SCIENCE SPOTLIGHT

POTATO PERILS

GEN ACTION

This project was undertaken with the financial support of the Government of Canada.

Canada

discovery centre

Potato Perils

Origin Story:
THE STARCHY CHRONICLES

Picture this: a sizzling plate of golden French fries, crispy on the outside and fluffy on the inside. They are everyone's favourite snack, but did you know climate change could put our beloved fries at risk? The changing climate is causing shifts in weather patterns and as a result causing damage to potato farms. This damage can affect how many potatoes we harvest in the coming years, which means less French fries on our plates!

Ensuring we have enough potatoes to eat is important for food security. Food security means that people have access to enough food that they need, whether they grow it themselves or buy it from a store. Canada is one of the best countries in the world for producing lots of potatoes! And guess what? Even though it is the smallest province, Prince Edward Island (P.E.I) grows the most potatoes in the country. They produce about 25 percent of all the potatoes in Canada! So, even though P.E.I is small, it is a major champion for growing this nutritious vegetable.

Potatoes grow so well in P.E.I because of its special red soil. This soil is unique because it has lots of iron in it, which helps the soil hold more water so potatoes can grow even better! Growing 25 percent of Canada's potatoes is a big job. Maximizing potato harvesting in P.E.I. is crucial to their economy. It also ensures that Canadians have access to enough food. Recently, local P.E.I farmers have been more and more concerned about the unpredictable changes that are occurring due to climate change and wanted to find ways to predict how these changes would affect their potato harvesting in the future.

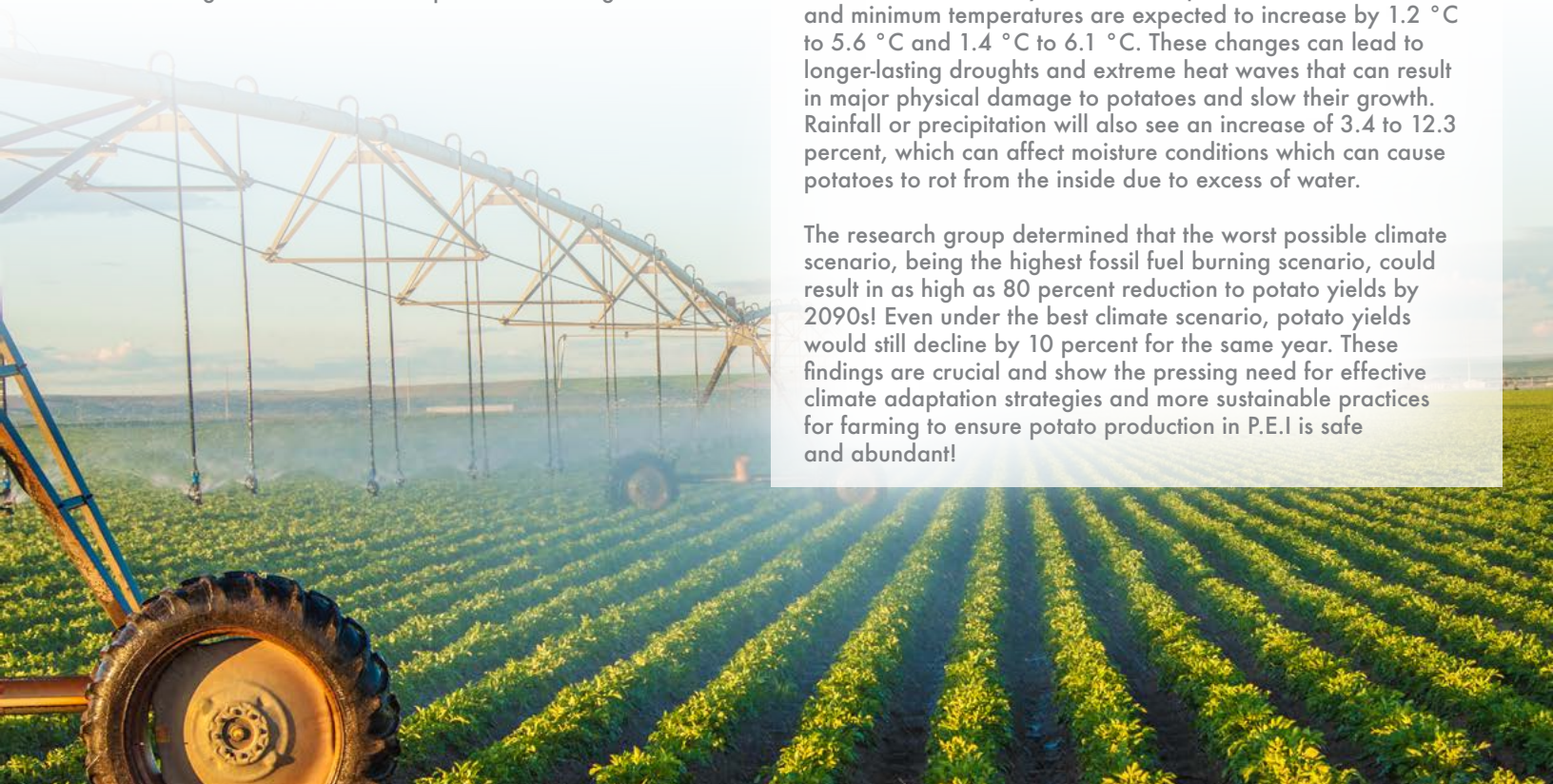
Sowing Seeds of Change:
INVESTIGATING CLIMATE EFFECTS ON POTATO FARMS

Dr. Xander Wang and his team worked on a project to see how climate change could affect potato farming in P.E.I. To do this, the research team collected necessary information from all over P.E.I, including the data on soil quality, weather patterns, and farmers' cultivation process for their potatoes.

Then the scientists used this collected information in the computer program called Decision Support System for Agrotechnology Transfer (DSSAT) under the Coupled Model Inter-comparison Project Phase 6 (CMIP6) climate scenarios. Using modelling systems, scientists can see how potatoes grow under different climate conditions. The scientists looked at five different climate scenarios or Shared Socioeconomic Pathways (SSPs). SSPs are predictions that depend on a range of factors like human activity and choices, economy, environmental action, amount of burning fossil fuels, and many more. These pathways allow predicting what can happen in the worst-case or best-case scenario.

Under a scenario that involves a lot of fossil fuel burning, the research team observed significant declines in future potato yields. As fossil fuels burn, they release more carbon dioxide (CO_2), a greenhouse gas, into the air. This greenhouse gas traps heat in the atmosphere and causes global temperature rise. In the period from 2050s to 2090s, the CO_2 concentration can see an increase by 2.4 to 140.9 percent, while maximum and minimum temperatures are expected to increase by 1.2 °C to 5.6 °C and 1.4 °C to 6.1 °C. These changes can lead to longer-lasting droughts and extreme heat waves that can result in major physical damage to potatoes and slow their growth. Rainfall or precipitation will also see an increase of 3.4 to 12.3 percent, which can affect moisture conditions which can cause potatoes to rot from the inside due to excess of water.

The research group determined that the worst possible climate scenario, being the highest fossil fuel burning scenario, could result in as high as 80 percent reduction to potato yields by 2090s! Even under the best climate scenario, potato yields would still decline by 10 percent for the same year. These findings are crucial and show the pressing need for effective climate adaptation strategies and more sustainable practices for farming to ensure potato production in P.E.I is safe and abundant!



Potato Power:
GROWING FOR A GREENER FUTURE!

Are you ready to become a Potato Power Champion?

Let's have fun while learning about sustainable food choices by growing our very own potatoes and see how we can positively impact the environment.

What you will need: a pot that is at least fifteen inches deep, a sprouted potato, soil, water, and a sunny spot. You will want to fill the pot with some soil and then dig out a section where your potato will go. Once planted, cover your potato with one to four inches of soil. Make sure your pot with potato receives at least six to eight hours of sun daily. Water your plant regularly, about every two or three days, but it is key to monitor how damp the soil is, if there is too much water or if the soil is too dry in your pot, the plant will not grow well. Harvest potatoes any time after the plant has flowered.

By becoming your very own potato farmer, you are gaining cool gardening experience and helping the environment. Potatoes are a sustainable crop because a lot of them can be produced in a small area of land. They also use less water than other crops, especially if you use P.E.I soil, their soil is enriched with iron allowing for better water retention and makes it easier for them to grow. Finally, potatoes can be stored for a long period of time, reducing food waste as they can last longer than most crops.

TAKING ACTION FOR A COOLER PLANET!

Become a climate hero and help your community reduce climate change's impacts on potatoes! Here are some exciting things you can do.

Support local farmers! Buying food from local farmers' markets is valuable because these farmers work hard to provide delicious food we eat every day. Since it takes lots of time, money, and resources to grow food like potatoes and other crops, it is also important not to waste your food! We should be mindful of how much food we buy and only take what we will finish.

Grow your own food! You can start your own school garden and see what type of fruits and vegetables your school can grow using eco-friendly methods. This can teach you how to grow and appreciate your food. You can even start a composting program alongside your school garden to turn food scraps into nutrient-rich soil for your garden.

Lastly, spread the word, talk to your friends and family about climate change and how it affects potato farming. Encourage them to take small actions to reduce their carbon footprint, like drying clothes in the sun or walking instead of driving short distances. By taking these small, simple steps, we can make a big difference and help protect our planet. Together we can make our world a better place for everyone!

MEET OUR LOCAL SCIENCE HERO:

Dr. Wang is an Associate Professor at the *School of Climate Change and Adaptation* at the University of Prince Edward Island (UPEI).

What do you enjoy most about your job?

I really enjoy training the young generations to understand the science of climate change and inspiring them to develop new technologies and tools that can help address climate change and build a climate-smart future.

Why is this research important?

In recent years, the erratic weather patterns have caused significant damage to potato production in P.E.I. The potato farmers are now extremely concerned about the prospects for the future of the potato farming industry in the context of climate change. This research provides science-based information about the potential impacts of future climate change on potato yields in P.E.I under different climate scenarios. The results suggest that potato production in P.E.I is likely to expect significant declines in the context of global warming, as more drought events would occur in the growing season.

This implies that it is important to develop effective climate adaptation measures (e.g., adjusting farming practices and introducing supplemental irrigation plans) to ensure the long-term sustainability of potato production in P.E.I.

This Science Spotlight was written based on Adekanmbi Toyin, Xiuquan Wang, Sana Basheer, Rama Ali Nawaz, Tianze Pang, Yulin Hu and Suqi Liu. 2023. *"Assessing Future Climate Change Impacts on Potato Yields – A Case Study for Prince Edward Island, Canada."* Canadian Centre for *Climate Change and Adaptation, University of Prince Edward Island. Foods*, 12(6) 1176 https://doi.org/10.3390/foods12061176

Climate Change
Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

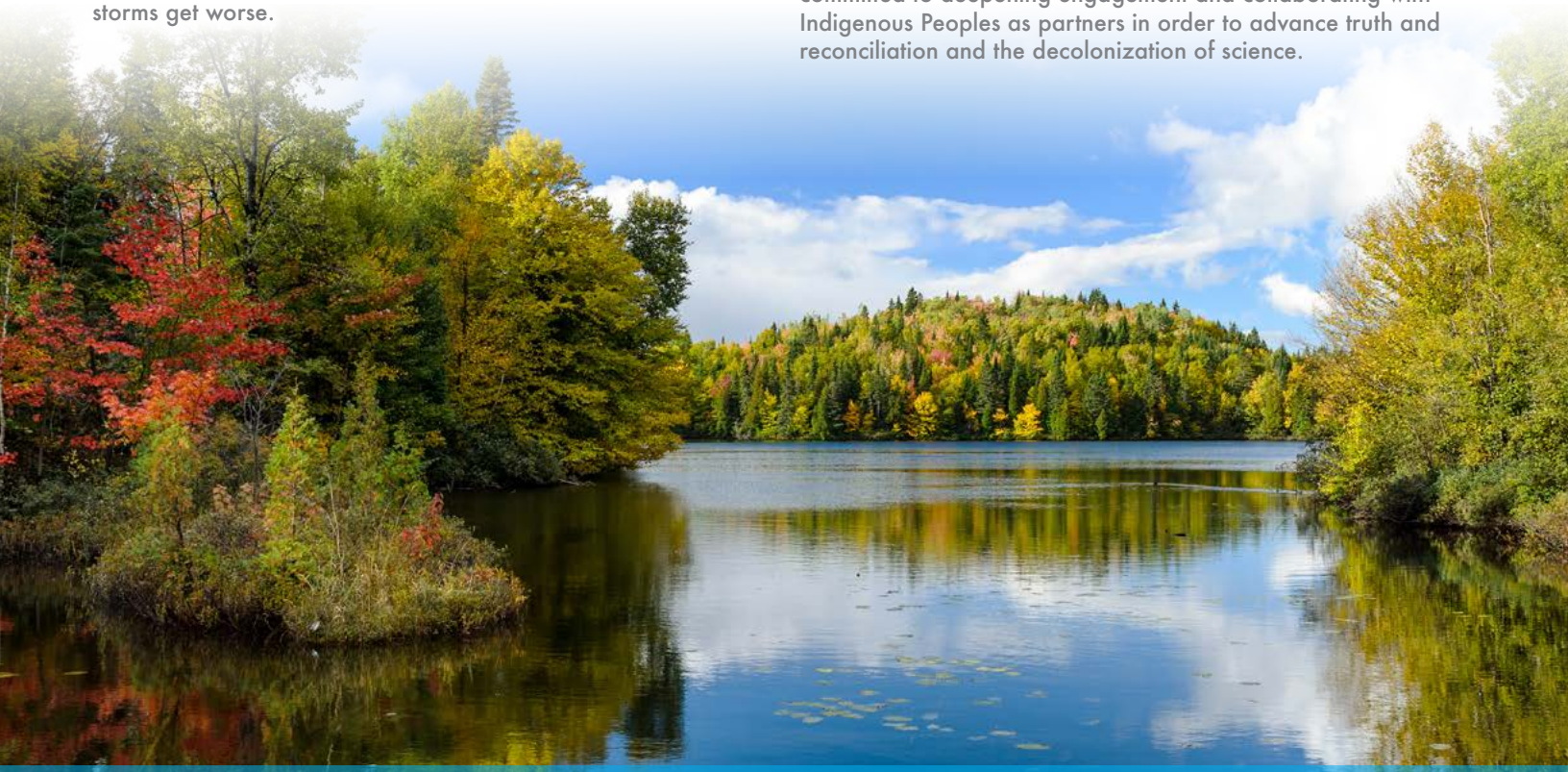
Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.
Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.



Climate Change: Past, Present, and Future is based on...Delmotte, Masson, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, et al. 2021. "Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change." Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.