Why is it important to farm sustainably?

Agriculture contributes a significant portion of greenhouse gas emissions

Present Impact of Climate Change in VT:
- Since 1900, the Earth has warmed 1.5°F, and air temperatures in Vermont have increased more than 4°F in the winter and 2°F in the summer over the past 50 years.
- The state is seeing spring arriving two weeks earlier, and winter one week later compared to 1960.
- The temperature of Lake Champlain has increased by as much as 7°F in some areas from 1964 to 2009.
- Annual precipitation in Vermont has increased by almost 7 inches.
- The number of days with heavy precipitation (more than 1 inch) has almost doubled in the past 50 years.

Future Impact of Climate Change in VT:
- The frost free season will likely increase by several weeks, with more rain and less snow.
- The number of warm days (reaching 87°F or higher) are expected to increase from about 6 per year to more than 20 per year
How can we farm more sustainably?

Regenerative Agriculture

Farming and grazing practices that, among other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity – resulting in both carbon drawdown and improving the water cycle.

- Regeneration International

Renewable Energy

Energy from sources that are naturally replenishing but flow-limited; renewable resources are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time.

- U.S. EIA
# Regenerative Agriculture Techniques

<table>
<thead>
<tr>
<th><strong>Permanent Raised Beds:</strong></th>
<th><strong>Local Inputs:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Helps crops to shed excess water. Can lay a tarp over the beds for 2 weeks to reduce weed pressure with NO herbicides.</td>
<td>Using compost/manure from your own farm or town is a healthier alternative to importing fertilizer. Can also use biomass in the bottom of the bed to create a microclimate.</td>
</tr>
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<tr>
<th><strong>Crop Rotation:</strong></th>
<th><strong>Cover Cropping:</strong></th>
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<tbody>
<tr>
<td>Rotating crops helps to keep your soil healthy because different families of plants contribute and deplete different nutrients from the soil.</td>
<td>Planting cover crops increases soil health and prevents erosion.</td>
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<th><strong>No Till:</strong></th>
<th><strong>Simple Tools:</strong></th>
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<tr>
<td>Tilling releases CO2 into the atmosphere, and also destroys the soil microbes and soil health. Using heavy equipment to till creates an impenetrable hardpan under the soil, so roots must grow sideways and plants can easily get waterlogged. Tilling also dredges the seed bank, increasing weed pressure.</td>
<td>Simple, hand powered tools can reduce energy usage, and help avoid the hardpan layer.</td>
</tr>
</tbody>
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# Sustainable Energy Technologies

<table>
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<tr>
<th><strong>Solar Power:</strong></th>
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<tr>
<td>Even a small solar array can help to offset carbon emissions: a 1.5 kW array saves about 8 metric tons of CO2 per year and pays for itself in just 2.5 years! Colocalization of solar PV panels and crops has been shown to increase plant moisture content and decrease panel heat stress.</td>
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<th><strong>Wind Power:</strong></th>
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<tr>
<td>Small-scale wind turbines can help power a farm, occupy very little space (one turbine only takes up ½ acre, so crops can be planted right up to the base), and some of the best wind resources in the country are on farmland. Payback on wind turbines can range from 18-27 years for a 10 kW system, or 6-8 years for a 660 kW system.</td>
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<th><strong>Biomass Energy:</strong></th>
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<tr>
<td>Crops and biomass wastes can be converted to energy on the farm, or farmers can sell biomass to energy companies that produce fuel for cars, tractors, heat, and power. This biomass can be produced at no extra cost to the farmer; it is simply repurposing waste. Biomass can also be buried underneath raised beds to create a microclimate, utilizing the energy from decomposition.</td>
</tr>
</tbody>
</table>
Resources

Regenerative Agriculture

General Information
- Kiss the Ground documentary
- Kiss the Ground website
- Regeneration International
  - Why Regenerative Agriculture?
- Introductory videos and book recommendations
- The Climate Reality Project - What is Regenerative Agriculture?

Educational Opportunities
- Kearsarge Food Hub
- Kiss the Ground Stewardship program

Books:
- The New Organic Grower by Eliot Coleman
- The Urban Farmer: Growing Food for Profit on Leased and Borrowed Land by Curtis Stone

Renewable Energy

Natural Resources Conservation Service Vermont (USDA)
- On-Farm Energy Site Assessment, financial assistance and conservation innovation grants

Union of Concerned Scientists
- Renewable energy and agriculture
- Biomass
- Wind

NREL
- Benefits of Agrivoltaics Across the Food-Energy-Water Nexus
- Data and tools