

# Navigating risks: examining the threats to API production amidst climate change challenges

By Florian Cardon and Marina Guillet



**Global climate change is one of the biggest challenges we face and the impact on crop yields could seriously impact production of plant-based active pharmaceutical ingredients (APIs).**

Extreme weather events, changes to seasonal patterns and temperature shifts are increasingly attributed to worldwide climate change. And expert opinions from across the scientific spectrum suggest that these climate-related risks will increase if the destruction of the planet's biosphere continues at its current rate. The recent [IPCC Synthesis report](#) makes for sombre reading.

One noticeable impact already observed is on the lifecycle of the world's vegetation, especially medicinal and aromatic plants (MAPs) whose ingredients are essential for drug production. It's not just the threat to their survival that is cause for concern but also their overall yield in the years ahead.

As Gerald Nelson, Professor Emeritus at the University of Illinois and one of the contributors to [Working Group II](#) of the 2022 IPCC report, says, "Different plants have different critical points [in their growth pattern]. If you have extreme events during those periods, you could lose the crop, even if the growing period is fine the rest of the time the crop is in the ground." Prof. Nelson continues, "Knowing what these key stress points are is key to growing [plants] in open fields. This raises a big question. Can the impacts of climate change be coped with?"

The effects are global, with no land immune to these changes. If one geographical area is affected by an extreme weather event, this could be repeated simultaneously at an environmentally similar open field location thousands of miles away. This [teleconnections](#) phenomenon links weather patterns at widely separated locations on the Earth.

El Niño is an example of a teleconnected weather pattern. The phenomenon starts in the Pacific Ocean bringing rain to South America but can affect large parts of the World. During El Niño droughts occur as far away as Indonesia and Australia and there is a decrease in rainfall during the Indian monsoon. At the same time El Niño brings heightened rainfall to the Horn of Africa, impacting regions of Ethiopia, Kenya, and Somalia with more tropical storms in the North Atlantic. All these events have an impact on open field culture and in particular on natural molecules extracted from plants.



It's also important to look at the rise in average temperature around the planet and consider the more nuanced impacts. Crop production could be affected by any change in the peak temperatures during the day. Where once the hottest temperatures could be expected at say 4 pm, these peaks could shift to later in the evening. The change in warmth in the absence of sunlight could impact the plant's metabolism and growing cycle and has the potential to lower yield and increase crop losses.

However, according to Prof. Nelson, "We don't have good data on crop failures, partly because of this location specificity problem." That said, MAP species often grow in specific habitats and geographies – such as an Alpine plant that only thrives at high altitudes. Any change in their growing environment puts them at greater risk of failure.

Some experts have even suggested climate change could affect not only the yield but also the chemical composition of MAPs. Studies have shown that temperature stress can affect the secondary metabolites and other compounds that plants produce<sup>1, 2</sup>. These compounds are usually the basis for their medicinal activity.

There is also a growing concern about the availability of cultivable land for plants as the climate changes. With the planet needing to [sustainably feed nine billion](#) people by 2050, most of the viable areas will be used for food production. This will leave limited space to satisfy the pharmaceutical industry's need for plant-based APIs.

Secondary metabolites are a good example of APIs that are likely to be directly affected by climate change. Currently, they are mainly produced by growing plants in fields which lacks scalable and sustainable production processes. [Samabriva's innovative plant-based platform](#) could be the answer the pharmaceutical industry needs for high-yield, low cost bioproduction of APIs at scale anywhere in the world.

By taking plant-based API production out of the field and into the factory, Samabriva's innovative technology offers a sustainable, stable way to make high value biomolecules. This will help the pharmaceutical industry reduce their need for agricultural land. It's just one example of how new bioprocessing technologies may offer a solution that is both localized and cost effective.

For any manufacturer looking to mitigate the risks from climate change, this new technology will be increasingly hard to resist. [Get in touch](#) to find out more about Samabriva's innovative platform.

1. Zobayed SMA, Afreen F, Kozai T. Temperature stress can alter the photosynthetic efficiency and secondary metabolite concentrations in St. John's wort. *Plant Physiology and Biochemistry*. 2005;43:977-984.

2. Kirakosyan A, Seymour E, Kaufman PB, Warber S, Bolling S, Chang SC. Antioxidant capacity of polyphenolic extracts from leaves of *Crataegus laevigata* and *Crataegus monogyna* (hawthorn) subjected to drought and cold stress. *J Agric Food Chem*. 2003;51:3973-3976.  
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