

## Catalog of State Actions Agriculture, Forestry, and Waste Management

A catalog of state-level, GHG-reducing actions and policy options based on actions undertaken or considered by state, local and private actors.

### Key to Future Rankings of Options in the Tables that Follow:

Potential GHG Emission Reductions*	Potential Cost or Cost Savings**†
<b>High (H):</b> At least 1.0 million metric tons (MMt) carbon dioxide equivalent (CO <sub>2</sub> e) per year by 2020	<b>High (H):</b> \$50 per metric ton CO <sub>2</sub> e (tCO <sub>2</sub> e) or above
<b>Medium (M):</b> From 0.1 to 1.0 MMtCO <sub>2</sub> e per year by 2020	<b>Medium (M):</b> \$5-50/tCO <sub>2</sub> e
<b>Low (L):</b> Less than 0.1 MMtCO <sub>2</sub> e per year by 2020, or 1 MMtCO <sub>2</sub> e by 2050	<b>Low (L):</b> Less than \$5/tCO <sub>2</sub> e
<b>Uncertain (U):</b> Not able to estimate at this time	<b>Negative (Neg):</b> Net cost savings
	<b>Uncertain (U):</b> Not able to estimate at this time

\*Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.

†Costs are denoted by a positive number. Cost savings (i.e., “negative costs”) are denoted by a negative number.

**Definition of “Priorities for Analysis”:**

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low:** Low priority options will be analyzed last, time and resources permitting.

**Notation of Options:**

\* **Options marked in bold and asterisk (\*)** indicate some of the related state actions that are approved or underway, as described further in the companion options description document. Subcommittee members are encouraged to provide information on other relevant actions.

### Agriculture, Forestry, and Waste Management (AFW)

Option No.	GHG Reduction Policy Option	Potential GHG Emissions Reduction	Cost/ Cost Savings per Ton	Other Factors: Jobs, Fuel Imports, Externalities, Feasibility	Priority for Analysis	Notes / Related Actions in Michigan
<b>AFW-1</b>	<b>AGRICULTURE – PRODUCTION OF ENERGY AND MATERIALS</b>					
1.1	Expanded Use of Biomass Feedstocks for Electricity, Heat, Steam Production	H	L-M	-Impact on food prices -biomass transport costs -sustainability issues		MI's Biomass Energy Program encourages use of biomass for energy through grants, partnerships, and policies. Michigan Department of Agriculture (MDA) has provided outreach to expand awareness and availability of renewable energy generating treatment technologies. DEQ promotes RE through E&O, P2 programs, loans and AgriEnergy conference.
1.2	In-state Liquid Biofuels and Feedstock Production	H	M-H	-51-cent per gallon federal subsidy -impact on food prices		MI Renewable Fuels Commission created to promote alt fuels. MI Renaissance zones offer tax incentives to renewable energy production facilities. Several new biofuel facilities are being located in MI. Transportation and Land Use TWG catalog addresses Low Carbon Fuel Standard.

1.3	Manure Digesters/Other Waste Energy Utilization	M	L-M	Downside issues to large-scale productions: -water quality -air quality -health issues.		MI Biomass Energy Program funded an Ag Dept study on anaerobic digestion byproducts. Michigan Department of Agriculture has provided outreach to expand awareness and availability of renewable energy generating treatment technologies. Promotion through AgriEnergy conference.
1.4	Improving Energy Capture from Corn and Biomass Heat	M	M			
1.5	Expand Use of Bio-based Materials	L-M	M			Promotion through AgriEnergy conference.
<b>AFW-2</b>	<b>AGRICULTURE – LIVESTOCK</b>					
2.1.1	Manure Management: Manure Utilization	L-M	L	The way manure is being managed on-site		
2.1.2	Manure Management: Methane Capture	M	L-M	Downside issues to large-scale productions: -water quality -air quality -health issues.		MI Ag Dept allows landowners to earn credits through installing methane digesters and offers training certification for operators of Anaerobic Digester Systems.
2.2	Changes in Animal Feed	L-M	L-M			
2.3	Rotational Grazing/Improve Grazing Crops and/or Management	L	L-M			USDA-Natural Resources Conservation Service (NRCS) offers a variety of cost-share programs for producers who improve system management.

2.4	Utilize Bio-filters to Control CAFO Emissions	M-H	M-H	- Potential for control of both enteric fermentation & manure CH <sub>4</sub> ?		<b>MCAC noted that there are other ways to do this.</b>
2.5	Consolidation of Livestock for Efficiency Gains	L	L-M			
2.6	Technology Improvements to Increase Energy Efficiency of Water Use	L	L-M			
<b>AFW-3</b>	<b>AGRICULTURE – CROP PRODUCTION</b>					
3.1	Soil Carbon Management	M-H	L	-May be a subsection of 5.2 -Ecosystem costs and benefits		MI landowners earn credits through conservation practices such as no-till and strip-till. The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
3.2	Nutrient Management	M-H	L	-Ecosystem costs and benefits		The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
3.3	Technology Improvements to Increase Efficiency	L-M	L-M			The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
3.4	Water Management	L-M	L-M			The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

3.5	Drainage Management	L-M	L-M			1.5 million acres impacted by drain maintenance and petition projects annually to improve drainage. The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
<b>AFW-4 AGRICULTURE – LAND USE CHANGE</b>						
4.1	Land Use Management that Promotes Permanent Cover	H	L			MI landowners earn credits for grass planting and increasing amount of stored carbon on conservation lands. The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
4.2	Preserve Open Space/Agricultural Land	M	M-H	- difficult to quantify additional indirect benefits from more efficient development.		MI protects more than 3,350,000 acres of farmland through easement grants.
4.3	Consolidation of Farm Land	L	M-H			
4.4	Update rural zoning to facilitate wind projects	L	L-M			
<b>AFW-5 AGRICULTURE – FARMING PRACTICES</b>						
5.1	Increase On-Farm Energy Efficiency	M	Neg-L			DEQ funded MSU's development of the Dairy Farm Energy Efficiency Audit Program.

5.2	Promotion of Farming Practices that Achieve GHG Benefits	M-H	L-M			MI Ag. Environmental Assurance Program (MAEAP) teaches farmers to prevent environmental risk. The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.
5.3	Programs to Support Local Farming/Buy Local	L	L-M			MI Food Policy Council, MIFFS, and various organizations encourage local & sustainable food growth and farm markets. Rep Fred Upton co-sponsored federal Farm to Cafeteria legislation to encourage local sourcing of school food programs.
5.4	Programs to Promote Organic Farming Practices that Achieve GHG Benefits	L-M	L-M	-Organic farming and sales have grown more rapidly than other ag sectors		<b><i>NOTE: Opposition to this option was expressed by TWG members who do not believe that organic practices should be encouraged over other GHG-reducing farm practices.</i></b> MSU has demonstration organic farm.
5.5	Promotion of Urban Agriculture, Community Gardens, and Green Roofs	L	Neg-L			MIFFS, Saginaw Bay WIN, MSUE Master Gardeners and some local cities – Detroit, Grand Rapids, Saginaw and Flint – promote and demonstrate urban agriculture.
<b>AFW-6</b>	<b>FORESTRY – PRODUCTION OF ENERGY AND MATERIALS</b>					

6.1	Expanded Use of Forest Biomass Feedstocks for Electricity, Heat and Steam Production	H	L-M	- costs vary dramatically depending on implementation mechanisms. -transport costs/impacts		See option 1.1.
6.2	In-state Liquid Biofuels Production	M-H	M-H			See option 1.2. Transportation and Land Use TWG catalog addresses Low Carbon Fuel Standard.
6.3	Improved Energy Capture from Wood Waste Combustion	L-M	L-M			
6.4	Improved Commercialization of Biomass Gasification and Combined Cycle	L-H	M-H	- reductions dependent on assumed technology penetration - costs dependent on structure of incentives program		
6.5	Expanded Use of New, Used, & Recycled Wood Products for Building Materials	L-M	L-M	Cost will depend on policies or incentive structure		
<b>AFW-7</b>	<b>FORESTRY – BIOMASS PROTECTION AND MANAGEMENT</b>					
7.1	Forest Protection – Reduced Clearing and Conversion to Non-forest Cover	H	L			MI has tax incentive programs for maintaining managed forests. It has a pilot carbon credit program for non-industrial working forests.
7.2	Urban Forestry	M-H	Neg-L			MDNR provides grants to urban communities for tree planting. MSU's Global Observatory program is developing tools for monitoring and measuring carbon reduction programs in MI.

7.3	Afforestation and/or Restoration of Non-forested Lands	M-H	L-M			MI pilot program enables landowners to earn credits for afforestation/reforestation and tree planting.
7.4	Forest Management for Carbon Sequestration and Biodiversity	M-H	L-M			Most large forest landowners have certified management that addresses biodiversity and MI has pilot program that enables landowners to earn credits through reforestation of degraded forest land.
7.5	Mitigation of Forest Carbon Sequestration Loss and Emissions Due to Wildfire	L-M	L-M			MDNR will typically replant or seed areas that do not show adequate natural regeneration following a wildfire.  MDNR uses several agreements with other agencies to help reduce fire numbers and size.
7.6	Mitigation of Forest Loss Due to Insects/Disease	L	L-M			
<b>AFW-8</b>	<b>FORESTRY – WOOD PRODUCTS AND WASTE</b>					
8.1	Improved Mill Waste Recovery	L	L	USFS estimates <2% not being recovered now,		Inhouse use and existing markets, including pellet, panel, paper, and cogeneration, leave little to be “wasted.”
8.2	Improved Logging Residue Recovery	L	L-M	Environmental and wildlife concerns impede more recovery, in addition to costs and lack of markets.		

8.3	Silviculture Improvements	L-M	L-M	Cost minimization and biodiversity tradeoffs		
<b>AFW-9</b>	<b>WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES</b>					
9.1	Advanced Recycling, Source Reduction, and Composting	M-H	Neg-L			Mandated recycling of office paper by State Government.
9.2	Promotion of Bioreactor Technology (Advanced Municipal Solid Waste Management Practices)	H	L			
9.3	Resource Management Contracting	L	L			
9.4	Enhanced Management of Organic Waste	M-H	L	Systematic capture of organic waste will facilitate composting, reuse of waste, and conversion to fuel.		WMU's Bronco biodiesel program plans to capture sewer grease for conversion to biodiesel.
9.5	Promotion of New & Existing Technologies for Waste Energy Conversion	L-H	L-H	- benefits dependent on penetration of new/existing technologies; - costs dependent on structure of incentives program.		New technologies could include biomass gasification and pyrolysis for producing biofuels, biochar and other products.
<b>AFW -10</b>	<b>WASTE MANAGEMENT – LANDFILL GAS STRATEGIES</b>					
10.1	Flare Landfill Methane at non-NSPS (smaller) Sites	L-M	M-H	- technical feasibility of collecting and controlling methane at some sites may be questionable		
10.2	Landfill Methane Energy Programs	M-H	L-M			
<b>AFW-11</b>	<b>WASTE MANAGEMENT – WASTEWATER ACTIVITIES</b>					
11.1	Energy Efficiency Improvements	L-H	Neg-L			

11.2	Lower Waste Processing Needs (lower water consumption, waste production)	L	L			The industrial and agricultural sectors in Michigan are working on water conservation.
11.3	Methane and Biogas Energy Programs	M-H	M			
11.4	Restoration of Soil Organic Carbon from Application of WWTP Bio-solids	L-M	L-M			
11.5	Heat Recovery	L	M-H			
11.6	Algae and Bio-Oils	M-H	M-H			