Healthy Soils Action Plan

An Interagency Plan to Reduce Greenhouse Gases and Improve Drought Resiliency by Innovating Farm and Ranchland Practices

California's Climate Future and Soils

California's Healthy Soils Initiative is a collaboration of state agencies and departments, led by the California Department of Food and Agriculture, to promote the development of healthy soils on California's farm and ranchlands. Innovative farm and ranch management practices contribute to building adequate soil organic matter that can increase carbon sequestration and reduce overall greenhouse gas emissions.

The Healthy Soils Initiative is a key part of California's strategy to reduce greenhouse gas emissions by increasing carbon sequestration in and on natural and working lands. Governor Edmund G. Brown Jr.'s Executive Order B-30-15 (April 2015), codified by SB 32 in September 2016, established a new interim statewide greenhouse gas emission reduction target at 40 percent below 1990 levels by 2030. The Executive Order points to carbon sequestration in California's forests and farmlands as one way to help meet that goal. The Brown administration also recognized the importance of soil health in the Governor's 2015-16 proposed budget by highlighting that "as the leading agricultural state in the nation, it is important for California's soils to be sustainable and resilient to climate change."

In building soil health, California can also make use of wasted resources bound for the landfill. Currently, some 12 million tons of compostable or mulchable organic waste is sent to California landfills annually, where it generates methane and other public health threats that must be managed or mitigated. The Healthy Soils Initiative presents an opportunity to return those organic materials back to the soil, where they can serve as a resource for California's critical agricultural economy.

Soil Health and California Agriculture

California leads the nation in agricultural production in terms of both value and crop diversity. California's 76,400 farms and ranches generated more than $47 billion in revenue in 2015 according to preliminary data from USDA, which further generates approximately $100 billion

in related economic activities. California's unique Mediterranean climate produces a broad diversity of crops including nearly half of the nation's fruits, nuts and vegetables.

California's crops depend on a reliable source of nutrient- and carbon-rich soil as a growing medium that we must enhance and maintain. The importance of soils has been affirmed by the Food and Agriculture Organization of the United Nations as they recognized 2015 as the International Year of Soils. With limited new arable land, continuing pressure to develop existing arable lands to other uses, an ongoing drought, growing population and climate change impacts, California's and the nation's food security is critically dependent upon the health and sustainability of our soils.

Health of agricultural soil relates to its ability to build and retain adequate soil organic matter via the activity of plants and soil organisms. Adequate soil organic matter ensures the soil's continued capacity to function as a vital living ecosystem with multiple benefits that sustains and produces food for plants, animals, and humans. These benefits include:

- **Improve plant health and yields** – soil organic matter contains important nutrients that support plant growth, biodiversity and yields.
- **Increase water infiltration and retention** – healthy soil reduces runoff and has the ability to hold up to *20 times* its weight in water; it assists flood management.
- **Sequester and reduce greenhouse gases** – carbon stored in soil has the potential to reduce overall greenhouse gas emissions from agriculture.
- **Reduce sediment erosion and dust** – healthy soil resists erosion and improves dust control.
- **Improve water and air quality** – practices to improve soil health can reduce emissions of criteria pollutants and affect the persistence and biodegradability of pesticides in soil and water.
- **Improve biological diversity and wildlife habitat** – at least a quarter of the world's biodiversity lives in the soil; activities to improve soil health on farms and ranches can also promote plant and animal biodiversity and provide wildlife habitat benefits.

Scientific research has shown that various agricultural management practices such as planting cover crops, reducing tillage, retaining crop residue, managing grazing and adding compost can provide the ability to build, retain and restore soil carbon. For instance, a 2009 study[1] found that combinations of cover cropping, manure application and conservation tillage applied to annual and non-woody perennial cropping systems had the potential to reduce GHG emissions by 0.45 million to 1.7 million $MTCO_2e$ /year in the Sacramento Valley, which included DayCent[2] model simulations for 1.6 million acres in Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Yolo and Yuba counties.

[1] De Gryze, S., Albarracin, M. V., Catala´-Luque, Rosa, Howitt, R. E., and Six, J. (2009). Modeling Shows that Alternative Soil Management Can Decrease Greenhouse Gases. California Agriculture, (April–June), pp. 84–90.
[2] DayCent: Daily Century Model. http://www.nrel.colostate.edu/projects/daycent-home.html

Actions for the Healthy Soils Initiative

State agencies, departments and boards met and agreed to a set of five primary actions for the Healthy Soils Initiative:

1. Protect and restore soil organic matter in California's soils.
2. Identify sustainable and integrated financing opportunities to facilitate healthy soils.
3. Provide for research, education and technical support to facilitate healthy soils.
4. Increase governmental efficiencies to enhance soil health on public and private lands.
5. Promote interagency coordination and collaboration to support soils and related state goals.

Guiding Principles

The actions listed above will be governed by the following guiding principles for the Healthy Soils Initiative:

- Promote voluntary actions through landowner partnerships, backed by sound science and bolstered by financial and technical incentives.
- Acknowledge the statewide diversity in climate, soils and crops.
- Meet the needs of producers. Engage stakeholders, including (i) scientific and technical expertise familiar with agricultural conservation programs and climate change issues, and, (ii) grower outreach and technical support to inform the development of programs under the Healthy Soil Initiative.
- Recognize the many ecosystem, public health, agronomic and economic benefits of healthy soil management practices.
- Maintain an inclusive effort and focus on building partnerships**.** Embed the value of Federal, research, private industry and non-profits partnerships.
- Set goals, assess progress and measure success.

Action 1 – Protect and restore soil organic matter in California's soil

Protecting and restoring soil organic matter in California will require a comprehensive approach including goal setting. Land management practices are critical to improving soil organic matter, but we must also ensure that we have the land base and adequate inputs to allow for implementation.

Goal Setting: Working with stakeholders, establish short- and long-term goals for building soil organic matter in California's agricultural and degraded soils. Allow for adaptive management, recognizing that goals may need to be adjusted based on research findings.

Activities under this action include:

- Expand the use of soil amendments that increase the carbon content of soils (e.g., compost and biosolids co-compost).
- Evaluate the potential for beneficial use of other carbon-based soil amendments (e.g. biochar and mulch) on agricultural and fire-impacted forest lands.
- Balance the addition of synthetic inputs with soil carbon and soil organic matter build-up.
- Support farmland conservation.
- Promote on-farm water storage and appropriate groundwater recharge.

Action 2 – Identify sustainable and integrated financing opportunities

Resource management practice standards developed and established by the U.S. Department of Agriculture's Natural Resource Conservation Service exist to support soil health, greenhouse gas mitigation and carbon sequestration. These practices can help offset the increased release of atmospheric greenhouse gas emissions from multiple industrial sectors including agriculture, thereby reducing California's overall GHG emissions.

There are new opportunities for establishing programs to enhance soil organic matter and soil carbon build-up in agricultural soils in California. With the signing of Assembly Bill 1613, the Budget Act of 2016 provides $7.5 million from the Greenhouse Gas Reduction Fund to implement the Healthy Soils Program under the Environmental Farming Act of 1995. Funds spent by the Greenhouse Gas Reduction Fund need to meet legal requirements for their use. In addition, there are a variety of funds available that support soil health. Programs should incentivize the implementation of management practices that will increase soil organic matter and protect environmental resources (e.g., air and water quality).

Activities under this action include:

- Develop and fund incentive and demonstration programs with new and existing resources to support farm and ranch land management practices (in accordance with guidance by NRCS, that may include practices such as cover crops and managed grazing) that increase on-farm carbon sequestration, greenhouse gas reductions, increase water-holding capacity and increase crop yields.
- Secure short and long-term funding sources to support a robust scientific research program to support and enhance healthy soils.
- Identify new and existing funds recognizing that funding sources meet established objectives and legal requirements for their use.
- Explore potential for development of markets and private investment in healthy soils.
- Encourage organic material diversion from landfills to more beneficial uses, including use of compost and mulch as soil amendments, by a tipping fee or complementary mechanism that incentivizes the diversion of organics.
- Avoid agricultural, urban and forest woody biomass accumulation and open pile burning by expanding uses and markets as soil amendments.

- Utilize federal opportunities and support services. Work with designated federal agencies to achieve a coordinated effort towards addressing the state's priority soil problems.

Action 3 – Provide for research, education and technical support

Investments in outcome-based research programs and activities are needed to ensure the most efficient ways to build and maintain soil carbon at the field level while meeting the agronomic needs of growers and ensuring protection of environmental resources. This requires support and allocation of resources for technical assistance to inform the implementation of management practices that build soil organic matter and carbon to support further adoption on a broader scale.

Activities under this action include:

- Identify (i) demonstration projects through a transparent process to meet soil carbon goals, and (ii) critical agronomic and economic research needed to fill knowledge gaps for goal setting and increasing soil organic matter throughout California.
- Provide boots-on-the-ground support. Utilizing partners such as Natural Resource Conservation Services, University of California Cooperative Extension and Resource Conservation Districts, enhance and expand technical assistance and outreach activities to distribute new and existing management practice information to farmers and ranchers.
- Evaluate, identify and map the appropriate regions of the state having ideal characteristics for soil carbon sequestration and water infiltration to aquifers to improve soil health, food production and resilience to climate change impacts and drought.
- Invest in outcome-based research and economic studies. Examples of research needs may include:
    - Evaluate existing research gaps in management practices and economics and co-benefits that contribute directly to building soil health and fund research to fill those gaps that will result in the development of practices to improve drought and climate resiliency.
    - Target research to establish how to work with and promote principles of healthy soils in managing soil borne pests and water and air quality.
    - Develop a user-friendly soil management database to host research findings and practical applications.

Action 4 – Increase governmental efficiencies to enhance soil health on public and private lands

Reduce the time required to move forward on governmental oversight of activities related to building soil organic matter to accelerate efforts to move our soil in a direction where it can help mitigate climate change impacts while at the same time ensuring food and economic security. A key aspect of this is ensuring a consistent, quality supply of organic amendments to build soil health.

Activities under this action include:

- Ensure regulatory consistency across agencies.
- Continue to address cross-regulatory permitting issues related to managing organic waste by engaging stakeholders, including through the processes laid out in AB 1045.
- Increase the generation and use of compost in California to improve soil health, by permitting 30 to 100 new or expanded composting and anaerobic digestion facilities statewide by 2020.
- Reduce methane emissions by diverting organic waste from landfills as described in the state's Short-Lived Climate Pollutant plan.[3]
- Proactively link production and utilization of non-compost soil amendments that show promise in improving soil health and are linked to related forestry and biomass management policies and goals as laid out in the Forest Carbon Plan, Climate Change Scoping Plan Update and related programs.

Action 5 – Promote interagency coordination and collaboration to support soils and related state goals

Multiple state agencies have programs and interests which directly or indirectly relate to soil health, given its multiple benefits. State agencies can benefit by working closely with existing and new resources to ensure our soils have the necessary amendments to build soil organic matter, improving resilience to climate change and the ability to support agricultural food production into the future. While interagency collaboration is key to all actions identified in this document, there are some specific actions to facilitate interagency activities:

- Coordinate agency activities and work across the Governor's Cabinet to facilitate broader discussions on soil health and its co-benefits. For example, measuring and tracking the benefits to increased groundwater supply and quality that Healthy Soils Initiative practices may provide is relevant to advancing local and statewide water management objectives, and it will be important to understand the potential for improved soil health to serve as a vehicle for dust mitigation. Improved soil health may serve to advance climate adaptation across multiple parameters.
- Include in the regular coordination among agencies the potential for broader discussions on soil health.
- Share relevant research and lessons learned for implementation of healthy soil management practices on other lands with other agencies.

California's farmers and ranchers play a critical role by managing soils in a way that sequesters carbon and reduces greenhouse gases. By setting clear goals, incentivizing voluntary on-farm management practices, funding necessary research and demonstration projects and working to promote interagency collaboration and increase governmental efficiencies, the Healthy Soils Initiative can play an important role in meeting California's 2030 greenhouse gas emission reduction target.

[3] SB 1383, passed the Legislature and awaiting action by the Governor, would require the state to reduce methane emissions by 40% below 2013 levels by 2030.