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Catalog of State Actions Agriculture, Forestry, and Waste Management Working Group

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 <u>1/</u>	Potential Cost or Cost Savings <u>1/ 2/</u>
High (H): At least 1.0 million metric tons (MMt) carbon dioxide equivalent (CO ₂ e) per year by 2020	High (H): \$50 per metric ton CO ₂ e (tCO ₂ e) or above
Medium (M): From 0.1 to 1.0 MMtCO ₂ e per year by 2020	Medium (M): \$5-50/tCO ₂ e
Low (L): Less than 0.1 MMtCO ₂ e per year by 2020, or 1 MMtCO ₂ e by 2050	Low (L): Less than \$5/tCO ₂ e
Uncertain (U): Not able to estimate at this time	Negative (Neg): Net cost savings
	Uncertain (U): Not able to estimate at this time
<u>1/</u> Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.	
<u>2/</u> 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 an asterisk (*)** indicate some of the related state actions that are approved or underway, as described further in the companion options description document. TWG 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 per Ton	Other Considerations: Jobs, Fuel Imports, Externalities, Feasibility	Priority for Analysis	Notes / Related Actions in MN
AFW-1	AGRICULTURE – PRODUCTION OF FUELS AND ELECTRICITY					
1.1	Expanded Use of Biomass Feedstocks for Electricity or Steam Production*					<ul style="list-style-type: none"> • Biomass for Electricity
1.2	In-state Liquid Biofuels Production					<ul style="list-style-type: none"> • Renewable Fuels Initiative • Ethanol • E85 • Production Incentives • Biodiesel
1.3	Manure Digesters/Other Waste Energy Utilization*					<ul style="list-style-type: none"> • Renewable Energy Production Incentive • Community-based renewable energy development • Biomass for electricity
AFW-2	AGRICULTURE – LIVESTOCK					
2.1.1	Manure Management: Manure Utilization					
2.1.2	Manure Management: Manure/Methane Capture					
2.2	Changes in Animal Feed					
2.3	Rotational Grazing (Improve Grazing Crops and/or Management)					

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2.4	Utilize Biofilters to Control CAFO Emissions					CAFO – confined animal feeding operation. Encourage confinement where this leads to additional opportunities for CH4 capture and control.
2.5	Increase Pasturing and Lower Densities					Decrease CH4 generation potential for manure deposited in feedlots, pastures, etc.
AFW-3	AGRICULTURE – CROP PRODUCTION					
3.1	Soil Carbon Management					<i>Blue Earth River Basin Initiative ran a project called the Third Crop Initiative. This initiative aims to replace annual crops with perennial crops.</i>
3.2	Nutrient and Water Management					
3.3	Technology Improvements to Increase Efficiency					e.g. Auto-Steer guidance systems. Also relates to Option 5.1.
AFW-4	AGRICULTURE – LAND USE CHANGE					
4.1	Land Use Management that Promotes Grassland Cover*					• Conservation Land Development
4.2	Preserve Open Space/Agricultural Land*					• Conservation Land Development
AFW-5	AGRICULTURE – FARMING PRACTICES					
5.1	Reductions in On-Farm Energy Use*					• Renewable Fuels Initiative
5.2	Organic Farming					

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5.3	Programs to Support Local Farming/Buy Local					
AFW-6	FORESTRY – PRODUCTION OF FUELS AND ELECTRICITY IN FORESTRY					
6.1	Expanded Use of Forest Biomass Feedstocks for Electricity, Heat and Steam Production*					<ul style="list-style-type: none"> • Biomass to Energy <i>Laurentian Energy Authority Biomass Energy Project. This project has produced a partnership between public utilities in the Cities of Virginia and Hibbing. Public utilities in these cities have converted formerly coal-fired power plants to power plants that re now 75% fueled by woody biomass.</i> <i>Minnesota currently does not allow roundwood timber to be used for energy generation, as this wood can be used to make long-lived wood products with long term sequestration potential.</i>
6.2	In-state Liquid Biofuels Production*					<ul style="list-style-type: none"> • Biodiesel • Renewable Fuels Initiative • Ethanol
6.3	Improved Energy Capture from Wood Waste Combustion*					<ul style="list-style-type: none"> • Waste to Energy

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6.4	Improved Commercialization of Biomass Gasification and Combined Cycle*					<ul style="list-style-type: none"> Renewable Energy Production Incentive
AFW-7	FORESTRY – BIOMASS PROTECTION AND MANAGEMENT					
7.1	Forest Protection – Reduced Clearing And Conversion to Nonforest Cover*					<ul style="list-style-type: none"> Conservation land development <i>The Minnesota Forest Legacy Partnership (MFLP) is pursuing 127,000 acres of forest conservation easements in Koochiching and Itasca Counties.</i>
7.2	Urban Forestry*					<ul style="list-style-type: none"> Terrestrial Carbon Sequestration Initiative
7.3	Afforestation and/or Restoration of Nonforested Lands*					<ul style="list-style-type: none"> Terrestrial Carbon Sequestration Initiative <i>The Board of Soil and Water Resources (BSWR) has been directed by the 2007 MN legislature to administer \$500k in grants to conduct site level ecological research and assessments, a clean energy program, and technical teams for native seed harvesting and working lands initiative.</i>

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7.4	Forest Management for Carbon Sequestration*					<ul style="list-style-type: none"> • Terrestrial Carbon Sequestration Initiative • Refers to a broad range of forest management options that result in carbon benefits (including those specified under 7.5 and 7.6).
7.5	Mitigation of Forest Loss and Emissions Due to Wildfire					
7.6	Mitigation of Forest Loss Due to Insect Blight					
AFW-8	FORESTRY – WOOD PRODUCTS AND WASTE					
8.1	Improved Mill Waste Recovery; Utilization of Sawmill Residues					
8.2	Improved Logging Residue Recovery					
8.3	Expanded Use of Wood Products for Building Materials					
AFW -9	WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES					
9.1	Advanced Recycling and Composting*					<ul style="list-style-type: none"> • Reinvigorate Recycling Campaign
9.2	Promotion of Bioreactor Technology (Advanced Municipal Solid Waste Management Practices)*					<ul style="list-style-type: none"> • Technical Assistance Program
9.3	Source Reduction Strategies					

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9.4	Resource Management Contracting					
9.5	Waste Coal Recapture					
9.6	Prevent Landfilling of Unprocessed Organic Material					
9.7	Promotion of New Technologies for Waste Energy Conversion					These could include biomass gasification and pyrolysis for producing biofuels, biochar and other products.
AFW-10	WASTE MANAGEMENT – LANDFILL GAS STRATEGIES					
10.1	Flare Landfill Methane at non-NSPS (smaller) Sites					
10.2	Methane and Biogas Energy Programs*					• Renewable Energy Production Incentive
10.3	Landfill Methane Energy Programs					
AFW-11	WASTE MANAGEMENT – WASTEWATER ACTIVITIES					
11.1	Energy Efficiency Improvements*					<i>Xcel operates a process efficiency program; a sub-program within the mandated conservation improvement program.</i>
11.2	Lower Waste Processing Needs (lower water consumption, waste production)					

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11.3	Install Digesters and Turbines or Engines*					<ul style="list-style-type: none"> Renewable Energy Production Incentive <i>The MCES has recently installed 2 2-MW turbine generators at its Empire WWTP. The council is also considering the installation of digesters and methane recovery systems at Blue Lake WWTP, and potentially more WWTPs.</i>
11.4	Restoration of Soil Organic Carbon from Application of WWTP Biosolids					
11.5	Heat Recovery					<ul style="list-style-type: none"> Recover heat from plant influent or effluent.
11.6	Algae and Bio-oils					
AFW-12	AGRICULTURE/FORESTRY – CONSERVATION OF NUTRIENT-RICH LANDS					
12.1	Conservation and/or Expansion of Peatlands					
12.2	Conservation and/or Expansion of Wetlands					