

# CROPS IN CONTAINERS



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### Origin Story: Where Do *Your* Fruits and Vegetables Come From?

Where do you get your fruits and vegetables? Many people in Canada can choose from a variety of fresh produce from grocery stores or farmers' markets. But many communities do not have access to fresh fruits and vegetables year-round. Why? Some communities have limited farming options because of extreme temperatures, poor soil, and limited space. It is hard to farm on a frozen tundra, a sandy desert, or a tiny space station! As a result, many communities have to import their fruits and vegetables from a long way away.

When fruits and vegetables have to travel for a long time, it can cause several problems:

- Produce is more likely to go rotten soon after it arrives.
- More greenhouse gases are emitted during transportation.
- Not all types of produce can survive the journey, so there is less variety.
- Produce is expensive since transportation costs more.

Climate change is making this an even bigger problem. Weather is more extreme and soil quality is diminishing, so fewer communities are able to rely on traditional farming. How can we make sure every community has access to a variety of fresh fruits and vegetables year-round? One idea is to build new types of farms...but not the large outdoor farms we are used to. Instead, imagine small farms grown in a large box.



## Containerized Food Production A Big Idea in a Small Space

Just like the name suggests, a containerized food production system is a method of growing food in a container! Any container could be used, though shipping containers are a popular option.

Container farms have many potential benefits for a community that has to ship in food from far away:

- Indoor growing. Crops can be grown year-round since they are indoors. This is especially important in winter when fresh produce is not available.
- Installed anywhere. The container can be placed anywhere in the community where it is allowed. Installed within a community, container farms provide fruits and vegetables close to home. This is convenient for the shoppers (short travel time!) and for the produce (stays fresher longer!).
- Flexibility. The community can decide what to grow and when. They control the conditions inside the container.



Image courtesy of ColdAcre Food Systems (https://coldacre.ca/)

Container farms have a lot of potential, but they are still not a practical option for many communities. There are challenges that need to be solved first:

•Limited crop choice. Currently, the crops that grow best in container farms are fast-growing and have shallow roots. Leafy greens like lettuce, spinach, and herbs are great options for container farms. High-calorie essentials like corn, wheat, and potatoes still need to get delivered. The other major problem is that many people do not want leafy greens. They would prefer other options.

•Constant high energy needs. Keeping a container heated and lit at the right conditions to grow crops takes a lot of energy. Each container requires as much energy in one day as four homes, and the energy must run every hour of every day. This is a problem since many communities do not have access to reliable energy. Also, many remote communities use diesel power – which is bad for the environment.

•Expensive! Right now, most container farms are not profitable businesses. They cost more to operate than they make in food sales. This is due to the high energy costs, the high cost of setting up a container farm, and the cost of replacement parts.

### Working on Solutions in the North

Many Northern communities cannot support large farms because of the extreme weather, short growing seasons, and frozen soil. For generations, many communities have survived by growing some seasonal foods, hunting, and fishing. But today there is increasing demand for a larger variety of storebought food. This needs to be imported and is often transported over long distances. Northern communities have limited fresh produce options available to them, especially in winter. The produce that is available, is usually not very fresh, is expensive (thirty dollars for a bag of grapes or a bag of salad!), and comes with a high environmental footprint.

<u>Ag1054</u> (https://ag1054.ca/) is a containerized food production system found in the Yukon Territory on the Kluane Lake Research Station run by Dr Henry Penn, Dr Craig Gerlack, and Alex Wilkinson. They are using their container farm to grow leafy greens for their community. They are also studying how to improve container farms in Northern communities. They want to make them more efficient, more adaptable, and better for the environment.

They are experimenting with different types of growing systems to provide more choices for local consumers. They want to provide such things as cucumbers, zucchini, and tomatoes, as well as leafy greens. Ag1054 is experimenting with solutions to power the container using renewable energy. Currently, the container is powered by a combination of solar panels, batteries, and diesel fuel. It is able to run off of solar energy in the summer, but still requires diesel power in the wintertime. In the future, they would like to test alternate energy sources like solar hydrogen.

Finally, the Ag1054 researchers are working hard to find solutions to uniquely northern problems. They want to make their containers durable enough to withstand extreme winters. They are also working on updating the technology to make it easier to fix and upgrade. This is important when the nearest hardware store is hundreds of kilometres away.

### It's All About Options

Where do you get your fruits and vegetables? In your community, you might see farming, grocery shopping, gardening, or foraging. Unfortunately, climate change is threatening how communities get their food. This is a scary problem because everyone needs to eat. Despite some challenges, container farms have the potential to offer cheap and eco-friendly fruits and vegetables year-round. They are one more option helping to make our communities more resilient to climate change while making sure we can get the food we want and need.



# Try This at Home:

### **Grow Your Own Food**

The biggest benefit of container farms is that fresh fruits and vegetables can be harvested year-round from a local source. This helps keep price and the carbon footprint low!

The ultimate locally grown food is food grown at home! Check out <u>the "I love to Garden Program Manual</u>" from Ottawa Public Health to find out how to build an indoor container garden from a plastic bottle or grow new plants from food scraps. Then, use your home-grown produce to create delicious recipes!

# Climate Action: Eat Local!

How can you contribute to a resilient, diverse, and ecofriendly food system? Supporting locally grown food is a great place to start.

•<u>Use local produce</u>. At the grocery store, look at the packaging and find out where the food came from. Can you pick food that is grown nearby instead of far away? You can also get local produce by hunting, foraging, shopping at farmers' markets, or subscribing to a local farm to get a share of their harvest (this is called community-supported agriculture).

•Inspire your community to eat locally grown food. Talk to family and friends about growing vegetables at home or in a community garden. Does your school provide lunches? If so, ask your teachers where the produce comes from, and encourage them to buy local when possible.

•<u>Grow your own food</u>. Do you have room for a pot on your kitchen table or a backyard garden? Food grown at home is as local as you can get!



This Science Spotlight was written based on the ongoing work of Dr. Henry Penn, as well as Alex Wilkinson, Craig Gerlach, Meriam Karlsson, and Henry Penn. 2021. "Controlled environment agriculture and containerized food production in northern North America." Journal of Agriculture, Food Systems, and Community Development, 10(4): 127 – 142. https://doi.org/10.5304/jafscd.2021.104.001

# 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.

