# Climate change threatens global beer supply with shrinking barley and hop harvests



The beer industry finds itself in precarious waters, facing an urgent crisis largely attributed to climate change. Atsushi Katsuki, the chief executive of Asahi, articulated a sentiment felt throughout the sector when he remarked, “Although with hotter weather the consumption of beer may grow and become an opportunity for us, climate change will have a serious impact… There is a risk that we may not be able to produce enough beer.” This warning, conveyed in a Financial Times interview, echoes a pervasive concern among brewers about the long-term viability of their core ingredients—barley and hops—as extreme weather patterns raise alarm bells.

A recent analysis by Asahi projects a troubling decline in barley harvests in France and Poland, estimating drops of 18% and 15% respectively by 2050 under scenarios of severe climate change. Even if global warming is kept under 2°C—an increasingly daunting task—the harvests would still suffer a decline of about 10% and 9% respectively. Such shifts would inevitably affect not only production volumes but also the flavour profiles of beers, as changes in hop quality become increasingly pronounced. Current trajectories suggest that the industry is on a path toward a potential 3°C rise in temperatures, which would exacerbate these challenges significantly.

The ripple effects of climate change extend beyond mere barley and hops shortages. According to research published in Nature Communications, hop ripening in key regions has begun occurring approximately 20 days earlier than it did in previous decades, contributing to reduced yields. It is estimated that the global supply of hops could decline by as much as 18% by 2050, while the qualitative parameters—specifically the alpha content, crucial for flavour—might drop by 20 to 31%. This paints a stark picture for an industry that thrives on consistency and quality.

Emerging data highlights another layer of complexity regarding the UK's beer supply chain. Recent research conducted by the British Beer and Pub Association (BBPA) indicates that extreme weather not only exacerbates current vulnerabilities but also hinders the ability to harvest hops optimally. In a changing climate, concentrated hop-growing regions are increasingly exposed to flooding and adverse growing conditions. Despite the UK only importing about 2% of its essential barley, it remains the fifth largest hop importer, with significant quantities coming from other countries—something that offsets precarious domestic situations but introduces risks associated with global supply chains.

Promisingly, there are initiatives aimed at mitigating some of these risks. In Colorado, Todd Olander of Olander Farms is pioneering efforts to develop water-saving barley strains in light of local water crises exacerbated by climate conditions. This exploration is part of a wider agenda involving farmers and brewers working collaboratively to address sustainability challenges while maintaining quality.

In Europe, the Society of Hop Research in Munich is actively developing new strains of hops capable of withstanding the rigours of climate change, including rising temperatures and diseases. Implementing these innovations in educational curricula for future brewers underscores the industry's commitment to sustainably adapting to the changing environment.

It is clear that the stakes are high. An analysis by GlobalData warns of substantially increased beer prices—potentially doubling—if climatic conditions continue to deteriorate. While this poses immediate concerns for consumers and industry profitability, it also raises deeper questions about the sustainability of 'luxury' products like beer. Academic research indicates that as food and water security become more pressing issues, the availability and accessibility of such products could decline, placing further pressure on breweries.

Bob Gordon of the Zero Carbon Forum urges a robust response, noting, “If we are to ensure our brewing industry is resilient enough to cope with drier summers and wetter winters, proactive steps are required.” This involves not only individual company efforts but a collaborative approach among stakeholders across the agricultural, hospitality, and brewing sectors to combat the climate crisis effectively.

Innovative practices are being put into place, including regenerative farming techniques aimed at improving soil health and resilience. Companies like Jubel, a UK-based craft beer producer, have switched to sourcing only regenerative barley, claiming that it could potentially halve carbon emissions linked to their supply chain. These sustainable practices promise better traceability and a reduced carbon footprint, addressing some of the industry’s pressing climate-related risks.

As experts in the field continue to caution about the long-term implications of climate change, the industry faces a dual challenge: not only must it adapt to changing environmental conditions, but it also needs to engage consumers in the narrative surrounding sustainability. Ensuring that brewing traditions are preserved while promoting innovative solutions will be crucial as the market navigates an uncertain future.

Indeed, as Jacob Aarup-Andersen, the CEO of Carlsberg, stated, “I think there is a chance that they will change in flavour but not a lot.” The reality, however, is that the flavour of beer is inextricably linked to the sustainability of the agricultural practices that produce its key ingredients. Without substantive action now, the future of beer could be as uncertain as the climate itself.

## Reference Map:

* Paragraph 1 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[4]](https://www.axios.com/2018/10/15/climate-change-beer-prices-double)
* Paragraph 2 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[5]](https://www.thebeertimes.com/en/how-climate-change-threatens-global-beer-production/), [[6]](https://www.agtechnavigator.com/Article/2023/10/16/Why-climate-change-could-have-a-bitter-impact-on-Europe-s-brewing-sector)
* Paragraph 3 – [[2]](https://www.axios.com/local/denver/2023/12/15/colorado-farmers-barley-grains-save-water-beer-spirits), [[3]](https://apnews.com/article/338ab02a216e77530e711c880bec9683)
* Paragraph 4 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[5]](https://www.thebeertimes.com/en/how-climate-change-threatens-global-beer-production/)
* Paragraph 5 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[6]](https://www.agtechnavigator.com/Article/2023/10/16/Why-climate-change-could-have-a-bitter-impact-on-Europe-s-brewing-sector)
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* Paragraph 7 – [[6]](https://www.agtechnavigator.com/Article/2023/10/16/Why-climate-change-could-have-a-bitter-impact-on-Europe-s-brewing-sector)
* Paragraph 8 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[5]](https://www.thebeertimes.com/en/how-climate-change-threatens-global-beer-production/)
* Paragraph 9 – [[7]](https://climateadaptationplatform.com/how-climate-change-affects-beer-quality-and-adaptation-solutions/)
* Paragraph 10 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[2]](https://www.axios.com/local/denver/2023/12/15/colorado-farmers-barley-grains-save-water-beer-spirits)
* Paragraph 11 – [[1]](https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/), [[3]](https://apnews.com/article/338ab02a216e77530e711c880bec9683)
* Paragraph 12 – [[4]](https://www.axios.com/2018/10/15/climate-change-beer-prices-double), [[6]](https://www.agtechnavigator.com/Article/2023/10/16/Why-climate-change-could-have-a-bitter-impact-on-Europe-s-brewing-sector)

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## Bibliography

1. <https://www.just-drinks.com/features/beer-today-gone-tomorrow-brewers-face-climate-change-pressures/> - Please view link - unable to able to access data
2. <https://www.axios.com/local/denver/2023/12/15/colorado-farmers-barley-grains-save-water-beer-spirits> - In response to Colorado's water crisis and the impacts of climate change, Todd Olander, owner of Olander Farms and Root Shoot Malting, is experimenting with cultivating water-saving grains for use in beer and spirits. As extreme heat and drought threaten the future of traditional barley and hops, Olander aims to maintain supply and reduce environmental impact by testing new barley strains named Lightning, Thunder, and Buck. This initiative represents a broader effort among farmers, manufacturers, and advocates to address water consumption issues while potentially mitigating rising costs associated with climate change. Although the success and taste of the new barley strains remain uncertain, this endeavor is part of a series of local solutions aimed at improving water conservation and sustainability in the industry.
3. <https://apnews.com/article/338ab02a216e77530e711c880bec9683> - Germany is leveraging education and research to combat climate change and its impact on the beer industry. The Society of Hop Research in Munich is developing new hop varieties capable of withstanding rising temperatures, droughts, and diseases. These seedlings will be integrated into university and vocational education programs to teach future brewers and farmers sustainable farming and brewing techniques. The Hallertau region, the world's largest hops-growing area, faces declining yields due to climate change, affecting traditional beer flavors. Continuous education and adaptation are essential for preserving the beer industry amidst climate challenges.
4. <https://www.axios.com/2018/10/15/climate-change-beer-prices-double> - According to a study published in Nature Plants, climate change could drastically affect beer prices worldwide. Due to climate-related droughts and heat waves, the production of barley, a key ingredient in beer that is particularly sensitive to heat, could severely decrease. This reduction in barley production could potentially lead to beer prices doubling. The study, co-authored by Steve Davis from the University of California, Irvine, emerged from both personal concern and a desire to provide concrete evidence of climate change’s impact. This comes in conjunction with a recent UN report warning of severe consequences without drastic global action to reduce greenhouse gas emissions. Additionally, NASA data indicates that 2018 is expected to rank as Earth's fourth-warmest year on record.
5. <https://www.thebeertimes.com/en/how-climate-change-threatens-global-beer-production/> - Climate change poses significant threats to global beer production, primarily affecting hops and barley. Hops, essential for beer's bitterness and aroma, are sensitive to climatic conditions. Traditional hop-growing regions like Hallertau in Germany and Yakima in the U.S. have experienced declining yields due to droughts and heatwaves. In Europe, hop production has decreased by 13% over the past 20 years due to climate change. If global temperatures rise by 2°C above pre-industrial levels, hop production could decline by up to 18% by 2050. Rising temperatures are altering alpha-acid levels, key compounds for hop bitterness. In some regions, alpha-acid levels have dropped by up to 20%, affecting the flavor of popular styles like IPAs. In Yakima, USA, which produces 75% of the country’s hops, farmers have reported yield losses of up to 15% due to recurring droughts. Barley, essential for fermentation, is also under threat. In Canada, one of the largest barley exporters, yields have fallen by 10% over the past decade due to droughts and heatwaves. Lower-quality barley, with reduced starch levels, can hinder fermentation efficiency. In Australia, the protein content of barley has increased by 5%, affecting its suitability for beer production. In Northern Europe, where 60% of the world’s beer barley is grown, farmers have reported yield losses of up to 7% due to extreme weather conditions.
6. <https://www.agtechnavigator.com/Article/2023/10/16/Why-climate-change-could-have-a-bitter-impact-on-Europe-s-brewing-sector> - New data shows European beer producing regions are projected to experience a 4–18% reduction in traditional aroma hops yield by 2050, and a 20–31% reduction in hops acids that are key for bitter flavouring, a Nature Communications study suggests. The authors call for urgent adaptation measures to stabilize international market chains. Beer is the world’s third most widely consumed beverage, after water and tea, and is the world’s most popular alcoholic beverage. In addition to water, malting barley and yeast, hops are used to flavour beer. Hops contain compounds called alpha acids that give beer its unique bitter aroma and also affect its quality. Since the cultivation of high-quality aroma hops is restricted to relatively small regions with suitable climate and environmental conditions, there is a risk that production will be affected by climate change. Currently, little is known about the possible effects of a predicted warmer and drier climate on the yield and alpha content of hops. Therefore researchers collected data on beer hops yield and alpha content between 1971–2018 from 90% of European beer hop growing regions in Germany, Czechia and Slovenia. They found that, compared to before 1994, hops ripening starts 20 days earlier, hops production has declined by almost 0.2 tonnes per hectare per year, and hops alpha bitter content has decreased by about 0.6%. By combining past data with climate models, the authors estimate the beer hops yield and alpha fold content will be reduced 4–18% and 20–31%, respectively, by 2050. Drought impact The largest declines are expected to occur in the southern hop growing regions, such as Tettnang, southern Germany and Celje, Slovenia. These projected declines will be caused by rising temperatures and more frequent and severe droughts, according to the models. To continue producing good quality beer, traditional beer hops farming practices need to adapt to alleviate the negative effects of climate change in Europe, the authors suggest. They wrote: “Since agricultural droughts are projected to increase with high confidence in southern Europe and medium confidence in central Europe, it will be necessary to expand the area of aroma hops by 20% compared to the current production area to compensate for a future decline in alpha content (and/or hop production).
7. <https://climateadaptationplatform.com/how-climate-change-affects-beer-quality-and-adaptation-solutions/> - The popularity of pale lagers has surged in Central Europe, particularly in regions such as Czechia, Slovakia, and Germany, where lager was first invented. Consumer preferences for beer aromas and flavours depend heavily on high-quality hops. The rise of craft beer producers and small breweries is driving an increased demand for these superior hops. However, hop yields and alpha content—the compound responsible for beer’s bitter taste—are sensitive to climate conditions, particularly heat and moisture. A 2023 study published in Nature, “Climate-Induced Decline in the Quality and Quantity of European Hops Calls for Immediate Adaptation Measures,” reveals that climate change—characterized by high temperatures, reduced precipitation, and drought—could soon affect the quality of hops. This change in hop quality may ultimately impact the beer’s flavour and overall quality. Researchers studied hop production in European regions where 90% of hops are grown. They discovered that a temperature increase of 1.4°C, combined with a decrease in precipitation of 24mm, reduces annual yields by approximately 200 kilograms per hectare in Germany, the Czech Republic, and Slovenia. Additionally, the alpha compounds in hops, which contribute to their bitterness, have declined by 0.6%. Furthermore, hops are now ripening about 20 days earlier than data collected before 1994. Researchers comparing annual hop yields between 1971-1994 and 1995-2018 found a significant decline in production, ranging from 130 to 270 kilograms per hectare. The most notable drop was observed in Celje, Slovenia, with a decrease of 19.4%. This was closely followed by regions in Germany: Spalt at 19.1%, Hallertau at 13.7%, and Tettnang at 9.5%. Projections for 2021 to 2050 indicate a further decline in hop yields, estimated to be between 4.1% and 18.4%, and a decrease in alpha content by 20% to 30% compared to 1989 to 2018. The most significant reductions in yield and alpha content are expected in the southern hop-growing regions of Tettnang, Germany, and Celje, Slovenia. These projected declines are primarily attributed to rising temperatures and more frequent and severe droughts. The study forecasts a substantial decrease in alpha content per hectare, estimated at 25.3% to 39.5% compared to current values.