How do you define "industrial agriculture"?

One way to think about "industrial agriculture" is that **it's a food production system that replaces natural cycles and ecological processes with synthetic inputs and fossil fuels.**

In an era when we know fossil fuels and mined minerals are becoming more expensive (not to mention running out) this system becomes ever more costly and irrational. Industrial agriculture takes what was once a highly efficient system—farming that turns solar energy into food we humans can eat—into a highly energy-intensive one.

Where sustainable farms build soil fertility through ecology, through techniques like planting nitrogen-fixing crops, industrial operations must import fertility to the farm using amixture of nitrogen, mined phosphorus, and potash (N, P, and K).38
Planting single varieties across vast acreage—called monocultures—is at the heart of the industrial model.
Monocultures enable you to plant uniform rows, spray uniform chemicals and fertilizers, and use large-scale machinery, cutting down on labor costs. But planting a monoculture means farmers don't actively build healthy soil, and they forego the benefits to plants and soil that come from planting a variety of crops.39
Many industrial farms also leave their fields bare much of the year, making the land vulnerable to erosion.
Industrial agriculture's approach to raising livestock separates animals from their source of food, as livestock move off fields and into factories.40
One result? Livestock become more vulnerable to disease—and drug use on the farm become commonplace.41
Another result? What was once a great source of nutrients for farming—animal manure—becomes a source of serious air, water, and soil pollution. Stored in what the industry euphemistically calls "lagoons," waste runoff from factory farms has become a major public health and environmental problem. In addition, manure stored in cesspits breaks down without oxygen (anaerobically), which releases methane into the atmosphere, which is a potent greenhouse gas.42

Notes

39. For research on the impact of one-crop plantings, or monocultures, on soil fertility see the work of the Pennsylvania-based
Rodale Institute at www.rodaleinsitute.org. See also Deborah Koons Garcia's documentary, Symphony of the Soil at www.
symphonyofthesoil.com.

40. To learn about the consolidation of the livestock industry and the growth of factory farming, see: James M. MacDonald
and William D. McBride, "The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks," U.S. Department of
Agriculture, Economic Research Service, January 2009. For more on livestock factory farms, or CAFOs (concentrated animal
feeding operations), and their impact on our health, the environment, animal welfare, as well as labor, politics, and economics,
see: Dan Imhoff, ed., The CAFO Reader: The Tragedy of Industrial Farmed Factories. Healdsburg, CA: Watershed Media, 2010.

41. National Academies Press, The Use of Drugs in Food Animals: Benefits and Risks, Washington D.C.: NAP, 1999: 12-13. There
are five major types of pharmaceuticals used in factory farming including: antiseptics, bactericides, and fungicides for skin and
hoof cuts and infections; ionophores to facilitate digestion for ruminants like cattle and to protect against parasites; steroid

anabolic growth promoters; antiparasite drugs; and antibiotics at a subtherapeutic level to promote growth or at higher level to address disease. Those are just the main drugs. Poultry growers, for instance, also use drugs with arsenic, like Roxarsone.

42. Union of Concerned Scientists, "The Hidden Cost of CAFOs: Issue Briefing," September 2008: "CAFO manure has contaminated drinking water in many rural areas, caused fish kills, and contributed to oxygen-depleted "dead zones" (areas devoid of valuable marine life) in the Gulf of Mexico, the Chesapeake Bay, and elsewhere. Ammonia in manure contributes to air pollution that causes respiratory disease and acid rain. Leakage under liquid manure storage "lagoons" pollutes groundwater with harmful nitrogen and pathogens, and some lagoons have even experienced catastrophic failures, sending tens of millions of gallons of untreated waste into streams and estuaries, killing millions of fish."

43. See the EPA Regulatory Definitions of Large, Medium, and Small CAFOs: http://www.epa.gov/npdes/pubs/sector_table.pdf . For detailed scope and definitions, see Code of Federal Regulations 40 CFR 122.23 (4) available at this permanent link: http://cfr.vlex.com/vid/19812671. Communities across the country are working to stop CAFOs from moving in. Read this heroic account of the impact of CAFOs and one-woman's community-based struggle to fight back, here: www.animalfactorybook.com.

44. For more on livestock factory farms, or CAFOs (concentrated animal feeding operations), and their impact on our health, the environment, animal welfare, as well as labor, politics, and economics, see: Dan Imhoff, ed., The CAFO Reader: The Tragedy of Industrial Farmed Factories. Healdsburg, CA: Watershed Media, 2010. To learn about the consolidation of the livestock industry and the growth of factory farming, see: James M. MacDonald and William D. McBride, "The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks," U.S. Department of Agriculture, Economic Research Service, January 2009.

45. See, for example, Cornell University Professor David Pimentel's study on pesticide residence, including: "Environmental and Economic Impact of Reducing U.S. Agricultural Pesticide Use," Handbook of Pest Management in Agriculture, Vol. I. Boca Raton, FL: CRC Press, 1991: 679-718. See, for example, Marion Nestle, "Superweeds: A Long Predicted Problem For GM Crops Has Arrived," The Atlantic, May 15, 2012.

46. According to data captured by the USDA, synthetic fertilizer (nitrogen, phosphate, and potash) use in the United States has gone up 279 percent from 1960-2010; prices have far outpaced the rise in usage with increases of at least 500 percent. Phosphate and potassium chloride have seen prices rise twelve to seventeen times since 1960. See: Economic Research Service U.S. Department of Agriculture, "Data Set: Fertilizer Use and Price," 2010.

How do you define "sustainable farming"?

Chemical giants Monsanto and Syngenta say they're in the business of "sustainable agriculture" but so does the organic vegetable grower selling at your weekly farmers market.

So what does "sustainable agriculture" really mean?57

Here's one definition from the 1990 farm bill. That year, the farm bill defined sustainable agriculture **as a way of farming that satisfies human food and fiber needs; enhances environmental quality and natural resources; makes the most efficient use of non renewable resources and on-farm resources; sustains the economic viability of farm operations; and enhances the quality of life for farmers and society as a whole.58**
That's a good definitional start. There are other terms you might encounter. Below you'll find a few of them and a little bit about what makes each unique. I chose to talk about "sustainable farming" in the film—not specifically organic agriculture, for instance. Because there are many practices along the spectrum of sustainability that still make huge improvements in terms of human, environmental, and animal welfare impact, but that are not organic farming by the letter of the law. And, of course, there are many farmers that go well beyond the requirements of organic, bringing even greater soil health and biodiversity to the farm.

Notes

57. Read more about sustainable agriculture on Sustainable Table's website: http://www.sustainabletable.org/intro/whatis/

58. "Sustainable agriculture" was addressed by Congress in the 1990 "Farm Bill" Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA), Public Law 101-624, Title XVI, Subtitle A, Section 1603 (Government Printing Office, Washington, DC, 1990)NAL Call # KF1692.A31 1990. http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml#toc2

76. See for instance, ETC Group: Action Group on Erosion, Technology, and Concentration, "Who Will Feed Us? Questions for the Food and Climate Crises." November 2009: 1. Jules Pretty and Rachel Hine, "Reducing Food Poverty with Sustainable Agriculture," Center for Environment and Society, University of Essex, UK, February 2001 and Badgley, C. et al., "Organic Agriculture and the Global Food Supply," Renewable Agriculture and Food Systems 22 (2007): 86-108.

77. There are many great studies on the resiliency of sustainable farms, especially during weather extremes like droughts. The Pennsylvania-based Rodale Institute found that during a ten-year period comparing organic and non-organic corn growing systems, the organic corn fields yielded on average 30 percent higher during dry years. Rodale Institute, "The Farming Systems Trial: Celebrating 30 Years." Kutztown, PA: 2011. For an example of a study from sub-Saharan Africa, see Amede Tilahun, "Yield Gain and Risk Minimization in Maize (Zea Mays) through Cultivar Mixtures in Semi-arid Zones of the Rift Valley in Ethiopia," Experimental Agriculture 31, no. 02 (1995). Researchers found that fields in this drought-prone region of Ethiopia planted with biodiverse fields yielded about 30 percent more than monocultures during normal rainfall years, and yielded 60 percent more during dry years.

78. Jules Pretty, "Agroecological Approaches to Agricultural Development," (Essex: University of Essex, 2006).

79. United Nations Environment Program Conference on Trade and Development, "Organic Agriculture and Food Security in Africa," September 2008.

80. The Farming Systems Trial out of the Rodale Institute has shown that diversified organic agriculture with cover crops used 45 percent less energy and produced 40 percent less greenhouse gases. Rodale Institute, "The Farming Systems Trial:

Celebrating 30 Years," Kutztown, PA (2011). Other studies about the benefits of organic farming in drought years include:
Amede Tilahun, "Yield Gain and Risk Minimization in Maize (Zea Mays) through Cultivar Mixtures in Semi-arid Zones of the Rift
Valley in Ethiopia," Experimental Agriculture 31, no. 02 (1995).

81. Leopold Center for Sustainable Agriculture, "Long-Running Experiment Shows Organic Farming is Profitable," (2011).

82. IAASTD, "Summary Report" (paper presented at the International Assessment of Agricultural Science and Technology for
Development Johannesburg, South Africa, April 2008), Executive Summary, 9

83. Badgley, C. et al., "Organic Agriculture and the Global Food Supply," Renewable Agriculture and Food Systems 22 (2007):86-108.

84. The Farming Systems Trial out of the Rodale Institute has shown that diversified organic agriculture with cover crops uses
less energy and produces less greenhouse gases; the Institute's organic no-till system also reduces fossil fuel use by 75 percent
over conventional tillage farming. Rodale Institute, "The Farming Systems Trial: Celebrating 30 Years," Kutztown, PA (2011). See,
for example, David Pimentel, "Impact of Organic Farming on the Efficiency of Energy Use in Agriculture." 2006:40. See for
instance, a discussion of the study in: David Pimentel et al, "Environmental, Energetic, and Economic Comparisons of Organic
and Conventional Farming Systems," Bioscience 55 (7): 573-582.

85. The Ogallala Aquifer that supports a quarter of U.S. farmland is being drained so fast it could be dry in a few decades.
The Aquifer is essentially "fossil water—irreplaceable. Committee on Twenty-First Century Systems Agriculture and National
Research Council, Toward Sustainable Agricultural Systems in the 21st Century. The National Academies Press, 2010. See also:
Kumar et al., "Ecologically Sound, Economically Viable: Community Managed Sustainable Agriculture in Andhra Pradesh, India."
Chris Reij, "Food Security and Water in Africa's Drylands," in African Re-greening Initiatives March 8, 2012.

86. According to the Global Phosphorus Research Initiative, worldwide phosphorus supplies won't be able to match agricultural
demand within fifty years. James Elser and Stuart White, "Peak Phosphorus," Foreign Policy, April 20, 2010.

87. Anna Lappé, Diet for a Hot Planet: The Climate Crisis at the End of Your Fork and What You Can Do About It. New York:
Bloomsbury USA (2011).