

# How Will Climate Change Affect My Big Mac Meal<sup>®</sup>?



(credit: M. Scanlon)



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## What is going on?

Regardless of the pros and cons of quick-service restaurant fare, the Big Mac Meal is an unqualified commercial success. It is also the end-point of a significant portion of agricultural products that emanate from the Canadian prairies.

For established food processors, three primary considerations govern business viability. Their manufacturing plant must be efficient, their product must be safe, and it must meet the exacting quality demands laid down by customers such as the quick-service industry. All three considerations will be affected by climate change and extreme weather that impact the producers of potatoes, canola, wheat and beef and their food processor partners who serve that sector. It is therefore highly unlikely that the Big Mac Meal of 2050 will be unaffected by a changing climate

To be assured of high-quality outputs, food processors demand high-quality inputs. Perhaps more importantly, processors demand consistency in the quality or process performance of those agricultural inputs. Variability in properties of agricultural commodities due to climate change poses significant challenges to the food processing industry. To maintain quality uniformity in a global industry, the quick-service cooked frozen French fry should taste the same in Shanghai as it does in Chicago. Potatoes, along with canola oil, make up more than 99% of a quick-service French fry. But, potatoes are particularly susceptible to quality changes brought about by variation in growing conditions.

## What is coming up, and does it matter?

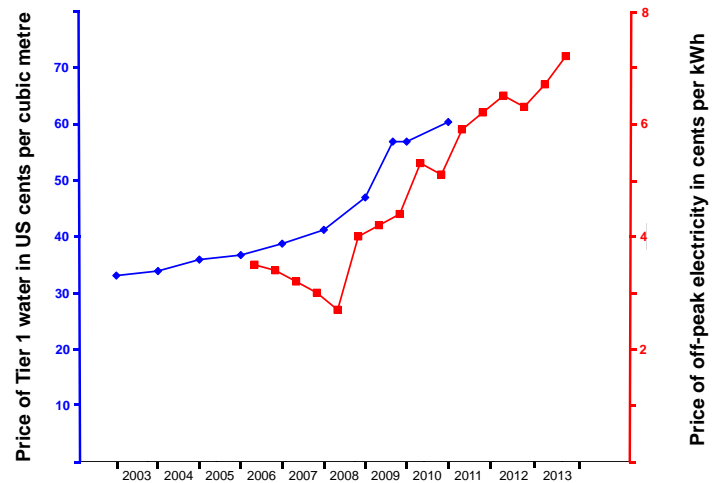
Too hot, too cold, too wet, too dry – potato tubers get stressed very easily. Tubers respond to physiological stresses by producing sugars. Unfortunately, sugars in potato strips diminish the appearance of the finished fry, and the processor can only do so much in the manufacturing plant to get those sugars out. A number of options exist for the quick-service buyer of fries from the climate-challenged processor: lower quality standards and risk losing customers, or lose customers because meals must be higher priced to offset the costs of rejected loads of tubers. A third pro-active option is through potato breeding programs, where cultivars tolerant to abiotic stress will be targeted while maintaining other fry quality traits. The capacity to sort strips based on composition at line speeds is an additional technological response to agriculture's 2050 climate challenges.

Food safety will also be increasingly challenged by the effects of climate change and extreme weather events. The old allies of food safety in meat processing plants - chilled process lines and copious emanations of wash water - will be harder to find as rising prices for refrigeration and potable water force processors into reconfiguring long-held manufacturing practices. Innovative reductions in water usage and the re-use of grey water streams for non-critical process tasks where food safety is not compromised are certainties in all future processing plans. An example is one meat processor who has reduced water usage from 3700 litres per head in 2010 to 2800 litres per head one year later.

One area where extreme weather can directly affect consumer health is not in the meat patty; this undergoes a rigorous heat treatment at the restaurant before the bun is loaded. Rather, the food safety threat arises from lettuce shreds that enhance the burger's textural contrasts. The intense precipitation of extreme weather events can ballistically launch soil-borne organisms such as *Listeria* and transfer them to the growing lettuce. With no option for heat treatment, these minor components in the meal may pose tomorrow's food safety threat.

Finally, plant efficiency can also be challenged by climate and extreme weather effects. Manufacturing plants that are

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***Energy and water prices from power-stressed Ontario and water-stressed Southern California<sup>1</sup>. As climate change reduces water supplies and increases energy costs, Canadian food processing facilities will have to cope with increased manufacturing costs. Exacerbating the problem is the high power cost of pumping water to regions that undergo periodic water stress.***

able to meet the standards of the quick-service industry rely on uninterrupted supplies of potable water and reliable power; they run on large volumes and tight margins. Reducing these inputs is a target for all processors, and some have cited aggressive reductions for 2020 through a variety of innovative strategies and new technology introductions.

In addition, since much of the Big Mac Meal relies on tightly integrated frozen and refrigerated distribution chains, extreme weather events could significantly disrupt the supply and quality of the Meal's components after they have left the process plant. Sensitivity to weather events is exacerbated because these tightly-controlled chains have been purged of the vast majority of previous inefficiencies.

To conclude, one can expect the effects of climate change and extreme weather to affect the viability of food processors meeting the demands of urban customers far from the Prairies. Elevated carbon dioxide levels may change more in the Big Mac Meal than just the carbonation level in the soda.