



Climate Smart Farming in the Northeast: Six Key Strategies for Farmers

In the Northeastern United States, climate-related risks such as extreme rainfall, drought, heat stress, changing disease and pest pressure, and unpredictable weather patterns pose serious threats to farmers' livelihoods. The average annual temperature in the Northeast has increased by approximately 2.4°F, and annual precipitation has increased by 4.9 inches over the last 120 years.

The frequency of extreme rainfall events (e.g., 2 inches of rain in a 24-hour period) has increased 71% between 1958-2012 (NOAA/NCDC). The length of the frost-free growing season has increased by 10 days, on average. These changes are projected to continue and increase in the future, and will pose threats to soil conditions, farm buildings, livestock health, as well as crop and animal productivity and quality.

Despite these risks, farmers can make changes to their practices and systems which will reduce the severity of these climate impacts. Climate change may create opportunities for new enterprises as warmer temperatures lengthen the growing season, while the variability and unpredictability will remain a challenge.

The Six Key Strategies listed below are actions that farmers can take to reduce risks and improve the sustainability of their farm. Many of these best management practices may not be new to farmers, but taken together they can help increase resiliency on the farm over the short and long-term.

1. Focus on Soil Health

Warming temperatures and extreme rainfall or drought will increase the potential for soil moisture stress to affect all crops. Healthy, well-structured soil that is protected by vegetation captures more water and is less susceptible to surface runoff, compaction, and erosion during heavy rain events. The following actions build soil health and resiliency to climate-related risks:

- Reduce tillage frequency and intensity, and transition to low-till or no-till planting methods where feasible.
- Increase organic matter inputs through cover crops, crop residues, manures, and compost.
 - Use winter and summer cover crops between main crops to maximize soil surface protection.
 - Use tillage methods which preserve plant residues on the soil surface. The goal is to minimize time with no plants covering the field.



- Develop a rotational plan to maximize the use of perennial crops in the rotation to avoid some or all tillage requirements.
- Reduce soil compaction by minimizing equipment passes over fields.
- Avoid fall tillage and bare winter fallow whenever possible.

2. Efficiently Manage Water Resources and Risks

Effective water management is critical in order to better handle the increased frequency of extreme precipitation events, storms, floods, and lengthening periods of short-term drought that are hitting the Northeast. Actions to improve water management include:



- Improve irrigation efficiency by using the latest technologies, such as micro-, subsurface, or drip irrigation; utilize reclaimed water if possible to conserve water during droughts.
- Install tile drainage in fields to remove excess water and control runoff.
- Expand or improve water supply systems to meet future demand, and increase water storage capacity by constructing deeper wells and ponds.
- Time fertilizer and manure applications based on weather forecasts.
- Construct over-sized and covered manure pits to minimize overflow risks during heavy rainfall events.
- Plant or manage riparian buffers along streams and ponds to capture remaining runoff, and integrate agroforestry into farming systems to increase water-use efficiency during dry periods.

3. Utilize Integrated Pest Management

Competition from weeds and increased threats from known and new invasive insects, weeds, and pathogens have increased in the warming climate. Employ these strategies to manage risks of pests and disease:



- Stay abreast of new threats and be aware of life cycles and how pests spread.
- Conduct regular scouting for weeds, insects, and pathogens, and control them with proven strategies.
- Use crop varieties and livestock lineage with resistance to pests and pathogens.
- Implement cultural and biological controls for pests whenever possible.
- Correctly use appropriate pesticides when pest or pathogens exceed economic thresholds.
- Practice sanitary farming practices (e.g. clean equipment in-between fields) to reduce the spread of pests and pathogens.

4. Diversify Farm Enterprises, Species, Crop Varieties, and Breeds

Diversifying farm enterprises, crops, and animals is a self-insurance policy for managing uncertainty in

a constantly-changing environment. Choosing a diversity of crops or animal species builds financial resiliency by reducing overall losses due to extreme weather events and market fluctuations. The following recommendations urge consideration of options to reduce these risks:

- Be open to change. Choose a variety of commodities, farm products and services that insulate against weather, environmental, market, and geopolitical threats.
- Diversify crop production by extending crop rotations and intercropping with multiple species or varieties.
- Select crop varieties based on maturity dates and genetics to match anticipated season length, rainfall and drought patterns, and pest/pathogen pressures.
- Consider controlled environment agriculture to extend the growing season, diversify operations, and decrease weather risks.



5. Reduce Livestock Stress from Extreme Temperatures

Heat waves, without cooling periods at night, increase the potential for heat stress on dairy cattle and other livestock and poultry. In dairy cattle, this can negatively affect milk yield, productivity, and animal health. In all livestock and poultry, heat stress can negatively impact average daily gains, feed efficiency, productivity and animal health. Heat stress can have both immediate and life-long impacts to young animals. Employ these strategies to reduce environmental stress:

- Ensure that dairy facilities are well ventilated and have proper cooling mechanisms in place. This includes calf housing, lactating and dry cow facilities, and access to shade while on pasture.
- Use fans and sprinkler systems controlled with automatic sensors to reduce the risk of heat stress on all animals.
- All animal classes should have access to fresh, clean water.
- Monitor and adjust diets for daily intakes. Rations should be balanced to meet animal needs at a reduced intake during periods of heat stress.



6. Engage in Farm Planning and Adaptive Management

Building resilience against climate-related threats requires careful planning and review of farm operations and the whole business. Baseline data is required to make whole-farm management decisions. These practices can help increase the sustainability of the farm:

- Develop an adaptation plan to identify your risks and practices to remediate them.
- Conduct a whole-farm energy audit to increase energy efficiency and opportunities for renewable energy sources.



- Utilize precision farming apps and weather and climate tools (such as climatesmartfarming.org) to make more informed crop production decisions.
- New and renovated farm buildings should be energy efficient and designed to withstand predicted weather conditions, including severe heat, heavy rainfall, wind, and snow loads.
- When purchasing new farm equipment, select options to maximize fuel efficiency and decrease labor and time constraints.
- Consider purchasing crop insurance to reduce economic risks.

For Further Information

- Cornell's Climate Smart Farming (<http://climatesmartfarming.org>) provides research based information, resources and decision tools to help farmers in New York and the Northeast to:
 - Increase farm resiliency;
 - Sustainably increase productivity and farming incomes;
 - Reduce GHG emissions through energy efficiency and renewable energy.
- Find your local Cooperative Extension Office: <https://nifa.usda.gov/land-grant-colleges-and-universitiespartner-website-directory?state=All&type=Extension>
- Find your local USDA office: <https://www.farmers.gov/connect>
- FAO Climate Smart Agriculture Sourcebook: <http://www.fao.org/docrep/018/i3325e/i3325e.pdf>
- NOAA National Climatic Data Center: <https://www.ncdc.noaa.gov/cdo-web/>
- USDA Adaptation Resources for Agriculture Workbook: https://www.climatehubs.oce.usda.gov/sites/default/files/adaptation_resources_workbook_ne_mw.pdf



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