



## FEEDING THE PLANET WHILE SAVING IT: HOW NEW FOODS CAN HELP!

**Marta Kozicka<sup>1\*</sup>, David Leclère<sup>1</sup>, Chris Davis<sup>2</sup>, Andre Deppermann<sup>1</sup>, Stefan Frank<sup>1,3</sup>, Dylan Bos<sup>1</sup> and Petr Havlík<sup>1</sup>**

<sup>1</sup>Integrated Biosphere Futures Research Group, Biodiversity and Natural Resources Program, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

<sup>2</sup>Kingdown Advisors LLC, Atlanta, GA, United States

<sup>3</sup>Institute of Sustainable Economic Development, University of Natural Resources and Life Sciences, Vienna, Austria

### YOUNG REVIEWERS:



**AAYUSH**

AGE: 8



**JESSE**

AGE: 15



**ZIYUAN**

AGE: 10

Eating a lot of meat and dairy puts pressure on nature. It leads to deforestation, water pollution, and climate change. By 2050, there will be over 9 billion people on Earth. Without any change in the way we eat, environmental damage will only get worse. What if we could eat foods that taste like meat and milk, but without hurting the planet as much? Novel plant-based foods, like plant-based burgers or oat milk, are made to taste and feel like animal products while using less land, water, and producing fewer greenhouse gases. Traditional plant-based foods, like tofu, lentils, and chickpeas are also healthy, tasty, and better for the planet. If everyone gradually replaced half of their meat and dairy with plant-based options we could save forests, reduce emissions, and make food more affordable. Even

small changes in diet can make a big difference for the planet—and our future.

## THE FOOD PROBLEM—AND A TASTY NEW SOLUTION

Imagine this: It is the year 2050, and Earth is buzzing with over 9 billion people. But there is a big challenge growing quietly—right on our dinner plates. The problem is that producing meat and dairy the way we do now is putting a lot of pressure on the planet [1]. Forests are being cut down, rivers are drying up, pollution from farming is damaging the soil and water, and many animals and plants are disappearing as their habitats are destroyed. Even though there is more food than ever, many people still go hungry [2]. We need tasty, and planet-friendly solutions before time runs out. So how can we all eat well without harming the Earth?

What if we could solve this problem by eating foods that look and taste like meat and dairy but are made from plants? Picture biting into a burger that looks, smells, and tastes like meat—but it is actually made from plants! This is already happening. These new foods, called **novel plant-based foods**, are made to feel just like eating meat or drinking milk. The plant-based food scene is expected to grow about 10% every year over the next decade—so you will see even more awesome options like chicken-free nuggets, oat milk ice cream, and even bacon made from mushrooms.

How is this possible? It all starts with plant **proteins**—usually from plants like soybeans or peas—which scientists and food developers transform into something that looks and tastes like the real deal. They mix the plant proteins with ingredients like fats, vitamins, minerals, and water [3]. This combination helps mimic the juiciness, flavor, and texture of animal-based products. Think of tofu, which has been a traditional plant-based food for centuries. Tofu is made from soybeans and is often used as a meat substitute because it can take on many flavors and has a similar texture to some meats. Novel plant-based foods take this idea further, using science to create foods that taste even closer to the real thing!

Novel plant-based foods need fewer inputs, like land and water, compared to meat and dairy. They also produce fewer **greenhouse gases** [4]. No cows mean no methane (a greenhouse gas) burps! But how much difference would it actually make if we all gradually replaced some of our meat and dairy with novel plant-based foods? We used a powerful **computer model** to find out. This model helps scientists study how changes, like switching to plant-based foods, could impact the environment, food supply, and greenhouse gases.

### NOVEL PLANT-BASED FOODS

Foods made from plants that look, taste, and feel like meat or dairy, like plant-based burgers or dairy-free milk.

### PROTEINS

Nutrients our bodies need to grow and stay strong. Found in foods like meat, beans, soy, and peas.

### GREENHOUSE GASES

Gases that trap heat in the air and cause climate change, like carbon dioxide, methane, and nitrous oxide.

### COMPUTER MODEL

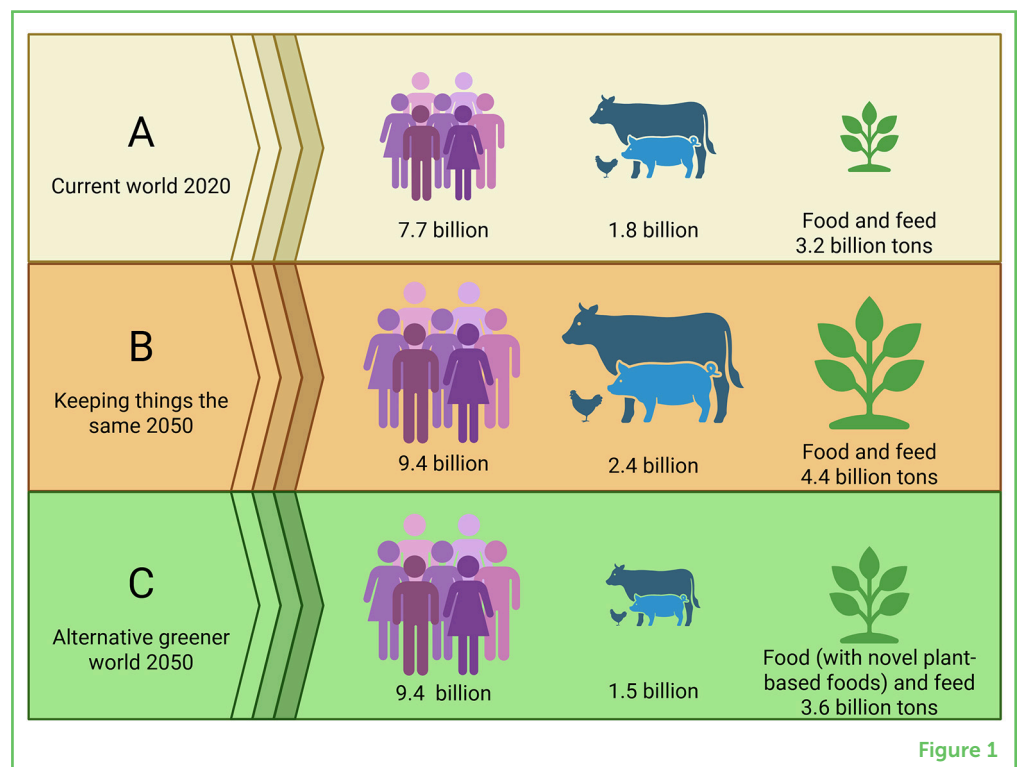
A computer program scientists use to test ideas and predict things like future food needs or climate effects.

## THE PROBLEM WITH THE WAY WE EAT

First, we found that by the year 2050, producing meat and dairy will strain the planet even more than it does today (Figure 1). As the world's population grows and people earn more money, the demand for animal-sourced foods is expected to rise a lot. For example, consumption of chicken might increase by 66% and milk by 49%. To meet this demand, we will need even more farmland to feed animals. This could destroy over 250 million hectares of forests and natural areas, leaving less space for wildlife and causing more greenhouse gas emissions that drive climate change. Farming also uses a lot of water and fertilizers, which can pollute rivers and oceans. Even though some regions might see better food supplies because of new farming technologies, many poorer people could still struggle to get enough food. These challenges show why we need better ways to produce food that are healthier for the planet and fairer for everyone.

**Figure 1**

The world now and in 2050, two options for feeding the growing population. **(A)** The current food system. **(B)** The future if we do not make major changes to the way we consume food. **(C)** The future if people eat half of the main meat and dairy products compared to **(B)**. Animal numbers are presented in Tropical Livestock Units (TLUs). TLUs measure the size of a herd by counting all animals as if they were the same size, like comparing them all to one big cow. Crops are measured by weighing solid part of a crop, without the water [created in BioRender. Bos, D. (2025) <https://BioRender.com/ii9kpp1>].



**Figure 1**

## HOW MUCH DIFFERENCE CAN NOVEL PLANT-BASED FOODS MAKE?

We then looked into alternative diets and their consequences for the planet. We found that changing our diets by replacing some meat and dairy with novel plant-based foods could bring huge benefits for the future environment. If everyone starts gradually switching their habits today, with the aim of eventually replacing just half of their animal-based foods (like meat and milk), the impacts of farming can



drop significantly. Let us have a closer look at the year 2050 in this alternative world.

First, water and fertilizer use would go down. Replacing half of animal foods with plant-based options could save 291 billion cubic meters of water per year—enough to fill 116 million Olympic-sized swimming pools! This switch would also reduce nitrogen use (in fertilizers) by 34 million tons a year, which could fill about 1.4 million large trucks. This would lead to cleaner water and healthier ecosystems (Figure 2).

**Figure 2**

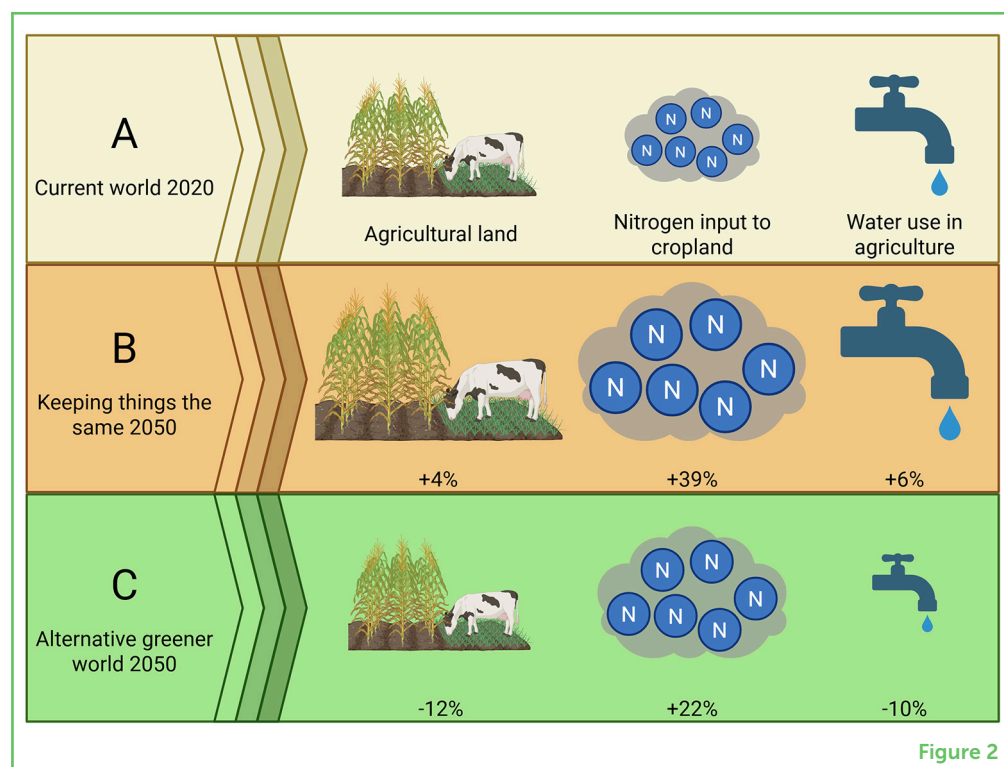
Agriculture now and in 2050, under two options for feeding the growing population. **(A)** The current food system, with land being used for growing crops for food and feed. This agriculture requires a lot of fertilizer, in the form of nitrogen, and lots of water. **(B)** The most likely future for agriculture if we do not make major changes to the way we produce and consume food. **(C)** There could be a greener future for agriculture if we lower our consumption of meat and dairy [created in BioRender. Bos, D. (2025) <https://BioRender.com/twvd2e3>].

## DEFORESTATION

Cutting down forests to make space for things like farming. This can harm animals and increase climate change.

## CO<sub>2</sub> EQUIVALENT

A way to compare different greenhouse gases by showing how much carbon dioxide they are equal to in warming the planet.



**Figure 2**

Greenhouse gas emissions from farming would also drop. Farming and land-use changes, like **deforestation**, are some of the biggest contributors to climate change. Under the current path, emissions from farming are expected to rise by 15% in 2050. But with plant-based substitutions, emissions would drop by 31%—a reduction of 2.1 billion tons of **CO<sub>2</sub> equivalent** in 2050. This is equal to taking over 450 million cars off the road.

Another great result is that much less land would be needed for farming. That means forests and wild places could finally stop shrinking and stabilize compared to today's levels. Instead of turning more land into farms (like the 4% increase we are on track for now), we could actually shrink farmland by 12%. This would free up about 653 million hectares of land—an area nearly twice the size of India. If we go the extra mile and turn that land back into forests, the benefits get even better—we could remove an extra 3.3 billion tons of carbon dioxide from the air in 2050. That is comparable to removing about 717 million



more cars! In addition, replanting forests also gives wildlife a chance to thrive and helps heal the planet. It is a big win for nature, and a big step toward saving endangered species and reaching global goals to protect our environment (Figure 3).

### Figure 3

The natural environment now and in 2050, under two options for feeding the growing population. **(A)** The current natural environment. To make space for agriculture, forests and other natural lands are converted to cropland and grassland. Agriculture is responsible for a large share of greenhouse gas emissions and biodiversity loss. **(B)** The most likely future for the natural environment if we continue eating as we are. **(C)** A greener future for the natural environment, where there is less need for agricultural land [created in BioRender. Bos, D. (2025) <https://BioRender.com/bgli91v>].

### FOOD SECURITY

When everyone always has access to enough healthy, nutritious food and no one goes hungry.

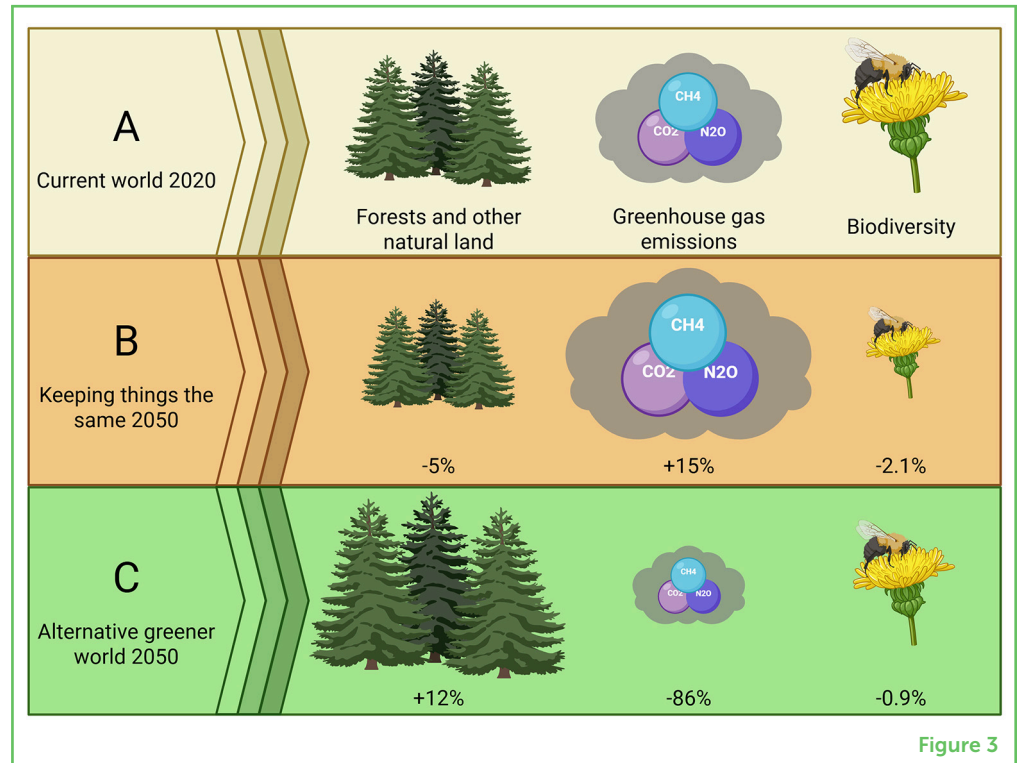


Figure 3

Finally, **food security** would also improve. Because crops could be grown more efficiently to feed people directly, food would become more available and cheaper. That means fewer people would go hungry. In fact, about 31 million fewer people could be undernourished—roughly the combined population of Australia and New Zealand.

It is clear that changing what we eat can make a big difference—but the effects are not the same everywhere in the world. For example, Sub-Saharan Africa, Brazil, and Latin America are key to saving forests and planting new trees, helping to lock away carbon. Even though people in these regions do not consume as much meat and milk as other regions of the world, these regions still drive more than half of global emissions reductions by 2050. There are many reasons for these differences. What matters is not only how many people live there and what they eat, but also how much food and feed they trade. We found that cutting beef consumption has some of the biggest benefits for emissions reduction and land use. As a result, countries with a lot of beef production, like Brazil, see the largest impacts.

Brazil is also home to the Amazon, the world's largest tropical rainforest, which spans several countries in South America—but the

majority, ~60%, is located within Brazil. The Amazon Rainforest is significantly affected by meat production, primarily through deforestation driven by cattle ranching and soybean farming to feed animals. This causes a lot of problems for nature and the environment. For example, it destroys habitats, leading to the loss of countless plant and animal species unique to the Amazon. Since Brazil is a major exporter of animal feed and beef, it feels the effects of dietary changes in other parts of the world. This is why changing our own food habits can save animals in the Amazon, no matter where we live!

## THE FUTURE OF FOOD

Switching to plant-based foods can be challenging for some people. Many people do not think plant-based foods taste quite like the real thing, and they can sometimes be more expensive. However, as more people choose these options, companies can improve the taste and lower prices, making plant-based foods more accessible to everyone. Cultural habits are another challenge. Meat is deeply embedded in many traditional dishes and giving it up can feel like a big change. The good news is that chefs and food creators are coming up with creative ways to incorporate plant-based ingredients into familiar recipes, making the transition easier and more enjoyable.

It is really important to understand how much our food choices matter. Even small changes in what we eat can make a big difference. While our study showed that switching to novel plant-based foods would make a positive impact, this is also true for traditional plant-based foods, like tofu or legumes. They are great protein sources too. We also do not have to completely stop eating meat—skipping meat on some days of the week would be a fantastic start. Swapping out beef for more sustainable meat like chicken would also be an improvement. As we explore plant-based foods, we need to make sure to balance our diets by including a variety of nutrients to stay healthy (see [here](#) or [here](#)). Finally, as you learn more about how plant-based foods can benefit the planet, share that knowledge with others. The more people who understand the impact of their food choices on the environment, the more likely these changes will spread and help create a better future for everyone.

The future of food is exciting! With science and creativity, we can create meals that are tasty, healthy, and good for the planet. Whether it is a tofu stir-fry, hummus, or a bowl of oat milk with cereal, every small change adds up to a big impact. Together, we can feed the planet while saving it for animals, plants, and future generations.

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## YOUNG REVIEWERS

### AAYUSH, AGE: 8

Hi, my name is Aayush, and I am 8 years old. I love Rubix's cubes, including Pyraminx, 2by2, 3by3, 4by4, and 5by5. I want to become a cop in the future. Going to my classes is fun.



### JESSE, AGE: 15

I am a boy with a wide range of interests. I love sports, such as playing basketball, badminton, and table tennis. I like the thrill of sweating it out. I also have a passion for art. I can play the clarinet, and I love to immerse myself in beautiful melodies. I also enjoy appreciating art. I am optimistic, open, and enjoy trying new things. I am particularly interested in reviewing articles that I have never encountered before.



### ZIYUAN, AGE: 10

I am Ziyuan, a 10-year-old science and biology enthusiast. I love exploring the wonders of nature, from insects in the backyard to stars in the sky. My room is my lab, I have two newts as pets. Excited to explore and learn together with everyone!



## AUTHORS

### MARTA KOZICKA

I am an agricultural economist, and I work as a Research Scholar at the International Institute for Applied Systems Analysis (IIASA) in Austria. In my research I focus on the ways to make the food system fair for everyone and kinder to the environment. One of the topics I am passionate about is how the foods we eat can help fight climate change and ensure no one goes hungry. When I am not working, I love exploring new foods and spaces, whether it is just around my neighborhood or in faraway places.

\*[kozicka@iiasa.ac.at](mailto:kozicka@iiasa.ac.at)



### DAVID LECLÈRE

I work as a senior researcher at the International Institute for Applied Systems Analysis (IIASA) in Austria. I use models and scenarios to explore sustainable future land use pathways. How will future human demand for biomass, crop production technologies and trade policies influence the amount of deforestation and air and



water pollution? What are related impacts on climate, ecosystems and wildlife? What measures do we need to avert on-going declines in biodiversity, and how to distribute efforts fairly across countries and actors? I am also a happy dad and husband, and I enjoy music and outdoor activities.



### CHRIS DAVIS

I am a chemist who started a small company called Bayshore Creamery that makes artisanal plant-based cheeses that are delicious, lactose free and sustainable. My work revolves around different ways to use science to address the challenges of climate change and biodiversity loss. Can we develop enzymes to make chemicals with less waste? Can we create organisms that can turn waste products into liquid fuel and other chemicals? Can we recreate the deliciousness and nutrition of animal products without harming the animal and the planet? The answer is yes. In my free time, I like to spend time in nature hiking and finding delicious food to eat.



### ANDRE DEPPERMAN

In University, I studied economics and during my PhD, I specialized in agricultural economics. Now, I work in Austria at the International Institute for Applied Systems Analysis (IIASA), a research institute where I use special computer models to study how people use land. My job is to explore how climate change affects our world and think about ways we can help prevent it. When I am not working, I love playing football or trying out other fun sports. I also enjoy making music and staying active in nature.



### STEFAN FRANK

I am a scientist at the International Institute for Applied Systems Analysis (IIASA) where I study how land is shared between farming, forests, and bioenergy. For this, I use a simulation model and forward-looking scenarios to inform government decisions about energy, climate policies, and protecting nature.



### DYLAN BOS

I work as a project manager at the International Institute for Applied Systems Analysis in Vienna, where I get to work on really cool projects on sustainability, fighting climate change, and on how to keep our ecosystems healthy. These projects are all about finding ways to make sure the Earth stays a great and healthy place for future generations, which I think is super important! When I am not working, I try to keep myself healthy too! I love cooking, reading interesting books, and I enjoy all kinds of sports, like Jiu-Jitsu, climbing, boxing, and running.



### PETR HAVLÍK

I am a principal scientist working to protect nature and use our planet's resources wisely. At IIASA, I lead an interdisciplinary team that studies how we use land and how we can manage it better. I led the creation of a model called GLOBIOM, which explores how our choices affect both the environment and people's lives. My work looks at how food security, farmers' incomes, and international trade are connected to caring for nature. I have also contributed to major climate reports, all to help build a better, greener future.