

## **Brief Description of Catalog Items Agriculture, Forestry, and Waste Management Technical Work Group**

### **AFW-1. PRODUCTION OF ENERGY AND MATERIALS**

#### **1.1 Expanded Use of Biomass Feedstocks for Electricity, Heat, or Steam Production**

Increase the amount of biomass available for generating electricity and displacing the use of fossil energy sources. Local electricity or steam production yields greatest net energy payoff.

*Recent Actions in MI:* The Michigan Department of Labor and Economic Growth's 'Energy Office' has created a Biomass Energy Program to encourage increased production and use of energy derived from Michigan's biomass resources through program policies, public and private partnerships, information dissemination, and state project grants. For more information on this program, go to [http://www.michigan.gov/cis/0,1607,7-154-25676\\_25753---,00.html](http://www.michigan.gov/cis/0,1607,7-154-25676_25753---,00.html)

Michigan Department of Agriculture has provided outreach to expand awareness and availability of renewable energy generating treatment technologies.

DEQ promotes renewable energy through E&O, P2 programs, loans, and the AgriEnergy conference.

#### **1.2. In-state Liquid Biofuels and Feedstock Production**

Increase production of liquid biofuels including ethanol and/or bio-diesel fuel from agriculture and/or forestry feedstocks and/or municipal solid and other waste (raw materials) to displace the use of fossil fuel. Promote the development of cellulosic ethanol technologies and ethanol production systems that improve the embedded energy content of ethanol. Increased production and consumption in-state give the highest benefits. This is a broad-based option that can look at a number of different items including:

- Encouraging the adoption of advanced technology in existing corn-based ethanol plants to improve their production of ethanol per bushel of corn, capture their CO<sub>2</sub> emissions, and install equipment to separate corn oil from their production process to be used for bio-diesel blending.
- Encouraging advanced refining in ethanol plants to produce higher value products such as fine chemicals and acids to further reduce the use of fossil fuels for the production of those materials.

Note: Other biofuels policies such as encouraging blending of renewable fuels will be addressed by the Transportation and Land Use working group.

*Recent Actions in MI:*

The Michigan Renewable Fuels Commission was established under Public Act 272 of 2006 is tasked with developing recommended policies and strategies to promote research, development, production and distribution of alternative fuels in Michigan.

Michigan Renaissance Zones were established Under Public Acts 270 and 273 of 2006 to allow for 10 additional zones to offer tax incentives to renewable energy production facilities, including agricultural processing facilities.

A number of ethanol and bio-diesel production facilities have located, or are planning to locate, in Michigan. Maps of these facilities can be found at:

[http://www.michigan.gov/documents/mda/EthanolMap\\_186352\\_7.pdf](http://www.michigan.gov/documents/mda/EthanolMap_186352_7.pdf) and  
[http://www.michigan.gov/documents/mda/Bio-dieselMap\\_183689\\_7.pdf](http://www.michigan.gov/documents/mda/Bio-dieselMap_183689_7.pdf)

### **1.3. 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.

*Recent Actions in MI:*

The Michigan Biomass Energy Program created by the Department of Labor and Economic Growth's "Energy Office" is focused on encouraging increased production and use of energy derived from Michigan's biomass. They recently funded a study by the Michigan Department of Agriculture to develop analytical data on the quality of agricultural by-products treated by anaerobic digesters. This data will develop a better understanding of the benefits of co-feeding digester systems.

Michigan Department of Agriculture has provided outreach to expand awareness and availability of renewable energy generating treatment technologies. These have included tours for industry, conferences, and development of educational materials.

Promotion through AgriEnergy conference.

### **1.4. Improving Energy Capture from Corn and Biomass heat**

Reduce emissions and increase heat efficiency from heat sources such as corn and other bio-feed stocks. Continue to advance the biomass heating industry.

*Recent Actions in MI:*

### **1.5. Expand Use of Bio-based Building Materials**

Increase the amount of renewable products used for residential and commercial buildings that reduce GHG emissions over conventional petroleum based products.

*Recent Actions in MI:*

Promotion through AgriEnergy conference.

## **AFW-2. AGRICULTURE – Livestock**

### **2.1.1. Manure Management: Manure Utilization**

2.1.1. 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), waste storage facility management (to reduce odor/emissions), and improved methods for application to fields (for reduced nitrous oxide emissions). Application improvements include incorporation into soil, instead of surface spray/spreading.

### **2.1.2. Manure Management: Manure/Methane Capture**

2.1.2. Implement digester and energy recovery projects at confined animal operations to both reduce methane emissions and utilize the energy to displace fossil fuels. (To date, most of these projects have been implemented at dairies and swine operations.)

#### *Recent Actions in MI:*

The Michigan Department of Agriculture, in conjunction with the Delta Institute has launched a pilot project titled, “Michigan Conservation and Climate Initiative.” This program allows Michigan agricultural landowners to earn greenhouse gas emission reduction credits through installing methane digesters and earn revenue from the sale of their credits on the Chicago Climate Exchange. For more information on the MCCI Program go to <http://www.michiganclimate.org/>.

Michigan Department of Agriculture provides training certification for operators of Anaerobic Digester Systems. This is the first step in providing the system requirements necessary in order to claim available property tax exemptions.

## **2.2. Changes in Animal Feed**

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.

#### *Recent Actions in MI:*

## **2.3 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. It appears that MI does not have a large degree of grazing, so this option may have limited benefit.

*Recent Actions in MI:* USDA-Natural Resources Conservation Service offers a variety of cost-share programs for producers who improve system management.

#### **2.4 Utilize Bio-filters to Control CAFO Emissions**

The utilization of collection and control equipment such as bio-filters at confined animal feeding operations (CAFOs) can reduce methane emissions.

*Recent Actions in MI:*

#### **2.5 Increase Pasturing and Lower Densities**

Increasing the area over which manure is deposited has the potential to reduce emissions of methane, since the manure is more likely to be decomposed aerobically versus anaerobically. There may be limitations to application of this option in MI depending on availability of pasture land.

*Recent Actions in MI:* The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

#### **2.6 Consolidation of Livestock for Efficiency Gains**

Consolidation of livestock, dairy and poultry into larger production units improves efficiency, improves implementation of technology such as manure digesters, reduces transportation related emissions, and generally provides cash flow necessary to implement new technology.

*Recent Actions in MI:*

#### **2.7 Technology Improvements to Increase Water Conservation**

Encourage closed loop systems when siting new construction.

*Recent Actions in MI:*

### **AFW-3. AGRICULTURE – CROP PRODUCTION**

#### **3.1 Soil Carbon Management**

The amount of carbon stored in the soil can be increased by the adoption of practices such as conservation, no till cultivation, and crop rotation. Increasing the planting of winter cover crops may help reduce the need for conventional spring tillage, and are beneficial to soil structure and nutrition. Another emerging technique with unknown potential in MI would be the application of bio-char (i.e., charcoal) to increase soil carbon content and stabilize soil carbon. Encouraging farmers to maintain sod waterways and buffer and filter strips in areas of their fields that are highly erodible will help reduce runoff and care soil erosion. By reducing mechanical soil disturbance, these practices reduce the oxidation of soil carbon compounds and allow more

stable aggregates to form. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

*Recent Actions in MI:* The Michigan Conservation and Climate Initiative allows Michigan agricultural landowners to earn greenhouse gas emission reduction credits through conservation practices including no-till and strip-till farming and earn revenue from the sale of their credits on the Chicago Climate Exchange. (See 2.1)

USDA-Natural Resources Conservation Service offers a variety of cost-share programs for producers who improve system management by implementation of NRCS-approved practice standards.

The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

### 3.2 Nutrient Management

Improve the efficiency of fertilizer use and other nitrogen-based soil amendments through implementation of management practices and Generally Accepted Agriculture Management Practices (GAAMP). Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N<sub>2</sub>O. Better nutrient utilization can lead to lower nitrous oxide emissions from run-off.

*Recent Actions in MI:* The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

### 3.3 Technology Improvements to Increase Efficiency

New technologies and cultivation methods have the potential to reduce GHG emissions when fossil fuel or electricity consumption can be reduced. Auto-steer guidance systems are an example. Also, auto swath technology, using GPS to automatically turn the spray boom sections on or off when coming to an area of the field that has been sprayed or needs to be sprayed. This can be used for planting, fertilizing, pesticide application etc. On odd shaped fields it can be a 3-5% savings:

[http://www.agleader.com/products.php?Product=directcommand\\_1](http://www.agleader.com/products.php?Product=directcommand_1).

Variable rate fertilizing and liming is also becoming more popular among farmers and agribusinesses. The field is sampled in a grid pattern so nutrient needs can be determined for particular areas of the field. Commercial applicators then apply crop nutrients as needed for each grid section. The areas of the field that do not need the fertilizer or lime have none applied on them. This can be as much as a 15-25% reduction in the amount of lime or fertilizer needed.

[http://www.agleader.com/products.php?Product=directcommand\\_g](http://www.agleader.com/products.php?Product=directcommand_g).

Green Seeker NDVI (Normalized Difference Vegetation Index) technology. A farmer applies 50 to 70% of his nitrogen at planting and then in season uses the Green Seeker to apply what the

corn or wheat plant needs when it is growing. This is a more efficient way of applying nitrogen and will reduce over-application of nitrogen.

This is a new technology that is still in its early testing stages, but looks to be promising.  
<http://www.ntechindustries.com/greenseeker-RT200.html>.

Examples of policy mechanisms could include:

- Encouraging the use of more fuel-efficient and larger equipment to reduce the consumption of fossil fuels.
- Encouraging the rapid adoption by farmers of advanced technology seeds that improve yield and resist insects and diseases. Benefits include greater yields per acres, with no additional fertilizer and reduced use of pesticide helps reduce GHG emissions.
- Encouraging greater use of water and rail transportation to reduce truck transportation of agricultural commodities and livestock. Making greater use of more efficient means of transportation could substantially reduce GHG emissions.

Note that this option has a similar counterpart in Option 5.1.

#### *Recent Actions in MI:*

The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

USDA offers RD implementation cost share.

### **3.4 Water Management**

Improve the efficiency of water use through implementation of best management practices and GAAMP (Generally Accepted Agricultural Management Practices). Excess water can lead to run-off of nitrogen with subsequent emission to the atmosphere as N<sub>2</sub>O. 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.

*Recent Actions in MI:* The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS (Natural Resources Conservation Service) practices.

### **3.5 Drainage Management**

Improve drainage on agricultural lands to prevent ponding, which could lead to anaerobic soils and GHG emissions (methane).

*Recent Actions in MI:* USDA-Natural Resources Conservation Service (NRCS) offers a variety of cost-share programs for producers who improve system management. In addition Michigan Department of Agriculture has partnered with NRCS to provide technical assistance to landowners in the design and installation of these systems.

Through inter-county petition and maintenance projects administered jointly by the state and local drain commissioners 1.5 million acres of agricultural land receives improved or consistent drainage to prevent ponding, flooding, and to improve aerobic soil conditions for increased crop production.

The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

## **AFW-4. AGRICULTURE-LAND USE CHANGE**

### **4.1 Land Use Management that Promotes Grassland Cover**

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. Includes opportunities to keep CRP lands covered in perpetuity.

Increased demand for corn-based ethanol and bio-diesel feedstocks can act as an incentive for converting grassland to cropland. Adopt mechanisms to prevent these acres from either returning to conventionally tilled production or to suburban/urban development.

#### *Recent Actions in MI:*

The Michigan Conservation and Climate Initiative allows Michigan agricultural landowners to earn greenhouse gas emission reduction credits through grass planting and earn revenue from the sale of their credits on the Chicago Climate Exchange. (see2.1)

The Michigan Forest Carbon Offset and Trading Program allows Michigan forest landowners to earn and sell greenhouse gas emission reduction credits through increasing the amount of stored carbon on conservation lands. (See 7.1)

The Federal Farm Bill offers a variety of cost share programs for landowners implementing NRCS practices.

### **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. Agricultural land conversion may be prevented through conservation land grants and conservation easements facilitated through non-profit land preservation organizations, policies to discourage greenspace development, expanded availability of public utilities, and encouraging urban redevelopment.

*Recent Actions in MI:* MI maintains temporary conservation easement on 41,000 farm parcels protecting more than 3.3 million acres of farm ground. New applications for the program in 2007 totaled 360 newly enrolling 28,800 acres. MI provides grants to local qualified permanent conservation easement programs to protect farmland. To qualify local programs must adopt an

ordinance and update their long range plan showing farmland protection areas. Grants have been awarded to 11 local programs for \$2.8 million to protect approximately 1,875 acres. MI also holds 87 permanent conservation easements protecting 19,000 acres.

The Governor sponsored a Blue Ribbon Commission on land use changes in MI.

MI has an underfunded purchase of development rights program where farmers can purchase the development rights to their land and thus put it into agricultural production for perpetuity.

#### **4.3 Consolidation of Farm Land**

Geographically consolidating farmland into larger fields reduces GHG by minimizing transportation of supplies, improving farm equipment efficiency, etc.

*Recent Actions in MI:*

### **AFW-5. AGRICULTURE-FARMING PRACTICES**

#### **5.1 Increase On-Farm Energy Efficiency**

Renewable energy can be produced and used on-site at agriculture operations. Examples include installation of solar or wind power, use of hydro-powered generators for irrigation, converting diesel farm equipment to LNG/CNG or hybrid technology, increase on-farm use of biofuels and other renewables, expanding farm energy audit programs, updating machinery, equipment, and engines, and improving efficiency of lighting systems which will reduce carbon dioxide emissions by displacing the use of fossil-based fuels.

*Recent Actions in MI:* The Farm Energy Audit Program at Michigan State University currently targets Michigan dairy farms measuring on farm energy efficiencies.

#### **5.2 Promotion of Farming Practices that Achieve GHG Benefits**

Provide incentives to farmers for using production processes that achieve net GHG benefits. For example, by using biotech crops or some organic farming practices that could achieve reduced GHG emissions compared to conventional farming, depending on the specific practices implemented (e.g., use of no-till cultivation and fewer chemical inputs). Promote Michigan Environmental Assurance Program (MAEAP) verification.

*Recent Actions in MI:* The Michigan Agriculture Environmental Assurance Program (MAEAP) teaches farmers how to identify and prevent environmental risks and comply with state and federal environmental regulations. Farmers who successfully complete the three phases of a MAEAP system are rewarded by becoming verified in that system. It involves a systems approach to environmental stewardship for numerous crops in Michigan, including nutrient and pest management, water use and soil conservation.

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

Promote the production and consumption of locally produced agricultural goods, including transportation and heating fuel and plastics, which displace the consumption of those transported from other states or countries. GHG reductions occur from reduced transportation-related emissions. This may include support for an Integrated Regional Food System. GHG reductions occur from reduced transportation-related emissions.

Recent Actions in MI: The Michigan Food Policy Council - [www.michigan.gov/mfpc](http://www.michigan.gov/mfpc) - issued a report with recommendations including preserving farmland, enhancing the viability of small- to mid-scale family farms, increasing markets for organic and sustainably produced food, and increasing access to fresh and healthy Michigan-grown food., Greater use of Michigan-grown foods reduces food miles (and their GHG), recycles dollars, and build healthier and more self-reliant communities.

MIFFS and various organizations encourage local and sustainable food growth and farm markets.

### 5.4 Programs to Promote Organic Farming Practices that Achieve GHG Benefits

Promote the implementation of organic farming practices that increase soil carbon content and preserve ecological populations. GHG reductions also occur from reduced transportation-related emissions of organic food.

**NOTE:** Opposition to this option was expressed by members of the technical working group who do not believe that organic farming practices should be encouraged over other production practices that may result in superior GHG reductions. The working group defers to the MCAC to make a decision on whether it should be included.

*Recent Actions in MI:* The Student Organic Farm at Michigan State University exposes students and faculty to organic farming concepts and techniques.

### 5.5 Promotion of Urban Agriculture, Community Gardens, and Green Roofs

Promote participation in urban agriculture programs that reduce GHG by sequestering carbon and reducing cooling costs by mitigating urban heat islands. Promote urban agriculture on vacant or abandoned lands. This policy reduces transportation-related emissions by reducing food miles for urban consumers.

*Recent Actions in MI:* MIFFS, Saginaw Bay WIN, MSUE Master Gardeners and some local cities, Detroit, Grand Rapids, Saginaw and Flint promote and demonstrate urban agriculture.

## AFW-6. FORESTRY –PRODUCTION OF ENERGY AND MATERIALS

### 6.1 Expanded Use of Biomass Feedstocks for Electricity, Heat and Steam Production

Increase the amount of biomass used from forests for generating electricity and displacing the use of fossil energy sources.

*Recent Actions in MI: See Option 1.1.*

## **6.2 In-State Liquid Biofuels Production**

Increase production of ethanol and/or bio-diesel fuel from agriculture and/or forestry feedstocks (raw materials) to displace the use of fossil fuel. Promote the development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels to improve the embedded energy content of ethanol. Increased production and consumption in state give the highest benefits.

*Recent Actions in MI: See Option 1.2.*

## **6.3 Improved Energy Capture from Wood Waste Combustion**

Reduce emissions and increase heat efficiency from heat sources such as wood burning stoves and furnaces.

*Recent Actions in MI:*

## **6.4 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.

*Recent Actions in MI:*

## **6.5 Expanded Use of New, Reused, and Recycled 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, plastic and concrete. Reduction potential is enhanced by promoting the use of locally grown wood due to lower transport-associated emissions. Promote utilization of recycled or reusable wood products to reduce wood waste.

*Recent Actions in MI:*

# **AFW-7. FORESTRY – BIOMASS PROTECTION AND MANAGEMENT**

## **7.1 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. In addition to land easements, potentially encouraging private landowners to receive some economic benefit from their land to maximize production may lower the likelihood that they will be diverted to developed use and reduce GHG emissions through efficient production.

*Recent Actions in MI:* The Michigan Department of Natural Resources, in conjunction with the Delta Institute has launched a pilot project titled, ‘Michigan Forest Carbon Offset and Trading

Program.’ This program allows Michigan forest landowners to document their creation of greenhouse gas emission reduction credits from increasing stored carbon on non-industrial working forests and earn revenue from their sale on the Chicago Climate Exchange.

The Michigan Department of Natural Resources administers the Commercial Forest Act and supports local tax offices in the implementation of the Qualified Forest Program. Both of these programs offer tax incentives to landowners to maintain managed forests. The Department of Natural Resources also administers a Forest Stewardship program that distributes federal grants to support private forest landowners to develop stewardship plans that promote sustainable forest management.

The Michigan Department of Agriculture works in collaboration with the Conservation Districts to provide private forest landowners support related to the implementation of sustainable forest management.

## 7.2 Urban Forestry

Maintain and improve the health and longevity of trees in urban and residential areas to protect and enhance the carbon stored in tree biomass. Indirect emissions reductions may also occur by reducing heating and cooling needs as a result of planting shade trees.

*Recent Actions in MI:* The Michigan Department of Natural Resources administers an Urban and Community Forestry program that distributes federal grants and provides technical information to municipalities to promote urban forest management.

## 7.3 Afforestation and/or Restoration of Non-forested Land

Establish forests on land that has not historically been forested (e.g., agricultural land) (‘afforestation’). Promote forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover (‘reforestation’). In addition, implement practices such as soil preparation, erosion control, and stand stocking to ensure conditions that support forest growth, and promote biodiversity of forests to improve ecosystem services and sustainability.

*Recent Actions in MI:* The Michigan Forest Carbon Offset and Trading Program allows Michigan forest landowners to document their creation of greenhouse gas emission reduction credits from afforestation or reforestation and earn revenue from their sale on the Chicago Climate Exchange.

The Michigan Conservation and Climate Initiative allows Michigan agricultural landowners to earn greenhouse gas emission reduction credits through tree planting, forest enrichment, and passive reforestation and earn revenue from the sale of their credits on the Chicago Climate Exchange. (See 2.1)

## 7.4 Forest Management for Carbon Sequestration

Promote forest management activities that promote forest productivity and increase the rate of carbon dioxide sequestration in forest biomass and soils and in harvested wood products. Practices may include: increased stocking of poorly stocked lands, age extension of managed

stands, thinning and density management, fertilization and waste recycling, expand short rotation woody crops (for fiber and energy), expanded use of genetically preferred species, modified biomass removal practices, fire management and risk reduction, pest and disease management, and promoting biodiversity of forests to improve ecosystem services and sustainability.

*Recent Actions in MI:* The Michigan Forest Carbon Offset and Trading Program allows Michigan forest landowners earn and sell greenhouse gas emission reduction credits through reforestation of degraded forest land. (See 7.1.) The Department of Natural Resources also administers a Forest Stewardship program that distributes federal grants to support private forest landowners to develop stewardship plans that promote sustainable forest management.

The Michigan Department of Agriculture works in collaboration with the Conservation Districts to provide private forest landowners support related to the implementation of sustainable forest management.

### **7.5 Mitigation of Forest Carbon Sequestration Loss and Emissions Due to Wildfire**

Programs that reduce the potential for and severity of wildfires also reduce GHG emissions by lowering the forest carbon lost during the fire in addition to the subsequent losses of carbon sequestration potential in the area impacted by wildfire.

*Recent Actions in MI:* The Department of Natural Resources is responsible for the coordination and implementation of the State's wildfire suppression program, which is funded by a combination of state and federal funds. The Department of Natural Resources currently has a goal to keep wildfires below 10 acres if possible and has an aggressive wildfire prevention program to limit the number of wildfires which includes strong participation in the Michigan Wildland Fire Protection Association. This wildfire program also includes community wildfire risk potential assessments and the development of community wildfire protection plans for communities at risk.

### **7.6 Mitigation of Forest Loss Due to Insects/Disease**

Programs that reduce insect damage to forests also reduce GHG emissions by maintaining the carbon sequestration achieved in healthy forests.

*Recent Actions in MI:* The Departments of Agriculture and Natural Resources administer forest health programs that monitor forest health and implement a combination of regulatory and science based technology transfer initiatives to reduce insect and disease damage to forests to maintain healthy and productive forests.

## **AFW-8. FORESTRY – WOOD PRODUCTS AND WASTE**

### **8.1 Improved Mill Waste Recovery – Utilization of Sawmill Residues & Emissions**

Improve treatment and cleaning of waste materials from paper mills, which can then be re-used to manufacture additional wood products. Ensure that sawmill byproducts are recycled or beneficially used for energy. Promote opportunities for using mill CO<sub>2</sub> emissions to create chemical products, such as carbonates.

*Recent Actions in MI:*

### **8.2 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.

*Recent Actions in MI:*

### **8.3 Silviculture Improvements**

Adoption of water conservation, improved harvesting technology such as improved equipment, and other GHG-reducing agricultural practices that can be applied to silviculture.

*Recent Actions in MI:*

## **AFW-9. WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES**

### **9.1 Advanced Recycling, Source Reduction, and Composting**

Increase recycling and reduce waste generation in order to limit GHG 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. Increase reuse and composting. Reduce the volume of waste from residential, commercial, and government sectors through programs that reduce the generation of wastes. Reduction of generation at the source reduces both landfill emissions as well as upstream production emissions.

*Recent Actions in MI:* Recycling is promoted by Michigan Department of Environmental Quality (MDEQ) including mandated recycling of office paper by the Michigan State Government. For details on the various recycling efforts in the Michigan, go to [http://www.michigan.gov/deq/0,1607,7-135-3585\\_4130---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3585_4130---,00.html)

### **9.2 Promotion of Bioreactor Technology**

A bioreactor landfill is essentially in-landfill composting activity at a Sub-title D sanitary landfill in which liquid, temperature, and air (for aerobic processes), are managed in a controlled manner to achieve rapid stabilization of the food, greenwaste, and paper-waste constituents. To optimize the rapid waste stabilization of these wastes, moisture, gas composition, gas flow, and temperature must be carefully maintained and monitored. Bioreactor technology is used to accelerate waste stabilization, enhance gas production and collection, control leaching, reduce volume, and minimize long-term liability of waste.

*Recent Actions in MI:*

### 9.3 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.

*Recent Actions in MI:*

### 9.4 Enhanced Management of Organic Waste

Reduces methane emissions associated with landfilling by reducing the biodegradable fraction of waste emplaced. Recently, an area of focus in the solid waste industry has been in increase recycling of organic wastes (lawn & garden waste, food waste, wood, paper, bio-based plastics, etc.) using different conversion technologies, including composting, anaerobic digestion, or hybrids of these technologies.

*Recent Actions in MI:*

### 9.5 Promotion of New & Existing Technologies for Waste Energy Conversion

New processes include biomass gasification and pyrolysis. A range of renewable products can be developed from these processes, including gaseous and liquid fuels, bio-char, and chemical products. Existing processes include waste combustion and energy recovery (as electricity, steam or both) or ethanol plants using co-products for heating and drying, rather than bringing in outside energy sources.

*Recent Actions in MI:* Bronco Bio-diesel at MSU program captures sewer grease and converts it for use in the local bus system.

## 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 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.

*Recent Actions in MI:*

### 10.2 Landfill Methane Energy Programs

Use the renewable energy created at landfills by anaerobic digesters (methane) to make electric power, space heat, or liquefied natural gas.

*Recent Actions in MI:*

## AFW-11. WASTE MANAGEMENT – WASTEWATER MANAGEMENT ACTIVITIES

### 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).

The term ‘efficiency improvements’ is defined, within the scope of wastewater management activities, as:

- Conversion of secondary aeration processes to fine bubble diffusion and optimization of oxygen transfer efficiencies.
- Research and development of diffuser cleaning protocols.
- Research and development to increase removal of chemical oxygen demand (COD) in primary treatment tanks and clarifiers.
- Evaluate steam usage in plant processes and biofilters. Optimize use and find alternatives.
- Research and development of options to optimize denitrification in secondary treatment.

Financial and performance analyses that may be conducted to assist the implementation of this option include:

- Creation of a leveraged state revolving loan fund program to capitalize energy efficiency in municipal WWTPs.
- Establish a “fair cost of service” pricing tariff for transmission and distribution of remotely sited wind power.
- Facilitate optimization of energy management by requiring all utility meter data to be available without extra charge on a monthly basis.
- Provide incentives to install interval meters to get whole load profile and make data available online and in real-time.
- Conduct benchmarking of energy use per million gallons treated in Michigan to showcase good and deficient energy performance in this specific climate.

Recent Actions in MI:

### 11.2 Lower Waste Processing Needs

Develop and implement best practices for lowering water consumption and lowering waste production in the industrial, commercial, and residential sectors. Encourage and create incentives for research and development on methods/technologies to reduce water consumption and waste production. Provide education to reduce water consumption and waste production. Lower water consumption and waste production lead to lower GHG emissions.

*Recent Actions in MI:*

### **11.3 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 renewable energy (biogas).

*Recent Actions in MI:*

### **11.4 Restoration of Soil Organic Carbon from Application of WWTP Biosolids**

Evaluate the restoration and sequestration of carbon in soil through land application of bio-solids at agronomically acceptable rates. Research and develop a mechanism to remove algae from WWTP (Waste Water Treatment Plant) ponds and apply solids to restore/sequester soil carbon.

*Recent Actions in MI:*

### **11.5 Heat Recovery**

Provide incentives to recover heat from wastewater influent or effluent through the use of heat pumps.

*Recent Actions in MI:*

### **11.6 Algae and Bio-Oils**

Provide financial incentive to research the production of bio-oils from algae or other organisms grown in wastewater effluents (would reduce carbon, nitrogen and phosphorus).

*Recent Actions in MI:*