CLIMATE CHANGE HARMS AGRICULTURE

PESTS, WEEDS, DISEASES
• More optimal living conditions for pests, parasites and fungi
• Invasive species expand and spread
• Reduced resilience to disease outbreak

EXTREME WEATHER
• Hurricanes and storms increase in frequency and severity
  • Hurricane Maria: $780M in ag losses
  • CAFO overflows

FLOODS AND DROUGHTS
• Irregular and extreme precipitation events more frequent and severe
  • 2016 CA Drought: $603M in ag losses
  • 2019 Midwest floods: 5-10M bushels corn and soy rotted; 19M acres left unplanted

HEAT WAVES AND WILDFIRES
• More frequent and severe
• Lead to yield declines
• Dangerous working conditions
INDUSTRIAL AGRICULTURE CONTRIBUTES TO CLIMATE CHANGE

**Nitrous Oxide**
- Excess fertilizer, animal manure
- ~73 coal-fired power plants

**Carbon Dioxide**
- Fertilizer manufacture, on-farm energy, food waste in landfills
- ~12 coal-fired power plants

**Soil Carbon**
- Forest and grassland conversion, tillage
  - ~17 coal-fired power plants
  - 7.8M+ acres converted to cropland from 2008-2012

**Methane**
- Cattle, animal manure
- ~87 coal-fired power plants
- Equal to emissions from entire oil and gas sector

*Does not include GHG from land conversion, foregone sequestration; additional food system emissions from processing, refrigeration, cooking, transport, etc.*
AGROECOLOGICAL PRACTICES REDUCE CHEMICAL USE, POLLUTION, CLIMATE IMPACTS

- Chemical-intensive, monoculture systems increase erosion and GHG emissions and are not necessary for high productivity and profitability.
- Organic and agroecological practices can provide ample nutritious food while reducing fertilizer/pesticide needs and costs.
- These proven practices include:
  - Perennial crops (see image)
  - Crop rotations (different yearly crops)
  - Cover crops (avoiding winter bare ground)
  - No-till, reduced till; prairie strips
  - Management intensive grazing
  - Agroforestry & silvopasture (trees)
  - Dry manure management
  - Organic fertilizer
  - Riparian buffers, wind breaks.
CARBON NEUTRAL FUTURE: BETTER PRACTICES CAN ACHIEVE CARBON NEUTRAL AGRICULTURE

U.S. TOTAL EMISSIONS (636 MMT)
- LAND USE
- ENERGY
- ANIMAL
- CROP

POTENTIAL REDUCTIONS
- MIN/MAX Reduction/Acre \times \text{Available U.S. Acres} (533-957 MMT)
- MEAN Reduction/Acre \times \text{Available U.S. Acres} (745 MMT)
ALTERNATIVE PRACTICES NEED INCENTIVES TO INCREASE ADOPTION

- Agroecological practices are very effective, but not widely employed
  - **Universal barriers include:** knowledge and capacity, technical and technological support, lack of site- or region-specific information, cultural attitudes, financial risks and opportunity costs…
  - >85% of USDA survey participants would NOT adopt structural conservation practices without outside funding

<table>
<thead>
<tr>
<th>PRACTICE</th>
<th>U.S. ADOPTION RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover crops</td>
<td>~4% of all cropland acres</td>
</tr>
<tr>
<td>No-till</td>
<td>26% of all cropland acres*</td>
</tr>
<tr>
<td>Fertilizer management</td>
<td>6% of corn and 24% of cotton acreage meet all 4 criteria for good nitrogen management**</td>
</tr>
<tr>
<td>Crop rotations (&gt;2 years)</td>
<td>~11% of all cropland acres</td>
</tr>
<tr>
<td>Residue grazed by livestock</td>
<td>12% of corn acreage</td>
</tr>
<tr>
<td>Certified organic</td>
<td>&lt;1% of all US farms</td>
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</tbody>
</table>

*Less than a third of “no-till farms” are truly no-till.

**No fall application, optimal rate, some N after planting, incorporated below soil surface
POLICY RECOMMENDATIONS TO ACCELERATE CARBON NEUTRAL AGRICULTURE

1. Eliminate policy barriers to adoption of agricultural land management practices with climate change mitigation potential

2. Incentivize practices with climate benefits

3. Increase funding for research and development

4. Improve education, outreach and participation through federal programs

5. Address related laws and programs affecting climate change and resiliency
STATUTORY CHANGES NECESSARY FOR CARBON NEUTRAL AGRICULTURE

• The Farm Bill
  • Expand and better target conservation programs to practices with climate change mitigation and resilience potential and away from practices with negative impacts
  • Increase funding for R&D into climate-friendly practices, education, & outreach
  • Reform crop insurance and commodity payments to avoid barriers to climate-friendly practices and create additional incentives

• Energy policy and laws
  • Fix renewable fuel standard to reduce conversion of native grasslands to cropland
  • Encourage on-farm renewable energy and energy efficiency

• Pollution and land management statutes
  • Eliminate barriers and create incentives for management intensive grazing
  • Increase information sharing and data availability
  • Prioritize climate beneficial practices in other water and air quality programs (e.g. nonpoint source)
RECOMMENDATION 1: ELIMINATE BARRIERS TO ADOPTION OF CLIMATE-FRIENDLY PRACTICES

• Reform crop insurance and commodity payments
  • Ensure payment calculation methods do not discourage conservation rotations, cover crops, perennial crops
  • Incentivize and do not impede risk minimization practices (i.e. climate resilience)
  • Improve process for including climate-friendly practices in "good farming practices"

• Permit and encourage management intensive grazing on federal land
  • Amend rules that currently lead to overgrazing; encourage forage growth
RECOMMENDATION 2: SHIFT INCENTIVES TOWARD CLIMATE FRIENDLY PRACTICES

- Leverage/expand existing programs
- Environmental Quality Incentives Program (EQIP)
  - Funded projects often counter-productive (NRCS review) or impede broader shift to agroecological practices (irrigation, CAFOs)
  - Prioritize climate-friendly practices
  - Allocate larger share of funding to practices that reduce GHG
- Conservation Stewardship Program (CSP)
  - Raise payment rate for conservation activities with climate change mitigation potential
  - Enhance opportunities for perennial crops
RECOMMENDATION 3: INCENTIVIZE VEGETATED BUFFERS AND EASEMENTS

- One third of riparian areas not protected, yet have highest conservation value
- **Conservation Reserve Program (CRP)**
  - Often only temporary benefits; accumulated soil C lost when CRP contracts expire and land put back into production
  - Offer longer-term agreements to keep land out of production and hold accumulated soil carbon longer
  - Expand and encourage use of 30-year contracts allowed by 2018 Farm Bill basis
  - Focus on land with greatest climate benefits
- **Congress and States can expand** Agricultural Conservation Easement Program (ACEP)
RECOMMENDATION 4: INCREASE FUNDING FOR RESEARCH AND DEVELOPMENT

- Research & outreach funding half of prior years & largely supports conventional ag
- **Fund R&D** of monitoring & measurement technologies and methods, including remote
- Increase investment for **USDA Climate Hubs** research and other USDA entities
- Increase funding for **Conservation Innovation Grants, Agroforestry Centers, On-Farm Soil Health Demonstrations**
  - Create explicit category for climate change mitigation & resilience
RECOMMENDATION 5: IMPROVE EDUCATION, OUTREACH AND PARTICIPATION

- Knowledge, information and capacity is major barrier for all practices
- Restore and increase funding, now far below previous levels; cannot depend on private sources of technical assistance
- Increase funding for educational and technical support from:
  - NRCS Conservation Technical Assistance program, agents and offices in each county
  - Farmer-to-farmer networks
  - On-farm demonstrations and workshops
- Establish national “Soil Health Champions” program to expand peer-network learning
RECOMMENDATION 6: OTHER LAWS AND PROGRAMS TO REDUCE GHG

• Increase support and eliminate barriers for other practices that reduce GHG:
  • Improved livestock manure management, e.g. switch from wet to dry manure management
  • New on-farm technology (remote sensing, precision agriculture, etc.)
  • New climate resilient crop and feed varieties
• Encourage and incentivize on-farm renewable energy & energy efficiency
• Reform “aggregate compliance” in renewable fuel standard to slow grassland conversion
• Address food waste
## STATE HEALTHY SOILS LAWS AND BILLS

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<tr>
<th>State</th>
<th>Water Goal</th>
<th>Climate Change Goal</th>
<th>Other Goals</th>
<th>“Healthy Soil” Definition</th>
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