Montana Agriculture in a Changing Climate

How a warming world impacts Montana’s $4.2 billion farm & ranch economy

Farmers and ranchers in Montana are already seeing some of the effects of global climate change on our local weather patterns and growing conditions. A growing body of research, some of which is being done right here in Montana, is pointing to a future with hotter and dryer summers and more aggressive weeds and pests, among other things.

What is “climate change”? 

Climate change is a broad term, describing the increase in average global temperatures (1.4°F over the last 100 years) due to growing concentrations of greenhouse gases in our atmosphere (an increase of 41% since 1800).¹

Greenhouse gases, like carbon dioxide (CO2), methane, and nitrous oxide have always been in our atmosphere. But over the past century, the burning of carbon-based fuels and other human activities have increased the concentration of CO2 in the atmosphere to levels not seen in the past 800,000 years.¹ Like the tarp on a greenhouse, these gases trap more of the sun’s energy in our atmosphere, warming it over time.

Virtually every climate and weather system on earth is driven by energy from the sun. This energy, in the form of light and heat, enters the earth’s atmosphere and is either absorbed by land, water, and plants, or is reflected back out to space. What we call weather is caused by the distribution of this energy around the earth’s surface. Precipitation, wind, jet streams: they are all caused by temperature variations in the earth’s atmosphere. In addition to warming the overall temperature of the atmosphere, the increased energy trapped by greenhouse gases also changes the gradients that drive our climate systems, which could likely change our weather patterns.

The basic science of climate change is widely accepted, 97% of climate scientists agree that our climate is changing due to increased greenhouse gas concentration.²

Learn More: http://deq.mt.gov/ClimateChange/Data/ClimateChangePrimer.mcpx

“Scientific evidence for warming of the climate system is unequivocal.”

- Intergovernmental Panel on Climate Change
It’s easy to think of climate change as a problem far off into the future. The reality, however, isn’t that convenient: Montana’s climate is already changing.

Since 1900, the average temperature in Montana has risen 2.4°F, and the number of days considered ‘extremely hot’ have increased three-fold. In addition to warmer temperatures, eastern Montana also receives 10% less precipitation than it did 100 years ago.

Climate models forecast that these trends will not only continue, but will likely intensify. It’s also projected that global average temperature will increase 2-11.5°F by 2100, and studies have shown that the climate is changing 1.8x faster in Montana than the global average.

What does this mean for Montana’s farmers and ranchers?

With all these projected changes and uncertainties in our climate, what does it mean for the 28,000 farms and ranches across Montana? And, in a state where agriculture is the largest industry, employing over 31,000 people and generating $4.2 billion a year, what will it mean for the state as a whole?

Climate and weather systems are notoriously difficult to predict, but researchers here in Montana, and around the world, are working to understand the pressures farmers will likely face, some of which we’re already beginning to see. Research points to both a decline in crop yields and an increase in costs. Crop yields and pastureland productivity are expected to decrease from a rise in temperature, less precipitation and available irrigation water.

For grains like wheat and barley, increasing temperatures will cause faster plant growth, which in turn reduces the time for plants to fully grow and mature, therefore reducing grain yield per plant. Researchers at Montana State University have demonstrated that the rise in temperature since 1950 has already reduced hard red spring wheat yields. Other studies have found that 1.8°F of temperature rise will reduce wheat yield by 6%. And, the same temperature rise was found to reduce corn yields by 5-15%. 
Losses in productivity are also projected for livestock forage. Increased temperatures and CO2 levels will decrease pasture productivity, meaning livestock will need to consume more to receive the same nutritional benefits. Effects on ranches would be compounded by less available water for livestock, along with the effects of heat waves and severe storms.

The projected cost of these crop losses is $79 million a year by 2050, or 18% of the current industry value. In addition to direct losses, it may become harder for farmers and ranchers to get crop insurance as weather related damage claims increase.

**WATER.** Crops don’t grow without it. It is quite literally the lifeblood of agriculture, and water shortages and droughts will disproportionately affect farmers and ranchers. Winter snowpack is an important source of water throughout the year, feeding our rivers and streams as it slowly melts. Snowpack has decreased in size by over 60% in the last 50 years. It is also melting off much faster: on average 10-15 days earlier than 50 years ago.

Rising temperatures will also reduce the soil absorption of precipitation, which would harm dry land farmers most severely. Models have shown that in arid states like Montana, significantly more land will require irrigation to sustain a crop by 2090. Not only will the costs for expanding irrigation infrastructure be significant, but as water supply decreases, irrigation will become more difficult.
SEVERE STORMS

While it’s true that no one weather event is directly caused by climate change, storms in a warming world carry with them more energy and, therefore, pack a bigger punch. But as the climate changes, so too will the weather, and our weather is expected to become more extreme: weather events, such as floods, severe storms, and hail will increase in both frequency and intensity. Montana alone had 20 climate and weather disasters, each with damages exceeding $1 billion, since 1980. This number is expected to rise, and the agriculture sector will likely absorb the majority of damages.

- In 2013, one hail event in the Gallatin Valley leveled crops and cost an estimated $50 million in damages.

WEEDS, PESTS, + DISEASE

have geographic or environmental ranges. As temperatures rise and precipitation patterns change, most pest species will either move or extend their ranges in order to survive changing conditions. These events will leave Montana farmers fighting a changing landscape of weeds, pests and disease. This could, in turn, cause a decrease in crop yields and an increase in the costs for pesticides and herbicides.

- Montana State University researchers have already found that cheatgrass grows better with warmer temperatures and with more CO2 in the atmosphere.

“Family agriculture in the U.S. has much to offer in the fight against climate change, but our farmers and ranchers need policy support from the federal government in order to make their best contributions. NFU stands ready to offer any support and assistance CEQ may find helpful on this or related matters” – NFU President Roger Johnson.

For generations, Montana farmers and ranchers have brought forward a strong work ethic, a deep connection to the land and a spirit of innovation that has shaped the character of our state. As the impacts of climate change mount, producers will need to be armed with the latest research, information and tools to mitigate the adverse effects, adapt to the changing conditions and continue providing a safe, reliable and healthy food source for the world.
Sources:


