Industrial agriculture: Environmental impacts and implications for our health

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Pittsburgh, Mar. 2019
Industrialization: Bigger farms, more intensive production (inputs, tillage)

“Plow up every bit of land you can get your tractor on and plant fence row to fence row”

“Get big or get out”

—Earl Butz, Secretary of Agriculture, 1973
US Industrial Agriculture:
More Farmland
Fewer Farmers
Larger Farms

U.S. Census of Agriculture
Global Agricultural Industrialization: “How to Feed the World in 2050”

70% More Food Production by 2050

Bruinsma/FAO 2009
Driver of Change: Population Growth

Population (billions)

1950: 2
2019: 7
2050: 10

UN, 2008
Driver of Change: $ = Meat Consumption

Worldwide Cattle, Chickens, Goats, & Pigs

FAO, 2011
Driver of Change: Policy e.g. Biofuels

Worldwide Bioethanol Consumption

Billions of Liters

OECD, 2012
Industrialized agriculture can disrupt ecosystem services
Agriculture – Climate Change – Our Health

Greenhouse Gas Emissions

- Industry: 21%
- Transportation: 14%
- Buildings: 6%
- Agriculture, Forestry and Other Land Use: 24%
- Electricity and Heat Production: 25%
- Other Energy: 10%

Lead to Climate Change & Threaten Food Production

IPCC 2014

https://climate.nasa.gov/effects/
Can no-till agriculture mitigate climate change?

‘4 per mille’ initiative under UNFCCC at Paris Agreement (2015)

From Minasny et al., 2017

Strudley et al., 2008
Average Annual Change in Total SOM Carbon per hectare of cropland (Mg C ha⁻¹ yr⁻¹)
No-till agriculture does not even come close to offsetting CO2 emissions

0.17 Pg C/yr vs
8.9 Pg C/yr ambition
Agriculture – Pollination – Our Health

60% of pollinator species in decline

Threatens our most nutritious foods

- Climate change
- Habitat loss
- Parasites
- Invasive species
- Pathogens
- Pesticides


Blog.blueapron.com/americas-tiny-farmers

about 75% of the world’s crops depend on pollinators
Can restoring pollinator habitat preserve pollination?

White House Pollinator Partnership Action Plan (2016)

Restoring 7 million acres of pollinator habitat by 2021
Pollinator habitats increase marketable yields of strawberries and squash.
Small Improvements to Industrial Agriculture May Not Be Enough

• Changing tillage practices alone will not stop climate change
• Pollinator habitats can improve pollination but is it enough?
Paradigm Shift → Agriculture & Health

• Cannot take for granted a consistent and nutritious food supply
• Stop looking for silver bullet solutions to agricultural sustainability
• Change research funding for integrated health & agricultural research (O ‘Rourke et al. 2017)
• Enough is enough! → eat less meat and roll back biofuel mandates
• Pay more for food → more resources for agricultural stewardship
Sustainable Intensification

• Efficient - Less waste
• New, smarter technologies
• Multifunctional: Food & ecosystem services & our health