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Half of the unprecedented global soybean production failure in 2012 is attributable to climate change.

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The United States (US), Brazil, and Argentina collectively produce about 75% of the world's soybean supply. In 2012, soybean crops failed in these three major producing regions due to spatially compound hot and dry weather across North and South America. This led to unprecedented shortages in the global supply, resulting in record-high market prices. Despite the severity of this event, the role of historical and future anthropogenic warming in influencing such occurrences remains unknown. Here, we present different impact storylines of the 2012 event by imposing the same seasonally evolving atmospheric circulation in a pre-industrial, present day (+1°C above pre-industrial), and future (+2°C above pre-industrial) climate. We use so-called nudged atmospheric simulations and train a statistical model to estimate yield losses from meteorological conditions. While the drought intensity is rather similar under different warming levels, our results show that anthropogenic warming strongly amplifies the impacts of such a large-scale circulation pattern on global soybean production, driven not only by warmer temperatures, but also by stronger heat-moisture interactions. We estimate that 51% (47-55%) of the global soybean production deficit in 2012 is attributable to climate change. Future warming (+2°C above pre-industrial) would further exacerbate production deficits by 58% (46-67%), compared to present-day 2012 conditions. This highlights the increasing intensity of global soybean production shocks linked to similar atmospheric conditions with warming and thus requires urgent adaptation strategies.