

Feeding

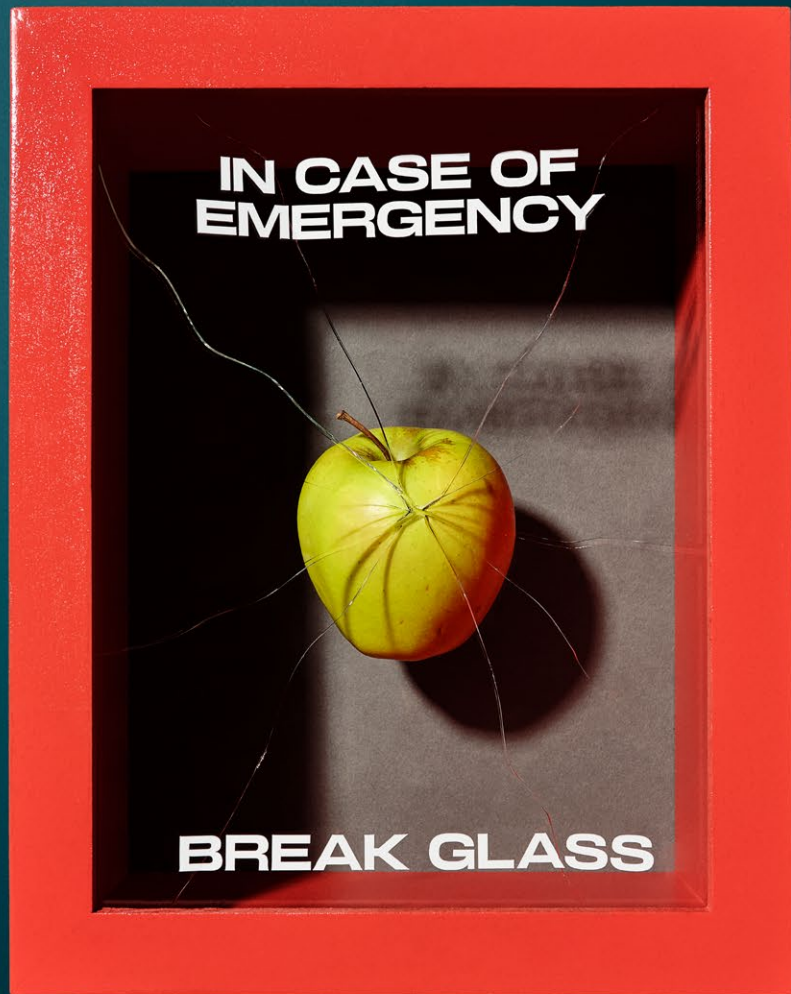


PHOTO BY SARAH WRIGHT

change

Feeding

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The host calls out. *Dinner is ready.* It's that time of year when potluck celebrations and food-filled gatherings take over.

Someone roasted a turkey. Around it, the table fills with favourites—latkes with sour cream, kebabs, Singapore noodles, bannock, lasagna, sushi—and, of course, the requisite veggie tray.

Plates are filled and everyone finds a spot to sit—on chairs, couches, the stairs—while others stand, balancing plates and cutlery as best they can.

There's small talk, maybe a bit of political debate. But no one is talking, or even thinking, about how the food is grown and produced, where it comes from or what it will take to keep it on our tables in the future.

Every bite on that buffet arrived through a complex mix of science, politics, history, economics and global supply chains, all now being reshaped by the biggest influence of all: climate change. Hunger is rising worldwide, billions lack regular access to safe and nutritious food and nearly half of what's produced in Canada ends up wasted.

Western researchers are tackling every part of the food system, from growing and distributing to improving nutrition and cutting waste. It won't happen overnight, but their work is a 'back to our roots' effort to reshape how we grow, share and sustain food for generations to come.



Photo by Sarah Wright

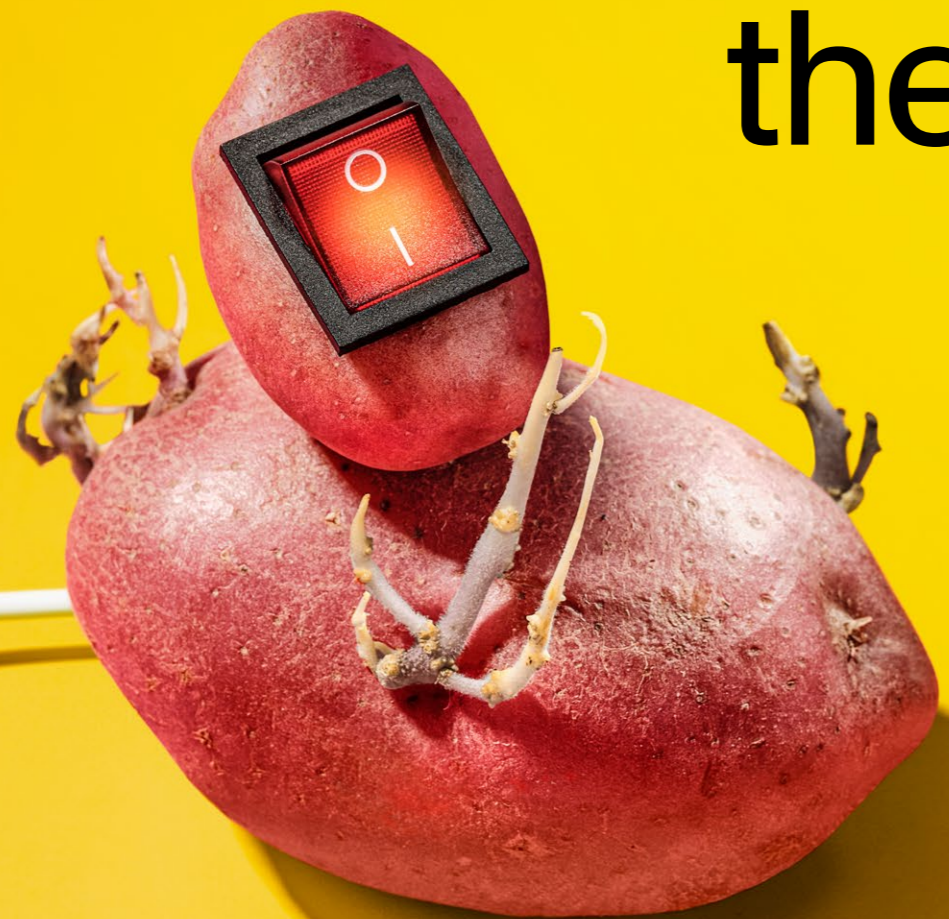
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The ingredients of our food systems—climate, culture, technology—are shifting fast. Bold ideas and innovation will define what's next.

change

Farming

From gene-edited potatoes to solar-powered growing systems, researchers are engineering crops and environments to withstand a changing climate.



the

future

Story by Jeff Renaud
Photo by Sarah Wright

North of the Arctic Circle—buried 100 metres deep into a remote Norwegian mountainside—the Svalbard Global Seed Vault safeguards more than 1.3 million seed samples, conserving 13,000 years of agricultural history.

Providing long-term, climate-controlled storage (-18 C) for samples of seeds from around the world, Svalbard secures the international food supply against war, sabotage, disease, severe weather and the most probable: human mismanagement (epitomized in the 1840s with the Great Irish Potato Famine and the death of one million people). The Global Seed Vault, completed in 2008, was entirely funded by the Norwegian government for approximately \$12 million and yet storing seeds there is free.

While it may sound like an elevator pitch for the next Christopher Nolan blockbuster, it's all real and unfortunately, these seeds may be needed far sooner than anyone involved in the project ever expected. The climate crisis and its consequences on food security loom large, but mass insect infestation or fungal, viral or bacterial plant disease also pose significant threats to the world's agriculture. In fact, one country has already made a potentially population-saving withdrawal from the seed vault's collection.

Scientists from the International Center for Agricultural Research in the Dry Areas (ICARDA) retrieved seeds from Svalbard during the Syrian civil war in 2015. They wanted to regenerate new samples in Morocco

and Lebanon in case Syria's seeds were destroyed during the conflict. The toll didn't reach the level of annihilation predicted and crops continued to grow, but the effort proved saving seeds for the future is one solution to food security when faced with a real-world threat. Why? Because it all starts with a seed.

"No seed, no food. That's the easiest way to put it," says Isaac Luginaah, co-director of the Western Centre for Climate Change, Sustainable Livelihoods and Health. "If you don't have viable seeds, you're toast. And if you have the wrong seeds, you're toast. And if seeds cannot grow in available soil and conditions, you guessed it, you're toast."

You're also toast if you can't physically get to the seeds tucked away in Norway for safekeeping. Like most things in life, there are haves and have-nots. While Luginaah concedes the seed vault is a solution for some (let's call government, big business and even academia the haves), the have-nots are going to be left high and dry. Pun intended.

"Do you really expect them to have every single seed from every single unique variety from every single growing condition and climate?" asks Luginaah, a geography professor. "Even if they do, how is a farmer from my small village in Ghana going to ever know they exist or, more importantly, have access to getting some? It's a solution for some but not the many."

For the past decade, Luginaah and his collaborators, many based in Africa, have used traditional agroecological practices to help growers mitigate challenges caused by climate change and government programs like mono-cropping—planting and growing the same crop, year after year, on the same plot of land, without crop rotation or diversity. These programs are intended to help farmers, but in the long-term, end up hurting them and the people they feed.

One solution Luginaah and his team have proposed is promoting traditional social networks that farmers keep between family, friends and neighbours. Everyone shares

seeds, which inherently boosts crop diversity. It works, but not everyone has a social circle with which to share. It also leaves the network vulnerable. If drought or flooding occurs, it likely means those closest to you are also affected.

Luginaah believes there's an even simpler approach—one that's available in each individual farmer's parcel of land. The idea, he says, doesn't cost any money, requires no government support or new expensive technologies, and it could start, literally, today.

Many, if not all, smallholder farmers do the same things: they cultivate their gardens with mulch or fertilizer, they grow, they harvest, they eat, they throw out any organic residue (straw, sawdust, wool and manure)

and compost what they can. All in the same field. Luginaah doesn't want them to change a thing. Just do the steps more methodically. With purpose.

The living labs Luginaah and his team have planned, starting with a project in Malawi, would test different approaches of agroecology like composting or intercropping (the practice of growing two or more crops simultaneously) in isolated plots within each field. Then farmers plant the same crop in all plots, water, watch and learn.

"If Malawian farmers track growth and yields, they'll know what works best where," says Luginaah. "And if they adopt this method, the benefits could be boundless."

Imagine which threats can be avoided if farmers simply knew the ideal growing conditions to maximize yields of a specific crop. It ensures the farms are far more resilient—a magic word when it comes to food security.

Luginaah is passionate about supporting smallholder farmers because such approaches can be easily scaled and shared with an open-source ethos across the continent and around the world.

"They don't have to rely on foreign or private investment or new, expensive infrastructure. They just need to modify the way they do things, slightly, and we think the results will be well worth it," says Luginaah. "It's a simple solution to a big problem."

If these new methods prove successful, the next stage may be super-sizing what local farmers can actually grow in their experimental fields. Globally, the "big four" crops (corn, rice, wheat and potatoes) alone account for almost 60 per cent of the world's calorie intake. The downside is these foods aren't very nutritious. Foods like salmon, kale and berries are more nutrient-dense options, providing more vitamins and minerals. These help you feel full with fewer calories, and are essential for disease prevention, weight management and overall health.

Potatoes, the only non-grain in the group, are the most nutritious—rich in carbohydrates, potassium and vitamin C—but are also high in sugar and starch. What if their nutrient density could be supercharged? And what if they were easier to grow and more resilient to climate change, drought and disease?

Traditionally, generating new crop varieties with these characteristics takes generations of plant breeding efforts. Schulich School of Medicine & Dentistry's Bogumil Karas dreams of a far more targeted approach, one confined to science fiction novels he read as a child growing up in 1980s Poland.

The recipient of a \$1.5-million grant from the Advanced Research and Invention Agency (ARIA), the U.K.'s research and development funding agency, Karas and his team are designing and building new plant chloroplasts—microscopic compartments of a cell that act like solar panels, turning sunlight into the energy plants need to grow. For now, he's working with potatoes (other fruits and vegetables are on the horizon) to provide enhanced traits like resiliency and nutrient density. How do they do it?

Working in Western's Biotron Experimental Climate Change Research Centre, Karas and his team are harvesting plant cells from Desiree potatoes (the popular, red-skinned variety) to create protoplasts, "naked" cells with the cell walls removed, so DNA—with the new desired trait—can be easily delivered. The new cell then regenerates into the plant.

The end goal—representing ARIA's overall mission for this project—is to create new technologies that can be applied to various crops and generate variants for different purposes, like adding nutrients or making plants self-fertilizing.

"Once we fully understand the function of each gene, rewriting DNA would allow us to create hardier, virus-free potatoes, or whichever plant or vegetable you choose, modified to thrive in different climates and resist diseases and pests," says Karas, a biochemistry professor.

Like Luginaah, he doesn't necessarily want to rush new technology into the fields.

"We are in a unique era where we can start creating life from scratch," says Karas. "But just because we can, doesn't mean we should."

ARIA-funded initiatives involve consultation with independent bioethicists who examine a range of social and moral considerations around synthetic biology and what's needed to introduce them into native soils.

"As we develop this technology, we need to be asking key questions," says Karas. "Who will own the seeds? What impact will the new potato have on the soil? And how easily will farmers in small towns be able to access this new variety? We need to ask these questions before we get to the end, because then it will be too late."

Sure, ethics and due diligence may offset speed of development, but the project remains a climate change-busting alternative to traditional plant breeding techniques. And while it's early days, Karas and others clearly have a plan for making a potato—already considered a robust and adaptable plant—capable of growing in a wide variety of soils and climates.

But potatoes still require the five essentials of growth: air, water, nutrients, space and sunlight. If one or more of these are missing, to quote Luginaah, "You're toast."

Not necessarily, says Joshua Pearce. What if we bring the climate and the right conditions directly to the plant? That's exactly what he's doing with the Western Innovation for Renewable Energy project.

Pearce, the John M. Thompson Chair in Innovation at Western Engineering and Ivey Business School, and his Free Appropriate Sustainable Technology research group have developed a net-zero energy farm that extends the growing season for berries and leafy greens like romaine lettuce and Swiss chard (all packed with vitamins, minerals and antioxidants) and is already greatly exceeding average traditional agriculture yields both indoors and outside.

Pearce's latest project shows yields of more than 200 per cent above the average for romaine lettuce grown outdoors. Indoors, 1,000 square feet have the same output as 10 conventional acres of farmland per year. The award-winning system strengthens food security and sharply reduces the impacts of flooding, drought, pests and disease.

"We absolutely annihilated our controls. We just had a super-hot summer in Ontario and lettuce doesn't like that, but the ones we planted under solar panels survived and thrived," says Pearce.

The future-proof farm combines solar photovoltaic panels shielded outdoor with an agrotunnel, an indoor growing system that houses vertical aeroponic (growing plants in the air) and hydroponic (growing plants in water) units that use high-efficiency, spectrally optimized LED grow lights.

"Our solution provides an extremely high-density, resilient method to obtain year-round healthy fruit and vegetables at a minimum production cost," says Pearce. "The system is modular, scalable and adaptable to various locations and extreme climate conditions."

What if the nutrient density of potatoes could be supercharged? What if they were easier to grow and more resilient to climate change, drought and disease?

The system is built on agrivoltaics, a fusion of 'agriculture' and 'photovoltaics.' While harnessing solar energy, arrays of panels are also used as shields to protect the outdoor plants from extreme weather, creating a microclimate to conserve water. Equally important, photovoltaics also provide all the electricity needed for the agrotunnel to run the lights, water pumps and heat pumps used for heating and cooling.

Inside the climate-controlled agrotunnel, berries and leafy greens are monitored with artificial intelligence, including computer vision systems, to identify disease and ripeness, measure moisture, carbon dioxide levels and high-energy efficiency. Food crops are also tested and monitored in outdoor agrivoltaics systems under different transparencies, colours and types of solar cells to find optimal conditions for outdoor growth.

All of this makes the agrivoltaic agrotunnel an ideal environment to further Karas' innovative work with potatoes and other synthetic plants, as prime growing conditions can be created despite what's happening in the great outdoors.

"We're seeing higher and higher temperatures. This summer, we had to pause our traditional greenhouse experiments because it was just too hot. So yeah, we have a problem," says Pearce. "We can assume temperatures will continue to rise, so what does that mean for growing? It's almost all bad. Anything temperature sensitive, like lettuce and strawberries, is in real trouble."

"Clearly, the future of growing must include protecting our food in some way. Whether it's in a traditional greenhouse, an agrotunnel or shading with solar panels. By far the most profitable way is agrivoltaics. Just cover your fields with solar panels in a way that's ideal for that particular crop in your location, then earn money off higher yields and solar electricity."

Sow the seeds. Genetically modified or otherwise. And reap the harvest. ●



The Svalbard Global Seed Vault, Feb. 2025.

Politics of

the



How climate, capitalism and inequality are reshaping agriculture and why local, inclusive approaches may be key to food security.

Story by Megan Stacey
Photos by Sarah Wright

plate

It was hailed as the “miracle crop” of the Andes, a nutrient-packed plant that’s naturally gluten-free and can grow amid frost and drought.

But when quinoa rocketed to popularity, adorning salads and grain bowls all over the world, its cost followed suit. Surging prices brought prosperity for some farmers who’d been growing it for centuries, but also introduced brokers and larger growers who dominated production, sometimes degrading soil and straining already scarce water supplies.

The powerhouse product once championed by the United Nations during the “International Year of Quinoa” in 2013 became both a success story and cautionary tale.

It’s a lesson in the power of food—and the risks inherent in our agricultural systems. As weather fluctuates and climate change intensifies, those consequences become more dire. “Food is one of the most fundamental starting points for thinking about many of the biggest challenges we face in the modern world,” says geography professor Tony Weis, an expert in global food systems and industrialized agriculture.

From climate change and corporate monopolies to discrimination and disease, food is entangled with the trickiest problems. “It’s a potentially powerful window into the problems as they exist now, but also the possibilities for change,” Weis says.

There is no miracle crop that can ensure every farmer is paid fairly or equalize access to healthy food. It’s about local realities, and solutions that work for the people eating and growing there. No one-size-fits-all solution will answer for the problems—and possibilities—seizing our food systems.

“We can’t go about building our economy while destroying the environment. We also can’t have a world that is grossly unequal. I want to live in a world with economic security for everyone,” says Bipasha Baruah, a Western Research Chair and professor of gender, sexuality and women’s studies. “So, how do we balance it all?”

The time for perfect or “morally pure” options is long gone, says Baruah, who specializes in interdisciplinary research at the intersections of environment, economy and equity. She wants to see creative ideas eagerly accepted and tested. “It could be a crop introduced in a different way. It could be a social form of innovation. We need to understand how an idea interacts with the local system. That’s why we need out-of-the-box thinking.”

Crops like corn, rice and wheat dominate much of the world’s food supply, but others are hardier and more climate resilient.

“It’s disturbing how narrow our food choices and availability are on the global scale,” Baruah says.

She works in Rajasthan, India, a desert state that’s become even drier due to infrequent rain. Decades ago, government incentives spurred farmers in the region to grow rice and wheat. This change curbed the use of traditional crops like barley and millet, though these higher-protein plants were better suited to the local vegetarian diet.

Food security improved as local producers began to use high levels of irrigation, pesticides and fertilizers. The government bought rice directly from farmers at a good price, converting the remaining barley farmers.

“Over time, barley almost died as a crop. Now, more recently, they’re discovering it can actually grow in drier soils and produces a better yield. So now we need to change other infrastructure—governments need to start developing models where they acquire barley,” she says. “People tend to think of food crops versus cash crops: rice versus rubber, lentils versus coffee. But you can have food and cash crop in one, like barley.”

Its growth in Rajasthan even allowed beer companies in India to use local products, rather than importing barley. Why bring in what can be grown locally? “Here is a crop that you can eat and sell. You can even feed the residue of the plant to cows and goats, which produce milk. It’s a little ecosystem,” Baruah says.

Those crop swaps and projects that challenge the status quo are urgent, Weis says. “Agriculture and food systems need to dramatically change to mitigate or reduce the extent of climate change in the coming years and decades,” he says.

“One of the core problems is the massive land use required to grow and raise the food we eat, particularly livestock,” Weis adds. “If we were to meet our nutritional needs more efficiently, we could conceivably return huge amounts of land to natural habitats, which would simultaneously enhance the conservation of biodiversity and the sequestration of carbon.”

Farmed animals control more than 75 per cent of all land devoted to producing food, between grazing and feed crops (led by corn and soybeans), but provide under 20 per cent of the world's calories.

Many consumers have little sense of how their beef and bananas are produced or where they come from. That contributes to the problem, says Weis. "A lot of people don't appreciate the extent to which agriculture bears on climate and other environmental challenges. They go into supermarkets and see an extraordinary bounty and don't think about where that food has come from or the conditions under which it was produced."

And those overflowing supermarkets belie the reality that interactions between climate change and agricultural systems are making life—and growing—much harder.

"Changes in climate patterns around the world have had such devastating consequences on food security in some countries," Baruah says. She's seeing countries with two growing seasons restricted to one and lack of rainfall in other areas reducing yields by one-third. The implications are enormous.

"The places poised to be hit worse and first by climate change—and those already being hit most adversely—are many of the world's poorest regions, which have had the least to do with causing it," Weis adds.

The ripples of the climate crisis affect more than just the food on your plate or the balance in your bank account. Health, behaviour and performance are also impacted.

"Food relates to so much that determines our quality of life. Half of the leading causes of death are food-related," says Jason Gilliland, a professor of geography who's cross-appointed to Western's School of Health Studies and Schulich School of Medicine & Dentistry. He leads Western's Human Environments Analysis Laboratory, focused on research that helps build healthy, thriving communities. "If you go to school hungry as I did when I was a child, you don't have the energy to learn and play as you would have otherwise. Good food is essential for optimal growth and development, and that means your brain, too."

He points to the need for universal school nutrition programs to fuel and educate kids and teens, so they learn to purchase and prepare foods effectively—ultimately taking a bite out of food insecurity and consequences of ultra-processed diets.

"It all takes knowledge and literacy and skills," Gilliland says. The system isn't built to provide it. Not in schools, and certainly not in the retail landscape, where a handful of large-format grocers have a monopoly.

Half of the leading causes of death are food-related.

The same issue applies to the massive industrial operations that grow most of our food. Even in southwestern Ontario, with its fertile farmland, the majority of agricultural space is devoted to just a handful of crops and livestock species. "Industrial monocultures and livestock operations are extraordinarily resource-intensive," Weis says.

From manufacturing to trucking in seeds, animals, pesticides and fertilizers over long distances, the focus is on producing extremely high yields and using as little labour as possible, Weis says. This approach is environmentally costly, giving big players an advantage and leaving smaller farmers struggling.

"There is a very small group of entities that control a great deal of the power and value in agriculture. Still, we see pockets of smaller-scale farmers trying to do things in radically different ways," Weis says. "Biodiverse farming takes more labour and knowledge, which makes it hard to compete with high-yielding industrial methods."

Though consumers can't change entire systems, there is still value in supporting those 'radically different' farmers through options like community supported agriculture boxes, farm-gate sales and advocacy, Weis says. Shopping local whenever possible, ponying up for fair trade products when it's not and eating less meat are actionable steps for people looking to put a more sustainable dinner on the table.

Weis sees some hope.

"There's lots of evidence that small, more biodiverse farms around the world that use vastly fewer inputs can still generate far more total net nutrition per land area than resource and pollution-intensive monocultures."

Even when people have the desire, having the access or ability to support new farming approaches isn't simple. In many suburbs, a trip to the grocery store can mean driving or taking the bus for kilometres.

"In some areas in London, Ont., public transit takes an hour to get anywhere. People can't shop for groceries that way," Gilliland says, stressing that city design matters. He advocates for a European approach, with small shops selling meat, dairy and fresh produce and walkable markets everyone can access easily and frequently.

Community gardens, shared food knowledge and growing on underutilized city land are other possible solutions to move the needle, Gilliland says. City planning plays a role, too. New neighbourhoods and high-development areas need to be scouted and planned for food—corner markets, retail stores and community gardens. "We need local cooperation and collaboration."

Experts agree there's also a role for governments and other global organizations to play in the future of food.

Subsidies are one tool, incentivizing farming approaches that aren't as environmentally damaging and encouraging producers to grow more sustainable crops. Governments can also buy food directly to support certain practices. But long-standing patterns of agricultural subsidies tend to favour the largest producers, Weis says.

When it's more profitable to grow another product that's shipped across the world, governments can help ensure growers also produce the fruits and vegetables needed for a healthy population, Gilliland adds.

Advocacy organizations fighting for less monopolization and more equitable agri-food systems are pushing for improvements via public policy, another avenue where passionate consumers can lend their voices.

The research and expertise of non-profits, inter-governmental organizations and even the private sector—as is the case with the beer industry in India—can also play a vital role. Their experimentation and guidance can help states determine which successful projects from other regions could work in their own countries, Baruah says.

Take the Food and Agricultural Organization's "forgotten foods" guide, detailing 100 promising crops traditionally cultivated in Africa but now neglected or underutilized. Looking back can give good clues to the future. Whether it's barley in Rajasthan or the African black plum in Nigeria, favouring local and traditional foods can offer better nutrition and more resilient crops.

Food sovereignty—the right to define agricultural systems and have access to healthy, culturally appropriate food—has become increasingly important in the age of geopolitical strife.

Canadians eagerly embraced the 'Elbows Up' mantra and sought to buy fewer American goods after President Donald Trump's repeated tariff threats. Though the context is unfortunate, Western experts agree it's a signal that consumers do care about where their food comes from. "Many of us are now paying attention and making that decision to buy the Canadian product over the Californian one," Gilliland says.

It's especially important among Indigenous communities, where food knowledge is aligned with health, medicine, sustainable environmental practices and connection to the land. Building on this understanding, Western researchers are leading a multi-million project to improve Indigenous food sovereignty for urban residents.

Led by Chantelle Richmond, Canada Research Chair in Indigenous Health and the Environment, alongside Indigenous knowledge keepers, the program is nourishing minds, spirits and reconnecting people with ancestral practices.

"There has been an important shift into research on Indigenous food security and food environments,

The places poised to be hit worse and first by climate change are many of the world's poorest regions, which have had the least to do with causing it.

but a lot of that work remains focused in northern communities or with populations living on reserve and rurally—leaving out Indigenous Peoples who live in urban centres," says Richmond, a geography and Indigenous studies professor. Nationally, more than half of the Indigenous population live in cities. In Ontario, it's about 75 per cent.

In London, Ont., Indigenous residents are 10 times more likely to suffer food insecurity. Traditional foods—and the resources, knowledges and practices so desperately needed to grow, cook or store them—require relationships and belonging, Richmond says. Too often, those connections must be built or rebuilt in urban centres. "This mismatch between need and resources—and the fact that this knowledge is so precious—is what drives our focus on Indigenous food sovereignty in London," she says.

Richmond and her collaborators—her team has partnered with the Southwest Ontario Aboriginal Health Access Centre—are working not just to keep people fed and full, but to reconnect them with culturally relevant practices, such as hunting and gathering in line with the natural cycles of the land.

"Our partnership is critical—as it is the community members themselves who best know what their challenges are, and how researchers like us can support them," Richmond says.

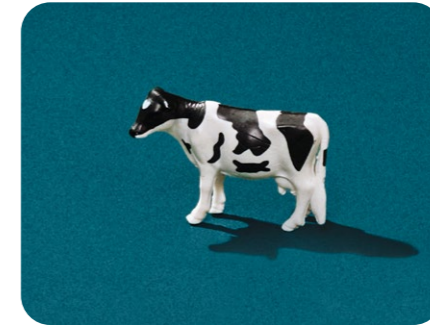
Despite the creative solutions brewing, the path forward remains murky.

"Farming has become an occupation of last resort for people. It's so precarious, and it's become even more so because of climate change," Baruah says. Weis and Baruah agree producers aren't seeing a fair cut of the money made from the foods they grew. Many are now dependent on off-farm jobs. In Canada, less than one per cent of the population now works in agriculture. Yet on a global scale, farming still remains by far the single largest livelihood.

It's especially fraught for women, who make up half of the world's small-scale farmers and an even greater proportion of the agricultural workforce in developing countries. "Women are basically feeding the world," Baruah says.

Yet, they often lack land rights. The inequity can prevent female growers from pursuing the innovative solutions so desperately needed to create fairer, more resilient food systems. The need for visibility and appreciation of all agricultural workers is a broader issue.

"We literally can't live without food. We don't respect farming; we've stopped valuing agriculture. Interest has declined among young people around the world," Baruah argues. Her message is like an echo of the "Farmers Feed Cities" bumper stickers. "We need to recognize and reward farmers," she says. "This is not an industry we should shortchange." ●



What we know, what we eat

Research is proving why food literacy alone isn't enough, and how cost, access and misinformation are shaping what ends up on our plates.

We know we shouldn't be eating junk food. But the fact is, too many of us are.

Canadians are still getting more than half their calories from ultra-processed foods (think packaged cold cuts, chicken nuggets, hot dogs, soda pop and all that stuff in the snack aisles of the supermarket). These mass-produced foods are heavy in salt, saturated fat and sugar. Only 22 per cent of kids are getting their recommended daily intake of what we know is healthy—fresh fruit and vegetables.

There are many reasons—from cost to marketing to convenience—why we so often opt for unhealthy food.

But several Western researchers are working to understand why these foods are chosen so often and designing programs to promote making healthier choices.

One is Danielle Battram, who heads up Western's Brescia School of Food and Nutritional Sciences. Her research focuses on understanding why we eat what we eat (a discipline called food behaviours) and on promoting programs that help children and adolescents understand how to eat healthy.

A registered dietitian, Battram has introduced a number of programs—from school lunchbox information to teaching food skills to teenagers—to help families develop healthy food practices that are easy to embrace.

"We teach them to focus less on trying to adhere strictly to one particular diet and instead to find ways to eat a variety and balance of whole, nutrient-rich foods. A bag of cheese puffs, for example, is not whole, nutrient-rich food."

Battram is working with Growing Chefs!, a London, Ont. not-for-profit organization that provides food education to children, schools and community groups with the goal of getting kids excited about healthy eating. The focus is on promoting local food that's good for you, while keeping things simple and fun. Kids learn where their food comes



You can't put the Mediterranean diet in a pill, because eating healthy is about more than just the food.

from, practise preparing healthy recipes and talk about taste, texture and the cultural aspects of food.

Like Battram, Jamie Seabrook believes this notion of understanding healthy eating and learning how to prepare it is essential in carrying healthy habits into adulthood.

Seabrook is a professor at Schulich School of Medicine & Dentistry. His research has shown the strongest predictor of food skills in university students is learning how to prepare meals during adolescence. Having taken formal nutrition education courses was also very important.

"We call it 'food literacy.' If you're exposed to it when you're young, you're less likely to turn to fast food and pre-packaged meals as a young adult."

Learning about food early can make a difference, but that doesn't always translate into action. Battram says knowledge alone isn't enough.

"We can't assume that lower income families have lower food literacy," she says. "Instead, what we are seeing is a disconnect between knowing what to eat and the ability to eat it."

Seabrook and his team conducted a recent study exploring the factors that influence the consumption of ultra-processed foods in Canada. Aside from food literacy, they also considered the availability of fast-food restaurants versus supermarkets in lower-income neighbourhoods, the cost of pre-packaged meals compared to healthier food and the skills and time required to cook a meal.

Their conclusion: resistance to healthy eating is not just about food literacy or motivation.

Seabrook says price is the core of the problem. In Canada the cost of food rose 19.1 per cent from 2018 to 2022, according to Statistics Canada.

"Food price is the number one determinant of food choice for those living in poverty," says Seabrook. "This is why we need to tackle people's ability to get healthy food, as well as food literacy. Many just can't afford to eat well."

This leads to another crucial factor—food insecurity. The World Food Programme (WFP) defines it as a state in which people don't have "access to enough safe and nutritious food for normal growth and development, and an active and healthy life."

Food insecurity is global, and it's on the rise. The WFP estimates that in 2024, 673 million people experienced hunger. Almost 17 per cent of Canadians were considered food insecure in 2022, up from 13 per cent the year before.

As challenging as the food insecurity problem is, Canada took an important step forward in the spring of 2025 when the federal government made good on a \$1-billion budget promise and launched a National School Food Program to provide meals for up to 400,000 students each year. Prime Minister Mark Carney has since announced plans to make the program permanent. That's good, say advocates, but not enough.

"It's an encouraging start, but lasting change will only come with a universal program that ensures every child, regardless of background, has access to healthy food at school every day," says Seabrook.

But access to food is only part of the story. Equally important is having clear, reliable guidance about what to eat. In today's online world, children and families are constantly exposed to conflicting advice, marketing and food trends that can make healthy choices feel confusing or out of reach.

That flood of misinformation is exactly what Dr. Saverio Stranges, a public health physician and chair of epidemiology at Schulich Medicine & Dentistry, is pushing back against. His research underscores the power of evidence-based eating: plant-based diets rich in fruits, vegetables, fish and healthy fats, like the Mediterranean diet, are proven to reduce the risk of chronic diseases such as cardiovascular disease, stroke and diabetes.

He also looks at the use of dietary supplements in North America. He says the lack of formal nutrition education in schools coupled with a slew of social media influencers touting their products has led to an epidemic of nutrition misinformation.

"One of the challenges in public health is that we live in an era where there are multiple sources of information, including social media and marketing, and people pick and choose what they want to believe, which may not align with current recommendations based on the best available evidence."

He says people are eager to find a quick fix to counteract their unhealthy eating habits—whether that's adhering to a super-restrictive diet or buying supplements online without consulting their health-care provider.

"But you can't put the Mediterranean diet in a pill, because eating healthy is about more than just the food," he says. "It's the social context that's key. The skills you learn, the habits you develop and whether families and communities have the access and support to put those lessons into practice." ●

We throw out too much food, but there are ways to cut the waste and put it to good use.

Scraps and solutions

Story by Alice Taylor
Photo by Sarah Wright

Every day, in kitchens across Canada, a half-eaten meal or a bag of salad greens slips to the back of the fridge. It hasn't gone off yet, but give it a day or two and it will. And when it does, it will end up where so much of our food does: the composter, green bin or, more often than we want to admit, the trash. We may feel a brief pang of guilt as we scrape the dinner plates or tie off the bag, but then we remind ourselves it's nothing compared to the waste produced by restaurants, grocery stores and supply chains.

We're wrong.

Multiplied across the country and around the world, households throw out the equivalent of a billion meals a day, even as hundreds of millions of people go to bed hungry and one in three experience food insecurity. North Americans are some of the worst offenders. In Canada, up to half the food produced for consumption never gets eaten. That's enough to feed every Canadian for five months, or every person in Denmark, Finland and Sweden for an entire year. This waste is not just an ethical failure. It is an economic and environmental failure too. Every time food is wasted, everything that went into producing it is also wasted.

That leftover lasagna you slid into the bin after a long week carries with it the embedded carbon, water, land, labour and transportation that brought it to the grocery store and then your kitchen. If it goes in the green bin, it's turned into compost or renewable energy. But if it's thrown in the garbage,

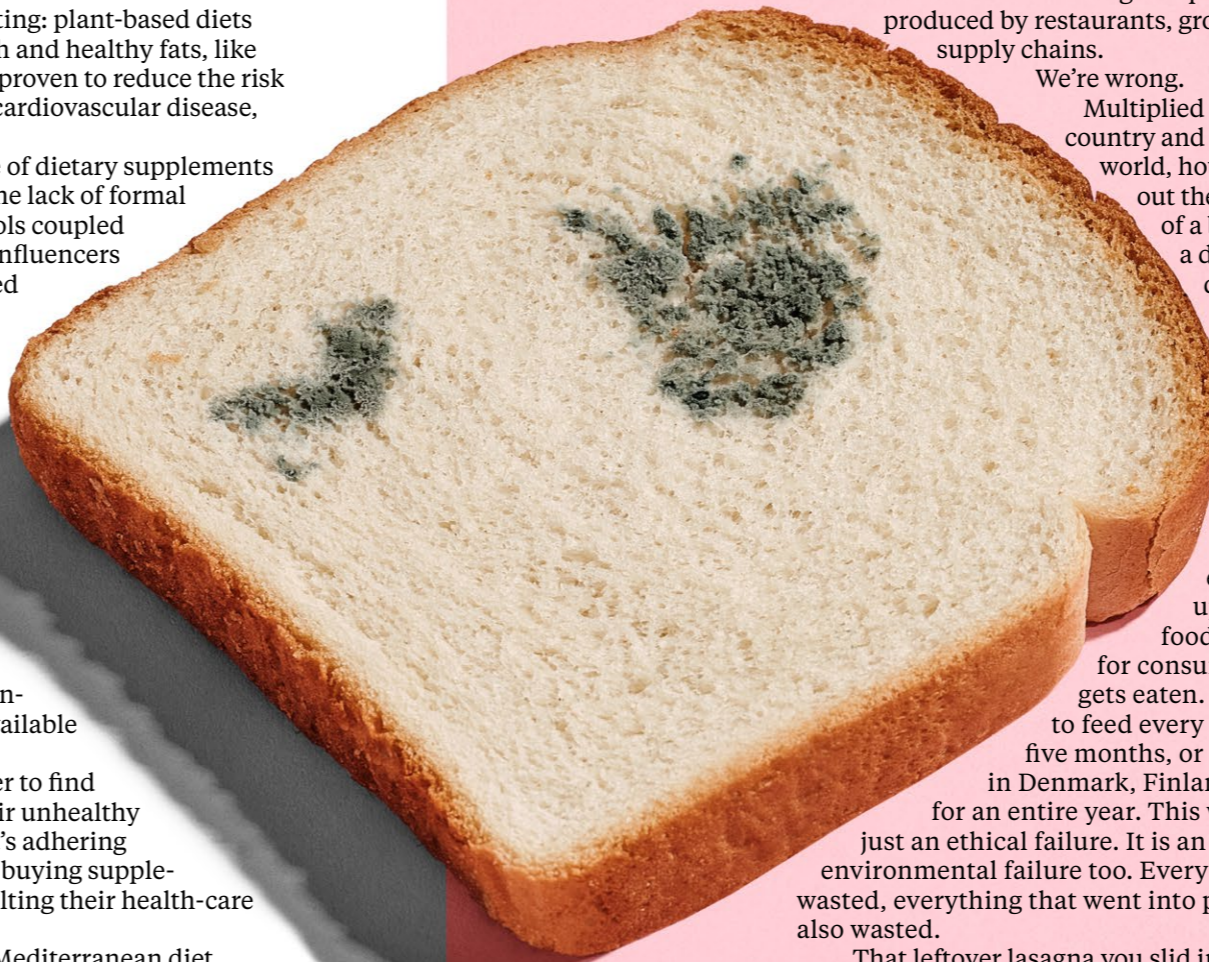
it ends up in a landfill, where it can contaminate groundwater and release methane, most of which won't be captured for energy and will instead be released into the atmosphere.

So, what can we do? This is where Western researchers Latifeh Ahmadi, Paul van der Werf and Naomi Klinghoffer come in, each approaching the problem from a different angle, but with a shared sense of urgency that food waste is both preventable and solvable.

Ahmadi, professor in Western's Brescia School of Food and Nutritional Sciences, sees the home as the front line in the fight against food waste. In Canada and other developed countries, the largest portion of food waste, she says, doesn't happen on farms or in transport, but in our kitchens. "Half of the food we waste happens in a household," says Ahmadi. "Instead of pouring more energy, land, fertilizer and water into producing food, we need to focus on preventing waste."

Worst of all, much of what we throw away is perfectly edible. Ahmadi's goal is to reduce—or, preferably, prevent—household food waste through education and better information. Her advice is simple: plan meals, check what's in your fridge before shopping and know that "best before" isn't "bad after." For foods where there's a safety risk, use expiration dates. Milk can spoil and become unsafe. Yogurt is different—it might taste a little sour, but it isn't harmful even after the date.

She also stresses the value of freezers. Freezing leftovers right away keeps them safe for up to two months, while choosing frozen vegetables prevents spoilage, saves time and money and offers the same nutritional value as fresh produce.



But food waste isn't confined to homes. In a study with her graduate students, Ahmadi found it is also widespread in food services. Their research in a campus restaurant showed dinner generated the most waste, consisting mainly of carbs, while plant proteins were rarely discarded. Waste was especially high among those on prepaid meal plans compared with pay-as-you-go diners. Ahmadi argues the solutions are clear: serve smaller, balanced portions, reduce carb-heavy defaults, improve taste and give students options for saving leftovers.

Ahmadi also sees potential in technology: "AI could automatically measure food waste by comparing images of plates before and after meals. Early tests using phone photos show high accuracy with little effort. With the right tools, this data can drive meaningful change."

Data is at the centre of Paul van der Werf's work. An adjunct professor in the department of geography and environment and in the Ivey Business School, van der Werf approaches food waste like a detective. He audits waste streams, surveys households and uses the data to build a clearer picture of what we're up against.

In a study of more than 1,200 households in London, Ont., van der Werf found each throw away an average of six edible portions a week—roughly \$600 per household every year. Households with children wasted even more. And while many assume food waste is a problem of affluence, income isn't the main driver. Lower-income households often waste as much food as wealthier ones, just in different ways.

Access to this kind of information helps municipalities make more informed decisions, from adjusting green bin sizes to developing education campaigns that resonate with residents. Grounding these policies in real-world evidence also allows local governments to establish a baseline for testing and refining strategies and tracking progress—or lack thereof—over time.

Like Ahmadi, van der Werf sees lifestyle shifts as the key to driving behaviour change, which he believes lies in grasping the underlying motivations. Money appeared to be the primary motivator for London, Ont. households, van der Werf and his team found.

"If you tell someone they're wasting \$20 a week, it's like watching them crumple up a \$20 bill and toss it," says van der Werf. "In my research, I was able to use dollars wasted or saved as a motivator and saw a 30 per cent reduction in food waste thrown out at the curb, measured through garbage samples collected before and after the

intervention." What's more, this reduction was still evident when samples were taken from these households a few years later.

In a recent report, *Good to the Last Bite*, van der Werf and his team employed a data-driven model to analyze food-wast-ing behaviour and provide household consumers with practical advice to help them reduce food waste, which translates to more money in their wallets, while at the same time helping the environment. The report offers five simple steps to stop waste: plan meals ahead of time, make a grocery list and stick to it, store food properly, prepare the right amount of food and use leftovers.

Whereas Ahmadi and van der Werf focus mainly on waste prevention, chemical and biochemical engineering professor Naomi Klinghoffer focuses on reinvention.

We generate significant waste through daily activities while consuming large amounts of energy and materials. Landfills take up valuable land, emit greenhouse gases and contribute to plastic pollution in oceans and waterways.

At the same time, resource extraction is accelerating to meet material demand. Mechanical recycling can handle only certain materials, but chemical recycling breaks down all types of waste, including food waste, into chemical building blocks that can be reused to create materials or low-carbon fuels. This approach supports a circular economy that benefits both society and the environment.

"In nature, there's no such thing as waste," Klinghoffer says. "Everything is reused. We need to shift to a mindset where all by-products are used productively." At Western's Institute for Chemicals and Fuels from Alternative Resources, Klinghoffer and her team work with biochar, a carbon-rich substance created by heating organic waste in an oxygen-free environment, a process called pyrolysis.

Biochar looks like charcoal, but it's far more versatile. Adjust the temperature or heating rate, and you can "tune" it for different uses—enhancing soil health, filtering pollutants from water, reducing the carbon footprint of cement, even creating conductive materials for electronics. Unlike many processes that release carbon back into the atmosphere, biochar locks it in place for centuries.

Looking ahead, Klinghoffer envisions this innovative, environmentally friendly process may have applications beyond industry. Small-scale pyrolysis units could one day allow communities, or larger farms, to process food waste locally, converting scraps into soil amendments, energy or other valuable resources.

Reducing food waste alone won't end hunger. Nor will turning the waste we're producing into alternative products like compost or biochar.

Food insecurity is tied to larger systemic barriers, but every meal we can save is a step in the right direction. Some of the answers are old-fashioned: planning meals, portioning properly and preserving food before it spoils. Some, like biochar, are cutting-edge. Paired with technological innovation and smarter policies, these interventions and simple steps have the potential to transform how we prevent, reduce and repurpose food waste. "The challenge is vast," Ahmadi says, "but so is the potential. By blending traditional knowledge with modern innovation, and pairing individual action with community-scale solutions, we can move toward a future where less is wasted and what waste we have is put to productive use." ●

