

hormones and increasing the rate of converting feed to muscle; at the same time, however, it increases stress in animals, leading to behavior issues, aggression, and other health problems. Ractopamine is permitted under the FDA because it is not classified as a growth hormone, which are prohibited in pig farming. There is significant controversy around the safety and potential risks of the drug to the health of animals receiving it and the humans consuming their meat. While allowed in the United States, ractopamine is prohibited in many countries including Russia, China, and those in the European Union.

Regenerative agriculture is a holistic land management and farming methodology that focuses on increasing and enhancing soil organic matter to improve nutrient content, water retention, and carbon sequestration. Unless certified by a third party with established regenerative standards, regenerative does not have an agreed upon definition or guarantee associated with the term's use.

Silvopasture is a type of agroforestry that combines trees with foraging land for livestock production.

Smallholder Farms are defined as independently owned farms whose principal operator(s) owns the farm business and demonstrates a strong commitment to sustainable farm practices and animal welfare. The principal operator is the person who is responsible for the on-site, day-to-day decisions of the farm or ranch business. Any slaughter of animals on smallholder farms must take place on farm property with attention to humane slaughter practices where reasonable given farm size and scale. Gross annual sales of a smallholder farm must fall under \$250,000.

Sows are mother pigs who have given birth to one or more litters.

Sub-therapeutic/non-therapeutic refers to a dose or concentration of a drug that is lower than usually prescribed to treat a disease effectively. For example, it can be common practice to add subtherapeutic doses of antibiotics to livestock feed to improve productivity.

Zoonotic diseases are infectious diseases that can be passed between animals and humans through direct contact or contact with contaminated vectors such as food or water. Common zoonotic diseases include the plague, salmonella, West Nile virus, rabies, and zoonotic influenza. Confinement of animals, or even people, increases the risk of spreading infectious diseases and there is growing concern that CAFOs are hotbeds for the spread of zoonotic diseases because of the close quarters, weakened immune systems of animals, excessive use of antibiotics, and improper waste management.^{xxxiii}

ⁱ EPA, "Sources of Greenhouse Gas Emissions: Agriculture Sector Emissions," Overviews and Factsheets, United States Environmental Protection Agency, 2019, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.

ⁱⁱ Neus González et al., "Meat Consumption: Which Are the Current Global Risks? A Review of Recent (2010–2020) Evidences," *Food Research International (Ottawa, Ont.)* 137 (November 2020): 109341, <https://doi.org/10.1016/j.foodres.2020.109341>.

ⁱⁱⁱ Courtney Lindwall, "Industrial Agricultural Pollution 101," *NRDC* (blog), July 31, 2019, <https://www.nrdc.org/stories/industrial-agricultural-pollution-101>.

^{iv} "The Welfare of Intensively Confined Animals in Battery Cages, Gestation Crates, and Veal Crates" (The Humane Society of the United States, July 2012), <https://www.humanesociety.org/sites/default/files/docs/hsus-report-animal-welfare-of-intensively-confined-animals.pdf>.

^v "Animal Welfare," *A Greener World* (blog), accessed July 12, 2021, <https://agreenerworld.org/challenges-and-opportunities/animal-welfare/>.

^{vi} The Humane Society of the United States, "An HSUS Report: Welfare Issues with the Use of Hormones and Antibiotics in Animal Agriculture," January 2016, <https://www.humanesociety.org/sites/default/files/docs/hsus-report-issues-with-hormones-welfare.pdf>.

^{vii} Senthil Venkatraman et al., "Adverse Effects on Consumer's Health Caused by Hormones Administered in Cattle," *International Food Research Journal* 25 (February 1, 2018): 1–10.

<https://www.proquest.com/openview/b2eb062a6ce426cffb8e6e53a84e316a/1?pq-origsite=gscholar&cbl=816390>.

^{viii} Bryony A. Jones et al., “Zoonosis Emergence Linked to Agricultural Intensification and Environmental Change,” *Proceedings of the National Academy of Sciences of the United States of America* 110, no. 21 (May 21, 2013): 8399–8404, <https://doi.org/10.1073/pnas.1208059110>.

^{ix} Jeff Moyer et al., “The Power of the Plate: The Case for Regenerative Organic Agriculture in Improving Human Health,” White Paper (Rodale Institute, 2020), <https://rodaleinstitute.org/wp-content/uploads/Rodale-Institute-The-Power-of-the-Plate-The-Case-for-Regenerative-Organic-Agriculture-in-Improving-Human-Health.pdf>.

^x “10 Things You Should Know about Industrial Farming,” United Nations Environmental Program, July 20, 2020, <http://www.unep.org/news-and-stories/story/10-things-you-should-know-about-industrial-farming>.

^{xi} Neus González et al., “Meat Consumption: Which Are the Current Global Risks? A Review of Recent (2010–2020) Evidences,” *Food Research International (Ottawa, Ont.)* 137 (November 2020): 109341, <https://doi.org/10.1016/j.foodres.2020.109341>.

^{xii} P.R. Shukla et al., “Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems” (Intergovernmental Panel on Climate Change, 2019), <https://www.ipcc.ch/site/assets/uploads/2019/11/SRCLL-Full-Report-Compiled-191128.pdf>.

^{xiii} Giampiero Grossi et al., “Livestock and Climate Change: Impact of Livestock on Climate and Mitigation Strategies,” *Animal Frontiers* 9, no. 1 (January 3, 2019): 69–76, <https://doi.org/10.1093/af/vfy034>.

^{xiv} “FAO’s Animal Production and Health Division: Pigs and Environment,” Food and Agriculture Organization of the United Nations, November 28, 2014, <https://www.fao.org/ag/againfo/themes/en/pigs/Environment.html>.

^{xv} Paloma Sisneros-Lobato, “Industrial Farming Is Not As You’ve Pictured,” NRDC, August 24, 2020, <https://www.nrdc.org/experts/paloma-sisneros-lobato/industrial-farming-not-youve-pictured>.

^{xvi} JoAnn Burkholder et al., “Impacts of Waste from Concentrated Animal Feeding Operations on Water Quality,” *Environmental Health Perspectives* 115, no. 2 (February 1, 2007): 308–12, <https://doi.org/10.1289/ehp.8839>.

^{xvii} Wendee Nicole, “CAFOs and Environmental Justice: The Case of North Carolina,” *Environmental Health Perspectives* 121, no. 6 (June 2013): a182–89, <https://doi.org/10.1289/ehp.121-a182>.

^{xviii} Michael Greger and Gowri Koneswaran, “The Public Health Impacts of Concentrated Animal Feeding Operations on Local Communities,” *Family & Community Health* 33, no. 1 (January 2010): 11–20, <https://doi.org/10.1097/FCH.0b013e3181c4e22a>.

^{xix} “Welfare Issues for Pigs,” Compassion in World Farming, accessed July 21, 2021, <https://www.ciwf.com/farmed-animals/pigs/welfare-issues/>.

^{xx} Animal Legal Defense Fund, “Ractopamine Emergency Rulemaking Petition” (Center for Biological Diversity, June 3, 2020), https://www.biologicaldiversity.org/programs/environmental_health/pdfs/2020-06-03-Ractopamine-Suspension-Petition--ALDF-FACT-Center.pdf.

^{xxi} Ben Knuth et al., “Advancing Organic to Mitigate Climate Change,” White Paper (Washington, D.C.: Organic Trade Association, 2020), https://ota.com/sites/default/files/indexed_files/OrganicTradeAssociation_ClimateChange_WhitePaper_PlanetOrganic.pdf.

^{xxii} Agricultural Marketing Service, “Organic Livestock Requirements” (USDA National Organic Program, July 2013), <https://www.ams.usda.gov/sites/default/files/media/Organic%20Livestock%20Requirements.pdf>.

^{xxiii} Agricultural Marketing Service, “Organic,” United States Department of Agriculture, accessed July 7, 2021, <https://www.ams.usda.gov/grades-standards/organic-standards#Livestock>.

^{xxiv} A Greener World, “What Is ‘Regenerative’? 9 Reasons You Should Care,” *A Greener World* (blog), November 13, 2020, <https://agreenerworld.org/a-greener-world/what-is-regenerative-9-reasons-you-should-care/>.

^{xxv} Shibu Jose and Jeanne Dollinger, “Silvopasture: A Sustainable Livestock Production System,” *Agroforestry Systems* 93, no. 1 (February 1, 2019): 1–9, <https://doi.org/10.1007/s10457-019-00366-8>.

^{xxvi} Paul Hawken, ed., *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming* (Penguin, 2017).

^{xxvii} “Literature Review: Crop & Livestock Integration,” *Rodale Institute* (blog), August 6, 2019, <https://rodaleinstitute.org/science/articles/literature-review-crop-livestock-integration/>.

^{xxviii} Jeff Moyer et al., “The Power of the Plate: The Case for Regenerative Organic Agriculture in Improving Human Health,” White Paper (Rodale Institute, 2020), <https://rodaleinstitute.org/wp-content/uploads/Rodale-Institute-The-Power-of-the-Plate-The-Case-for-Regenerative-Organic-Agriculture-in-Improving-Human-Health.pdf>.

^{xxix} Jason E. Rowntree et al., “Ecosystem Impacts and Productive Capacity of a Multi-Species Pastured Livestock System,” *Frontiers in Sustainable Food Systems* (2020), <https://doi.org/10.3389/fsufs.2020.544984>.

^{xxx} Hannah Gosnell, Susan Charnley, and Paige Stanley, “Climate Change Mitigation as a Co-Benefit of Regenerative Ranching: Insights from Australia and the United States,” *Interface Focus* 10, no. 5 (October 6, 2020): 20200027, <https://doi.org/10.1098/rsfs.2020.0027>.

^{xxxi} Natural Resources Conservation Service, “Animal Feeding Operations,” United States Department of Agriculture, accessed July 2, 2021, <https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/livestock/afo/>.

^{xxxii} “Why Are CAFOs Bad?,” Sierra Club, February 24, 2015, <https://www.sierraclub.org/michigan/why-are-cafos-bad>.

^{xxxiii} Lisa Held, “Industrial Meat 101: Could Large Livestock Operations Cause the Next Pandemic?,” *Civil Eats*, May 29, 2020, <https://civileats.com/2020/05/29/industrial-meat-101-could-large-livestock-operations-cause-the-next-pandemic/>.