Testimony before the House Agriculture Committee for a Hearing on "Climate Change and the U.S. Agriculture and Forestry Sectors"

Written statement provided by
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February 25, 2021

Good morning Chairperson Scott, Ranking Member Thompson, and members of the committee. My name is Michael Shellenberger, and I am Founder and President of Environmental Progress, an independent and nonprofit research organization.[1] I am an invited expert reviewer of the next assessment report by the Intergovernmental Panel on Climate Change (IPCC), a *Time Magazine* "Hero of the Environment," and author of the 2020 book on the environment, *Apocalypse Never*, published by HarperCollins.

I will make four points in my testimony:

1. American farmers are world leaders in innovation, productivity, and environmental protection.
2. Technological change and agricultural modernization will significantly outweigh climate change in the U.S. and around the world.
3. Vegetarianism is not important for protecting the environment or reducing greenhouse gas emissions.
4. The U.S. should directly and through the World Bank and other institutions help poor and developing nations to modernize agriculture for economic development, environmental, and public health reasons.

I will draw upon the best-available science as well as upon my interviews with scientists to present the evidence supporting these three claims and recommendation.

I. The American farmer is a world leader in innovation, productivity, and environmental protection

Urbanization, industrialization, and energy consumption have been overwhelmingly positive for human beings as a whole. From preindustrial times to today, life expectancy extended from thirty to seventy-three years.[2] Infant mortality declined from 43 to 4 percent.[3] From 1981 to 2015, the population of humans living in extreme poverty plummeted from 44 percent to 10 percent.[4]

Our prosperity is made possible by using energy and machines so fewer and fewer of us have to produce food, energy, and consumer products, and more and more of us can do work that requires greater use of our minds and that even offers meaning and purpose to our lives.

The declining number of workers required for food and energy production, thanks to the use of modern energy and machinery, increases productivity, grows the economy, and diversifies the workforce. Former farm workers who move to cities spend their money buying food, clothing, and other consumer products and services, resulting in a workforce and society that is wealthier and engaged in a greater variety of jobs.

The human population growth rate peaked in the early 1960s alongside rising life expectancy and declining infant mortality.[5] Total population will peak soon.[6] And thanks to rising agricultural productivity, the share of humans who are malnourished declined from 20 percent in 1990 to 11 percent today, about 820 million people.[7]

Farms and cities are thus deeply connected. Cities concentrate human populations and leave more of the countryside to wildlife. Cities cover just more than half a percent of the ice-free surface of the earth.[8] Less than half a percent of Earth is covered by pavement or buildings.[9] At the same time, humankind's use of land for agriculture is likely near its peak and capable of declining soon.[10]

As wealthy nations develop and farms become more productive, grasslands, forests, and wildlife are returning. Globally, the rate of reforestation is catching up to a slowing rate of deforestation.[11] The key is producing more food on less land. While the amount of land used for agriculture has increased by 8 percent since 1961, the amount of food produced has grown by an astonishing 300 percent.[12]

Though pastureland and cropland expanded 5 and 16 percent, between 1961 and 2017, the maximum extent of total agriculture land occurred in the 1990s, and declined significantly since then, led by a 4.5 percent drop in pasture land since 2000.[13] Between 2000 and 2017, the production of beef and cow's milk increased by 19 and 38 percent, respectively, even as total land used globally for pasture shrank.[14]

The replacement of farm animals with machines massively reduced land required for food production. By moving from horses and mules to tractors and combine harvesters, the United States slashed the amount of land required to produce animal feed by an area the size of California. That land savings constituted an astonishing one-quarter of total U.S. land used for agriculture.[15]

Today, hundreds of millions of horses, cattle, oxen, and other animals are still being used as draft animals for farming in Asia, Africa, and Latin America. Not having to grow food to feed them could free up significant amounts of land for endangered species, just as it did in Europe and North America.

Energy is required for all of this agricultural modernization. Thanks to fertilizers, irrigation, petroleum-powered tractors, and other farm machines, the power densities of farms rise ten-fold as they evolve from the labor-intensive techniques used by small farmers in poor nations to the energy-intensive practices used on California's rice farms.[16]

American farmers embraced the digital revolution starting in the 1990s. It was then that they started using GPS for auto-steering combines and other farm machinery, significantly reducing both overlaps and gaps in fields. Farmers mapped soils and used new equipment to apply chemicals at precise and variable rates specific to different soils. GPS also opened up precision agriculture, as it is called. Special equipment can space seeds precisely, while genetic engineering helps farmers guard against insects and weeds with fewer and less toxic chemicals.

Conventional agriculture is used on 99 percent of U.S. cropland and is responsible for significant environmental improvements to farming. The total amount of pesticides

applied to U.S. crops declined 18% between 1980 and 2008 and is today 80 percent lower than their 1972 peak.[17] Total fertilizer use in the U.S. peaked in 1981 and hasn't risen since, despite an increase in total crop production of 44 percent, according to the Environmental Protection Agency.[18]

The use of water per unit of agricultural production has been declining as farmers have become more precise in irrigation methods. Irrigation water used per bushel of corn has declined by nearly half since 1980, while greenhouse gases declined 31 percent.[19]

High-yield farming is also better for soils. Eighty percent of all degraded soils are in poor and developing nations of Asia, Latin America, and Africa. The rate of soil loss is twice as high in developing nations as in developed ones. Thanks to the use of fertilizer, wealthy European nations and the United States have adopted soil conservation and no-till methods, which prevent erosion. In the United States, soil erosion declined 40 percent in just fifteen years, between 1982 and 1997, while yields rose.[20]

II. Technological change and agricultural modernization will significantly outweigh climate change in the U.S. and around the world.

In 2019 the Intergovernmental Panel on Climate change warned that warming of 1.5 degrees Celsius above pre-industrial temperatures would cause "long-lasting or irreversible" harm. *The New York Times* reported that planetary warming threatens to worsen resource scarcity, and "floods, drought, storms and other types of extreme weather threaten to disrupt, and over time shrink, the global food supply."[21]

But there is little to no scientific basis for claims that climate change will reduce agricultural productivity globally. "It's difficult to see how we could accommodate eight billion people or maybe even half of that," said Swedish agronomist Johan Rockström of the Potsdam Institute in Germany, if temperatures rise four or more degrees above preindustrial levels.[22] But when I asked Rockstrom by telephone for the scientific studies supporting his claim, he said, "I must admit I have not seen a study."[23]

In fact, scientists have done that study — two are Rockström's colleagues at the Potsdam Institute — and they found that food production could increase even at four to five degrees Celsius warming above preindustrial levels, and they found that technical improvements, such as fertilizer, irrigation, and mechanization, mattered more than climate change.[24]

Food production would only decline in the US and North America if the American farmer stopped innovating and adapting, which is counter to the nature of farmers. IPCC finds that there would be net agricultural productivity declines "without adaptation" and that the productivity of agriculture in some parts of North America will improve with warmer temperatures. Some of the yield increases in recent decades came from rising temperatures in Canada and greater precipitation in the U.S. Where water is not a limiting factor, rising temperatures will increase productivity in North America, unless farmers stop innovating and adapting.[25]

There is very good reason to believe that American farmers will adapt well to climate change. "The North American agricultural industry has the adaptive capacity to offset projected yield declines and capitalize on opportunities under 2° warming," IPCC writes, including through genetically modified seeds. Many of these practices bring other economic and environmental benefits. Low- and no-till farming reduces soil erosion, allows for the retention of moisture, and reduces greenhouse gases.[26]

The U.S. Government's Fourth National Climate Assessment supports IPCC's findings. It similarly suggests that the risks of climate change to U.S. farmers will be mitigated by innovation and adaptation. Farmers can adapt by changing what they produce, altering productive inputs including seed type, and using new technologies. Farmers can alter crop rotations, use different cover crops, and deploy irrigation. Farmers can manage heat stress among life stock by changing breeds and diets, providing shade, and altering patterns of feeding and reproduction. The Assessment points to pest and disease management, climate forecasting tools, and crop insurance as proven effective ways to reduce risk and increase productivity and efficiency.[27]

Human beings around the world today produce 25 percent more food than we consume, and experts agree surpluses will continue to rise in a warmer world so long as poor nations gain access to fertilizer, irrigation, roads, and other key elements of modern agriculture.[28] The FAO projects that even farmers in the poorest regions today, like sub-Saharan Africa, may see 40 percent crop yield increases from technological improvements alone.[29] It concludes that food production will rise 30 percent by 2050 except in a scenario it calls Sustainable Practices is adopted, in which case it would rise 20 percent.[30]

Roughly 40 percent of the planet has seen "greening"—more forest and other biomass growth—between 1981 and 2016. Some of this greening is due to a reversion of former agricultural lands to grasslands and forests, and some of it is due to deliberate tree planting, particularly in China.[31] This is even true in Brazil. While the world's attention has been focused on the Amazon, forests are returning in the southeast, which is the more economically developed part of Brazil. This is due to both rising agricultural productivity and environmental conservation.[32]

Part of the reason the planet is greening stems from greater carbon dioxide in the atmosphere, and greater planetary warming.[33] Scientists find that plants grow faster as a result of higher carbon dioxide concentrations. From 1981 to 2016, four times more carbon was captured by plants due to carbon-boosted growth than from biomass covering a larger surface of Earth.[34]

All else being equal, it would be best for global temperatures to remain stable. We should not want them to either rise or decline. The reason is because we have built our civilization based on current temperatures.

But all else isn't equal. The cause of climate change is rising energy consumption, and that energy consumption has been necessary for the 90 percent decline in natural disaster deaths, the 25 percent and rising global food surplus, and the 30 percent decline in the global burden of disease.

Some have suggested that climate change will make diseases like COVID-19 more frequent or more severe, but the main factors behind the novel-coronavirus pandemic had nothing to nothing to do with climate change and everything to do with the failure of the Chinese regime to protect public health.

Governments and farmers have known what "biosecurity" measures to take for decades, and enacted them, partly, in response to the 2005 avian flu (H5N1) epidemic. These measures include hardened facilities to prevent, for example, bats, from entering buildings; the regular testing of animals and workers; and disallowing live animals from being transported and sold at markets.[35]

Other scientists find similar outcomes. The UN Food and Agriculture concludes that food production will rise 30 percent by 2050 unless "sustainable practices" are adopted — in which case it would rise just 10 to 20 percent.[36] And a paper published in *Nature* in 2019 found that "agro-ecological" farming, which has long been promoted by European governments, US NGOs, and the UN, does not improve the agricultural productivity of small African farmers.[37]

In the summer of 2020, politicians and the news media pointed to climate change as the cause of historic, high-intensity "megafires" in California and Oregon, but leading forest scientists said fire suppression and the accumulation of wood fuel, not climate change, were what made California's fires more intense.

"Climate dries the [wood] fuels out and extends the fire season from 4-6 months to nearly year-round but it's not the cause of the intensity of the fires," said US Forest Service scientist Malcolm North. "The cause of that is fire suppression and the existing debt of wood fuel." North estimates that there is five times more wood fuel in California's forests, on average, than before Europeans arrived.

A large, well-managed forest turned a high-intensity fire into a low-intensity one, proving that how forests are managed outweighs the higher temperatures and longer fire season caused by climate change. In 2013, after a high-intensity megafire known as the Rim Fire in the Stanislaus Forest reached Yosemite National Park, where prescriptive burning had occurred, it became a surface fire. Similarly, the high-intensity Rough Fire of 2015 turned into a surface fire after it reached Sequoia National Park, whose managers had been using prescribed burns for decades.

The evidence for the efficacy of what foresters call "fuel treatment," through selective logging, prescribed burning, or both, can also be found on US Forest Service lands. In 2014, areas where there had been selective logging and prescribed burning survived the high-intensity King megafire Eldorado National Forest. Similarly, the 2018 Carr fire burned through areas where there had been treatment of wood fuels over the last three decades. Even so, areas that had prescribed fire within the last five years, particularly the last three years, did better. Such cases are powerful evidence that selective logging and prescribed burning could allow many forests in California and elsewhere to survive climate change.

III. Vegetarianism is not an important factor for protecting the environment.

In 2019, the Intergovernmental Panel on Climate Change (IPCC) published a special report on food and agriculture. "Scientists say that we must immediately change the way we manage land, produce food and eat less meat in order to halt the climate crisis," reported CNN.[38] Americans and Europeans need to reduce consumption of beef and pork by 40 percent and 22 percent, respectively, said experts, in order to feed ten billion people.[39] If everyone followed a vegan diet, which excludes not only meat but also eggs and dairy products, land-based emissions could be cut by 70 percent by 2050, said IPCC.[40]

But the headline number in the IPCC's 2019 report, a 70 percent reduction in emissions by 2050, referred only to *agricultural emissions,* which comprise a fraction of total greenhouse emissions.[41]As such, converting to vegetarianism might reduce *diet*-related personal energy use by 16 percent and greenhouse gas emissions by 20 percent, found a study, but *total* personal energy use by just 2 percent, and total greenhouse gas emissions by 4 percent. [42]

As such, were IPCC's "most extreme" scenario of global veganism to be realized—in which, by 2050, humans completely cease to consume animal products and all livestock land is reforested—total carbon emissions would decline by just 10 percent.[43]

Another study found that if every American reduced her or his meat consumption by one-quarter, greenhouse emissions would be reduced by just 1 percent. If every American became vegetarian, US emissions would drop by just 5 percent.[44]

Study after study comes to the same conclusion. One found that, for individuals in developed nations, going vegetarian would reduce emissions by just 4.3 percent, on average.[45] And yet another found that, if every American went vegan, emissions would decline by just 2.6 percent.[46]

Plant-based diets, researchers find, are cheaper than those that include meat. As a result, people often end up spending their money on things that use energy, like consumer products. This phenomenon is known as the rebound effect. If consumers respent their saved income on consumer goods, which require energy, the net energy savings would only be .07 percent, and the net carbon reduction just 2 percent. [47]

None of this means that people in rich nations can't be persuaded to change their diets. For example, since the 1970s, Americans and others in developed nations have been eating more chicken and less beef. The global output of chicken meat has grown fourteen-fold, from eight metric megatonnes to 109 metric megatonnes, between 1961 and 2017.[48]

The good news is that the total amount of land humankind uses to produce meat *peaked* in the year 2000. Since then, the land dedicated to livestock pasture around the world, according to the Food and Agriculture Organization of the U.N., has decreased by more than 540 million square miles, an area 80 percent as large as Alaska.[49]

All of this happened without a vegetarian revolution. Today, just 2 to 4 percent of Americans are vegetarian or vegan. About 80 percent of those who try to become

vegetarian or vegan eventually abandon their diet, and more than half do so within the first year.[50]

Developed nations like the United States saw the amount of land they use for meat production peak in the 1960s. Developing nations, including India and Brazil, saw their use of land as pasture similarly peak and decline.[51] Part of this is due to the shift from beef to chicken. A gram of protein from beef requires two times the energy input in the form of feed as a gram from pork, and eight times a gram from chicken.[52] But mostly it is due to efficiency. Between 1925, when the United States started producing chicken indoors, and 2017, breeders cut feeding time by more than half while more than doubling the weight.[53]

Meat production roughly doubled in the United States since the early 1960s, and yet greenhouse gas emissions from livestock *declined* by 11 percent during the same period.[54] Producing a pound of beef in the U.S. today requires one-third less land, one-fifth less feed, and 30 percent fewer animals as the 1970s.[55]

American cow milk production in the U.S. today requires 90 percent as much land and 79 percent fewer animals as it did in 1944.[56] Fewer animals means two-thirds less methane, a potent greenhouse gas, per glass of milk today as compared to 1950.[57]

Last fall I visited a milking operation owned by Matt Swanson near Turlock, California. I was amazed as I watched dozens of cows calmly eat and get milked as they slowly turned on a giant merry go-round. The machine was labor-saving, allowing for under a half dozen workers to oversee an operation with hundreds of milking cows.

IV. The U.S. should directly and through the World Bank and other institutions help poor and developing nations to modernize agriculture for economic development, environmental, and public health reasons

The use of land as pasture for beef production is humankind's single largest use of Earth's surface. We use twice as much land for beef and dairy production as for our second largest use of Earth, which is growing crops. Nearly half of Earth's total agricultural land area is required for ruminant livestock, which includes cows, sheep, goats, and buffalo.[58]

During the last 300 years, an area of forests and grasslands almost as large as North America was converted into pasture, resulting in massive habitat loss and driving the significant declines in wild animal populations. Between 1961 and 2016, pastureland expanded by an area almost the size of Alaska.[59]

While people in developing countries increased their per capita meat consumption from 10 kilograms per year to 26 kilograms between 1964 to 1999, people in the Congo and other Sub-Saharan African nations experienced no change in per capita meat consumption.[60]

Activists argue that factory farms are far worse for the natural environment than free-range beef, but pasture beef requires *fourteen to nineteen times* more land per

kilogram than industrial beef, according to a review of fifteen studies.[61] The same is true for other inputs, including water. Highly efficient industrial agriculture in rich nations requires less water per output than small farmer agriculture in poor ones.[62] Pasture beef generates 300 to 400 percent more carbon emissions per kilogram than industrial beef.[63]

This difference in emissions comes down to diet and lifespan. Cows raised at industrial farms are typically sent from pastures to feedlots at about nine months old, and then they are sent to slaughter at fourteen to eighteen months. Grass-fed cattle spend their entire lives at pasture and aren't slaughtered until between eighteen to twenty-four months of age. Since grass-fed cows gain weight more slowly and live longer, they produce more manure and methane.[64]

In addition to their longer lifespans, the roughage-heavy diets typical of organic and pasture farm systems result in cows releasing more methane. These facts combined tell us that the global warming potential of cows fed concentrates is 4 to 28 percent lower for cows fed roughage.[65]

Attempting to move from factory farming to organic, free-range farming would require vastly more land, and thus destroy the habitat needed by endangered species. "You simply can't feed billions of people free-range eggs," a farmer told a journalist. "It's cheaper to produce an egg in a massive laying barn with caged hens. It's more efficient and that means it's more sustainable"[66]

Modernized agricultural techniques and inputs could increase rice, wheat, and corn yields five-fold in sub-Saharan Africa, India, and developing nations.[67] Experts say sub-Saharan African farms can increase yields by nearly 100 percent by 2050 simply through access to fertilizer, irrigation, and farm machinery.[68]

If every nation raised its agricultural productivity to the levels of its most successful farmers, global food yields would rise as much as 70 percent.[69] If every nation increased the number of crops per year to their full potential, food crop yields could rise another 50 percent.[70]

The most efficient meat production in North America requires twenty times less land than the most efficient meat production in Africa. Replacing wild animal meat with modern meats like chicken, pork, and beef would require less than 1 percent of the total land used globally for farming.[71]

The technical requirements for creating what experts call "the livestock revolution" are straightforward. Farmers need to improve breeding of animals, their diet, and the productivity of grasses for foraging. Increasing meat production must go hand-in-hand with increasing agricultural yields to improve and increase feed. In Northern Argentina, farmers were able to reduce the amount of land used for cattle ranching by 99.7 percent by replacing grass-fed beef with modern industrial production.[72]

The dominant form of climate policy in international bodies and among nations around the world emerged from 1960s-era environmental policies aimed at constraining food and energy supplies. These policies are correctly referred to as Malthusian in that

they stem from the fears, first articulated by the British economist Thomas Malthus in 1798, that humans are at constant risk of running out of food.

Real world experience has repeatedly disproven Malthusianism. If it hadn't, there wouldn't be nearly eight billion of us. Worse, Malthusian ideas have been used to justify unethical policies that worsen socioeconomic inequality by making food and energy more expensive, including closing down nuclear plants.[73]

The same report which found that agricultural modernization outweighs climate change also found that climate *policies* were more likely to hurt food production and worsen rural poverty than climate change itself. The "climate policies" the authors refer to are ones that would make energy more expensive and result in more bioenergy use (the burning of biofuels and biomass), which in turn would increase land scarcity and drive up food costs. The IPCC comes to the same conclusion.[74]

Policymakers should explicitly reject policies that significantly raise food and energy prices, directly or indirectly. Republicans and Democrats alike should affirm their commitment to human flourishing and prosperity, both of which depend on cheap food and energy, which depend on the rising productivity of inputs to agriculture and electricity generation, including labor, land, and capital.

But we should go beyond that and seek to help our brothers and sisters in poor nations to modernize agriculture, industrialize, and modernize their economies, for economic and environmental reasons. Such a partnership will be good for America and good for the planet.

Thank you for inviting my testimony.

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[1] Environmental Progress is an independent non-profit research organization funded by charitable philanthropies and individuals with no financial interest in our findings. We disclose our donors on our website: http://environmentalprogress.org/mission.

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