

Agriculture, Forestry and Waste Management Policy Work Group

Brief Descriptions of Potential State Actions

AFW-1 AGRICULTURE - PRODUCTION OF FUELS AND ELECTRICITY

1.1 Manure Digesters/Other Waste Energy Utilization

Reduce the amount of methane emissions from livestock manure by installing manure digesters on livestock operations. Energy from the manure digesters is used to create heat or power, which offsets fossil fuel-based energy production and the associated Greenhouse Gas (GHG) emissions.

1.2 Biodiesel Production

Increase production of biodiesel fuel from agriculture and/or forestry feedstocks (raw materials) to displace the use of fossil diesel. Increased production and consumption in state give the highest benefits.

1.3 Biomass Feedstocks for Electricity or Steam Production

Use agriculture and/or forestry byproducts such as orchard trimmings, crop residue, and forest thinnings to produce electricity or steam production.

1.4 Ethanol Production

Promote the production of ethanol from crops, agricultural waste, or other materials to displace fossil fuel (petroleum based gasoline) use. Promote the development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels to improve the embedded energy content of ethanol.

AFW-2 AGRICULTURE – FERTILIZER AND MANURE MANAGEMENT

2.1 Nutrient Management

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of management practices. Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N₂O. .

2.2 Manure Management

Implement manure management practices that reduce GHG emissions associated with manure handling and storage. Potential practices include but are not limited to manure composting (to reduce methane emissions) and improved methods for application to fields (for reduced nitrous oxide emissions).

2.3 Manure Composting

Manure composting is a process that produces heat which, in turn, produces a final product that has a controlled odor, is stable, and free of pathogens and viable plant seeds. It can then be beneficially applied to the land. Controlled (aerobic) composting methods can reduce methane emissions from manure storage piles.

2.4 Change Feedstocks

Livestock emit methane directly as a result of digestive processes (enteric fermentation). Research suggests that changes in the energy content of feed and other dietary changes can reduce methane emissions from enteric fermentation. By optimizing nitrogen (protein) utilization in the feed, nitrogen levels in the manure can be reduced, which in turn reduce the potential for nitrous oxide emissions.

2.5 Reduce Non-Farm Fertilizer Use

Following the same principles of the nutrient management option, reduce the non-agricultural uses of fertilizers (e.g., on golf courses and private residences) to reduce N₂O emissions.

AFW-3 AGRICULTURE - SOIL CARBON MANAGEMENT

3.1 Conservation Tillage/No-Till

The amount of carbon stored in the soil can be increased by the adoption of conservation tillage. Reducing mechanical soil disturbance reduces the oxidation of soil carbon compounds and allows more stable aggregates to form. Other benefits of conservation tillage include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

3.2 Reduce Summer Fallow

Traditional summer fallow techniques (e.g., plowing and leaving land uncultivated during the summer) can increase erosion and decrease the amount of organic matter in the soil. By planting cover crops and/or using no-till cultivation practices, soil carbon will not be lost from soils.

3.3 Increase Winter Cover Crops

Similar in concept to reduced summer fallow, by covering crops with grasses, legumes, or small grains grown between regular grain-crop production periods, the land is protected and the soil is improved. There is a reduction of water and wind erosion and increased crop yield, while also improving the soil's carbon and nitrogen content.

3.4 Improve Water and Nutrient Use

By managing and improving water consumption and nutrients spread on crops, there will be a minimal loss of carbon from the soil. Reduced water consumption can result in lower energy use for water pumping. Better nutrient utilization can lead to lower nitrous oxide emissions from run-off.

3.5 Rotational Grazing/Improve Grazing Crops and/or Management

Heavy grazing can cause significant soil disturbance and result in carbon losses from soils. Rotational grazing where animals are moved from field-to-field on a regular basis reduces soil disturbance and maintains soil carbon levels. Rotational grazing also can improve plant vigor and enhances soil carbon levels.

AFW-4 AGRICULTURE-LAND USE CHANGE

4.1 Convert Land to Grassland or Forest

Convert marginal agricultural land used for annual crops to permanent cover such as grassland/rangeland, orchard, or forest, where the soil carbon and/or carbon in biomass is higher under the new land use. Adopt mechanisms to prevent these acres from either returning to conventionally tilled production or to suburban/urban development.

4.2 Preserve Open Space/Agricultural Land

Reduce the rate at which agricultural lands are converted to developed uses, while protecting private property rights and responsibilities. This retains the above- and below-ground carbon on these lands, as well as the carbon sequestration potential of these lands. Transportation emissions will be reduced indirectly through more efficient development and lower vehicle use.

4.3 Promote "No Net Loss" of Agricultural Land

Same as option 4.2. with implied higher goal level.

AFW-5 AGRICULTURE-FARMING PRACTICES

5.1 Convert Diesel Farm Equipment to LNG/CNG or Hybrid Technology

Provide incentives to farmers for changing to lower carbon fuels (e.g., biodiesel fuel) or hybrid technology that do not create as much emissions as the traditional diesel equipment.

5.2 Organic Farming

Provide incentives to farmers for growing organic products. Organic farming may result in reduced GHG emissions compared to conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemical inputs).

5.3 Programs to Support Local Farming/Buy Local

Promote the production and consumption of locally-produced agricultural commodities, which displace the consumption of commodities transported from other states or countries. GHG reductions occur from reduced transportation-related emissions.

AFW-6 FORESTRY – BIOMASS PROTECTION AND MANAGEMENT

6.1 Forest Protection – Reduced Clearing and Conversion to Nonforest Cover

Reduce the rate at which existing forest are cleared and converted to developed uses. Much of the carbon stored in forest biomass and soils can be lost as a result of such a land use conversion.

6.2 Increase Maintenance of Urban and Residential Trees

Maintain and improve the health and longevity of trees in urban and residential areas to protect and enhance the carbon stored in tree biomass.

6.3 Afforestation and/or Restoration of Nonforested Lands

o. Establish forests on land that has not historically been forested (e.g., agricultural land). In addition, implement practices such as soil preparation, erosion control, and stand stocking to ensure conditions that support forest growth.

6.4 Reforestation/Restoration of Managed Stands

Promote forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover. In addition, implement practices such as soil preparation, erosion control, and stand stocking to ensure conditions that support forest growth. [NOTE: technically there is no reason to separation afforestation and reforestation]

[Note Regarding 6.5-6.11 (excluding 6.9): there are conflicting views on the magnitude of long-term net gains in c-sequestration as a result of these practices and the benefits are highly variable depending on site-specific conditions. This comes up regularly on our calls. However, there is agreement that better forest management can increase carbon stocks and that these are the key practices (subtle but significant distinction). Often these are combined in state processes into a single option for improving forest management.

6.5 Increased Stocking of Poorly Stocked Lands

Increase forest density and longevity by planting appropriate species for the region. This practice may increase the amount of carbon per unit area that is sequestered and stored in forests.

6.6 Age Extension of Managed Stands

Utilize timber stand improvement best practices to increase the longevity of the tree stand. This involves management interventions that reduce competition and enhance growth of desirable species .

6.7 Thinning and Density Management of Managed Stands

Utilize timber stand improvement best practices to control the density of the forest. This involves thinning or selected removal of trees in an immature stand to increase the growth rate and improve the quality of the forest.

6.8 Fertilization and Waste Recycling

Recycled waste can be used as a fertilizer to restore the health of a nutrient depleted forest and increase forest productivity

6.9 Expand Short Rotation Woody Crops

Increase and focus on rapid growing species that can be used for energy and fiber. Short rotation woody crops have the potential to sequester carbon at high rates in the near term because of their relatively fast growth rates. They continue to provide benefits post-harvest by providing a source of renewable energy to displace fossil emissions.

6.10 Expanded Use of Genetically Preferred Species

Promote the use of trees that are disease resistant and insect tolerant.

6.11 Modified Biomass Removal Practices

Allow natural decay of wood to enhance carbon sequestration. By reducing the amount of dead wood removed from the forest (e.g., by preventing fuelwood collecting), more nutrients from decaying biomass are available for forest growth.

Note: re: 6.12-6.17: Conceptually the options below would increase the use of practices that have significant carbon benefits. Those are the same practices as listed above, so these options are technically redundant. The only distinction is that the options below have an assumed implementation mechanism via existing programs. Some of the options are hard to distinguish, particularly when it comes to carbon benefits. Listing them this way, however helps state identify relevant programs in their state.

6.12 Fire Management and Risk Reduction Programs

Help prevent the loss of forests to fires by outlining programs to eliminate or reduce the impact of fires and other harm through education, awareness, and land management. Intense fire disturbance can damage site conditions and reduce the likelihood that a healthy forest will regenerate. In addition, reducing fire will reduce emissions of methane and nitrous oxide that occur because of combustion processes.

6.13 Ecosystem Health Risk Reduction Programs

. Enhance forest management programs that seek to maintain healthy forests by preventing any number of harmful impacts (e.g., preventing and eliminating pest and disease infestations).

6.14 Drought Management Programs

Reduce the effects of drought by planting tree species that are well matched with site conditions and spaced to enhance water-use efficiency. Encourage active reforestation of watersheds to prevent erosion and other degrading processes from damaging ecosystem health.

6.15 Flood and Riparian Management Programs

Reduce the impacts of heavy rain and of flooding on the erosion of river and stream banks. Plan riparian buffers with appropriate tree species to stabilize soils and reduce erosion impacts.

6.16 Watershed Management Programs

Ensure that the actions taken to maintain the health of the watershed also maintain or increase the health of the forests and managed tree stands.

6.17 Habitat Management Programs

Ensure that the actions taken to improve wildlife habitat also maintain or increases the health of the forests and managed tree stands.

AFW-7 FORESTRY – WOOD PRODUCTS AND WASTE

7.1 Improved Mill Waste Recovery

Improve the treatment and cleaning of the waste materials from paper mills, which can then be re-used to manufacture additional wood products. Ensure that sawmill byproducts are recycled.

7.2 Improved Logging Residue Recovery

Use more efficient logging methods to fully utilize harvested trees, which will minimize carbon losses from wood damaged during harvesting and maximize the potential for carbon sequestration in harvested wood products. Process the logging remains efficiently.

7.3 Expanded Use of Wood Products for Building Materials

Increase the amount of renewable wood products used for residential and commercial building. The use of wood products in place of other building materials can increase carbon sequestration in wood products and displace GHG emissions associated with processing high-energy input materials such as steel and concrete.

7.4 Expanded Use of State and Locally-Grown Wood Products

Increase the amount of state and locally grown lumber and other wood products used in the area. This increases the amount of carbon stored in wood products and reduces transportation-related emissions by eliminating the need to haul materials over long distances.

AFW-8 FORESTRY – ENERGY PRODUCTION

8.1 Expanded Use of Forest Biomass Feedstocks for Electricity

Increase the amount of forest biomass available for generating electricity and displacing the use of fossil energy sources.

8.2 Expanded Use of Forest Biomass Feedstocks for Residential, Commercial/Institutional, or Industrial Heating

Increase the amount of forest biomass available, including recycled wood products, to burn for heating.

8.3 Improved Efficiency of Wood Burning Stoves and Direct Heat

Reduce emissions and increase heat efficiency from heat sources such as wood burning stoves and furnaces. [NOTE: the tangible GHG benefits are pretty low for this one. This is sometimes a focus in developing countries where fuelwood gathering is a significant driver of deforestation, so reducing demand for fuelwood would also protect existing forests, but the relevance in the US is questionable. Higher efficiency would also reduce methane and nitrous oxide emissions]

8.4 Improved Energy Capture from Wood Waste Combustion

Same as 8.3.

8.5 Expanded Landfill Methane Recapture

Landfill methane is produced from a complex process of waste decomposition and fermentation (including wood waste) under anaerobic conditions. Methane gas can be captured from landfills and destroyed (e.g., by flaring) or used as a renewable energy source. This technology prevents methane emissions and can displace emissions from fossil energy production. A similar option is provided under Waste Management.

8.6 Improved Commercialization of Biomass Gasification and Combined Cycle

Improve the rate of technology development and market deployment of biomass gasification and combined cycle (BGCC) technologies. These technologies expand the application of renewable fuels derived from biomass.

AFW-9 WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES

9.1 Advanced Recycling and Composting

Increase recycling and reduce waste generation in order to limit greenhouse gas emissions associated with landfill methane generation and with the production of raw materials.

Increase recycling programs, create new recycling programs, provide incentives for the recycling of construction materials, develop markets for recycled materials, and increase average participation/recovery rates for all existing recycling programs.

9.2 Advanced Municipal Solid Waste Management Practices

Municipal solid waste can be composted and processed with bioreactor technology. Composting has advantages over land-filling and incineration because of lower operational costs, less environmental pollution, and beneficial use of the end product. Bioreactor technology is also used to accelerate waste stabilization rates, enhance gas production, facilitate leaching, reduce volume, and minimized long-term liability of waste.

9.3 Source Reduction Strategies

Reduce the volume of waste from residential, commercial, and government sectors by including recycling, reuse, and composting.

9.4 Resource Management Contracting

Unlike traditional solid waste service contracts, resource management (RM) compensates waste contractors based on performance in achieving an organization's waste reduction goals rather than the volume of waste disposed. As a result, RM aligns waste contractor incentives with the goals to explore innovative approaches that foster cost-effective resource efficiency through prevention, recycling, and recovery.

9.5 Manure Digesters

Methane emitted as a result of livestock manure management can be captured and used as an energy source with manure digester technology ("anaerobic digesters"). Energy from the manure digesters is used to create heat or power, which offsets fossil fuel-based energy production and the associated greenhouse gas emissions. NOTE: redundant w/ 1.1

9.6 Waste Coal Recapture

Promote research and implementation of recovering waste coal. Waste coal is a usable material that is a byproduct of previous coal processing operations.

AFW-10 WASTE MANAGEMENT – LANDFILL GAS STRATEGIES

10.1 Flare Landfill Methane at non-NSPS (smaller) sites

Encourage smaller landfills that do not fall under strict environmental protection regulations to capture and flare methane gas. Flares are used to safely combust toxic and volatile gases from landfills and they convert methane gas, which has a relatively high global warming potential, to carbon dioxide.

10.2 Methane and Biogas Energy Programs

Encourage and promote the use of anaerobic digesters and energy recapture for waste materials other than municipal solid waste at landfills (e.g. food processing waste). These projects will help prevent the emission of methane while producing clean energy. Anaerobic digesters make a two-fold contribution to climate protection: the usual unchecked discharge of methane into the atmosphere is prevented, and the burning of fossil fuels is replaced with an unlimited supply of clean, renewable energy (biogas).

10.3 Landfill Methane Energy Programs

Use the clean, renewable energy created at landfills by anaerobic digesters to make electric power, space heat, and liquified natural gas.

AFW-11 WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES

11.1 Energy Efficiency Improvements

Provide incentives for efficiency improvements. Encourage the set up of energy policies, energy audits, and energy cost tracking. Identify and implement energy improvements such as using energy efficient equipment and generating on-site power (e.g. solar power).

11.2 Lower Waste Processing Needs

Develop and implement best practices for lowering water consumption and lowering waste production at the industrial, commercial, and residential levels. Encourage and create incentives for research and development on reducing water consumption and waste production. Provide education to reduce water consumption and waste production.

11.3 Install Digesters and Turbines or Engines

Provide incentives to install anaerobic digesters to treat municipal waste and create methane. Install turbines or reciprocating engines to generate electricity from the methane.