

# CLIMATE

Average Over Decades  
30 years or more



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Conditions at any point  
in time and place

# Key Definitions

**Mitigate: Lower greenhouse gas emissions, sequester greenhouse gasses, convert high impact GHG to lower impact GHG**

**Adaptation: Changes to practices, management, financial activity (including insurance), technology, and infrastructure in response to changing conditions**

**NOT Exclusive.**

Strategies Ranked Within Categories	
<b>Farming</b>	
3.1 More governmental support for farm and public infrastructure	4.50
1.3 Education, research, and technical assistance	4.00
<b>Land</b>	
1.7 Expanded crop insurance programs and technical assistance for damaged land	4.42
3.5 Slow farmland loss and disposition	4.30
3.6 Better harmonize State goals around renewable energy development and natural resource protection, including	4.25
4.1 Make full use of State and federal conservation programs with increased funding and functional changes.	4.25
4.2 Expand private and public markets for carbon credits and water quality credits	4.18
1.6 APR considers farm viability and infrastructure needs of current and future farmers	4.17
3.10 Restore productive farmland without negative environmental impacts	3.82
3.2 Use suitable publicly-owned land for farming	3.73
1.1 Farm exemptions from storm water and other climate related fees/taxes	3.00
1.3 Zoning bylaws that permit energy and other commercial enterprises in areas zoned for agriculture	2.18
<b>Inputs</b>	
2.1 Monitor and manage soil for optimal health and nutrient application	4.27
3.3 Reduce water pollution across the food system	4.20
2.2 Incentives to use best practices for soil health	4.18
3.2 Incentives and technical assistance for farm and food businesses water conservation	3.91
4.1 Increased resources to Extension for pest monitoring and TA	3.82
5.2 Increase energy efficiency throughout the food system	3.82
5.3 Increase ease of installation and total amount of renewable energy generation across the food system	3.82
1.5 Maximize composting of food waste	3.73
3.1 Adequate water for maintaining and growing the food system	3.70
1.2 Reduce food waste	3.64
1.4 Maximize anaerobic digestion and industrial uses of food waste	3.00
<b>Fishing</b>	
1.1 Encourage sustainable fishing practices	4.18
2.3 Expand local seafood markets, product development, and seafood supply chain innovations	4.10
2.4 Improve local seafood infrastructure and supply chain systems	4.00
5.1 Conduct research to advance the fishing and aquaculture industries	3.91
1.2 Support shellfish operations and management	3.90
<b>Processing</b>	
4.1 Invest in food processing and distribution infrastructure	4.30
<b>Distribution</b>	
2.3 Greater efficiency in production, processing, and distribution	3.89

<b>Top 2 Strategies by Category</b>	
<b>Farming</b>	
3.1 More governmental support for farm and public infrastructure	4.50
1.3 Education, research, and technical assistance	4.00
<b>Land</b>	
1.7 Expanded crop insurance programs and technical assistance for damaged land	4.42
3.5 Slow farmland loss and disposition	4.30
<b>Inputs</b>	
2.1 Monitor and manage soil for optimal health and nutrient application	4.27
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<b>Fishing</b>	
1.1 Encourage sustainable fishing practices	4.18
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4.1 Invest in food processing and distribution infrastructure	4.30
<b>Distribution</b>	
2.3 Greater efficiency in production, processing, and distribution	3.89

Summary Strategies/Recommendations

Score

Increase funding, loan and grants for on farm and public infrastructure (Adapt & Mitigate)	4.50
Expand crop insurance and technical assistance for damage to farmland (Adapt)	
Strengthen farmland loss and land disposition policies. Restore farmland without negative environmental impacts. Encourage use of suitable publicly-owned land for farming (Adapt & Mitigate)	
Monitor and manage soil for optimal health and nutrient application. Tax benefits or other incentives for best practices (Adapt & Mitigate)	
Harmonize State goals around renewable energy development and natural resource protection, including farmland (Adapt & Mitigate)	
Increased funding and functional changes to State and federal conservation programs (Adapt & Mitigate)	
Provide incentives and technical assistance to reduce water pollution across the food system (Adapt)	
Expand private and public markets for carbon credits and water quality credits (Mitigate)	
Encourage sustainable fishing practices that protect fish and shellfish stock and habitat (Adapt)	
Ensure that the APR Program considers farm viability and infrastructure needs (Adapt & Mitigate)	
Expand/Improve local seafood markets, infrastructure, product development, and supply chain. Support shellfish operations. (Adapt)	
Develop and coordinate educational, research, and technical assistance supports. Increased resources to Extension for monitoring and TA (Adapt & Mitigate)	4.00
Provide incentives and technical assistance for farm and food businesses using water conservation practices (Adapt)	
Greater efficiency in production, processing systems and distribution (Adapt & Mitigate)	
Increase energy efficiency & renewable energy generation (Mitigate)	
Maximize composting of food waste (Mitigate)	
Ensure water resources for maintaining and growing the food system (Adapt)	
Reduce food waste (Adapt & Mitigate)	
Farm exemptions from storm water and other climate related fees/taxes (Adapt)	
Maximize anaerobic digestion and industrial uses of food waste (Mitigate)	3.00

# Existing Support

**Non Profits-** Workshops, TA, Grants and grant funded TA, Emergency Loan Fund, measurement and monitoring of soil health and carbon sequestration

## **Federal-**

- **Environmental Quality Incentives Program (EQUIP)** provides financial and technical assistance to agricultural and forestry producers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation, and improved or created wildlife habitat.
- **Agricultural Management Assistance (AMA)** provides financial assistance to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control. Conservation basis.
- **Rural Energy for America Program** provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. (under 50K in population) Mitigation- Biomass (e.g. biodiesel and ethanol, anaerobic digesters, and solid fuels), Geothermal, Hydropower , Hydrogen, wind, solar, Ocean (tidal, current, thermal) and Energy Efficiency

# Existing Support

**State:** UMass - Mass Clean Energy Center (CEC) - Division of Conservation Services

Whole Farm Water - NE Climate Hub, Commonwealth Organics-to-Energy, Landscape Partnership Program

MDAR

- Ag Composting & Composting Improvement Programs
- Urban Ag Program,
- Farm Viability Enhancement Program,
- APR Improvement Program,
- Matching Enterprise Grants for Agriculture Program,
- Agricultural Climate Resiliency & Efficiencies (ACRE) Program,
- Agricultural Environmental Enhancement Program (AEEP),
- Stewardship Assistance & Restoration on APRs Grant (SARA),
- MA Farm Energy Program (MFEP),
- Ag Energy Grant Program



# MOST LIKELY CLIMATE CHANGE IMPACTS FOR THE NORTH EAST

## **AG Impacts**

- Extreme Rain Events
- Extreme Snow Events
- Drought
- Erratic Early/Late Season Frost/Thaw Dates
- New/Increased Pest Pressures
- New/Increased Disease Pressures
- Extreme Heat Events
- Perennial Crop Species Migration
- Loss of or Changes in Foods Shipped to MA

## **Impacts**

## **Fisheries**

# Survey to Service Providers on Programs

that may support climate impact adaptation & mitigation strategies

Survey link to view the survey

[https://www.surveymonkey.com/tr/v1/te/akU\\_2BQc2vAhAsa\\_2B264x1g6\\_2FpF\\_2Fhy3EhxbpxJDHYpYZT3PErDK\\_2Bf6OjNYOPsqZdKwgg6hzflAOoEMMJVnE3w8OW2hjIQkUqKhwoPQ2GIaNpWnLDER1Ufm30Djmi\\_2BYGtAZRW4le2FyPvdwMRSVvhJcJtkv4Ymkya71TDAk7yal76WGw\\_2Fiyt6Zr8RLXrBu\\_2F76fHOPey](https://www.surveymonkey.com/tr/v1/te/akU_2BQc2vAhAsa_2B264x1g6_2FpF_2Fhy3EhxbpxJDHYpYZT3PErDK_2Bf6OjNYOPsqZdKwgg6hzflAOoEMMJVnE3w8OW2hjIQkUqKhwoPQ2GIaNpWnLDER1Ufm30Djmi_2BYGtAZRW4le2FyPvdwMRSVvhJcJtkv4Ymkya71TDAk7yal76WGw_2Fiyt6Zr8RLXrBu_2F76fHOPey)

# Extreme Rain-

- N/P (3 of 6) Tillage reduction / no-till farming, perennial integration, cover crop strategies, regenerative grazing, other soil health/ agro ecology, No Bare Soil, Winter Cover Crops, Diverse Crop Rotation, Contouring, New Crop Varieties, Consulting and help accessing TA, Emergency Loans
- USDA- No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Contouring, Retention Ponds, Wetland Creation/Restoration/Management, Mulching, Compost Applications, Nutrient management, Soil testing
- State- Moisture sensing, No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, New Crop Varieties, Contouring, Retention Ponds, Wetland Creation/Restoration/Management, drainage systems, Business Planning, Diversification, increase permeability and water retention alleviating urban storm water run off

# Extreme Snow

- **N/P** (1 of 6) – Emergency Loan
- **State** (2) – Grants to maintain/repair agricultural infrastructure

# Drought

- **N/P (3)** – Increase soil health/organics, No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Contouring, New Crop Varieties, Irrigation/Irrigation Efficiency, Consulting
- **USDA** – Drip irrigation, Mulching, No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Water Retention Ponds, Irrigation/Irrigation Efficiency
- **State** – Optimize water applications, No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Irrigation/Irrigation Efficiency, Water Retention Ponds, Improved Crop Varieties, diversification

# Extreme Heat

- N/P (2) - No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Improved Crop Varieties, Silvopasture, 0 percent loan, Consulting, Education
- State (3) – Optimize water applications, No/Minimal Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Improved Crop Varieties, Silvopasture, microclimates with green coverage reduce the Urban Island Heat effect.

# Erratic Early/Late Season Frost/Thaw Dates

- **N/P (2)** - high tunnel management and other season extension education, 0 interest loan, consulting
- **State** - Season Extension Infrastructure, Improved Crop Varieties, replacing perennials such as fruit trees, transitioning to high yield plantings, crop rotation, winter cover crops

# New/Increased Pests

- **N/P (2)** – Education and scouting support through grants, Crop health through reduced nitrogen and balanced fertility, Up to Date Research, No/Minimal Tillage, No Bare Soils, New/Improved Crop Varieties, Integrated Pest Management (IPM), Population Control, 0 interest loan, consulting
- **USDA** - No/Minimal Tillage, No Bare Soils, Winter Cover Crops, IPM, mulching, drip irrigation
- **State** - TA, No/Minimal Tillage, Winter Cover Crops, No Bare Soils, New/Improved Crop Varieties, IPM, Diverse Crop Rotation



# New/Increased Disease Pressures

- **N/P (2)** - Crop health through reduced nitrogen and balanced fertility, 0 percent Loan, Consulting , Education
- **USDA** - No/Minimal Tillage, No Bare Soils, Winter Cover Crops, IPM, mulching, drip irrigation
- **State (2)** - No/Minimal Tillage, Winter Cover Crops, No Bare Soils, New/Improved Crop Varieties, Integrated Pest Management, Diverse Crop Rotation

# Perennial Crop Species Migration

- N/P (1) - Education/Outreach
- State (1) - Improved Crop Varieties, Diversification

# Loss/change in foods shipped in and out of MA

- N/P (1) - Marketing Support, TA, Support Local Production & Purchasing, Support Equitable Access to Local Food

# Hypoxia (low-oxygen) in Coastal and Freshwater Systems

- State (1) - Reduce Soil Sediments, Nutrient Management

# Fisheries and Oceanic Conditions- Increases in Water Contaminants

- State (2) - Use Shellfish to Clean the Water

# Mitigation

- **N/P (5)** - Solar, Wind, Anaerobic Digesters , Energy Efficiency, Electrify Fossil Fuel Burning Equipment, TA, Increase photosynthetic efficiency of cover crops, crops, and perennials, No/Minimal Tillage, No Bare Soil, Winter Cover Crops,
- **USDA** - No/Minimal, Tillage, No Bare Soil, Winter Cover Crops, Diverse Crop Rotations, Forest stand improvement
  - Electrify Fossil Fuel Burning Equipment,
  - Biomass (e.g. biodiesel and ethanol, anaerobic digesters, and solid fuels)
  - Geothermal
  - Hydropower
  - Hydrogen.
  - wind generation.
  - solar generation.
  - Ocean (tidal, current, thermal) generation
  - Energy Efficiency

# Mitigation

**State** - 8 of 10 MDAR, Division of Conservation Services, CEC

- Top soil preservation
- Facilitate healthier, more resilient soils
- Winter Cover Crops
- No Bare Soil
- Diverse Crop Rotations
- Increased green space
- Energy Efficiency
- Solar
- Wind
- Anaerobic Digesters
- Electrify Fossil Fuel Burning Equipment
- Heat recovery from composting

# By the Numbers

- **Agricultural Environmental Enhancement Program (AEEP)** **FY 14 to 20**  
333 applicants - \$5,548,337. 170 funded - \$2,500,000      average of 41 applicants/ year and 21 funded

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- **Agricultural Food Safety Improvement Program (AFSIP)** **FY 14 to 20**  
302 applicants - \$3,634,428. 165 funded - \$1,570,000 ,      average of 43 applicants/ year and 23 funded

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- **Agricultural Energy Program Traditional - (ENER)** **FY 14 to 20**  
259 applicants - \$5,626,710. 172 funded - \$3,305,509      average of 37 applicants/year and 24 funded

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- **Agricultural Energy Program Special Projects - (ENER-SP)** **FY 17 to 19**  
46 applicants -\$2,001,951.      27 funded - \$878,211      average of 15 applicants/year and 9 funded

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- **Agricultural Climate Resiliency & Efficiencies (ACRE)** **FY 18 to 20**  
128 applicants -\$3,742,045.      78 funded - \$2,000,000      average of 16 applicants/year and 9 funded



# By the Numbers

- **APR Improvement Program (AIP)** **FY 15 to 19**  
69 applicants - \$4,675,000. 32 funded - \$2,350,000 average of 13 applicants/ year and 6 funded

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- **Farm Viability Enhancement Program (FVEP)** **FY 15 to 19**  
126 applicants - 44 funded - \$2,550,000 average of 25 applicants/ year and 8 funded

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- **Matching Enterprise Grants for Agriculture (MEGA)** **FY 15 to 19**  
97 applicants - \$874,552. 48 funded - \$409,340 average of 19 applicants/year and 9 funded

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- **Urban Agriculture Program** **FY 14 to 20**  
\$2,500,000 available approximately \$2,494,000 funded \$200K in 2014, \$400K in 2015  
500K in 2016, \$350K since

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- **Stewardship Assistance & Restoration on APRs (SARA)** **FY 16 to 18**  
53 applicants – 17 awarded of 27 eligible \$319,000 awarded

# By the Numbers

## Center for Eco Technology-

Utility incentives for installed energy efficiency projects where there was some collaboration with the Mass Farm Energy Program.

2014	\$6,095.63
2015	\$82,230.98
2016	\$200,215.62
2017	\$136,579.80
2018	\$15,723.79
2019	\$24,201.76
TOTAL	\$465,047.58

# By the Numbers

## USDA

2014 to 2019

- EQUIP

Annual budget approximately 4 to 5 million.

2014	2,121,000
2015	2,663,000
2016	4,058,000
2017	4,393,000
2018	3,652,000
2019	3,591,000

- AMA

Annual budget approximately \$150K to \$200K

2014	88,300
2015	117,500
2016	160,400
2017	311,700
2018	96,800
2019	216,800

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