Feeding the World: Malthusian Ideas in American Agriculture

Can organic agriculture feed the world?

Many people think it can't.

If every farm in the world transitioned to organic methods, they claim, a couple billion people would die because there wouldn't be enough food for them. It is only through genetic engineering, intensive fertilization and the use of pesticides that we can even think about feeding the world's current population of over 7 billion—not to mention the 9 billion humans that the United Nations projects will be on the earth by 2050.

This line of reasoning is at the root of almost all opposition to organic farming. It is believed and taught by many well-meaning people who sincerely want to help end world hunger and poverty. They are not evil chemical company executives who are trying to take over the world; they are humanitarian aid workers, university professors, agricultural economists, government workers and traditional American farmers who believe that it is their patriotic duty to produce as much food as possible.

When organic farmers attack these people instead of the underlying ideology, it's like starting a debate about religion or politics. Nobody wins and feelings are hurt on both sides. Instead, maybe it's time to dig down to the roots of when and where the idea that there might not be enough food for everyone in the world entered into American agriculture. The idea, in fact, goes back to the 1940s—but it was based on theories formed when our country was still in its infancy.

Malthus' Principle of Population

One of the first people to suggest that the human population might someday get too large for its food supply was an Englishman named Thomas Robert Malthus, who hastily wrote a short pamphlet entitled *Essay on the Principle of Population* in 1798. In 1803 he revised and expanded his ideas into a book-length work with the same title.[1]

Malthus' college training was in mathematics, and his *Essay* was an attempt to use mathematical calculations to explain the persistent poverty of the English working class at the time.[2] The problem, he concluded, was that people were poor simply because there were too many of them.[3]

The human population, Malthus explained, was capable of doubling approximately every 25 years, which he called "geometrical" growth.[4] The term "exponential" growth is more frequently used today to describe the same phenomenon.

Geometrical or exponential growth, projected out far enough, is a terrifying concept. A classic illustration is the legendary inventor who presented his king with a chessboard as a gift.[5] The king was so pleased with the game that he asked the inventor what he would like in return.

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[1] Niall O'Flaherty, "Malthus and the History of Population," in Thomas Robert Malthus, *An Essay on the Principle of Population: The 1803 Edition*, edited by Shannon C. Stimson (New Haven: Yale University Press, 2018), 477.

[2] Shannon C. Stimson, "Introduction," in Malthus, *Principle of Population*, xi-xii.

[3] Malthus, *Principle of Population*, 401, 411, 423-424.

[4] Malthus, *Principle of Population*, 16.

[5] This version of the chessboard fable is modified from Donnella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972), 29.

His price: One grain of rice for the first square on the chessboard, two grains for the second square, four for the third, and so on—double for each square.

The king readily agreed; it seemed like a token amount of rice. But it wasn't. By the time the king got to the 64th square on the chessboard, he owed about 1.5 trillion tons of rice for that square alone—more than the annual production of his entire kingdom! Some versions of the fable say that the audacious inventor was beheaded once the king realized his mistake.

Malthus argued that the human population, if left unchecked, would tend to increase exponentially. This was not purely theoretical; he cited calculations made by Benjamin Franklin showing that the population of the United States had indeed been doubling every 25 years. In fact, Franklin's estimate accurately predicted American population growth up through 1890.[6]

Unfortunately for the human race, Malthus claimed that it was not possible for agricultural production to increase geometrically, though he had no data to support this contention. He arbitrarily determined that the best increase anyone could hope for in agriculture was an "arithmetical" increase. Thus, one unit of production might be able to double to two in the next year, but then could only increase to three, then four, then five.[7] In fact, he predicted that per-acre yields would actually diminish in the long run because of soil exhaustion.[8]
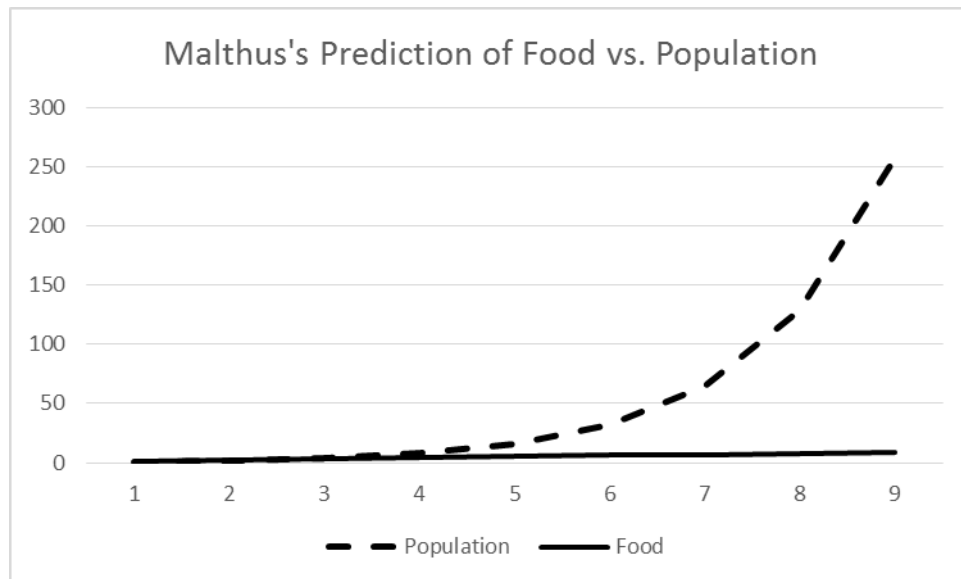

Figure 1: When population increases geometrically and food increases arithmetically, the gap quickly becomes impossibly large. Graphical representation of the numbers listed in Malthus, *Principle of Population*, 16.

If population increased geometrically and food supply could only increase arithmetically, the gap between demand for food and actual supply would increase exponentially each year. Obviously, such an increase of population in excess of the food supply was impossible in reality, since human beings cannot live without food.[9] Thus came into play what Malthus called the "checks" on population growth.

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[6] Conway Zirkle, "Benjamin Franklin, Thomas Malthus and the United States Census," *Isis* 48, no. 1 (March 1957): 58-62.
[7] Malthus, *Principle of Population,* 16.
[8] Malthus, *Principle of Population*, 14.
[9] Malthus, *Principle of Population*, 271.

Malthus said that there were two kinds of "checks" on population growth. One type, the "positive checks," would raise the death rate to equal the birth rate and thus keep population stable. Poverty, war, prostitution, disease and famine all fell into this category of "positive checks"—all very undesirable.[10]

The only way to keep the "positive checks" from operating, Malthus argued, was for people to voluntarily adopt "preventative checks" and lower the birth rate to equal the death rate. He proposed late marriage as the best way to accomplish this. A man shouldn't marry, Malthus argued, until he had saved up enough money to support five or six children.[11]

Most controversially, Malthus blamed the poor's poverty on themselves. People weren't poor because of oppressive employers, or unfairly low wages, or any other social or political reason. The poor were poor because there were too many of them and they were having too many children. Keep the birth rate level with the death rate, Malthus proposed, and poverty would disappear.[12]

From the very beginning, Malthus' views were heavily criticized. Karl Marx claimed that the real problem was an exploitative capitalistic system.[13] Charles Dickens argued that blaming the poverty of the poor on their numbers was hard-hearted and cruel.[14] And a couple people pointed out that plants and animals also had the potential to increase exponentially, at a much faster rate than humans—so why couldn't food production keep up with population growth?[15]

Moral and social concerns aside, most people had discredited Malthus by the end of the 19th century for the simple reason that none of his predictions came true. The Industrial Revolution and its concurrent increase in population was accompanied by an agricultural revolution, with food production actually increasing faster than population growth.[16] Malthus hadn't foreseen that—so why should he have been right about anything else?

2.5 Acres Per Person

During the first few decades of the 20th century, the question of how many people the earth could support was mainly an academic consideration. One of the scholars who was most interested in the study of populations was the statistician Raymond Pearl, who earned his Ph.D. at the University of Michigan and became a professor at John Hopkins University in 1918.[17] Pearl's mathematics were far more complicated and nuanced than the simple geometrical vs. arithmetical hypothesis of Malthus.

Along with his colleague Lowell J. Reed, Pearl developed what he considered to be a "law of population growth": All populations, whether fruit flies or humans, tend to follow a logistic growth curve. The first half of a logistic curve looks a lot like an exponential growth

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[10] Malthus, *Principle of Population*, 19.

[11] Malthus, *Principle of Population*, 391-392.

[12] Malthus, *Principle of Population*, 401, 411, 423-424, 466.

[13] George A. Donohue, "Leading Population Theories Since Malthus," *A.K.D. Quarterly* (May 1950): 13.

[14] Charles Dickens, *A Christmas Carol*, in *Charles Dickens: Four Novels* (Avenel, NJ: Gramercy, 1982), 564.

[15] John Bellamy Foster, "Malthus' Essay on Population at Age 200: A Marxian View," *Monthly Review: An Independent Socialist Magazine* 50, no. 7 (December 1998).

[16] Stanley A. Cain, "Food and People: A Second Look at Malthus' Principles of Population," *Journal of Politics* 13, no. 3 (August 1951): 316.

[17] Howard Brown Woolston, "Raymond Pearl: The Biology of Population Growth," *American Journal of Sociology* 35 (November 1929): 404; Michael A. Little and Ralph M. Garruto, "Raymond Pearl and the Shaping of Human Biology," *Human Biology* 82, no. 1 (February 2010): 79-80; Thomas Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism* (New Brunswick, NJ: Rutgers University Press, 2012), 16-19.

curve, but then it passes an inflection point, growth slows down, and eventually it levels out—looking somewhat like an elongated S.[18]

Pearl found that a logistic curve fit actual population data much better than an exponential curve. Given a constant environment, any population would increase to the limit of the environment, then remain in a steady state. With advances in culture or technology, a new, higher upper limit might be set, starting a new growth cycle.[19]

While admitting that accurate data on the total world population did not yet exist, Pearl made some rough calculations and tentatively predicted that world population would probably level off around 2 billion people, unless a "new cycle, made possible and inaugurated by scientific discoveries" began.[20] Like Malthus, he feared that someday population would outstrip food supply, but he also noted that the production of food and items like coal, iron and cotton was actually increasing faster than the rate of population growth.[21]

In 1935, the Land Policy Section of the USDA's Agricultural Adjustment Administration conducted the first real investigation to see just how many people could be fed with American agriculture at that time. These researchers calculated that in 1930-1933 it took about 2.2 acres to feed each American an "adequate diet at moderate cost."[22]

Included in this 2.2 acre figure was a 16-22 percent allowance for feeding the horses and mules used for agricultural production; only about 1.8 acre per person was actually used to grow livestock and crops for direct human consumption.[23] Tractors had already entered American agriculture in 1935 but had not yet fully displaced horses; the researchers predicted that the horse-tractor ratio would remain approximately the same in 1940.[24]

While valuable as a description of American agricultural productivity during the years the data was collected, this USDA study was not especially useful for predicting the future. The researchers noted that there was great potential for increasing agricultural yields by using already known methods such as fertilization; controlling water supply, insects and diseases; and farming more intensively.[25] And the data applied specifically to the United States and was never intended to be extrapolated to a global scale.

The USDA study languished in obscurity for ten years, under the nondescript title *Agricultural Land Requirements and Resources: Part III of the Report on Land Planning*. Few people actually read it or understood its methodology. But someone, somewhere, remembered that it had concluded that it took approximately 2 ½ acres of land to feed each American. Divorced from its context, and with the original study never cited, this "2.5 acres per person for an adequate diet" soon became an axiom in discussions about how many people the world could feed.

War and Worries

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[18] Raymond Pearl, "The Curve of Population Growth," *Proceedings of the American Philosophical Society* 63, no. 1 (1924): 10-17.
[19] Raymond Pearl, *Studies in Human Biology* (Baltimore, MD: Williams & Wilkins, 1924), 561, 587.
[20] Pearl, *Human Biology*, 589-590, 634.
[21] Raymond Pearl, "The Population Problem," *Geographical Review* 12, no. 4 (October 1922): 636-645.
[22] USDA, *Agricultural Land Requirements and Resources: Part III of the Report on Land Planning* (Washington, DC: GPO, 1935), 11.
[23] USDA, *Agricultural Land Requirements*, 2.
[24] USDA, *Agricultural Land Requirements*, 24, 26.
[25] USDA, *Agricultural Land Requirements*, 14.

During the 19th century, Americans had never seriously subscribed to Malthus's gloomy belief that population would always outstrip food supply and cause poverty. "Malthusianism," as this philosophy was called, didn't fit with the American experience. Nor were Americans much in favor of "Neo-Malthusianism," the belief that birth control and contraceptives were the only way to keep populations from exceeding their food supply.[26]

All of this changed during World War II. As the European nations destroyed each other's transportation and production infrastructure and farmers were drafted into the military, the predictable result was severe food shortages. Even before the United States joined the war, it began shipping food aid to England.

"Food will win the war and write the peace," proclaimed Secretary of Agriculture Claude R. Wickard when the United States entered the war.[27] For the first time in American history, food became a weapon. American farmers were called upon to pull out all the stops and produce more food than they ever had before.[28]

In 1943, the Office of Price Administration took over the American food supply. It controlled both the price and the supply of critical agricultural commodities. Items like meat, butter and sugar were rationed. No one in the United States was in any danger of starving, but it was a shock to go to the grocery store and find once-everyday foods temporarily unavailable.[29]

At first, most people understood that the "food crisis" was temporary, caused by the war. They knew that the United States would need to continue sending food to Europe for a couple years after the war until they could get their agriculture restarted, but that was only for the short term.

But what if the war hadn't caused the food crisis at all? What if it was the other way around? What if Germany and Japan had become aggressive because they couldn't feed themselves, because they were overpopulated? What if Malthus was right, population had outstripped food supply, and the war was just a "positive check" trying to restore a lost balance? What if the future only held more and worse wars until the overpopulation problem was solved?[30]

These were the questions being asked in 1945 by Guy Irving Burch and Elmer Pendall in their influential book *Population Roads to Peace or War*, reprinted in 1947 under the title *Human Breeding and Survival*. The book's central thesis was that democracy and freedom were impossible in overpopulated countries.

"Democracy has been a rare institution in the history of the world," Burch and Pendall argued. "It is like a flower that cannot survive where the weeds of overpopulation crowd."[31] War,

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[26] For more on the history of birth control and its relation to neo-Malthusianism, see Matthew Connelly, *Fatal Misconception: The Struggle to Control World Population* (Cambridge, MA: Harvard University Press, 2008) and Derek S. Hoff, *The State and the Stork: The Population Debate and Policy Making in US History* (Chicago: University of Chicago Press, 2012).

[27] Roy F. Hendrickson, *Food "Crisis"* (Garden City, NY: Doubleday, Doran, 1943), 2, 260.

[28] John D. Black, *Food Enough* (Lancaster, PA: Jaques Cattell, 1943), 1.

[29] Kendra Smith-Howard, *Pure and Modern Milk: An Environmental History since 1900* (New York: Oxford University Press, 2014), 62-64; Louis Bromfield, "We Aren't Going to have Enough to Eat," *Reader's Digest* (August 1943): 111-117.

[30] Dudley Kirk, "Population Changes and the Postwar World," *American Sociological Review* 9, no. 1 (February 1944): 28-35; Arthur P. Chew, "The Catch in Industrialism, Part 2: Food and Empire," *The Land* 6, no. 1 (Spring 1947): 57-62; M. H. Cadwalader, "Japan Today," *The Land* 6, no. 2 (Summer 1947): 174-176.

[31] Guy Irving Burch and Elmer Pendell, *Human Breeding and Survival: Population Roads to Peace or War* (New York: Penguin, 1947), 36.

they argued, was caused by scarcity of natural resources and food, and thus the best way to prevent war in the future was to halt population growth.[32]

Burch and Pendall believed that the optimum world population was somewhere around 1.6 billion people, based on calculations that there were approximately 4 billion acres of arable land on earth and it took 2.5 acres to provide "a minimum adequate diet" for each person.[33] The earth was already overpopulated by some 600 million people, they argued, which was what had sparked the world war and would continue to cause wars until the population could be decreased back down to 1.6 billion people.[34]

The solution? Population control. Burch and Pendall advocated an immediate international birth control program to stabilize and eventually slightly decrease the world's population. It must, at all costs, be stabilized no higher than 2 billion to keep world peace. Their book was the first to so clearly lay out the neo-Malthusian approach to world problems. While admitting that birth control was "not a cure-all," they felt that it was a vital first step to prevent World War III from destroying the human race.[35]

Population Roads to Peace or War started a storm of controversy about the ethics and morality of birth control. It started a neo-Malthusian movement in the United States which would reach its zenith in the 1970s. It initiated trends that would shape US foreign policy for the remainder of the 20th century. And, even if no one today realizes it, it was the beginning of the idea that organic agriculture couldn't feed the world.

"We could go back to an organic agriculture in this country if we had to," Secretary of Agriculture Earl Butz told the *New York Times* on April 16, 1972. "We know how to do it. We did it when I was a kid. We didn't use any chemicals then.

"But before we go back to organic agriculture somebody is going to have to decide what 50 million people we are going to let starve…You simply could not feed 206 million Americans even at subsistence levels with the kind of agriculture we had 50 years ago. It would be impossible."

Butz was right that 1920s American agriculture couldn't have fed everyone in the 1970s, or today. But he mistakenly equated organic agriculture with the inefficient practices upon which the original "2.5 acres per person" statistic was based.

Unfortunately, Butz was an influential leader, many people wanted to believe him, and his unsupported statement was repeated so many times that many people today sincerely believe it is true. But it isn't, and it never was.

In reality, organic agriculture and what we now call "conventional" agriculture were both developed in the 1940s to improve wasteful farming practices. They both are capable of increasing yields many times over the averages of the 1920s. Organic agriculture holds just as much promise of feeding 9 billion people by 2050 as any other system, and may be more sustainable in the long run.

Can organic agriculture feed the world?

Only time will tell, but there is no inherent reason why it can't.

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[32] Burch and Pendell, *Human Breeding*, 7.
[33] Burch and Pendell, *Human Breeding*, 27, 50.
[34] Burch and Pendell, *Human Breeding*, 27.
[35] Burch and Pendell, *Human Breeding*, 67-68.