L 145-6.
this was a mistake, apologises and many thanks. This is now corrected.
A: There are 3 models discussed here (later work, after this submission, extended the number of models)

*) Are the "cultivar related coefficients" at L 156-7 the same as the "six parameters defining the genotype" at L 153?
A: Yes, we use this two termes for same parameters, now this is stated more clearly at line 152.

*) L 169: "Schema from Annex1"?
A: replaced now with "described in Annex" at lines 173-4
*) L 172: What does "static" mean here?
A: explained at line 176
*) L173: What is NUTS3?
A: explained at line 176-7
*) L 178-186: Per GMD guidelines, subplots in a single figure should have one combined caption, and the figure should be one single image. Either combine the captions and subplots or renumber 1a → 1 and 1b → 2. (Same for Fig. 3a/b.)
A: we corrected this aspect

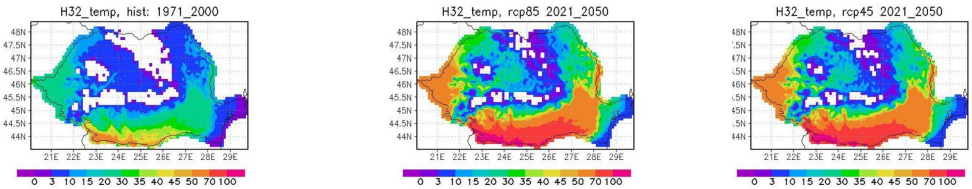
*) Table 1 (L 233): Suggest using e.g. “Apr. 1” instead of “1.04” for dates to avoid ambiguity and confusion.
A: Indeed, this would be ideal, however there was no place to put it with high, clear size in labels in Figures, so for consistency we used same notation as in Figures.

*) L 239 and following: Subsections should be labeled 3.1, 3.1.1, etc. according to GMD guidelines.
A: we corrected this aspect

*) Figs. 3a, 3b (L 270-306):
o Fig. 3a: What is H32temp?•
A: the definition is now explained at lines 222-224 and the threshold values explained on the Fig.3 caption, lines 233-8.

o Fig. 3a: What is ENS? Why does the figure with that in the caption not have an associated date range?
A: “ENS” was removed from the text (used “ensemble” instead);

o Fig. 3b: Why do titles say “Martonne*1” and “Martonne_aridity*1”?
*A: we redone the figures with uniformised tex*t
o Fig. 3b caption says that both rows show deltas in the right two panels (“and changes relative to it”), but neither does.
A: The figures are correct; these are indeed deltas in H32 figure (new Fig 3b), we re-verified the data and the plots, and specified also in the text: the index almost doubles under climate scenarios (line 224).
We attach here the plots with full field H32 [C] for Historical (left, 1970-2000), RCP4.5 (middle, 2021-2050) and RCP8.5 (right, 2021-2050)



o Fig. 3b caption: What are IM and ID?
A: JCI defined line 2015; IM define line 266; ID is no more used.

*) L 313-4: “each of the three decades” conflicts with “both decades” and the fact that only two decades are shown in Fig. 4.
A: corrected, there is no more “three decades” in the text.
Fig. 4 (L 322-55): Change subplot titles to something meaningful.
A: subplot titles were uniformised.

*) L 371-377:
o Text refers to “Control simulations” but Fig. 5 only shows “treatments.”
A: Control simulations (Ctrl) were defined at lines 280-1 (ERA5 driven).

Fig.5 was moved to supplementary material, S1.

o Is it possible to say which of the treatments was closest to real practices?
Fig. 5 (L 378-383):
A: in every year, another treatment was closer but in specific cases where data were available, we verified against data from the Official Data basis, as the case of 1995 year, and obtained that if conditions are closer to the used ones, the results are the closest to measurements (line 289-291).

o Most colors are very hard to see against white.
A: the figure was re-done and moved to supplementary S1)
o Add Y-axis label and tick numbers.
A: the Y-axis label was redone, figures are bold (original Figure, more clear, is included in Figure's tar, in the text it might be a problem of import file)
o Were the data first normalized to Z scores before correlation analysis?
A: no normalisation was applied, nor bias correction (we added this specification in S1)

L 393-4: How does change in anthesis date affect growing season length? Wouldn't growing season length only be affected by sowing and maturity dates?

A: In the DSSAT MODELS the anthesis and maturity dates are calculated (and not pre-defined), for each simulation based on thermal time, and cultivar dependent parameters. As you mention, anthesis date change, cannot ***alone*** *lead to season's length change. The stress factors for water, temperature and nitrogen may impose a premature ending of grain filling or crop failure.*

Fig. 6 (L 398-414):
o Do not use red and green on the same plot, as this is hard to distinguish for people with the most common color vision deficiency.

A: *Solved (the colors are now red, blue and black)*

o Why do plots only show some treatments?

A: *Explained in line 305: only small differences appear (linked to model instability under enhanced fertilization) in the maturity dates.*

o This figure is impossible to understand without referring back to Table 1, but some thoughtful figure design would make that unnecessary.

A: *Additional explanations were added in the legend of Fig. 6*

o Add Y axis labels.
A: solved
L 433: What is an H value?

A: *Shortcut for harvest is defined as H at line 316*

Fig. 7 (L 449-475): Add Y-axis labels.
A: *Solved*
L 483-4: How exactly would richer soil lead to the model simulating slower maturity?

A: *"In our study this premature ending of simulated vegetation season occurred more frequently in treatments with higher nitrogen fertilization. This may favour leaves development, enhanced transpiration and earlier depletion of the soil moisture leading later to water stress." line 304-306*

L 522-3: Why increase the soil water content? This is insufficient explanation.

A: *We increased the initial soil water content by 5% as indicated by the projected maximum change over the pilot area,(genotyping is an adaptation Tool so getting closer to projected conditions could bring more accuracy)*

Fig. 9 (L 577-89):
o Far too small, especially considering the tiny plots inside plots.
A: *Inside plots were removed, figure enlarged, other changes available at editors requests (line 390)*

o What is "Hmax left"?
A: *shows the sense of the axis: increasing values of H are on leftwards direction of the axis (line 394).*

o Add X axis tick marks for some points between 1 and 200.
A: solved

L 834-5: Why is the disclaimer about the US Government necessary? None of the authors have US government aSiliations.
A: *removed*

Q: All multi-plot figures: Add subplot labels (a, b, etc.) and refer to these in the text to help readers make the connection between what you write and what the figures show.
Most figures are unnecessarily small; please enlarge them and make sure to use a high DPI (at least 300).
A: *Figures were enlarged, zooms were removed*

Q: Significant work is needed on language cleanup. I've listed a number of examples here, but this list is not complete.
• L 30: Should "actual" be "current"?• A: *Replaced*
L 34: "in opposite" should be "on the other hand" or "in contrast" "in opposite" was replace with "in contrast"
L 37-8: "but emphasizes... actual climate." I'm not sure what this means. (no more occurring)
L 59: "9,1 milliards" should be "9.1 billion". A: *corrected at line 44.*
L 125-6: "mainly for isolated extremes, or broad parameters' range"—?
A: *re-written, this does no more occur*
L 150: Delete last comma. A: *whole sections 3.3 and 4 were rewritten*
L 213 (Fig. 2): "Maxim" should be "Maximum": A: *corrected*
L 263-4: What is "([C]+10)"? Why the +10? A: *this is the standard formula for the indicator.*
L 285: "conventionality" should be "continentality". A: *corrected*
L 311-13: Total precipitation is listed twice. A: *corrected*
L 316: "evolution" implies the long-term process of speciation. Presumably this should be "development". A: *indeed, but present in ML literature for the "evolution" of a "population" in GA/ ML. Only associated with GA we maintained "evolution" in the text.*

L 350: “Ox axis” should be “X axis”. A: *corrected*
L 360: “turns in opposite” should be “flips” or “reverses”. *A: was rewritten, does no more occur*
L 382: “the S-Romania” should be “southern Romania”. A: *Corrected*
L 389-391: This is not a complete sentence. A: *The paragraph was rewritten*
L 395: “slowed grain feeling”? A: *The paragraph was rewritten*
L 430: Should “Harvest” here be “yield”? A: *We used both, harvest mainly related to model values (in the 3.3 section)*
L 434: “no more valid” should be “not true” or “no longer true”. *A: rewritten, does no more occur*
L 481: “overestimate”? A: *re-written, does no more occur*
L 500: “astuciously,” while technically a word, is extremely obscure. Try instead: “smartly,” “astutely.” A: *re-written, does no more occur*
L 524: Should “known” be “no”? A: *re-written, does no more occur*
L 533: Should “intra-model” be “inter-model”? A: *re-written, does no more occur*
Throughout: “decade” should be changed to “dekad” when referring to a period of ten days, to avoid potential confusion with the much more common usage of “decade” to refer to a period of ten years. A: *this change has been done (“decade” was replaced with “dekad”)*
Throughout: When referring to figure axes, “Ox” and “Oy” should be “X” and “Y”. A: Corrected
Throughout: Instead of H or Harvest, just say yield.
A: *We used both, harvest mainly related to model values (in the 3.3 section), mainly when we needed to avoid repetition in the same phrase.*

Q: You might consider using an LLM with a prompt like “Please clean up this text from a scientific paper,” feeding it one or two paragraphs at a time. However, (a) make sure to check the output yourself to ensure it didn’t remove important ideas or introduce any spurious ones, and (b) make sure to have a native English speaker check the output for remaining inaccuracies.

A: *We have followed Revisor advice, we considered LLM on the text, and adopted tool’s suggestions, in parts of the text. We are grateful for the suggestion, indeed.*

As an example, I asked Google Gemini to clean up the text at L 310-320, and it gave me:
Figure 4 presents the projected changes in extreme weather events for the Călăraşi target subregion under the RCP85 scenario compared to the historical period (Hist). The analysis focuses on three key variables during the critical maize sowing month of April: freezing days (FD), total precipitation (RR), and severe precipitation events (RR10, days with daily accumulated precipitation exceeding 10 mm). A decreasing trend in FD is observed for both decades under the RCP85 scenario. However, it's noteworthy that the third decade may still experience intervals with even higher FD counts compared to the historical period. This late-spring blizzard phenomenon, crucial for plant evolution, has beenlinked to the combined influence of Polar Jet instability and warmer Eastern Mediterranean sea surface temperatures (Caian and Andrei, 2019). As both factors are projected to intensify in a warming climate (Lelieveld et al., 2012; Shaw and Miyawaki, 2024), the region may experience a higher potential for severe spring blizzards, which could negatively impact crops and annual yields.

Although this is an improvement, there are still issues, including:
• “target subregion”—what is “target” saying here? A: *target area defined at line 200.*
• “evolution” should be “development”. A: *replaced, apart GA*
• Explanation of “decade” (ten-day period, not ten years) *was removed*.
• Gemini changed “main sowing month” to “critical sowing month,” but I think “main”

makes more sense.