International Journal of Environmental Sciences & Natural Resources
ISSN: 2572-1119

Juniper Publishers
key to the Researchers

Opinion
Volume 31 Issue 5 - April 2023
DOI: 10.19080/IJESNR.2023.31.556327

Int J Environ Sci Nat Res

IPCC 2022 Report Assessment from a Food Security Perspective

Julian Schlubach*

Independent Expert, France

Submission: March 27, 2023; **Published:** April 05, 2023

***Corresponding author:** Julian Schlubach, Independent Expert, 310 ancienne route de Paris, A1 – 13540 Aix en Provence, France

Abstract

The IPCC report issued in 2022 presents a wide perspective on the climate change impact and adaptation measures. Even though the findings of the report raise serious concerns, they may not reflect the full picture regarding food production and related food security challenge. Some biases in the way the topic has been addressed are misleading. The research references don't cover the full range of faced challenges, and the proposed solutions are partly misleading. The pernicious long-lasting effects should not be underestimated. Besides, the focus on extreme events and on vulnerable populations can be misunderstood. A systemic perspective beyond the sole effects of climate change could be important in assessing the complex interaction between human broader activity and the effects of climate change.

Keywords: Climate change; Food production; Agricultural production systems; Biodiversity; Environmental impact; Greenhouse gas emissions; Environmental degradation; Deforestation

Introduction

The latest IPCC report [1] raises serious concern regarding the climate change trend, the impact which may be expected, and provides some perspective toward adaptation. Over recent years, due to extreme climatic events that have marked people's minds, the issue has gradually been taken more seriously than it had been in previous decades. However, climate change has also less visible consequences which are not as well understood. The IPCC report doesn't provide either a complete picture in this regard. Risk represented by pandemics is well developed in the report, even though part of the grass root causes linked to the loss in biodiversity is not much tackled, while risk faced by agricultural production systems and food security would require more attention.

The IPCC report may be misleading in that it may suggest that the main risk lies in the increase in the frequency of extreme events, as well as pandemics, for which technical responses can be provided. It is a reality, but it's only part of it. Besides, a more detailed analysis of the content of the IPCC report reveals several biases that can affect the understanding of the overall climate change issue.

The Structure of the IPCC Report, the Chapters Discussed and Main Biases

The report is divided into several chapters dedicated to emissions trajectories and emission reduction measures, to the analysis of the impact of climate change and finally to the responses to be provided, the adaptation. The aim here is to take a closer look at the question of impact (Chapters 2 & 3) and the proposed responses, with a particular prism relating to agriculture and food security (Chapters 6 & 8).

The IPCC report attempts to remain focused on climate change without getting lost on other factors of environmental degradation, which can however combine to reinforce each other. This applies to deforestation and land degradation. It is commendable to want to distinguish between the direct effects linked to greenhouse gas emissions and the environmental footprint exerted elsewhere. However, in order to provide an effective response, minimizing the danger that humanity faces, it is necessary to analyse the environmental impact in a systemic way.

Although established on the basis of solid multidisciplinary teams, the report also presents some biases likely to suggest to part of the readership that it would not be directly concerned by the consequences of climate change. Thus, it can implicitly be understood that the main threat would be the intensity and frequency of extreme events, which moreover would particularly affect the so-called most fragile ecosystems and the poorest populations, themselves dependent on these same ecosystems (8.4.5.7 - p. 1548). The statement can be misleading with regard to financial and political elites who may think that they will be able to protect themselves from negative externalities.

With regard to the analysis of the impact, the report does not constitute an exhaustive catalogue of the consequences that can be expected from climate change. However, it is likely to be perceived as such by the public at large. A bias is introduced due to the choice of treated themes, the scientific references used, as well as the research publications which received funding and those which have been reported upon, while other topics have been left aside. In particular, agriculture and food security are insufficiently addressed.

With regard to the adaptation component of the report, the belief in all-powerful technical solutions, capable of responding to all eventualities, also tends to minimize the risk and the stakes. The adaptation component is also more fragile than the chapters dealing with the impact, in the sense that it is essentially not based on research applying scientific methods and related publications.

Impact

The main consequences described in the IPCC report refer in particular to phenomena that can already be observed. Thus, extreme climatic events mark the spirits and are highlighted. It is indeed more complicated and more uncertain to communicate on impacts that may be more pernicious due to slow and continuous deterioration, but also based on predictive models whose temporality cannot be precisely predicted. Risk analysis remains mainly based on past meteorological data analysis. Yet, as increase in greenhouse gas emissions on a global scale continues year after year, the world is entering a period of chronic climate instability unparalleled on the scale of human history.

Several structural phenomena will thus combine and affect agricultural production systems both locally and on a global scale. Extreme events such as storms, hail, droughts, or mega fires mark the spirits. However, the IPCC report may not reflect sufficiently more pernicious structural phenomena over time. These more subtle changes concern in particular the disruption of ecosystems and of agricultural production systems due to increasing climatic instability, prolonged episodes of high temperatures beyond the tolerance threshold of plants [2,3], and the occurrence of events affecting the plants physiology at critical times in crop development [4]. The expected steadily evolving situation would require more attention from this perspective.

Adaptation

The predominant idea, which is also present in between the lines of the IPCC report, is that plants grow best with water, sufficient nutrients and warmth. This assessment is a little simplistic, but nevertheless takes on a form of reality in the relatively stable climatic framework that has prevailed over the last millennia while agriculture has developed. The cold has been one of the main constraints faced by field crops in temperate latitudes in northern Europe and the United States. However, the rapid change over a comparatively short time scale calls into question what seemed acquired.

A widely held dominant idea is that there is no high temperature that cannot be compensated by sufficient irrigation and selection of suitable plant breeds, or with the help of genetic engineering. This perspective seems predominantly commercially motivated. The bias thus created is not incompatible with the search for solutions, but the food security topic also requires a strategic perspective, establishing the limits of proposed solutions, which is lacking in the IPCC report.

The presented solutions come up against several limitations. Indeed, even if to a certain extent part of the populations of Northern Europe see climate change as a boon which could bring them a more clement climate, they do not gauge that the phenomenon engaged is not a heating system whose thermostat can be adjusted, assuming that they can take temporary advantage of the ambient dynamics. The report does not either assess properly the consequences of climatic instability.

The solutions presented would require more attention, developing the specific constraints faced in each case, and detailing the limits of what can be expected from those.

Discussion

Impact

Regardless of the frequency of occurrence of temperatures that exceed the physiological limits of plants at critical development stages [3], increasing instability of air masses [5-7] could further endanger field crops. In addition to frost episodes at critical times of plant development, there is also high temperature with a similar effect. An extreme event at the time of critical stages of plant development can lead to a drop in production, or even a total loss of harvest. The more the climate becomes erratic in inter-seasonal periods, the higher is the probability of the occurrence of such events.

At a different pace, in different areas of the world, raising temperatures for prolonged periods, beyond the plants' maximum tolerance, is likely to gradually erode yields [8].

The fact that in a temperate environment, as is the case in part of Europe, there is a greater margin for adaptation in the short or medium term than in other regions of the world, does not mean that the ambient conditions will not deteriorate. Thus, in addition to the risk of frost in winter, heat waves are likely to become an increasing matter of concern. In particular, the so-called tropical nights during which the temperatures no longer drop below 20°C disrupting the nocturnal respiration mechanisms necessary for plants [9], are likely to become more frequent. The meteorological models take into account the occurrence of such events [10]. However, downscaling models, at the local level regarding the expected effect on crops, are lacking.

It is also necessary to make the link between the loss of biodiversity of ecosystems on the one hand and the loss of biodiversity within cultivated species on the other. Seasonal

How to cite this article: Julian S. IPCC 2022 Report Assessment from a Food Security Perspective. Int J Environ Sci Nat Res. 2023; 31(5): 556327. DOI: 10.19080/IJESNR.2023.31.556327

temperature changes and climate instability also affect ecosystems which, as they become impoverished, lose resilience and potential for climate regulation and populations.

Where the permanent vegetation cover regresses the climate is modified at the local level [11]. Soil heating increases air temperature and contributes to reducing rainy periods, which are concentrated in more violent events, while the soil loses its ability to retain water.

The very low intraspecific biodiversity of cultivated plants reduces the resilience of crops and their ability to resist diseases or extreme events. The synchronization obtained in the germination and then the stages of crop development make them particularly vulnerable to an increasingly unstable climatic environment. The search for performance is made to some extent at the cost of lower resilience and sustainability. This trend is especially challenging in the background of climate change.

Adaptation

It could be useful to remind that genetic engineering can accelerate the optimization of characteristics present within existing species and to some extent between living species, but that it does not create anything new. Thus, there are indeed physiological limits, even if these differ from one species to another. Beyond a maximum temperature, the yield of the plant begins to drop, down to the so-called 'zero' production threshold. The limit can be pushed back using irrigation techniques, in particular by sprinkling in fine droplets, but pushing the limits does not mean the absence of limits. Besides the fact that high temperatures will gradually and regularly exceed the physiological limits of cultivated plants, thinking of being able to compensate for high temperatures by increased irrigation is a headlong rush. Available water resources are likely to become an increasingly limiting factor, while at the same time crops' physiological limits will be more frequently reached.

The availability of water is expected to decrease, in particular, due to the reduction in the volume of snowmelt [12] and rainfall events that are less spread out, more violent and therefore less able to replenish groundwater. Water reservoirs will remain marginal solutions with regard to the loss of mobilized water volumes. In this regard, it should be noted that drawing from groundwater to supply surface water reservoirs, which will also be subject to increasing evaporation, might not be a rational solution. This could locally result in considerable changes in the level of the groundwater with the key to entire ecosystems which could collapse when the roots of the plants no longer reach the water. Wanting to irrigate more to compensate for temperature increases is a headlong rush that will only be possible for a time and in no case can be extended to all existing agricultural production systems.

Besides, the presented solutions don't address the expected increased occurrence of high-temperature events, at crops' critical development stages.

Conclusion

Providing solutions to some climate change challenges might be seen as an opportunity to innovate and unlock new sources of profit. Genetic engineering is promoted from this perspective, ignoring the intrinsic limits of intra and interspecific genetic potential. Water resources management will also require a long-term perspective implying difficult arbitrations. The IPCC report adaptation chapters would require defining more precisely the limits faced by the proposed solutions.

Solutions likely to mitigate the extent of the disaster are of course not excluded, but there is no universal solution and the precautionary principle should preferably be applied. It should also be understood that the path of specialization of living production systems, whether for crops or livestock, at the cost of a loss of intra-species biodiversity, presents high risks.

Ecuadorian Africa with particularly fragile tropical ecosystems and agriculture run a major risk from this point of view. However, it would also be misleading to believe that Northern countries will be spared from food security issues. Food sovereignty in Europe is eroded by urban sprawl [13] and gradually by climatic events which affect production more frequently than in the past; even though, the physiological limits of field crops are yet still rarely reached. The vision that solutions are only a matter of investment, while climate change would not be a direct threat for the richer countries and for the privileged population among those, is misleading. A strategic perspective encompassing systemic analysis outside vested interests would urgently be needed. Periods of instability resulting from poorly controlled food security would lead the countries concerned, if not the world, into spirals of degradation.

References

1. IPCC 2022 - AR6 WGI.
2. Saleem Ur R, Arif M, Hussain K, Hussain S, Mukhtar T, et al. (2013) Evaluation of Maize Hybrids for Tolerance to High Temperature Stress in Central Punjab. Columbia International Publishing.
3. Hatfield JL, Prueger JH (2015) Temperature extremes: effect on plant growth and development. Elsevier Weather and Climate extremes 10: 4-10.
4. Prasad PVV, Djanaguiraman M (2014) Response of floret fertility and individual grain weight of wheat to high temperature stress: sensitive stages and thresholds for temperature and duration. Funct Plant Biol 41(12): 1261-1269.
5. Zamora RA, Korty RL, Huber M (2016) Thermal Stratification in Simulations of Warm Climates: A Climatology Using Saturation Potential Vorticity. University of New Hampshire.
6. Lindsey R (2021) Understanding the Arctic polar vortex.

How to cite this article: Julian S. IPCC 2022 Report Assessment from a Food Security Perspective. Int J Environ Sci Nat Res. 2023; 31(5): 556327. DOI: 10.19080/IJESNR.2023.31.556327

7. Lolis CJ (2007) Climatic features of atmospheric stability in the Mediterranean region (1948-2006): spatial modes, inter-monthly and inter-annual variability. Meteorological Applications 14(4): 361-379.

8. Schlubach J (2001) Downscaling model in agriculture in Western Uzbekistan climatic trends and growth potential along field crops physiological tolerance to low and high temperatures. Heliyon 7(5): e07028.

9. Sadok W, Jagadish SVK (2020) The Hidden Costs of Nighttime Warming on Yields. Trends in Plant Science 25(7): 644-651.

10. World bank, climate change knowledge portal - data.

11. Song YT, Zhou DW, Zhang HX, Li Guang, Jin YH, Li Q (2013) Effects of vegetation height and density on soil temperature variations. Chinese Science Bulletin 58: 907-912

12. Punkari M, Droogers P, Immerzeel W, Korhonen N, Lutz A, et al. (2014) Climate Change and Sustainable Water Management in Central Asia – ADB.

13. European Environmental Agency report (2006) Urban sprawl in Europe, the ignored challenge.

DOI: 10.19080/IJESNR.2023.31.556327

How to cite this article: Julian S. IPCC 2022 Report Assessment from a Food Security Perspective. Int J Environ Sci Nat Res. 2023; 31(5): 556327. DOI: 10.19080/IJESNR.2023.31.556327