

# Agriculture Roadmap to 2020

## Report to the Oregon Global Warming Commission

The following report, *Agriculture Roadmap to 2020*, was developed by the Agriculture Technical Committee of the Oregon Global Warming Commission (OGWC). Agriculture Committee members are listed in Appendix B of this report.

### I. PURPOSE AND CONCLUSIONS

The purpose of the Committee was to develop and prioritize a set of strategies and actions for minimizing Greenhouse Gas (GHG) emissions and increasing carbon storage in the Agriculture sector to meet Oregon's 2020 greenhouse gas (GHG) goal. The recommendations will be considered by the Oregon Global Warming Commission for inclusion in the Interim Roadmap to 2020/Report to the new Governor and Legislature, to state agencies, and to Oregon's Congressional delegation. Recommendations may also guide private sector investments and university research agendas.

After several months of deliberations the Committee narrowed the Key Actions to the list below. Appendix A contains the complete list of Recommended Actions developed by Agriculture Technical Committee. The Committee's Key Actions are more fully described in Section III – Key Actions For 2020. In summary they are:

- Increase Nutrient Use Efficiency
- Increase Carbon Sequestration in Crop Management
- Develop Manure to Energy Methods
- Proactively Prepare for and Adapt to Climate Change Impacts on Water Supply

### II. FUTURE STATEMENTS

Oregon has a thriving, resilient agricultural industry that is part of a diverse rural economy that produces food and agricultural crops more efficiently with fewer Greenhouse gas (GHG) emissions. Agriculture has prepared for and adapted to climate changes in the most cost-effective and sustainable ways. The multifaceted economic, ecological and social benefits of farming and food systems to Oregon are recognized, quantified and rewarded, including the provision of a diverse and sustainable array of food, feed, and horticultural products. Ecosystem services such as carbon sequestration, clean air and water, healthy soil and wildlife habitat, visual amenities, and the essential role of agriculture in creating the fabric of strong communities, cultures, and economies, are recognized and rewarded.

### **Agricultural GHG reduction and carbon sequestration is an integral part of agricultural conservation research, planning, outreach and incentive Programs.**

Greenhouse gas reduction and carbon sequestration is one of multiple conservation goals for agricultural lands, alongside water, air and soil quality and wildlife habitat, reflected in agricultural technical assistance programs, agricultural research and outreach programs, and conservation funding programs.

Benefits of reducing atmospheric GHG emissions and sequestering carbon have been quantified and fully realized on agricultural lands, where appropriate. Research has quantified the GHG reduction and carbon sequestration possibilities on agricultural lands, including soil carbon sequestration rates, soil nitrous oxide emissions, livestock diet strategies, and methane reduction through improved manure management. Research has developed the best agricultural practices to realize GHG reductions and these have been demonstrated and adopted by farmers and agricultural technical assistance and resource providers. Environmental policy and programs provide market-based and other economic incentives to farmers that foster the adoption of GHG reducing and sequestering practices based on sound agri-business considerations.

Agricultural management practices which effectively reduce and sequester GHG have been developed and applied consistent with regional conditions. Practices include those that enhance soil carbon sequestration, improve nitrogen use efficiency, increase ruminant digestion efficiency, capture gaseous emissions from manure and other wastes, generate renewable energy from agricultural lands and agricultural waste products, and reduce energy and fuel consumption

### **Agriculture has prepared for and adapted to climate changes using the most cost-effective, technically feasible and sustainable paths**

Agricultural research, outreach, conservation technical and financial assistance, and risk management funding programs have prepared agriculture for the effects of climate change, including reduced snowpack and seasonal water supply, increased atmospheric carbon, drought, warmer average temperatures, extreme weather events, and changes in pests and invasive plants. Through a combination of planning, research, education, efficiencies, and infrastructure improvement, agriculture is a strong, thriving industry despite these challenges because its practices and methods have evolved and adapted to a changing climate.

Ongoing efforts continue to help agriculture adapt and mitigate climate change. Research programs have increased crop yields and quality, improved input efficiency, and reduced our dependence on external energy sources. Examples of such programs include: crop breeding, crop management, abiotic stress management, soil management, and crop management.

Investment has increased local and regional food production, processing and distribution capacity and infrastructure to create a more resilient food system that better adapts to the uncertainties of climate change.

### **Agricultural GHG accounting is well established**

Oregon has invested in the critical foundation for agriculture's full participation in state, national and international mitigation and adaptation programs by developing a consistent means for establishing baseline GHG levels and for addressing in a scientifically-defensible manner additions and changes to these levels in GHG accounting.

### **Robust incentives and well functioning ecosystem markets exist**

Robust incentives and ecosystem markets are available and accessible to landowners with operations of all sizes. Measurable indices have been devised for agricultural systems (e.g. carbon, water quality, air quality, energy, hydrology, wildlife, native vegetation, space).

- Activity in the marketplace is at a level that investment returns to land owners are equal to or exceed inventory, accounting, and other transaction costs.
- Greenhouse gas reductions are accounted for, and aggregated information about their impact is shared globally.
- Markets depend upon solid oversight and accountability from national and international governing body.

Market emergence and function has resulted in a sustainable supply of verifiable ecosystem services that continue to motivate and maintain long-term investment. State governments cooperate with implementing and administering national and international policy agreements and standards for market participation and verification.

### III. KEY ACTIONS FOR 2020

Each of the priority actions described below requires capacity, commitment, and funding for ongoing research, outreach and easily accessible incentives and financing. Without capacity, commitment and funding, the change that is possible in Oregon agriculture to reduce GHG emissions and adapt to climate change will not be realized. In a time of shrinking budgets, this means that budgets for university and local resource provider staff to do research and outreach, and for incentives and financing for GHG reduction, carbon sequestration and climate change adaptation must be increased.

#### 1. Increase Nutrient Use Efficiency

- 1.1. Create targeted research, outreach programs, technical assistance and tools that increase nutrient use efficiency in Oregon agriculture.
- 1.2. Research soil emission coefficients to establish baseline and future emissions data.
- 1.3. Create an initiative to identify strategies and actions to close the nutrient loop (better utilize all organic materials, urban and rural, for plant nutrition and building soil quality). Bring together waste management industry and agricultural industry to determine how to more efficiently use organic materials in an economically viable way.

#### 2. Increase Carbon Sequestration in Crop Management

- 2.1. Determine irrigated soil carbon sequestration rates.
- 2.2. Encourage practices that sequester carbon in the soil and build soil quality.
- 2.3. Increase outreach and incentives to protect and restore native vegetation, habitats and riparian areas along agricultural lands.

#### 3. Develop Manure to Energy Methods

- 3.1. Develop low-cost technology, incentives, offsets and technical assistance to significantly increase adoption of methane capture and digester technology for all size animal operations.

#### 4. Proactively Prepare for and Adapt to Climate Change Impacts on Water Supply

- 4.1. Promote irrigation efficiency.
- 4.2. Help facilitate water storage projects at all scales that are protective of Oregon's watersheds and natural resources.

## APPENDIX A

### Technical Committee Recommended Actions

According to national data and data provided by the Oregon Department of Energy to the Global Warming Commission Agriculture Committee, the two areas that contribute the highest volume of direct GHG emissions in Oregon agriculture, and therefore present opportunities for meaningful reductions are animal agriculture and soil management. We also know that there is an opportunity for significant reductions in indirect GHG emissions from energy and nutrient use efficiency on farm, and renewable energy generation. Finally, there is an opportunity for carbon sequestration through improved soil management. The following actions present opportunities to most significantly reduce direct and indirect GHG emissions and to sequester carbon in Oregon agriculture.

#### 1. Maintain and Build Technical Assistance Capacity

##### a. Maintain Current Capacity

- i. Maintain full appropriations and stable funding for agricultural technical assistance entities.
- ii. Advocate for continued and higher funding for farm conservation funding programs that assist with mitigation and adaptation of climate change.

##### b. Expand and Build Capacity

- i. Develop capacity for voluntary emissions/sequestration audits.
- ii. Provide hands-on training and implementation support for mitigation and adaptation measures.

#### 2. Improve Markets and Financing for GHG investments

##### a. Incentives/Funding

- i. Advocate for tax credits for capital costs associated with agricultural efficiency projects (i.e. irrigation efficiency, nutrient applications)
- ii. Develop incentives that encourage the producers to internalize business management to address GHG considerations.
- iii. Increase research funding for agricultural practices that reduce and sequester GHGs.

##### b. Marketing

- i. Support agriculture's documentation of GHG reductions and carbon sequestration to access carbon offset and ecosystem markets and as an agricultural product marketing tool for developing new markets and keeping existing markets.
- ii. Reduce transaction costs for participating in ecosystem markets.

##### c. Financing

- i. Well-established and easy to navigate financing structure for research and practices that reduce or sequester GHGs.

#### 3. Crop Management

##### a. Soil Management

- i. Nutrient Use Efficiency
  1. Create targeted research, outreach programs, technical assistance and tools that increase nutrient use efficiency in Oregon agriculture .
  2. Promote water application methods that increase nutrient use efficiency.
  3. Update general and crop-specific fertilizer recommendations to accurately meet plant nutrition needs, reduce N<sub>2</sub>O emissions, and protect water quality.
  4. Quantify the costs and benefits, recommend policy, program and incentive changes to provide a true economic incentive to increase nutrient efficiency.
  5. Support farmer access to incentives for nutrient use efficiency (i.e., cost share assistance, direct payments, tax credits, carbon credits).

6. Determine soil emission coefficients to establish baseline and future N<sub>2</sub>O emissions data.
  7. Develop accurate longer range regional and local weather forecasts to permit more accurate nutrient recommendations.
- ii. Create an initiative to identify strategies and actions to close the nutrient loop (better utilize all organic materials, urban and rural, for plant nutrition and building soil quality). Bring together waste management industry and agricultural industry to determine how to more efficiently use organic materials in an economically viable way.

**b. Building Soil Carbon**

- i. Determine irrigated soil carbon sequestration rates .
- ii. Encourage practices that sequester carbon in the soil and build soil quality.
  1. Research and outreach to provide information on best practices for building soil organic carbon and soil quality such as adding organic matter and increasing cropping intensity.
  2. Quantify the costs and benefits, recommend policy, program and incentive changes to provide a true economic incentive to build soil quality and soil organic carbon.
  3. Support farmer access to tools, technical assistance and incentives for building soil organic carbon (i.e., cost share assistance, direct payment, tax credits, carbon credits).

**4. Animal Agriculture**

**a. Feed/Diet management**

- i. Develop, enhance, and promote use of tools that help livestock growers calculate and reduce GHG emissions from diet management strategies.
- ii. Maintain and enhance access to USDA incentives for feed best management practices to reduce GHG emissions.

**b. Manure**

- i. Develop low-cost technology, incentives, offsets and technical assistance to significantly increase adoption of methane capture and digester technology for all size animal operations.
- ii. Increase use of manure as an organic amendment to enhance soil and plant quality.

**c. Range Lands**

- i. Assist range managers with adoption of practices to quantify and increase sequestration of carbon in rangeland soils.
- ii. Continue research in rangeland carbon sequestration opportunities.

**5. Energy**

**a. Energy Use**

- i. Assessment of opportunities for reducing energy intensity in Oregon agriculture (ODA is working on a report; NEEA has commissioned a market study).
- ii. Provide greater energy efficiency technical assistance to agricultural producers.
- iii. Encourage development of web-based, standardized energy efficiency evaluation tools to reduce the need for individual energy audits and help growers identify opportunities on their operations.
- iv. Implement tools that allow for measurement of energy use.
- v. Partner with serving utilities and public benefits administrators for support in incorporating energy efficiency products, practices and services into Ag operations.
- vi. Irrigation efficiency strategies

1. Conduct landscape-scale analyses to identify and evaluate groundwater and surface water supply issues, water supply constraints, optimal irrigation water systems and management for specific landscapes.
  2. Identify ways to increase water use efficiency by plants will reduce irrigation demands to improve management of irrigation water.
  3. Identify current policy and economic barriers the adoption of water conservation, irrigation efficiency and other proposed solutions.
  4. Promote economic incentives for growers to adopt more efficient irrigation and water management technologies – for both, irrigation capital expenses as well as management expenses (subscribing to irrigation scheduling service).
- vii. Fuel use efficiency
1. Support tractor and other farm equipment efficiency demonstration projects
  2. Help growers get incentives for fuel reduction capital expenses
  3. Increase the adoption of carbon efficient operations
  4. Increase access to carbon efficient transportation for agricultural products
  5. Outreach and incentives for improved heating/cooling efficiency
  6. Promote crop management strategies that minimize fuel use.
- b. Renewable Energy Generation**
- i. Support farmer access to technical assistance and incentives for renewable energy generation.
  - ii. Co-location of agriculture with industry to utilize methane and biomass for energy and heat. Identify and evaluate appropriate technologies with respect to scale and complexity.
  - iii. Infrastructure and policies to support local and grid connected renewable energy generation on farms

## 6. Adaptation Specific Actions

### a. Adapting to a CO<sub>2</sub>-enriched atmosphere

- i. Develop models that predict how CO<sub>2</sub>/climate interactions may affect Oregon crops
- ii. Research into how to maintain crop quality under greater CO<sub>2</sub> concentrations

### b. Invasive species

- i. Model changes into key pests including insect, diseases, and weeds in key Oregon crops and develop minimum GHG impact strategies for addressing them

### c. Evaluate alternatives for meeting Oregon's water supply needs.

- i. Help facilitate water storage projects at all scales that are protective of Oregon's watersheds and natural resources
  1. Support a streamlined "filtering" process that could help pre-evaluate potential irrigation or other agricultural water storage projects and minimize the costs of studies and regulatory reviews.
  2. Support competitive grant program or matching fund program that would help identify good projects and work with applicants through review and permitting.
  3. Evaluate strategies to promote low-impact on-farm water storage ponds.
- ii. Promote irrigation efficiency
  1. Support a tax credit program for water efficiency and irrigation efficiency savings.

### d. Regional Food Systems

- i. Investing in local food and regional food production, processing, and distribution capacity and infrastructure for a more resilient food system

### e. Native Vegetation

- i. Increase outreach and incentives to protect and restore native vegetation and habitats along agricultural lands.

## **7. General Outreach/Technical Assistance**

### **a. Education**

- i. Demo projects with other Oregon agricultural sectors similar to carbon neutral challenge for wineries/climate friendly nurseries project
- ii. Provide information to growers on GHG accounting tools that are available, and if needed, create better tools
- iii. Conduct more outreach to agricultural producers about energy efficiency, renewable energy, mitigation and adaptation practices and incentives
- iv. Outreach and technical assistance in the major recommendation categories.

## **8. Research**

### **a. Maintain existing research and expand research funding in the following areas:**

- i. Increased nutrient use efficiency
- ii. Best practices for building soil organic carbon and soil quality such as adding organic matter and increasing cropping intensity
- iii. Methods for maintaining crop quality under greater CO<sub>2</sub> concentrations
- iv. Measurement of GHG emissions resulting from animal feeding management.
- v. Determine irrigated soil carbon sequestration rates.
- vi. Determine soil emission coefficients to establish baseline and future N<sub>2</sub>O emissions data.

## APPENDIX B

### Agriculture Technical Committee Members

<b>Name</b>	<b>Organization</b>
Stephanie Page	Oregon Department of Agriculture
Allison Hensey	Oregon Environmental Council
Tammee Dennee	Oregon Wheat Growers League
Steve Petrie	OSU
Shanna Brownstein	Climate Trust
Sharon Peterson	NW Energy Efficiency Alliance
Lori Rhodig	NW Energy Efficiency Alliance
Bill White	USDA
Kumar Venkat	Clean Metrics Corp
Whitney Rideout	Oregon Association of Nurseries