



## Brief Description of Catalog Items

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

(Note that this listing is incomplete and will be fleshed out during the subcommittee process; subcommittee members are encouraged to provide input to the subcommittee facilitators on existing policies and programs, where relevant. Recently enacted policies and programs in Florida are listed where relevant in the policy options catalog notes. Additional details will be added to this document under each of the option descriptions, as they are provided)

#### AFW-1 PRODUCTION OF FUELS AND ELECTRICITY

##### 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 FL:* EO 07-127 includes a request to the Public Service Commission to establish a Renewable Portfolio Standard that would require utilities to obtain 20% of generation from renewable sources. Presumably this would create demand for biomass feedstocks.

##### 1.2 In-state Liquid Biofuels Production

Increase production of ethanol and/or biodiesel 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 use renewable fuels to improve the embedded energy content of ethanol. Increased production and consumption in state give the highest benefits.

*Recent Actions in FL:* Current efforts include:

- Sales tax exemption for fueling equipment
- Corporate income tax credit for production and fueling equipment
- DACS Florida Farm to Fuel program which in FY 07-08 included \$25M in grants;
- FDEP Renewable Energy Technologies Grant Program which funded some liquid biofuels in FY 06-07;
- \$20M FY 07-08 to UF IFAS for cellulosic ethanol.

##### 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 FL:* EO-07-127 RPS request may create additional demand; further recent rulemaking by the PSC would enable net-metering for up to 2MW in capacity and standard interconnection for all distributed renewables, thus furthering the likelihood of this technology.

#### **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 feedstocks. Continue to advance the biomass heating industry.

#### **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.

### **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), manure crusting, addition of additives to decrease amount of nutrients lost, 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 FL:* Florida law authorizes the development of best management practices for manure management & utilization as it relates to surface and ground water protection

#### **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.

#### **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.

#### **2.4 Utilize Biofilters to Control CAFO Emissions**

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

*Recent Actions in FL:* Manure management is required for Confined Animal Feeding Operations (CAFOs) in Florida under various programs administered by the Department of Environmental Protection (NPDES) and the Department of Agriculture & Consumer Services in order to protect water quality.

### **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.

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

Consolidation improves efficiency and when used with livestock improves implementation of technology such as manure digesters as well as reducing transportation related emissions.

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

Encourage closed loop systems when siting new construction.

## **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. Reducing summer fallow and increasing winter cover crops are complimentary practices that reduce the need for conventional tillage. In addition, the application of biochar (i.e., charcoal) may also increase soil carbon content and stabilize soil carbon. 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 FL:* Refer to the project sponsored by Environmental Defense. The paper is called “Opportunities for greenhouse gas reduction by forestry and agriculture in Florida”. Sabine Grunwald has section called “Role of Florida soils in carbon sequestration” This section outlines the factors that Florida soils can contribute to carbon sequestration.

### **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 FL:* IFAS, DEP & DACS have developed Best Management Practices for row crops in Florida; includes irrigation, fertilization, and pest management 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, etc. On odd shaped fields it can be a 3-5% savings: [http://www.agleader.com/products.php?Product=directcommand\\_l](http://www.agleader.com/products.php?Product=directcommand_l).

Variable rate fertilizing and liming is also becoming more popular among farmers. The farmer has a local Co-op grid sample the field and then variable rate applies the fertilizer or lime as need in the areas of the field that need it. The areas of the field that do not need the fertilizer or lime have none applied on them. This can be as much as 50 to 60% 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 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. A more efficient way of applying nitrogen and will result in less nitrogen being over applied. 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>.

Also, may encompass newer machines with better fuel efficiency, larger planters and combines, and genetically modified seed.

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

*Recent Actions in FL:* See 3.2

### 3.4 Water Management

Improve the efficiency of water use through implementation of best management practices and GAAMP. 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 FL:* DEP has a nonpoint source management program for agriculture IFAS, DEP & DACS have identified the best way to manage for better crop production

### 3.5 Drainage Management

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

## AFW-4 AGRICULTURE-LAND USE CHANGE

### 4.1 Land Use Management that Promotes Permanent 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 biodiesel 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 FL:* IFAS, DEP & DACS have developed BMPs related to water quality protection associated with various agricultural concerns.

#### **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.

*Recent Actions in FL:* Florida Rural and Family Lands Protection Act of 2001 authorizes the purchase of conservation easements by DACS for the purpose of preserving family farms.

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

Improve efficiency by geographically consolidating farmland. GHG reductions from minimizing transportation of supplies, improving farm equipment efficiency, etc.

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

#### **5.1 Reductions in On-Farm Energy Use**

Renewable energy can be produced and used on-site at agriculture operations. For example, 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, and updating machinery, equipment, and engines will reduce carbon dioxide emissions by displacing the use of fossil based fuels,

#### **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).

*Recent Actions in FL:* Required by Florida Statute 570.954, which promotes the farm to fuel initiatives. This promotes the use of Florida crops and agricultural wastes as a source of renewable energy

### **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.

*Recent Actions in FL:* Florida Agricultural Promotional Campaign (FAPC) promotes local farming and agricultural products in Florida

### **5.4 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. Also reduces transportation-related emissions by reducing food miles for urban consumers. Promote urban agriculture on vacant or abandoned lands.

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

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

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

*Recent Actions in FL:* Florida Division of Forestry promotes the development of woody biomass. – See also 1.1 above

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

Increase production of ethanol and/or biodiesel 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 FL:* See 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.

### **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.

### **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.

## **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.

*Recent Actions in FL:* Florida has aggressively pursued the acquisition of conservation lands over the past 25 years preserving more than 2M acres with more than \$6B in funding for the Preservation 2000 program and its successor, the Florida Forever program.

### **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 FL:* The Urban & Community Forestry Program in DACS works in promoting urban forestry and provides grants.

### **7.3 Afforestation and/or Restoration of Nonforested 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.

### **7.4 Forest Management for Carbon Sequestration**

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, and pest and disease 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 FL:* Florida has a robust wildlands fire prevention program organized by the Division of Forestry in DACS and executed by several land-management agencies including the water management districts, DEP, the Fish & Wildlife Conservation Commission, as well as federal land managers.

## **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 FL:* All land managing agencies in Florida use prescribed fire and other means in order to prevent insect and/or disease outbreaks.

## **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.

### **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.

### **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 FL:* BMPs developed by DACS, DEP, and IFAS related to water quality protection and water conservation.

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

### **9.1 Advanced Recycling**

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.

*Recent Actions in FL:* DEP administers a Waste Reduction program which includes recycling grants to local government; a loan program for recycling businesses; a recycling business assistance center; Florida law also stipulates that counties must implement a recycling program with a minimum objective reducing MSW disposal by 30%.

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

A bioreactor landfill is essentially in-landfill composting activity at a Subtitle 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 FL:* DEP and the UF Hinkley Center for Solid and Hazardous Waste Management currently funding three demonstration projects in Florida – see [www.bioreactor.org](http://www.bioreactor.org)

### **9.3 Source Reduction Strategies**

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 FL:* The Pollution Prevention Program and the waste reduction section are involved with the implementation of waste reduction strategies throughout the state.

### **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 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, biobased plastics, etc.) using different conversion technologies, including composting, anaerobic digestion, or hybrids of these technologies.

### **9.6 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, biochar, chemical products, and methane to methanol. 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 relying on outside energy sources.

## **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 FL:* DEP is able to regulate this activity through permitting

### **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 renewable energy (biogas).

*Recent Actions in FL:* Promoted by the Hinkley Center for Solid and Hazardous Waste Management at the University of Florida

### **10.3 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 FL:* Florida is a partner in the EPA's Landfill Methane Outreach Program

## **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.
- Conduct benchmarking of energy use per million gallons treated in Florida to showcase good and deficient energy performance in this specific climate.

*Recent Actions in FL:*

### **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 FL:* DEP (Pollution Prevention Program) & DEP wastewater programs

### **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. Reductions occur via methane control and offsetting fossil energy use.

### **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 biosolids. Research and develop a mechanism to remove algae from WWTP ponds and apply solids to restore/sequester soil carbon.

### **11.5 Heat Recovery**

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

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

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

