FARMER AND RANCHER-LED CLIMATE CHANGE SOLUTIONS

LISTENING SESSIONS:

Summary of Public Input

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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Final Draft

CONTENTS

cdfa

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

INTRODUCTION

The California Department of Food and Agriculture (CDFA) held a series of six public stakeholder meetings in February 2021 to solicit farmer- and rancher-led climate change solutions that sequester carbon, reduce greenhouse gases (GHGs), ensure climate resilience, provide food security, and increase biodiversity. These meetings were held in accordance with Executive Order (EO) N-82-20, which calls for the development of innovative strategies for using California lands to address climate change and biodiversity crises, and for CDFA to work with agricultural stakeholders to identify farmer- and rancher-led solutions.

This report summarizes recommendations made by farmers, ranchers, and other public stakeholders. These recommendations will be used to improve CDFA's agricultural programs and incentives, to inform the development of the next climate change Scoping Plan, and for ongoing and future work of the Natural Working Lands Climate Smart Strategy.

PROCESS

The six meetings were organized around three agricultural categories: livestock and dairy, perennial crops (trees and vines), and annual crops (row and field crops).

Two meetings were held for each of the three sectors as follows:

- Dairy and Livestock Session 1 – February 8, 2021
- Dairy and Livestock Session 2 – February 12, 2021
- Annual Crops Session 1 – February 16, 2021
- Annual Crops Session 2 – February 19, 2021
- Perennial Crops Session 1 – February 23, 2021
- Perennial Crops Session 2 – February 23, 2021

In accordance with California's COVID-19 Pandemic Health and Safety protocols, the meetings were held virtually via Zoom.

Each meeting began with a background presentation about EO N-82-20, how prior stakeholder engagement efforts have been used to inform the State's climate strategies and programs, and a summary of existing programs and management actions implemented by the CDFA Office of Environmental Farming and Innovation (OEFI). The Department of Conservation's Sustainable Agricultural Lands Conservation (SALC) Program was also discussed. PowerPoint

presentations used at the meeting are posted on the OEFI website at http://www.cdfa.ca.gov/oefi/climate/.

Following the presentations, participants were invited to share their ideas about climate change solutions, including:

- Additional management practices that farmers and ranchers can use as climate change solutions;
- Technologies that could facilitate farmer- and rancher-led climate solutions;
- Research gaps that are impeding potential farmer- and rancher-led climate solutions;
- How CDFA could gather economic information to show the benefits of existing (and new) farmer- and rancher-led solutions, including incentives that would be required to have growers provide their data;
- Other existing programs or strategies that could be part of farmer- and rancher-led solutions;
- Other programs or strategies that could provide examples of farmer- and rancher-led solutions;
- Improvements to CDFA's existing management practices and incentive programs; and
- Barriers to implementing potential farmer- and rancher-led climate solutions.

Meeting participants provided comments verbally and via the Zoom "chat" feature. In addition, participants were invited to email additional comments following the meetings.

COMMON CONCERNS AND SOLUTIONS

Among the numerous ideas that were offered, a few prevalent themes from the farmer and rancher perspectives were expressed:

- Farmers and ranchers feel burdened by regulations and program requirements. They support voluntary incentives but are concerned that incentives may become regulations. Their recommendations to relieve this burden include:
    - Reducing and streamlining existing regulations and avoiding new additional regulations to support farmers' and ranchers' ability to continue their operations.
    - Reducing and creating efficiencies in program application and reporting requirements (within CDFA and among agencies

collecting similar information) to increase farmer participation in, and net benefits from, these programs.
    - Stable funding of State programs to improve farmers' ability to plan for applications.
- The climate change benefits of keeping land in agricultural use (rather than converting it to urban use) should be recognized and promoted by CDFA and other agencies. Recommendations to this end include:
    - Preserving agricultural land by providing increased protection measures and funding, which would result in a major climate change benefit;
    - Quantifying the benefits of agricultural operations, in addition to their impacts; and
    - Recognizing and providing credit for those benefits.
- Farms, and especially smaller farms, need greater support, particularly financial support required for the cost and financial risk associated with investments in new technology and equipment.
- Make case studies available showing whole-costs and whole-benefits with sustainable practices.

A technical assistance workshop provided to Hmong farmers in California by the University of California Agriculture and Natural Resources Cooperative Extension Services

RECOMMENDATIONS

Recommendations made by stakeholders are listed below, organized by livestock and dairy, annual crops, and perennial crops sectors/meetings. These include suggestions for new programs and incentives; improvements to existing programs and incentives; technological tools, data, education, and guidance; and research to advance climate change solutions.

DAIRY AND LIVESTOCK

Under this topic, CDFA heard from dairy and livestock producers, and from agricultural stakeholders in general. The following comments have been organized into several sub-sections. The sub-sections are listed below.

1. Implement New Programs and Incentives
2. Continue and Improve Existing Programs
3. Research and Education
4. Provide Tools, Technology, and Localized Data
5. Improve CDFA Relationships and Communications with Farmers and Ranchers
6. Coordinate/Collaborate with Other Agencies

1. Implement New Programs and Incentives

Implement Water-Related Management Actions

- Reduce dependence on water for dairies facing water scarcity.
- Improve water storage for multiple benefits: dilute nutrients to protect groundwater, improve soil health, increase wildlife habitat, and recharge groundwater.
- Continue developing operationally feasible water efficient technologies and practices and incentivize and promote their adoption.

Promote Byproducts

- Identify viable options for dairies to export excess manure nutrients off-site, including cropland around dairies, many of which are importing fertilizers and generating their own "waste" that could be combined with manures.
- Create incentive programs to export manure off small-scale dairy facilities and upcycle it. Turn manure from a waste into an asset.
- Find efficient ways to convert farm vehicles to effectively run on methane gas produced by dairy digesters.
- Seek "other" uses for separated solids from manure slurry.

- Connect dairy farmers and crop farmers to export manure nutrients, process them and export them for use on crops. This will reduce methane and nitrous oxide emissions, prevent water quality impacts from dairies, help build soils on crop farmland, and offset fossil fuel derived fertilizers.
- Stop managing manure by digesting it for the methane; methane gas pipeline infrastructure is obsolete.
- Provide farmers and ranchers with economic prospectus and analysis support. Byproduct commodities must be monetized to create revenue streams.

Organic Farming

- Pay for certification and inspection fees for farmers transitioning to organic practices.
- Provide free consultations with experienced experts for farmers and ranchers who want to transition to regenerative and/or organic. Consultants should have years of hands-on experience informed by data and science, besides University of California (UC) Cooperative Extension.
- Build markets for farm products with the highest carbon sequestration. Scaling organic labeling and requiring public kitchens to buy 60% organic are two ways to do this.

Other

- Pay farmers and ranchers for the carbon sequestration that is created via grazing and other ranch practices.
- Offset the State-mandated overtime wage increases that currently threaten sheep and goat grazing industries, among other agricultural operations.
- Provide incentives for landowners who lease to ranchers, to encourage implementation of climate-smart practices on their property.
- Promote biological control methods (such as use of bacteria and insects) that can reduce fly and parasite load on grazed animals and increase biodiversity.
- Promote and protect sheep and goat grazing to reduce fire risk and sequester carbon.
- Incentivize use of manure drip systems to reduce nitrous oxide emissions.
- Implement an offset program, or provide incentives, for farmers to use feed additives to reduce enteric methane emissions.
- Develop a one-time concentrated investment to kick-start a nutrient cycling and soil health economy.

    - Bring diverse stakeholders together to research, explore, understand, and connect specific markets. This work could include an inventory of current wastes, where they are, and the impacts they are creating. It could also include an assessment of what specific current markets are using another product where manure, agricultural waste, or compost could be used as more beneficial alternative.
    - Together develop an implementation plan that specifies the roles of different industries and other stakeholders as well as a funding plan.
- Develop and expand the Fertilizer Research and Education Program (FREP) scope, to include manures. Similar to FREP, conduct research and provide recommendations for improving nutrient management using organic sources of nutrients, such as manures.
- Consider exchanging "mitigation payments" for livestock lost to mountain lion attacks (payed to ranchers by other state Fish and Game Departments) for carbon credits given to ranchers involved in grazing programs.
- Allow mammalian composting.
- Allow compost to be moved from one farm to another. Provide funding for compost transport and spreading.
- Provide funding for tools that can be shared among farmers, tool repair, better tools,
- Incentivize a transition from extensive grazing to regenerative grazing methods and silvopastoral systems validated by peer-reviewed science in contexts, such as severely degraded areas, where these practices would improve soil health and catalyze natural successional processes towards increased biodiversity.

<u>How to Incentivize</u>

- Focus funding on supporting implementation of practices and less on providing technical assistance. If these programs are simpler for growers to apply for and benefit from, there will be greater climate benefit.
- Provide incentives at the front end, via CDFA, as opposed to the back end. Front end grants are the most cost effective and help smaller farms. Incentives on the back end incentivize dairy digester programs at larger farms in other states.
- Support farmers and ranchers by ensuring incentives do not restrict land use or make farmers totally transform their operations.

- Make climate solutions implementable for all, especially small farms and ranches. When programs and incentives are set up for use by larger operations, they leave out a lot of other farmers and ranchers.
- Look to Natural Resources Conservation Service's (NRCS's) Conservation Stewardship Program as an example of an incentive-based program supporting existing/ongoing beneficial management practices.
- California cattle ranchers are increasingly burdened by over-reaching government regulations. Implement EO N-82-20 so that it increases economic productivity on public lands, mitigates wildfire hazard and, in turn, will serve to continue to help finance and maintain the burgeoning costs of our state's infrastructure, schools, and essential services.

Solid separation of manure implemented with assistance from the Alternative Manure Management Program in California

2. Continue and Improve Existing Programs

Healthy Soils Program (HSP)

- Add a focus within the HSP to understand and communicate to growers the water benefits of healthy soils practices.
- Incorporate the benefits of sheep and goat grazing into HSP incentives:
    - Apply HSP credits to fuel load reduction to reduce potential carbon release from large fires.
    - Provide credits in HSP and other programs for carbon draw down and biodiversity promotion from grazing.
    - In the HSP, account for the fact that soils gain water retention from hooves walking across them.
- Take into account higher labor costs when quantifying reduced fuel load from the HSP incentives for prescribed grazing.

State Water Efficiency and Enhancement Program (SWEEP)

- Continue funding and enhancing SWEEP.
- Continue accepting the manure drip irrigation system as an eligible practice in SWEEP.
- Look for ways to prioritize co-benefits, such as nitrous oxide emissions and reduced leaching, to expand the impact of projects funded through SWEEP.

Dairy Digester Research and Development Program (DDRDP)

- Provide funding for the DDRDP, which has been highly effective but has not been apportioned funding in this year's proposed budget.
- Provide financial support for small-scale dairy farms implementing dairy digester programs.
- Address inadequate funding of DDRDP that will result in net economic losses for the State because the Low Carbon Fuel Standard (LCFS) is already serving as a subsidy to dairies outside California.
- Given the dual benefits of dairy digesters, consider incentives and funding mechanisms to make this technology more accessible to farms of all sizes.
- Eliminate use of public funds for purchase of methane digesters, as such actions will effectively subsidize both continued and further cattle-based dairy and livestock commodity production.
- Adopt a robust methane emissions tax that would promote the economic internalization (at the firm and commodity-purchasing levels) of the methane-emission-associated climate disruption costs of cattle-based dairy and livestock commodity production.

- De-prioritize incentives for large-scale production of methane gas; in particular, do not fund manure digesters for concentrated animal feeding operations (CAFOs). The best use for animal manure is as composted organic material to replenish the soil, which increases productivity, carbon sequestration, and water retention.

Alternative Manure Management Program (AMMP)

- Provide funding for the AMMP, which has been highly effective but has not been apportioned funding in this year's proposed budget.
- Continue funding and enhancing AMMP to incentivize practices that generate co-benefits (such as addressing acute groundwater nitrate challenges by being a first step in enabling dairies to export their excess manure off-site) and respond to CDFA's Farm Equity efforts (bringing incentive funding to more diverse dairies while also keeping a focus on cost-effectiveness).
- Allow DDRDP awardees to also receive AMMP funds to capture nutrients from digester effluent.

Other

- Continue to compensate ranchers to set aside crops in order to provide habitat for wildlife and promote biodiversity. Create simpler and swifter mechanisms to seek compensation when wildlife needs present these opportunities.
- Explore creating an incentive program focused on incentivizing nutrient management practices and technologies. A first step would be to articulate the co-benefits these practices and technologies could have – including on groundwater quality, surface water quality, GHGs, criteria pollutants, and water availability – and the improved outcomes for human health, ecosystem health, and agricultural viability that would result.
- Ensure that incentives strategies overall reflect the climate costs of methane emissions associated with dairy and livestock commodity production, especially by avoiding any subsidies that would encourage increased methane production or further externalize its social, environmental, and other costs.

Clockwise from top: Verification site visit conducted for the Dairy Digester Research and Development Program in California; a biogas upgrading facility; aerial view of a covered lagoon digester

3. Research and Education

Quantify Existing Impacts and Benefits

- Quantify the fire-risk reduction, carbon sequestration, and soil health benefits of sheep and goat grazing. Calculate the total number of acres grazed annually including federal, State, and private lands.
- Provide more specified information on the greater productivity and carbon sequestration from including at least eight species in pastures. The literature provides evidence of a community tipping point, increasing productivity with enough biodiversity, but does not identify the optimal number of species and whether the forages are annual or perennial.

- Fill research gaps regarding differences in enteric emissions when animals are grazing rangelands. Research underway in the Middle East could inform California.
- Track early adopter carbon sequestration and support those early adopters in peer-to-peer transfer of knowledge.
- Quantify how much nitrous oxide is conserved by using manure drip systems.
- To understand the true impact of dairies, research how much GHGs, emissions, groundwater impact, etc. have been reduced with the recent closure or exodus of dairies in the last two years.
- Determine how much carbon is being sequestered without government funding sources, because farmers and ranchers may be sequestering more than they are being given credit for.
- Ground truth the Intergovernmental Panel on Climate Change (IPCC) reporting for calculating the global warming temperature (GWT) or global warming potential (GWP) of methane; it is flawed.
- Update government agencies' baseline of livestock emissions. Their theoretical emission numbers are based on antiquated research that has been disproven at large by actual emission data collection.
- Utilize dairy industry data on emission rates in confinement facilities. In California and nationally, the dairy industry has spent tens of millions of dollars on research and probably have the most accurate data sets.
- Evaluate and assess the most promising practices and technologies that provide real-time information about nitrogen concentrations in manure.
- Quantify nitrous oxide emissions reductions from switching from flood to more efficient irrigation using manure.
- Share findings about reducing nitrous oxide emissions from manure management.
- Identify the net water effect from cover crops, looking at in-season water use and water savings over time through increased infiltration and soil water holding capacity.
- Determine how cover crops affect both groundwater recharge and mineral nitrogen immobilization. Identify the types of cover crops that could increase drainage while also temporarily immobilizing mineral forms of nitrogen, and which cover crops might lead to more pollutant loading into the groundwater table.

- Improve the science of climate and carbon sequestration for methods and regions.
    - Better document sequestration to:
        - Support funding and resources for its adoption.
        - Identify the results of specific practices.
        - Guide efficient implementation in various regions.
- Compile a soil sample database that helps guide the possibilities in given climatic zones. Set realistic targets rather than targets based on different soil types/ climatic factors.

Find New Solutions

- Research practices that will increase methanotrophic bacteria in pasture soils.
- Increase research into climate solutions specific to the dairy sector, particularly pasture-based dairy farming.
- Conduct research on how land management practices such as composting and intensive rotational grazing can be used to maximum environmental benefit on dairies.
- Provide more research or guidance on how to best mitigate nitrous oxide emissions, especially in pasture-based systems. Producers find that these emissions are difficult to understand and quantify, given the many variables involved in nitrogen cycling.
- Research how to utilize and mobilize the high-nutrient effluent from dairy digesters.
- Invest in agronomic research to increase nutrient uptake and production of crops to reduce the number of acres needed to feed animals, therefore allowing more acreage for wildlife habitat.
- Support research and policies that would allow California livestock operations to supply the compost needed to sustainably fertilize the California crop sector. Many livestock producers, especially dairy producers, are interested in making compost to use or sell. However, there are significant challenges involved, both logistical and regulatory.
- Identify how manure compost could decrease the demand for synthetic nitrogen, potassium, and phosphorus fertilizers; the resulting impacts to GHGs, criteria pollutants, water quantity and water quality; and the fate of carbon in manure compost when applied in a no-till system.
- Conduct more research on developing a sustainable feed crop production system, preferably in California and neighboring states. Embedded emissions in feed crop supply chains represent a significant portion of the dairy sector's climate impact.

- Encourage UC Cooperative Extension to support biological methods of pest control. They promote chemical fertilizers and toxic pesticides that adversely affect biodiversity and GHG emissions.
- Share science and beneficial practices. Incentives distract from the integrated holistic approaches to regenerative land management that most cost-effectively decrease GHG emissions.
- Develop a formal protocol for bringing methane-reducing feed additives to market safely and effectively. A clear regulatory path will help farmers and ranchers conduct supplement trials.
- Emphasize and create opportunities for soil health improvement methods other than compost application, such as research into soil health microbiology and biochar application. Biochar generated from agricultural waste biomass has several benefits and increases soil carbon content.
- Build capacity and solutions for improved manure nutrient management. Develop an understanding of nutrient concentrations, including both organic and inorganic forms of nitrogen, so adjustments can be made to meet nutrient management plans.

Education

- Invest in educational programs for farmers about using feed additives. These programs can create jobs for farmer-educators and modernize farms.
- Educate landowners who lease to ranchers, to encourage implementation of climate-smart practices on their property.

Healthy Soils Program rangeland compost application demonstration in California

4. **Provide Tools, Technology, and Localized Data**
    - Provide or improve access to real-time production monitoring technology to deliver data on individual animals and allow improved efficiency in feeding.
    - Use technology to identify site- and case-specific emissions. For example, improve calculations to quantify differences in emissions from Holstein versus Jersey dairy cows.
    - Provide regular updates on California's progress towards the goal to conserve 30 percent of the State's land and coastal waters by 2030 to fight species loss and ecosystem destruction.
    - Develop and provide use protocols for feed additives.
    - Quantify soil improvements with various manure management practices over time.
    - Promote technological advancements on the farm; these also create a better-educated workforce.
    - Create tools to calculate site-specific or industry-specific emission rates from a holistic perspective, with multiple inputs including animals, row crops as carbon sinks, and permanent crops.
    - Identify and validate real-time soil analysis technologies that will equip farmers with the data they need to cultivate healthy soils.
    - Explore new predictive analytics technologies such as feeders that monitor actual enteric emissions from small and large ruminants. Examples include C-Lock and Crop Performance.
    - Be cautious in recommending Carbon Management & Emissions Tool (COMET) Farm, or provide technical support to users. The interface is incredibly complex and time-prohibitive. The data outputs can be informative, but it is challenging to understand exactly how changes in GHG emissions relate to specific changes in agricultural management practices.
    - Make the COMET-Farm tool for calculating carbon more user-friendly so farmers can quantify their actual carbon emissions and carbon sequestration (a carbon balance) with actual calculations from real research equations, rather than theoretical.
    - Include biochar derived from woody and manure-based sources within the quantification methodology, the California Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model (CA GREET), and the COMET-Planner tool.
    - Support next generation waste biomass conversion technologies, such as pyrolysis, that create value added products such as enteric biochar, soil

amendment biochar, syn-gases, and liquid transportation fuels generated from agricultural waste biomass including dairy manure and waste nut shells.
- Bring pilot technologies to the California market by increasing funding incentives and collecting data for several emerging technologies operating in other states but not commercially recognized in California.

5. Improve CDFA Relationships and Communications with Farmers and Ranchers

- Continue to focus on voluntary, incentive-based programs, rather than increasing regulatory requirements.
- Seek input from farmers and ranchers regarding what a "meaningful" incentive is.
- Celebrate ranches as wildlife sanctuaries with biodiversity and credit them with the myriad ways they contribute to everyday byproducts.
- Reduce fears associated with wildlife reporting; encourage and celebrate hosting of species.
- Foster positive relationships with farmers and ranchers who can be envoys to their neighbors and build trust, encouraging others to share economic data with CDFA.
- Show farmers that climate smart practices can be of benefit to them. Work with farmers from the perspective that:
    - Farmers don't want to give up control of their land.
    - They feel over-burdened by regulations and fear the regulations will interfere with their livelihoods.
    - Farmers want to help and do what is right.
- Work with farmers through trusted Resource Conservation Districts (RCDs); if information comes from local people it will reduce the threat that some farmers feel from the State and encourage more participation.
- Successful farmers are the most trusted sources; foster and leverage those relationships.
- Utilize RCDs to track carbon sequestration data, since they have relationships with farmers and ranchers and have the pulse on what is happening locally.
- Reach out to small ranchers and farmers in small-scale, grassroots meetings using local trusted messengers. Show them how these programs will be to their benefit, benefit the environment, and not harm their business.

- Hold listening sessions and public input meetings in the evening when more ranchers and farmers could join.
- Hold separate listening sessions for dairies and livestock ranchers, as their needs are quite different.

6. Coordinate/Collaborate with Other Agencies

- Encourage local governments to incentivize, and not over-tax farm and ranch improvements by farmers, ranchers, and landowners investing in on-the-ground climate change solutions.
- Take into account federal land, Williamson Act land, and conservation easements in calculating progress towards "30% by 2030" goals.
- Engage with California Air Resources Board (CARB) to explore the alternative use of GWP in measuring the climate benefits of agricultural methane reduction. There is an emerging scientific debate around methane accounting methods.
- Prioritize working land conservation and include these lands as "conserved lands" for 30% by 2030 goals.
- Encourage CARB to start using the latest IPCC methodology for calculating the GWT or GWP of methane. The correct calculation of the GWP or GWT of methane is roughly 80 times more than the metric being used currently.
- Allow counties to opt out of State executive order overreach.
- Align program outcomes with statutory requirements, such as criteria pollutants in the federal Clean Air Act.
- Reinstate a Sheepherder Exemption for agricultural overtime rules. Under current laws, the cost of labor kills large-scale sheep and goat operations.
- Work with other agencies to reduce regulations and costs. For example, when CalRecycle started enforcing compost rules over certain tonnages with the State Water Resources Control Board, the California Environmental Quality Act (CEQA) and permitting made it economically infeasible to develop composting onsite.
- Coordinate with Air Pollution Control Districts (APCDs).
- Coordinate with municipalities that are considering bond measures in order to figure out how to comply with waste diversion requirements.
- Look to Project 21 and the green new deal being proposed by the Biden administration to identify barriers and create a paradigm shift in thinking.
- Integrate financial incentives with NRCS Conservation Practice Standard 808 to help farmers with the costs of their initial carbon-based soil

amendment application to increase soil carbon and improve the physical, chemical, and biological properties of the soil.

- Cattle ranchers with public land permits to graze livestock are essential in restoring lands damaged by wildfires, but only if the administering government agencies with a proven poor track record for managing lands, support active and flexible multiple use of these public lands.
- State agencies must localize planning decisions and avoid issuing state-wide edicts for best management practices. They must work cooperatively and supportively with the local natural resource-based businesses that use public lands.
- Participate in regional planning and partnerships with local, state, and federal agencies.
- Provide more technical experts to support local entities.
- Create public/private funding opportunities to supplement State funding. Help develop and encourage private investments to help reach conservation and climate goals. Funding ideas include:
    - Use rolling vs. competitive applications.
    - Encourage cooperation - provide extra points for multiple participants in applications.
    - Conduct capacity building to get people ready for applications.
    - Advanced payments should be uniform and available across all state grants.
    - Pay invoices, not receipts. Local entities can't afford to pay contractors prior to getting paid by the state. Allow grantees to submit invoices, not proof of payments.
    - Try to reduce the amount of time to pay invoices. Waiting for reimbursement puts a large burden on small nonprofits, RCDs and landowners.
    - Consider tax credits for proper land management and conservation practices.
    - Consider changes to requirements for "life of a project".

California dairy cows

California central coast strawberry field

ANNUAL CROPS

Under this topic, CDFA heard from farmers and ranchers, and from agricultural stakeholders in general. The following comments have been organized into several sub-sections. The sub-sections are listed below.

7. Implement New Programs and Incentives
8. Continue and Improve Existing Programs
9. Provide Technical Assistance
10. Provide Data, Tools, and Other Resources
11. Research and Education
12. Reduce Regulatory Burdens and Coordinate with Other Agencies
13. Preserve and Expand Agricultural Land
14. Support and Seek Input from Farmers and Ranchers
15. Methods and Incentives for Gathering Economic Data to Demonstrate Benefits

7. **Implement New Programs and Incentives**
    - Provide financial assistance for solar installation on farms and ranches.
    - Provide support and incentives to switch to alternative growing methods that draw down carbon.
    - Allow farmers who are increasing the carbon content of their soil to convert that stored carbon into qualifying credits that can be sold into the California carbon market.
    - Pay farmers and ranchers for the carbon they sequester.
    - Incentivize farmers to achieve or transition to regenerative organic certification.
    - Reduce GHGs from food waste by providing incentives for food processing, and/or farm products to go to food banks.
    - Provide growers with incentives to plant hedgerows, beneficial habitat, and cover crops.
    - Fund sprinkler irrigation (including low-flow, linear/center pivot, over-head sprinkler irrigation) for rice farms to reduce release of methane and provide growers flexibility to cover crop extensively.
    - Continue to build public-private partnerships.
    - Create incentive programs for nurseries, or provide them with tax credits or carbon credits. Many produce low water use crops, which are important to climate change adaptation.
    - In grants for development of practices, incorporate the requirement for ongoing monitoring of impacts, benefits, and metrics that compare the actual field results to theoretical results.
    - Provide consistent funding for ongoing practices to make them less risky for farmers to adopt sustainably. Annual appropriations have offered feast and famine approaches that don't incentivize farmers for the long-term, especially when they don't improve quality or yields.
    - Promote programs advancing climate change solutions, such as California Certified Organic Farmers (CCOF), Agricultural Services Certified Organic (ASCO), Sustainability in Practice (SIP) and the Irrigated Lands Regulatory Program (ILRP).
    - Demonstrate alternatives to soil surface management approaches that result in residue free fields, or at least the surface of those fields. These approaches result in (externalized) costs with regards to soil health, water use, insect/disease issues in the crop, fertilizer use, off site pollution from runoff, greatly reduced groundwater recharge, and ultimately a negative climate impact as soil carbon is continuously exhausted.
    - Incentivize high-density grazing on annual crop lands, to build soil and

sequester carbon.

- Offset prohibitive start-up costs (e.g., mobile electric fencing) for farmers seeking to implement high-density grazing on annual crop lands.
- Provide a program to help further progress of growers who already use solar or other more efficient, carbon saving processes. Reward growers already providing a good example.
- Support on-farm and ranch management strategies and practices that maintain or increase biodiversity, including:
    - Restoring habitat within agricultural systems, for example by prioritizing native plants in hedgerows, riparian buffers, roadside buffers, and grassed drainage ditches to increase habitat for pollinators and native insects.
    - Agroforestry, the integration of trees and tree crops into agricultural systems, for example through establishment of hedgerows and riparian buffers.
    - Managing cover crops for biodiversity, for example by maximizing the diversity of plant species (observations suggest that the plant exudates produced by a diversity in the range of 7 to 10 plant species achieves a tipping point of biological functionality), selecting species which provide food or habitat for native and beneficial insects, and allowing cover crops to flower when possible.
    - Planting insectary plants in hedgerows, at row heads, around pumps, in buffer strips, on in-field drive roads, and as interplantings. Devoting even a small portion of total area to insect habitat - from one to five percent depending on situation - provides significant benefits for biological pest control, and can often be done in non-crop areas.
    - Enhancing agricultural biodiversity by supporting intercropping, polycultures, and use of rare, native, and heirloom plant varieties.
    - Where appropriate, transitioning to regenerative grazing practices aligned with peer-reviewed science which improve soil health and catalyze natural successional processes towards increased biodiversity on rangelands.
- Investigate the potential to support rewards for early adopters of carbon farming, for example by paying farmers retroactively for carbon sequestration achieved through a transition to identified carbon sequestering practices.

8. **Continue and Improve Existing Programs**
    - Increase funding for SWEEP; in the last round only 25% of applications were funded.
    - In SWEEP, offset the costs of installing solar panels or make the program accessible to those without solar panels. Farms who installed solar system can't compete to get help with needed irrigation system upgrades.
    - Improve soil moisture monitoring programs in SWEEP.
    - If a farmer can generate compost that meets regulations, allow that to satisfy HSP requirements.
    - Gear the HSP towards water-related benefits, since climate change exacerbates water related issues. Water-based incentives and benefits could incentivize adoption.
    - As part the HSP, reduce the cost barrier and risks associated with equipment purchases. Currently HSP offers a per acre reimbursement for practices, but not for the capital expenditure of the new technologies. This requires smaller growers to take on the risk of insolvency in order to purchase modern no-till and reduced-till equipment. Providing aid for the capital expenditure would help immensely with adoption of new systems.
    - Find ways to overcome the barrier that the volume of paperwork required for HSP and SWEEP presents to many farmers with limited time and resources.
    - Incorporate groundwater retention as a program benefit of HSP and SWEEP.

Farmers in California with Climate Smart Agriculture incentivized projects

9. Provide Technical Assistance

- Expand funding to allow for more technical assistance beyond application and awardee assistance.
- Provide staff/funding to provide technical assistance for existing programs.
- Expand technical assistance to integrate implementation of existing practices into ongoing operation management plans.
- Provide technical assistance to manufacture soil moisture monitoring systems at a large scale.
- Provide technical assistance for farms switching to "no-till" practices.
- Provide technical assistance and cover the costs of implementation of practices.
- Provide technical assistance on all climate beneficial practices.
- Provide direct assistance in completing paperwork and understanding guidelines required by existing State programs.
- Develop long-term funding for technical service providers (such as RCDs) for biodiversity hedgerows.

10. Provide Data, Tools, and Other Resources

- Provide carbon measurement data and training on quantification that can be understood and implemented by farmers.
- Promote the "gasifier" technology that Cal Fire is using, to turn biomass into liquid fuel and activated carbon.
- Increase access to compost, perhaps by expanding composting operations more widely around the state. Currently, transportation distances for compost are cost prohibitive.
- Plan strategically for the increase in organics recycling to provide access to high quality compost.
- Teach farmers to use the COMET-Planner to quantify carbon sequestration.
- Augment COMET to be a usable tool for the diversity of agriculture in California. COMET-Planner and -Farm are built for traditional farming operations and even modifications for "specialty crops" don't go far enough to simplify the software and make them useable. Practices are designed and identified for large acreages with monoculture, but California farms are much more diverse than that.
- Develop funds to repair and maintain tools needed for healthy soils practices.
- Put in place systems for farmers to share costs by sharing tools.

- If the intention is to move to a management by objectives model for GHG carbon dioxide equivalent (CO_2e) tool creation, have a feedback and analysis loop that determines the actual production of those tools and how efficient each is in accomplishing the promised reductions.
- Demonstrate machinery capabilities that can help with surface residue management. This might include new choppers or the roller/crimper, high residue planters/cultivators. The Midwest has developed the capabilities to efficiently sow seeds in fields with large amounts of surface residue.

11. Research and Education

- Research the short- and long-term financial benefits of the existing practices, to help guide farmer decisions about which to adopt.
- Quantify SWEEP water savings and HSP fertility increases.
- Provide more information on carbon farming and related impacts on climate. Inform farmers if there are certain crops/practices that show enhanced carbon farming outcomes.
- Quantify the GHG reduction that comes from reducing or eliminating conventional pesticides.
- Research and quantify the benefits of transitioning from conventional to organic farming practices.
- Research how greenhouse production of container plants (with the process of grading large areas of land and removing native vegetation to make room for greenhouses) compares with carbon sequestration provided by large groves that have native cover crop and do not disturb large areas of landscape.
- Provide growers with research-backed benefits to plant hedgerows, beneficial habitat, and cover crops.
- Research connectivity between hedge rows and rodent/predator populations, to develop remediation techniques.
- Provide more research about how long carbon is stored in agricultural systems. It may be more temporary storage than widely thought.
- Improve the science of climate and carbon methodologies so people can quantify how much carbon they are sequestering.
- Update equations used to identify GHG and carbon sequestration by practice.
- Conduct more research in annual vegetable cropping systems with cover cropping and conservation tillage.
- Measure real time GHG incentives for genetically modified organisms (GMOs) that pull more carbon.

- Research how increased water storage would improve healthy soils.
- Research the impact of dew in providing the water needs for a winter annual cover crop.
- Identify the return on investment of cover crops, factoring in all the benefits (short and long term) weighed against costs.
- Characterize potential cover crop mixes and pasturage that support above-ground biodiversity, considering factors such as cost, availability, indigeneity, allelopathy, mowability, durability, and rainfall patterns, for example self-sustaining, perennial mowed cover crop blends suitable for planting in orchard understory that maximize productivity of deep roots and carbon sequestration.
- Support experiments to identify strategies for maximizing microbial productivity and soil biodiversity, for example long-term, large-scale trials on organic farms using multi-species cover crop blends (with a minimum of eight species suggested by previous studies) plus compost.
- Evaluate practices to encourage methanotrophic (methane eating) bacteria in the soil.
- Compare benefits of systemic agroecological and permaculture design approaches with application of individual practices. Characterize the benefits from design and assessment approaches based on systemic agricultural management strategies.
- Identify crops whose water demand is aligned with water availability in their growing region and develop regional markets for these crops.
- Identify best practices for coordinating crop planting with expected future climate change scenarios to maximize productivity and minimize water use.
- Study how to optimize the health of crops and agricultural ecosystems to combat pests and disease, as the basis of successful Integrated Pest Management. For example, assessment of strategies for ACP/HLB in citrus should involve trees with healthy soil, diverse cover crops, no herbicide use, and hedgerows or other habitat enhancements.
- Consult with Indigenous groups to identify recommendations for agricultural practices and social systems suitable for long-term maintenance of land at the landscape level.
- Explore whether and how to develop standards related to farm labor that contribute to increased farm and community resilience. Metrics might include farm labor rate of pay, benefits, availability of year-round employment (achieved through diverse year-round cropping cycles), and some indicators of access to food, housing and health care.

Field day demonstration in California of State Water Efficiency and Enhancement Program conservation management practices

12. Reduce Regulatory Burdens and Coordinate with Other Agencies

- Continue to provide incentives for voluntary programs and do not implement more regulations. Farmers and ranchers feel vilified and overburdened by increasing regulations.
- Find ways to overcome cost barriers when food safety practices and labor costs increase food prices and affect consumers' ability to afford the passed-on costs of these practices that they otherwise support.
- Address water costs and regulatory requirements as barriers to increasing vegetation/crops for purposes of multiple benefits, including carbon sequestration.
- At an agency level, resolve contradictions in regulations that present barriers to implementation by farmers.
- Develop a cooperative regulatory environment reflective of equally valid objectives across agencies, which support farmers and ranchers. Some of these regulatory jurisdictions include: invasive pest regulatory actions, food-security and safety practice requirements, pesticide regulatory setbacks and buffer zones, and ILRP management requirements and restrictions.

- Work across state agency lines to provide more certainty in regulations, so growers have assurances they won't be penalized by one agency for participating in a program supported by another. Currently implementing some conservation practices could create uncertainty with regulators such as the State Water Resources Control Board (SWRCB). Exempting conservation practices that match best practices would give certainty to growers to implement. This is done in multiple other states including Minnesota.
- Promote regional planning for healthy soils practices to find highest and best use of funding.
- Promote municipal food scrap collection for composting.
- The Administration should encourage OEFI programs to be under continuous appropriation like SALC Program has been afforded, especially if they've shown demonstrable benefits.
- Encourage the Central Coast Regional Water Quality Control Board to conduct research before the capping the maximum nitrogen credit for cover crops to 30 pounds per acre in the Agricultural Order 4.0.
- Provide regulatory "credit" in ILRP and the Sustainable Groundwater Management Act (SGMA) for conservation practices. Healthy soils practices help with water quality.
- The State Water Resources Control Board should recognize and advertise the benefits of using healthy soils on water quality and include it in ILRP guidance. At present, the practices are approved by each regional board requiring a great deal of work from local groups to advocate for adoption.
- Clarify and simplify regulations for on-farm composting. The current complexity deters many from implementing this practice.
- Address contamination in composting orders. There are concerns that new compost stocks will have contaminants.
- Reduce the 25-year requirement for a long-term commitment to practices as a "life of the project." This funding requirement keeps many people from implementing practices because of the uncertainty of agriculture.
- Seek nationwide collaboration with agencies and private companies such as NRCS, Nori, Indigo Ag, and Western Sustainability Exchange among others to coordinate building a comprehensive and scalable database from which to develop increasingly reliable models to reduce the verification cost of carbon credits, as well as to possibly include ecosystem services credits related to soil, water and air quality, that might be a path to increase payments to farmers.

13. Preserve and Expand Agricultural Land

- Broaden awareness of the benefits of agricultural land in fighting climate change. The Yolo County Climate Action Plan found that each acre of agriculture and open space conserved saves nearly 100 times the amount of GHG emissions that would result if the land were converted to urban use.
- Strengthen, fund, and incorporate the Williamson Act into any policies to mitigate climate change. It is voluntary, hugely popular among those who participate in it, and before it was cut it cost the state less than $50 million to make all participating counties whole through subvention funding.
- Restore adequate subvention funding to counties that participate in Williamson Act contracts and require them to restore the 10-year contract term.
- Incentivize new farms and offset startup costs such as root stock, labor, infrastructure, and purchase of land.
- Promote or provide infrastructure (equipment, planting, cultivating, harvest and moving the product) in diverse geographic regions to promote farming diverse crops.
- Promote farming villages to reduce environmental impacts of homelessness and urbanization.
- Support community-supported agriculture and smaller-scale processing facilities in order to reduce the geographic distance between producer and consumer.
- Preserve farmland distributed across California to reduce transportation emissions.
- In protecting agricultural land, prioritize land that provides the most carbon/GHG benefit.
- Categorize agricultural land uses and correlate them with GHG CO_2e reduction potential.
- Continue assistance and provide additional technical support staff for SALC Program applications. Ramp up education and outreach about the program including the role of RCDs in SALC.
- Provide capacity training for holding conservation easements to RCDs and land trusts.
- Provide support to RCDs and land trusts to identify high priority lands for conservation.
- Work with other agencies to develop a certification program for local consultants that assess conservation easements. The quality of a

consultant can impact the economic success of a conservation easement.
- Provide incentives to landowners to keeping working lands working, including but not limited to reduced water costs, reduced taxes, or credits to landowners that maintain farms in conservation friendly ways. This is particularly important in urban and suburban environments.
- For land preservation and management projects, fund and support the pre-work, including education and outreach, and provide financial assistance, through grants or other sources, to RCDs, Land Trusts, and others, for the development and maintenance of projects.

14. Support and Seek Input from Farmers and Ranchers

- Seek input from a diverse array of California's farmers and ranchers, such as smaller scale producers, diversified farmers and producers of color, who have historically been undeserved by public programs, and who may have very different needs and ideas. Conduct outreach in partnerships with non-governmental organizations (NGOs), the California Farm Academy program, and other groups who can help connect CDFA with those producers.
- In promoting the benefits of these programs, speak to what motivates farmers (i.e., water savings, lower fertilization needs, better pest management, better yield, lower production costs, easier regulatory compliance for other programs). Currently the benefits of the programs have been messaged in terms of GHG emission reduction which may not be as readily understood by farmers.
- Show the public what farmers and ranchers are achieving, rather than only focusing on what they need to do better. Shift public perception to show that farmers are making great strides in the fight against climate change, rather than perpetuate the narrative that farmers are polluting.
- To encourage some industries to be more comfortable sharing sensitive or proprietary information, seek voluntary financial information and aggregate it to protect anonymity.
- Continue to seek input about the creative practices of farmers and ranchers.
- Build healthy relationships with farmers and promote opportunities for farmers to share promising practices between each other.
- Build partnerships by sitting down and talking face to face with farmers or farmer groups in a more traditional farmer style, rather than a sterile government style of communication.

- Seek information from the informal rancher to rancher network as a means of sharing information and trial results. RCDs have partnered with this organization, but funding is needed to coordinate these learning networks, conduct monitoring, and facilitate new ideas in carbon sequestration.
- Conduct outreach through commodity groups, Agricultural Commissioners, UC Cooperative Extension, Agricultural Water Quality Coalitions, RCDs, Irrigation Districts, etc.
- Take advantage of the localized knowledge of County Agricultural Commissioners in developing a task force for on-farm practices.

Soil moisture monitoring in an oat field in California

- Look to UC Agriculture and Natural Resources' Cooperative Extension offices and research facilities as a good source for assessing local needs.
- Use grower-centric and organized groups (in addition to ancillary industries like pest control advisers and crop advisors) to message these programs.
- Utilize the California Farm Demonstration Network; CDFA is one of a number of partners.
- Look to the United States Department of Agriculture (USDA) National Organic Program as an existing farmer-led solution.
- Increase support for people from historically displaced or excluded demographic groups to access land and technical support. Provide direct financial support, reduce barriers to accessing financial services, and connect people in these groups with landowners through programs like FarmLink and food hub projects that aim to make healthy and sustainably produced food accessible and affordable to all.

15. Methods and Incentives for Gathering Economic Data to Demonstrate Benefits

- HSP quantitative measures are difficult and expensive to record. Gather a grower focused per-acre cost or total expenses spent prior to the project in comparison to the expenses after the project. Yields may not become higher with implementation of an HSP practice, but efficiencies will be gained (less fuel use, less labor, and less mechanical compaction over the soil).
- In order to incentivize farmers to provide economic data, make the benefits of the program worth the time is takes to provide that data. For example, providing financial help that reduces capital expenditure risks associated with changing farming systems would make the time spent to provide economic information to demonstrate the benefits worthwhile.
- Aim to discuss economic information in a comfortable space that supports relationship building and learning. Create venues for sharing information about costs and benefits in a peer-to-peer learning setting. Costs and yields could be discussed as part of Open TEAM, Soil Health Academy, Farmers Guild, Farmers Union, Young Farmers' Coalition, or Lighthouse Farmer style groups. Area peer-to-peer learning networks allow for locally specific discussion of agronomic and economic factors relevant to farmers.
- Request economic information efficiently so that there is no added paperwork burden.
- Aim to ensure that requested information on farmers' costs and return on investment will be used to facilitate farmer learning about beneficial solutions, rather than only compiled into averages for reports that are not directly useful to farmers.
- Research and publish case studies of self-identified successful organic farmers that include economic breakdowns and explanations of choices and decisions the farmer made. Highlight and recognize in these case studies the quantitative and qualitative outcomes and benefits of on-farm solutions to the farmer, on-farm biodiversity, and adjacent land uses and ecosystems.
- Tie the collection of information clearly to beneficial outcomes for farmers, such as rewarding quantified carbon sequestration and ecosystem services or identifying ways to lower costs.

Cover cropping conservation management practice in a California vineyard

PERENNIAL CROPS

Under this topic, CDFA heard from farmers and ranchers, and from agricultural stakeholders in general. The following comments have been organized into several sub-sections. The sub-sections are listed below.

16. Implement New Programs and Incentives
17. Continue and Improve Existing Programs
18. Conduct and Utilize Research
19. Involve Farmers/Ranchers in Research
20. Provide Data and Tools
21. Provide Guidance and Education
22. Work with Other Agencies and Programs
23. Reduce Regulatory Burdens and Coordinate Existing Programs
24. Take a Whole-Systems Approach
25. Create a Culture Shift that Supports Farmers
26. Design Outreach to Best Reach Farmers

16. Implement New Programs and Incentives

Wood Products and Biomass

- Invest in pilot projects and offset startup costs to simplify using orchard wood for bioenergy such as gasifiers at the end of their lifecycle.
- Provide incentives for orchards to send pruning waste to biomass power plants.
- Incentivize production of biochar with orchard wood, which sequesters carbon for 100+ years, rather than composting or whole orchard recycling which does not.
- De-prioritize incentives for burning or incineration of organic material that could be feasibly reincorporated into the soil. Biomass incineration may be the only feasible option in cases where, for example, orchard waste includes diseased material. In such cases, production of biochar as a carbon sequestering soil amendment may be appropriate. However, other options such as whole orchard recycling, mulching, and composting of biomass could often be made possible with appropriate financial support. Subsidies for biomass management should focus on putting organic matter back into the ground.

Soil and Compost

- Prioritize adding organic matter to the soil, rather than taking it off the farm.
- Set up on-farm composting systems.
- Help farmers compost or find a climate-safe venue for small fruits left behind after size-screening.
- Fund biochar or biochar/compost additions through the HSP.
- Incentivize farmers and off-farm businesses to compost and incorporate plant and animal residues into the soil.
- Encourage farmer- and rancher-led efforts to increase composting by supporting formation of grower-led cooperatives for sharing compost turners, tub grinders, and front-end loaders.
- Reduce government barriers to on-farm composting.

Organics and Pest Management

- Provide funding or cover start-up costs through HSP for transitional organic certification. Organic has a market-based premium built in to incentivize adoption. The challenge is growers must go through a three-year transition period to convert to organic. That process must be funded by the grower (and any Healthy Soils programs which they may qualify for). Only after this transition period can the grower start recouping their

investment. For open field crops, three years can seem like an eternity to have more expensive farming methods without the financial support.

- Waive certification and inspections fees and provide consultation on organic farm plans, to get a bigger return on investment for carbon sequestration compared to incentivizing siloed practices like HSP is doing using COMET-Planner.
- Support farmers in the transition to organic farming practices. Current pesticide-dependent farming practices are not addressing the increase in pest impacts as a result of climate change.
- Compensate farmers for the fees for organic transition, certification, and inspections (the Pennsylvania Farm bill provides an example of this approach). Paperwork requirements and certification costs are some of the biggest barriers to adopting and maintaining organic farming practices.
- Offer free or subsidized consultation to develop an organic farm transition plan for those interested in transitioning (the Pennsylvania Farm bill provides an example of this approach).
- Support formation of grower-led regional infrastructure for biological pest control, such as regional networks of insectaries and regional field scouts.
- Fully recognize and account for the ecological and carbon sequestration contributions already being made by many California famers while also providing significant funding, technical assistance and other support to help California farmers transition away from agricultural pesticides to more ecological farming that focuses on prevention of pest and disease problems through an emphasis on promoting plant and soil health and resilience.
- Establish an incentive program for alternative pest management practices and strategies that reduce the use of synthetic pesticides.
- Incorporate into natural and working lands planning concrete strategies for helping farmers to transition away from agricultural pesticides, including support for farmers, such as:
    - Subsidizing transition to organic farming (covering expenses related to development of organic plans, ensuring no farmer has to pay for organic certification, providing a full day or two of free transition assessment/services, etc.).
    - Working with other government entities to support public procurement from small- and medium-sized California organic farmers, especially from socially disadvantaged farmers.
    - Supporting regional Integrated Pest Management efforts.

- Promote cooperative regional insectaries to avoid the use of toxic pesticides.
- Add existing pesticide impacts to critical measurement tools for carbon.
- Incorporate existing research about pesticide impacts on GHGs and soil's ability to sequester carbon into incentives for farmers.
- Transition away from the hazardous use of pesticides; pesticides reduce biodiversity, which is critical for successful farming (soil microbiota and pollination).
- Add an incentive program for adoption for integrated or organic pest management practices to have a more holistic and comprehensive approach to climate change resiliency.
- License Pest Control Advisors to ensure that they do not profit from the sale of pesticides and agrochemicals.

Other Practices

- Offset financial risks for farmers to try new technology.
- Invest in RCDs' equipment lending programs for specialized equipment required for carbon sequestration practices. Small farms are unable to purchase equipment that they need only once a year or on occasion. RCDs can and often do serve as local lenders of equipment for climate-smart agricultural practices. They also have the local relationships and program management experience to operate successful equipment lending programs.
- Promote and support the use of electric tractors.
- Provide financial incentives for orchard/vineyard farmers to change to higher density plantings. To switch to no-till practices for perennial crops, in some cases it will require the re-development of the perennial crop, closer spacing, different rootstock, etc. to make the no till practices economically viable. Tighter spacing quickly increases costs.
- Count orchard trees as CO_2 sinks.
- Facilitate private payments for GHG/CO_2 offsets by working to standardize verification and make it cheaper.
- To ensure that these practices are truly farmer-led, allocate funding for each region that farmers can prioritize for the projects that they think are significant.

Make Connections

- Invest in programs of peer-to-peer training involving early adopters. This should provide an adequate measure of new farmer adoption of carbon sequestering systems.

- Incentivize peer-to-peer learning, broadly.
- Develop or promote networks that help connect generators of novel soil amendments and biofertilizers with ranchers/farmers who need it.
- Allow for or make a funding category for community engagement in addition to funding for practice implementation.

How to Incentivize

- Create opportunities for food companies to offset initial climate-smart practice costs for farmers.
- Work with packers/processors to provide farmers/ranchers incentives from the packer/processor end. Farmers are responsive to incentives from these partners.
- Develop something similar to the NRCS cost-share program to support farmer transition to organic practices.
- Set up or investigate the standardization of carbon accounting procedures. As the farming community acts as a significant sink for carbon in the environment they would benefit from a scientific and rigorous approach to measurement so that the appropriate practices can be measured and rewarded.
- In implementing EO N-82-20, remember that the primary function of California's working landscape is for providing a sustainable, abundant supply of food, fiber and renewable energy for our communities and the world. For these benefits to be realized, working lands must be kept working.
- Assure that government incentives have accountability and intention to avoid the risk of creating an infrastructure reliant on tax-payer dollars, which would redirect resources away from activities that would result in sequestering or reducing carbon.
- California's farmers and ranchers have been managing the health of their soils and conserving the State's natural resources for generations. In order to further the adoption of on-farm practices, assistance will be necessary. Identify a sustainable funding source for such work that is neither inconsistent (such as the Greenhouse Gas Reduction Fund) nor temporary (such as a General Obligation Bond).
- Work with the private sector to fill funding gaps that may be present, bearing in mind they themselves are the largest procurer of agricultural commodities. Support, provided by the State, can also be found in leveraging that purchasing power.

- Avoid limiting access to funds based on farm characteristics, at a time when many farms in California, regardless of size or demographics, are stressed and in legitimate need. Keep a watchful eye on non-farm intermediaries that may divert funds to narrow or non-farm-related purposes.
- Avoid program criteria that are shaped by special interests and seek to assist only a small subset of the farming community. Although the fact that some have been historically disenfranchised and lack access to important capital to enter into or initiate change within the agricultural sector must be acknowledge and addressed, resist hand-picking beneficiaries and inadvertently opining on what is the "right" or the "wrong" type of farming.
- Avoid a paradigm that rigidly assumes what's capable on one field is replicable everywhere else.
- Prioritize funding to farms under 500 acres. Small farms can respond more flexibly to management challenges, tend to have greater on-farm crop diversity, produce over 70 percent of the world's food, and are better situated for localizing our food supply to enhance food security.
- Establish mechanisms to ensure that incentives are regularly updated to reward outcomes based on the most current and data-supported models and verification programs.
- Avoid incentives that will increase the demand for scarce resources, such as cover crop or hedgerow planting during periods of low rainfall. Incentives and support should seek to minimize the demand for new irrigation water by supporting farmers to align their species choices and planting schedules according to local water availability.
- Ensure mechanisms by which to continually evaluate the carbon sequestration performance of farming systems being incentivized, according to the latest peer reviewed science.

17. Continue and Improve Existing Programs

- Offset the biggest stumbling blocks in implementing climate smart solutions: the amount of documentation required, the types of equipment needed to do the job, and the cost of new technology needed for the job.
- Improve the HSP modeling tool to include farmers who want to do whole orchard recycling, compost and cover cropping on the same field. Funding has been denied to farmers for these three practices because of

the limitation of HSP modeling for organic carbon inputs to soils. This was a lost opportunity for HSP.

- Provide increased and more reliable HSP funding to make the program more accessible and worthwhile to apply for.
- Schedule HSP solicitations at the same time each year, to allow producers to plan projects for HSP funding, leading to more implementation of climate beneficial farming practices.
- Help food safety certified producers adopt HSP practices (such as compost, hedgerows, and windbreaks) by educating HSP technical assistance providers and food safety certifiers about the intersection between food safety and climate beneficial farming practices.

State Water Efficiency and Enhancement Program irrigation project recipients at their blueberry farm in California

18. Conduct and Utilize Research

- Conduct long-term studies proving or disproving the capacity of soil to generate long chain carbon sequestration retained by soils (drawdown).
- Research what kinds of plants work well as cover crops with limited winter water in the southern San Joaquin Valley.
- Quantify the multiple benefits of combining carbon sequestration practices (e.g., orchard recycling, composting, and cover crops together).

- Conduct research to help identify the level of incentivization needed to account for any absent or unclear agronomic benefits.
- Conduct further research on using biochar and compost from woody debris in wooded land near local farms.
- Utilize biochar research done in Tuscany, Italy.
- Research how cooperative grower-led insectaries fit into a paradigm of more climate friendly farming.
- Seek new carbon farming resources in international workshops.
- Use adjusted warming potential in addition to global warming potential in quantifying the benefits of different practices farmers and ranchers can undertake.
- Review the results of Dr. Horwath's research at UC Davis that concludes that the metric of organic was a better predictor of carbon sequestration compared to no till and cover crops. Adopt policies in accordance with those findings.
- Utilize existing research data on the most successful conservation practices from farmer trials. Sources for this existing data include:
    - The Conservation Agricultural Systems and Innovations group
    - Commodity boards
    - Agricultural extension advisors
    - American Farmland Trust (specifically on methodologies to assess the return on investment on soil health practices including in some specialty crops)
- Science must play a central role in framing policies and practices intended to achieve climate resiliency and carbon neutrality on working lands. Invest in research and development, capitalizing on the unparalleled agricultural expertise existing in our public university systems, to identify new on-farm management practices and develop carbon offsets. Findings and recommendations that inform farm activities cannot simply be theoretical; they must be field-trialed and tested to prove they have practical applicability for everyday farmers to undertake, not just niche farm sectors or incubator farms. For these practices to be scalable and broadly embraced, they must be accessible without technical assistance, not create externalities, and be accessible to all.
- Allocate resources for studying the long-term impacts of pesticides on human health in California agriculture.

19. Involve Farmers/Ranchers in Research

- Direct researchers to connect with growers through boards and commissions (e.g., Walnut Board, Almond Board, Pistachio Commission, etc.)
- Provide a venue to connect early adopters with researchers to quantify long-term benefits of implemented practices.
- For future long-term funded studies, frame collaboration with early-adopting farmers and ranchers as necessities.
- Fund long-term studies on soil carbon sequestration in various agricultural systems, possibly through the State's Climate Change Research Plan.
- Seek input from farmers and ranchers about how to reduce GHG emissions from agricultural transportation.
- Develop or promote networks that help connect generators of novel soil amendments and biofertilizers with researchers interested in partnering with them.
- Utilize data from early adopters who might have pre-empted government programs. Compensate these early adopters for their data.
- Use the experience and ingenuity of the agricultural community to field-truth practices and offer farmer and rancher-led solutions.

20. Provide Data and Tools

- Increase access to weather stations and aerial technology to help with managing farming practices and solving problems in the field. These resources are too costly for small farms.
- Provide data quantifying carbon sequestered by permanent crops. Providing this data to investors can help attract private capital and also use the crops to validate climate goals.
- Make remote sensing tools available to verify changes in soil.
- Utilize tools like Cal-Adapt to incorporate measures that are useful for farmers, for instance pest and disease models or more specific crop sensitivities to heat/chilling/water availability, etc.
- Develop a Life Cycle Assessment program that's specifically designed for farmers and ranchers and calculates environmental impacts resulting from certain production practices.
- Follow Australia's good example of publishing a "climate atlas" for specific crops, e.g., grapes, to show how grape growing relevant conditions will change across an area.

21. Provide Guidance and Education

- Provide guidance on how to adapt Midwestern regenerative agricultural practices to Californian landscapes.
- Teach farmers and ranchers to use detailed T-charts to track transition costs. Ensure they understand they will likely not see savings before 7 or 8 years, when inputs for many farm systems finally fall for the remaining life of the crop system. The American Farmland Trust does this in their support tutorials.
- Provide more funding for UC Cooperative Extension officials to spread locally and expand their services. Currently there are weeks of wait time for a farm visit due to limited staffing. They can provide technical assistance to:
    - Help growers implement many of the latest technologies that would aid in these climate smart practices.
    - Focus specifically on implementation of regenerative and carbon farming.
- Provide Farm Advisors on soil, water, plant health, and air.
- Teach Farm Advisors in perennial crops the disadvantages of instructing growers to use Roundup to kill cover crops to ensure bare dirt under trees in an effort to mitigate danger from rattlesnakes.
- Educate orchards about how applying 'clean cultivation' techniques for ease of harvesting actually adversely affects carbon storage.
- Teach farmers that biochar applications must be properly charged with extant nutrients prior to application.
- Model the NRCS's incentives, staffing advice, and in-the-field interaction. Those services have provided the most important impact to farming practices.
- Provide farmers with guidance to address food waste and crops not harvested because of damage like smoke taint.
- Provide agronomic research-backed benefits to implementing climate smart practices.
- Provide farmers with more education about how climate change will affect them, to dispel skepticism about climate change and dismantle the perspective that it is a way to put in more regulations that make it difficult to farm. For example, the walnut board found out that warming weather has affected chill hours which affects walnut bloom and set.
- Provide guidance and other information that will assist local jurisdictions to develop solar policy that respects and supports agricultural land (farmland and rangeland) preservation and production.

- Fund technical assistance providers, rooted in the community with strong local relationships, to give producers on-the-ground support in integrating climate- and nature-beneficial practices into their operations. For the program to accomplish its vision and goals, technical assistance must be funded more broadly than helping producers prepare grant applications.
- Subsidize training programs that support state goals, such as training in agricultural practices that reduce the use of agrochemicals and build soil health and biodiversity.

Table grape canopy in California

22. Work with Other Agencies and Programs

California Air Resource Board (CARB)

- Improve and continue the CARB specific program for agricultural and low mileage vehicles. It is difficult to reach CARB by phone or email to enroll in the program, and it ends in January 2022. Additionally, there are areas of the state that are exempt for this low mileage requirement.
- Encourage CARB to provide substantially more funding for vehicle replacement in their Truck and Bus Regulation. The program is intended to reduce GHGs, but thousands of vehicles will be scrapped and replaced with often expensive vehicles that only operate 2-3 months per year.
- Work with CARB to reduce prerequisites that may be a barrier to investments for scaling transition to organic farming practices.
- Encourage CARB to standardize state-wide incentives for purchase of electric tractors and other farm equipment as much or more than fossil-fuel powered equipment in order to reduce barriers at the local level.

Land Management Agencies

- Partner with forest management agencies to sequester carbon in forests adjacent to farmland.
- Many farmers and ranchers have forest land adjacent to their operations. Actively push to deregulate logging, increase control burns, and manage the forest land in a way to prevent forest fires, which are massive contributors of GHGs and air pollution.
- Combine the State's approach to managing forested areas with climate-smart practices by using woody debris on nearby farmland for carbon sequestration (primarily in the form of compost or biochar). Often sources of carbon come from far away and transportation is both costly and has a large carbon footprint.
- Work with other State Agencies to improve fire prevention techniques. Fires release large amounts of carbon and endanger crops.
- For truly long-term carbon storage, focus on surrounding riparian or forest areas for preservations, or for reduction, and focus on energy/fuels consumed during the production of the crop. Carbon will be sequestered in a perennial farming system only so long as the crop is there. In vineyards, since every 25-30 years the vineyard is removed and replaced (or the crop is switched), anything done in the crop footprint is a 25-30 year band-aid.

Farm Waste

- Develop outreach/education programs that teach growers how to recycle materials like old drip line, grow tubes, bird netting, etc.
- Help farmers increase their organic matter in soils by working with agencies that recycle yard trimmings to make them available to farmers.
- Find ways to overcome the restrictions that limit organic farmers' ability to recycle into organic systems. Food waste and brewery waste grain would be good examples of this.
- Generate a plan or agreement with the food safety modernization act for onsite composting for food safety purposes.

Other

- To sequester carbon, require public kitchens to buy a steadily increasing amount of organic. For example 10% by 2025 and 10% more each year until 50% by 2028.
- Promote organic farming by implementing a buy-local policy for State-funded public kitchens.
- Work with the irrigation districts to help promote farmers in implementing climate smart practices. Because of the irrigation district's easement rights, some have blocked farmers' efforts with NRCS to plant border crops to help with sediment erosion, and preservation of natural beneficial and predatory bugs and insects in an effort to reduce the use of chemicals.
- Encourage the Office of Planning and Research's Climate Risk and Resilience branch to commit to working with early-adopting farmers over the long-term to monitor results.
- Consider how to track implementation of climate-smart agricultural projects funded on working lands through non-CDFA programs (e.g., grant programs funding similar work through other State agencies and departments, USDA Farm Bill cost-share programs, etc.), private sector programs (e.g., Zero Food Print and carbon markets), and practices adopted by producers at their own expense.
- Encourage the UC Division of Agriculture and Natural Resources, the Cooperative Extension, and the UC Statewide Integrated Pest Management project to follow the Roadmap for IPM in California, including updating recommendations to emphasize pest prevention and biological and cultural controls.
- Encourage the Department of Pesticide Regulation to adopt a hazard-based evaluation of pesticides similar to the European Union model.

23. Reduce Regulatory Burdens and Coordinate Existing Programs

- Consolidate application and reporting requirements for different programs that cover similar areas, within CDFA and across agencies.
    - Utilize one comprehensive questionnaire and allow information access for all the agencies asking for the same information.
    - Allow transitional organic or organic certification to be a qualification for HSP funding, rather than requiring farmers to resubmit the same information as that program.
    - Use self-assessment data from commodity group sustainability programs to inform a consolidated database for reporting requirements.
- Streamline the many government agency programs into an easily accessible and incentive-based program to reduce the paperwork burden (staff hours/money/waiting time) on farmers and ranchers.
- Simplify data entry so if a farmer applies for one program, they can leverage that input, so they don't have to fill out a similar form for another program. Create a single portal for all farm data input to reduce the burden of reporting on farmers. All agencies that need access to this data would be able to access it through this portal.
- Allow flexibility in the nitrogen ratio for the HSP compost program in the winter months for farmers with limited compost access.

24. Take a Whole-Systems Approach

- Implement a program like the Community Alliance with Family Farmers (CAFF) Lighthouse Farmer Program from the 1990's to promote community-based organizing centered on how farmers learn and change.
- Encourage "systems" and not "practices"; research shows organic blocks using cover crops sequester more carbon than any other combinations of practices.
- Recognize that there are differences across the state and "one size fits all" is not always true. Water issues, for example, are very different in Fresno vs. Butte vs. Del Norte. Common themes, but different metrics and specific goals may be appropriate.
- Count GHGs attributed to agricultural transportation as transportation emissions and not as agricultural emissions when calculating GHGs.
- In the context of the limited time available to address climate change threats and diminishing global arable land (functioning topsoil), share with

the public the State's perspective regarding the challenge of acting now while accruing sufficient research outcomes along the way.

- Adopt life-cycle assessment methodology in understanding and verifying the climate and environmental benefits as well as impacts, and the value of agricultural land use systems for providing ecosystem services that are often taken for granted.
- Create a whole systems approach to farming where the grower can rely more on the biological systems, and not the chemical systems. Biodiversity is created by cover cropping to increase the amount of time living roots are in the ground and that biomass added as food to the soil for the biological food web, the use of conservation tillage to sustain that food web, and insectary habitat to encourage a diversity of pollinators and beneficial insects. Fund this research and reach the growers that will make the biggest impact, the largest growers.
- Incentivize a systems approach. Scaling a systemic approach to carbon sequestration will require an "integrated landscape management" approach.
    - Farmers and ranchers need context- and outcomes-driven systemic approaches that can be extended to broader landscapes, such as watersheds or ecological regions, through community-level relationship building and/or decision-making bodies. Community-led decision making would also be a good way to ensure that farmer- and rancher-led solutions remain led by farmers and ranchers. For example, landscape-level decision making could be supported by RCDs, who are often already trusted partners of farmers and ranchers and familiar with the local context of their region. Skilled facilitators can ensure inclusive conversations that span digital and cultural divides. Many farmers respond better to in person relationship building than to solely digital interactions.
- To encourage application of systems approaches, make it possible for farmers to report on and be paid for multiple practices and outcomes on the same land, by supporting development of additional Ecosystem Service Credits (besides carbon sequestration and water saving credits).

25. Create a Culture Shift that Supports Farmers

- Credit perennial crops for the carbon storage they provide, like forestry and urban trees are credited. These do not necessarily need to be carbon offset credits, but credits in a larger sense.

- Recognize that the trees farmers grow consume carbon and produce oxygen.
- Support and recognize perennial crop growers for what they are doing to help the environment. For example, the almond industry recently received criticism for the amount of water they use. However, the narrative totally ignored the positive benefits of a tree transpiring water and making food, a carbon sink, a habitat, and oxygen to breathe. Even adding the water to the air helps moderate temperature swings/extremes.
- Farmers are now considered climate villains but could be hero's with incentives and recognition for planting cover crops, using compost, and planting millions of trees.
- Close the gaps in the popular narrative around farming by acknowledging that every imaginable human endeavor results in environmental impacts of some kind. Instead highlight what we are getting in return.
- Advocate for agriculture and what farmers do for the environment. If farmers go out of business our food will have to be imported, which is a very unsustainable and unsafe situation for our country. Everyday farmers are competing with foreign companies who do not have the regulatory compliance and wages that we pay in the US.
- Support farmers by giving them credit for the efforts they are making. To promote more farmer engagement with CDFA (instead of being viewed as just another governmental agency they have to deal with), it is important to publicly support the current efforts while encouraging more.
- Quantify what farmers know they are doing for the environment and then help us educate the public.

26. Design Outreach to Best Reach Farmers

- Devote sufficient resources to outreach, language, and cultural competency to reach small-scale and medium-scale farmers, especially socially disadvantaged farmers. The lack of resources is a major barrier to farmers participating in CDFA's current programs.
- Hold outreach activities geared specifically towards people from historically displaced or excluded demographic groups.
- Provide listening sessions in other languages.
- Do not schedule listening sessions in the morning.
- Be mindful that it takes time to see results in perennial crops. For any new technology or practices, there will need to be a timeline in place to facilitate better adoption from growers on the back end.

- Use existing channels of UC Cooperative Extension lecture series and farm advisors, to provide targeted outreach to individual crops or industries.
- Provide targeted presentations to specific industries that explain what programs might be right for each. Listening to all the State programs is overwhelming for the individual farmer and they are likely to tune it out.
- To reach farmers, present information in terms that the grower can understand in a venue where they are used to actively listening to techniques and updates. Mass mailings or television ads will not help.
- Invest in additional on-the-ground technical assistance, outreach, and peer-to-peer training and support networks, and devote sufficient resources so that all farmers, regardless of size, income, language, racial and cultural background are able to access new and existing programs intended to benefit them.

California central valley specialty crop farmer

PUBLIC COMMENTS ON THE DRAFT REPORT

A public comment period on this report was provided to stakeholders from March 30 to April 30, 2021. A total of 14 public comment letters were submitted by several organizations or groups of organizations. Three individuals provided comments during the public comment period; a large number of individual contributions had already been made during the Listening Sessions period.

An initial review of the comments highlighted a number of suggestions shared between stakeholders. Several comments advanced a "nutrient and soil health economy" that would take advantage of manure, food wastes, and excess biomass in California. Other comments advocated a map to track the implementation of Climate Smart Agriculture, undertaken independently and voluntarily by farmers and ranchers or through incentives, to create public recognition of agricultural ecosystem services and to pave the way for potential ecosystem service markets. Further climate smart agricultural extension services, outreach capacity, and technical assistance were also requested, beyond the CDFA-supported efforts.

Comments included addressing several ongoing persistent agricultural concerns that the State is engaged in. For example, proposals to make Climate Smart Agriculture incentive awards dependent on farm size was supported by some but not supported by other commenters. Several stakeholders requested more funding of manure digesters, making economic and climate-based arguments, while others saw that funding as supporting the expansion of a potential pollution source.

Concerns that farmers and ranchers face together were also discussed in the comments. There was interest in how the State's future biodiversity strategies might affect agriculture. Comments noted that farmers work to safeguard the land and nature but are concerned about the risks involved with working to protect and enhance the natural ecosystem. There was interest in the HSP's cover cropping practice, but many practical and research questions about how to do it in different regions, especially considering water availability, pollinator habitat, and pest management concerns. There was interest in understanding "whole" farm and ecosystem costs and benefits in relation to Climate Smart Agriculture practices, with a range of ideas on how they could best be gathered and distributed further.

NEXT STEPS

The California Department of Food Agriculture has now received several hundred ideas and comments as part of the 2021 Farmer and Rancher-Led Climate Solutions Listening Sessions. CDFA will use this information in several ways, informing efforts within the Department itself to promote and protect California agriculture, and contributing to other state and federal reports such as the CARB AB 32 Scoping Plan, the California Resources Agency (CNRA) Natural and Working Lands effort, and the State of California State Adaption Strategy. The Department will continue to look for opportunities to take actions that advance the comments and solutions proposed through this effort.

The Secretary of the California Department of Food and Agriculture would like to thank all participants in this process for their time, patience, and commitment to work together. Through this process, CDFA gained a view of the shared intentions, science and policy that will allow the Department to build upon California's progress, serving as an example for agricultural adaptation and mitigation in response to climate change.

"The supply of ideas and input which has come through these sessions will continue to motivate us for years to come, to ensure agriculture and the environment are sustainable into the future, and we look forward to working through these comments and suggestions," observes the Secretary of CDFA, Karen Ross.

Dairy in Point Reyes, California

POLL RESULTS

During the listening sessions, polls were conducted via the Zoom polling feature to identify the interests represented by meeting participants, as well as to learn whether they have previously participated in CDFA programs and/or the Department of Conservations' SALC Program. Poll results are shown in the tables below and on the next page.

Perspectives

What perspective do you primarily represent?	**Annuals 1**	**Annuals 2**	**Perennials 1**	**Perennials 2**
Farmer or rancher	15	15	31	17
Academia	6	3	3	2
Ag support services (certified crop advisor, pest control advisor, etc.)	3	2	5	3
Government	13	5	12	6
Nonprofit	9	9	7	7
Other (please share your answer in the chat)	4	3	2	2
Technical assistance provider	13	5	6	4
Vendor	1	1	3	2
Total	**64**	**43**	**69**	**43**

Participation in State Incentives

Which of these programs have you participated in? (Select all that apply)	**Annuals 1**	**Annuals 2****	**Perennials 1**	**Perennials 2**
Alternative Manure Management Program (AMMP) with CDFA	6	1	1	1
Dairy Digester Research & Development Program (DDRDP) with CDFA	2	0	1	1
Healthy Soils Program (HSP) Incentives Program with CDFA	32	9	15	9
Other (please share your answer in the chat)	10	0	3	2
State Water Efficiency and Enhancement Program (SWEEP) with CDFA	20	5	6	5
Sustainable Agricultural Lands Conservation (SALC) Program with DOC	7	3	1	1
I am a farmer or rancher but have not participated in these programs	n/a*	4	17	6
I am not a farmer or rancher/these programs do not apply to me	n/a*	20	28	23
Total (participants were able to select multiple responses)	**77**	**42**	**72**	**48**
Total poll participants	64	42	69	43
Total attendees able to vote (online, not on phone)	94	63	107	67
Percentage of attendees participating in polls	68%	67%	64%	64%
Notes: The Livestock and Dairy Sessions did not include these polls.				
*This option was not available on this date.				
**In this session an error prevented participants from being able to "select all that apply" and participants only selected one program each.				

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TABLE 1.

The Consolidated Recommendations in the first column of the table below are compiled from received comments. The Received Comments in the second column represent summarized actions presented in the Listening Sessions and the subsequent written 30-day Public Comment period. Potential Cost in the fourth column is defined further as - Low: achievable by existing personnel and Low resources; Medium; requiring more funding but within existing programs' scale and scope; High: on the level of new programs or significant statewide resources required to implement. The timeframe referenced in the last column is defined as - Short: within one year; Medium; 1-5 years; Long: 5 years or Longer.

Key Partners;

CDFA – California Department of Food and Agriculture

CNRA – California Natural Resources Agency

CARB – California Air Resources Board

CEC – California Energy Commission

CPUC – California Public Utilities Commission

GoBiz – Governor's Office of Business and Development

SGC – Strategic Growth Council

OPR – Governor's Office of Planning and Research

UCANR – University of California Agricultural and Natural Resources

USDA-NRCS – United State Department of Agriculture Natural Resources Conservation Services

CalEPA – California Environmental Protection Agency

DOC – California Department of Conservation

CDFW – California Department of Fish and Wildlife

DWR – California Department of Water Resources

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Avoid new regulations, preferring incentives, tax breaks, regulatory relief, and support for collaborative solutions	Concern that Scoping Plan process would produce new regulations, not just incentives	CDFA, CARB	Low	Short
	Create tax credits for conservation practices and biodiverse land management	CDFA, CNRA, OPR	High	Long
	Strengthen, fund, and incorporate the Williamson Act into policies to mitigate climate change		High	Medium
	Ease dairy digester permitting in the state	CDFA, State and Regional Water Quality Control Boards, CalEPA	Low	Medium
	Develop incentives for RNG and electric farm equipment as they become increasingly reliable and available	CDFA, CEC, CARB, CPUC	High	Medium
	Make equipment for healthy soils practices available to smaller farmers through incentives, cooperatives and equipment lending programs	CDFA	Medium	Medium
	Create stand-alone solar energy incentives for farms and ranches	CDFA, CEC, CARB, CPUC	High	Medium
Build markets for sustainable agriculture	Build markets and branding for sustainable farm products, especially those from Climate Smart Agriculture	CDFA, GoBiz, OPR	Medium	Medium
	Utilize state procurement process to support local agriculture including smaller, disadvantaged, and organic growers	CDFA, CA Department of Finance	Medium	Medium

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Establish a nutrient cycling, biomass and soil health economy with emerging technologies	Establish a nutrient cycling and soil health economy with emerging technologies through a concentrated investment following an action and funding plan including diverse stakeholders	CDFA	Medium	Short
	Incentivize export of manure off-dairy	CDFA, CARB	Medium	Short
	Support "upcycling" manure into more useful forms, remaining cognizant of food safety standards and resulting market pressures	CDFA	Medium	Medium
	Study and "connect" manure and biomass supplies with potential consumers	CDFA	Low	Short
	Expand the Fertilizer Research and Education Program (FREP) scope to include manures and statutory authority	CDFA	Medium	Short
	Allow DDRDP awardees to also receive AMMP funds to capture nutrients from digester effluent	CDFA, CARB	Low	Short
	Explore creating an incentive program focused on nutrient management practices and technologies, following study of the co-benefits – including groundwater quality, surface water quality, GHGs, criteria pollutants, water availability, human health, ecosystem health, and agricultural viability	CDFA, CARB	Medium	Medium
	Increase agricultural access to compost with increasing organics diversion – transport cost is often prohibitive	CDFA, CalRecycle, CARB, CalEPA	High	Medium
	Clarify and simplify regulations for on-farm composting while ensuring food safety	CDFA, CalRecycle, State and Regional Water Quality Control Boards,	Low	Medium
	Expand options for mammalian mortality management, including composting and small-scale, climate smart rendering technologies	CDFA, CalRecycle, State and Regional Water Quality Control Boards	Low	Short
	Work with state, regional, and federal agencies to develop practical and economically viable biomass utilization facilities	CDFA, CalRecycle, State and Regional Water Quality Control Boards	High	Long

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Develop real-world cost-benefit analyses for Climate Smart Agriculture practices	Obtain data on climate smart agriculture practice costs and benefits in California	CDFA	Medium	Medium
	Some climate smart agriculture advantages or disadvantages will be impossible to capture in quantitative terms and therefore may be discussed qualitatively	CDFA	Low	Medium
	Long timeframes would have to be used to capture advantages of climate smart agriculture practices	CDFA	Low	Medium
	Real costs should include investments made by the public and private sectors	CDFA	Low	Medium
	Organics' costs and benefits must be gathered and analyzed	CDFA	Medium	Medium
	Provide case studies of successful organic farmers of all farm sizes that include economic breakdowns but also explanations of decisions the farmer made. Highlight the quantitative and qualitative outcomes and benefits to the farmer, on-farm biodiversity, and adjacent land uses and ecosystems	CDFA	Medium	Medium
Move towards systemic, whole-farm Climate Smart Agriculture projects	Many farmers and ranchers are ready for a move towards whole-farm climate smart agricultural projects, incorporating multiple practices and aspects of biodiversity, including biocontrol, sterile insect technique (SIT), and integrated pest management (IPM) strategies.	CDFA	Medium	Medium
	Fund initial organic technical assistance and organic system plans, including certification and other paperwork	CDFA	Low	Short
	Fund organic transition input costs to allow more transition by farmers with limited resources for years when losses are expected	CDFA	Medium	Medium

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Make incentive programs more regular in funding, easier to apply to, and more flexible in payment and planning	Seek to secure funding agreements with the Legislature or the Greenhouse Gas Reduction Fund that reduce incentive program funding fluctuations between years. This way farmers and ranchers can plan more accordingly	CDFA	Low	Medium
	Move to upfront payments, especially for disadvantaged farmers, or reimburse invoices instead of receipts	CDFA	Low	Short
	Take advantage of overlap between HSP applications and organics certification	CDFA	Medium	Medium
	Provide rolling application periods of sufficient length, or a fixed yearly application window	CDFA	Low	Short
	Develop common data-entry approaches to reduce application burden and possibly monitoring burden; a central database could be accessed using per-application authorizations	CDFA	Medium	Medium
	Explore multiple participant applications to CDFA's Climate Smart Agriculture incentives	CDFA	Low	Medium
	Make compost incentives more flexible: fund transport and spreading; adjust strictures on compost C to N ratio to relieve farmers with limited access to compliant products, especially in the winter	CDFA	Low	Short
Include ecosystem services outside GHGs and water savings in State incentive programs.	For SWEEP: Evaluate ways to prioritize co-benefits, such as N2O emissions and reduced leaching, to expand the impact of projects funded through the program	CDFA, CARB	Low	Short
	Projects should be able to receive consideration for their contribution to the biodiversity and integrity of landscapes surrounding the farm or ranch, or for return to previous landscape features, especially where neighbors are ready to collaborate – evaluate survey approaches for natural enemies	CDFA, CNRA	Low	Medium

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Consider more emissions trade-offs and life-cycle emissions in assessing Climate Smart Agricultural practices' impacts	GHG impacts of climate smart agriculture practices should take into account use of fuel on-site, yields, and thereby life-cycle emissions for the products if they differ from the conventional or previous practice. Life cycle considerations such as energy embedded in fertilizers and water would also improve comparisons between whole systems	CDFA, CARB	Low	Medium
	For more precise AMMP and DDRDP methane estimations, incorporate and communicate findings on nitrous oxide emissions from manure application to soils, as compared to baseline synthetic fertilizer emissions	CDFA, CARB	Low	Short
	Give systematic recognition of organic systems' carbon sequestration	CDFA	Low	Medium
Address inequity in the distribution of land and resources	Address lack of access to financial services and land for small farmers	CDFA	Low	Medium
	Prioritize support to small farms, for social justice and environmental reasons	CDFA	Low	Short
	Develop standards related to farm labor that contribute to increased farm and community resilience	CDPH, CDFA, SGC, OPR	Low	Medium
Make Climate Smart Agriculture outreach and technical assistance more unified and more widely available	Promote varied climate solutions and programs in unified outreach efforts; increase coordination of CDFA, RCDs, USDA-NRCS, and UCANR	CDFA, USDA-NRCS, UCANR	Low	Medium
	Provide Technical Assistance for long-lived practices such as hedgerows	CDFA, USDA NRCS	Medium	Short
	Fund CSA TAPs and training programs for participants outside State CSA incentive applicant/award pool	CDFA	High	Medium
	Increase funding for UC Cooperative Extension	UCANR	Low	Short
	Provide training on the quantification of carbon sequestration.	CDFA, CARB, UCANR	Low	Short

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Make outreach more specific to communities and organizations, utilizing more peer-to-peer approaches	Hold activities geared specifically towards people from excluded demographic groups and towards specific industries	CDFA	Medium	Short
	Build up language and cultural competency in outreach efforts	CDFA	Low-Medium	Short
	Explore more partnerships and input from organizations rooted in socially disadvantaged farming communities, including farmworkers	CDFA	Medium	Medium
	Ramp up education and outreach about the SALC program including the role of RCDs in it	CDFA, DOC, UCANR	Low	Short
	To address methane emissions, perform outreach on dairy feed additives even if no incentive is to be offered	CDFA, CARB	Medium	Short
	Utilize more peer-to-peer networking for disseminating CSA practices, for giving farmers models, and for assessing the actual barriers to CSA practices on farms	CDFA, UCANR	Medium	Short
	Focus more outreach and messaging on benefits to farmers and on what they have accomplished	CDFA, UCANR	Low-Medium	Short
	Support the growth of Resource Conservation Districts, which are lacking or under-resourced in certain areas of the state, such as the San Joaquin Valley	CDFA, DOC	High	Medium
	Consider using various farming organizations for outreach, rather than direct CDFA efforts	CDFA	Low	Medium
	Design HSP Demo Projects to perform outreach through community channels	CDFA	Low	Short

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Augment on-farm biodiversity and its services, such as biological pest control, while addressing related regulatory and practical barriers	Support formation of grower-led regional infrastructure for biological pest control, such as regional networks of insectaries, seed sources, plant nurseries, regional field scouts, and regional Integrated Pest Management efforts	CDFA, CDFW, DPR	Medium	Medium
	Quantify the GHG and soil carbon effects from reducing or eliminating conventional pesticides to increase official support for biological control	CDFA, CARB, DPR	Low	Medium
	Encourage the Department of Pesticide Regulation to adopt a hazard-based evaluation of pesticides similar to the European Union model	DPR	Low	Medium
	Follow the Roadmap for IPM in California	CDFA, DPR	High	Medium
	Establish insectary plants in non-cropped areas. Devoting a portion of total area to beneficial insect habitat provides significant benefits for biological control	CDFA, CDFW, DPR	Medium	Medium
	Incentivize beneficial habitat such as cover crop mixes, hedgerows and windbreaks, supporting their intersection with native plants, biodiversity and IPM	CDFA, CDFW, DPR	Medium	Medium
	Study regulatory conflicts that are setting back implementation of biological control to replace pesticides	CDFA, DPR	Low	Medium
	Address Irrigation District easement rights, which often interfere with conservation and biodiversity measures	CDFA, State Water Resources Control Board	Low	Medium
	Simplify biodiversity set-asides and associated payments: "Make farmers less scared to report endangered species."	CDFA, CDFW	Low	Medium
	Reinvest in ensuring the genetic resources for California crops are modernized and maintained (e.g., clonal repositories)	CDFA, UCD	High	Long
	Address the viability of cover crops and hedgerows with regard to water supply, including increased soil moisture retention and dew uptake, in different parts of the state, through research and outreach	CDFA, UCANR	Medium	Medium
	Encourage the Central Coast Regional Water Quality Control Board to conduct research before the capping the maximum nitrogen credit for cover crops to 30 pounds per acre in Agricultural Order 4.0	CDFA, State and Regional Water Resources Control Boards	Low	Short

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Explore biodiversity initiatives for rangelands and pastures, including grazing intensity	Explore biodiverse pastures and their benefits, such as shade and carbon sequestration, especially on degraded rangelands	CDFA, UCANR, CNRA	Medium	Medium
	For biodiversity on rangelands, grazing may need to follow a "regenerative" model, while particular plant species should be monitored, such as pollinators.	CDFA, UCANR, CNRA	Medium	Medium
	In HSP and other programs, account for the economic pressures on grazers, such as transportation and overtime wages	CDFA	Medium	Medium
	Allow more grazing on public lands to avoid wildfires.	CDFA	Low	Long
	Any grazing-based carbon management program or incentive should account for and deduct manure and enteric GHG emissions against carbon sequestered on grazed lands	CARB, CDFA	Low	Short
	Incentivize high-density grazing on annual crop lands, to build soil and sequester carbon. Offset prohibitive start-up costs (e.g., mobile electric fencing) for farmers seeking to implement high density grazing on annual crop lands	CDFA	Medium	Medium
Continue improving CDFA GHG calculators and other climate adaptation computational tools for farmers	Explore how low QM tools can be expanded in the direction of ecosystem services, metrics of use to credit markets, life-cycle emissions, multiple practices, and other whole-system considerations	CDFA, CARB	Medium	Short
	Establish mechanisms to ensure that incentives are regularly updated to reward outcomes based on data-supported models and verification programs	CDFA, CARB	Medium	Medium
	Adopt different Global Warming Potentials (GWP) for methane	CARB	Low	Medium
	Tools like Cal-Adapt should incorporate measures more useful for farmers: pest and disease models, crop sensitivities to heat or chilling, water availability	CDFA, CEC, UCANR	Medium	Medium
	Develop a predictive "climate atlas" for crops	CDFA, UCANR	Low	Short
	Early adopters of conservation agriculture wish to be connected to researchers, feeling that academic research has ignored the effects seen by them	UCANR, RCDs	Low	Medium

Consolidated Recommendation	Received Comments	Key State Agency/Partners	Potential Cost	Timeframe
Coordinate with national organizations and national governmental programs to facilitate ecosystem and carbon credit markets, standardize verification protocols, and establish data sharing systems, aiming for a voluntary, comprehensive tracking of various conservation agriculture practices	Coordinate with national organizations and national governmental programs to facilitate ecosystem and carbon credit markets, standardizing verification protocols, establishing data sharing systems, and addressing other points of potential confusion	CDFA, CARB	Medium	Medium
	Support carbon in standing biomass using "adjusted GWP" storage credits	CDFA, CARB	High	Medium
	CDFA should consider how to track implementation of Climate Smart Agriculture practices more broadly, including projects funded on working lands through non-CDFA programs and practices adopted by producers at their own expense. RCD personnel could perform ground-level tracking	CDFA, DOC	High	Medium
	Seek ways to reward and support early adopters of Climate Smart Agriculture, including "post-implementation" credits	CDFA, CARB	High	Medium
	Explore a coordinated statewide agricultural mitigation program for all state agencies that are required to obtain agricultural mitigation. We further recommend that the state should consider tracking and report how much agricultural land it converts annually, while also attempting to minimize its impact on its most productive, versatile and resilient farmlands,- coordination with western plant board states.	CDFA, DOC	High	Medium

TABLE 2.

Research requests were documented during the Listening Sessions and Public Comment period by CDFA. Requests were summarized, where possible, to combine similar ideas.

Research Area	Research Subject Requests
Water	➢ Identification of crops whose water demand is aligned with water availability in their growing region ➢ Best practices for coordinating crop planting with expected future climate change scenarios to maximize productivity and minimize water use ➢ Net water effects of cover crops, looking at increased retention and dew capture ➢ Use of cover crops as catch crops to retain nitrogen during groundwater recharge
Soil Health and Soil Carbon	➢ Soil health microbiology and biochar application ➢ How co-products from bioenergy or bioproduction work in soils ➢ Early carbon farming adopters' soils and experiences with the practices ➢ Long-term trials of soil organic carbon benefits from conservation practices ➢ Practices to encourage methanotrophic (methane-eating) bacteria in soil ➢ Strategies for maximizing microbial productivity and soil biodiversity
Manure Use	➢ Efficacy of the most promising technologies to provide real-time nitrogen concentrations in manure ➢ Soil improvements with various manure amendments over time, especially in systems like organic, no-till, and perennials ➢ Effects of switching to micro-irrigation using manure slurry, such as those on food safety, yields, and soil health. ➢ Composting plant biomass/coproducts with animal wastes to develop composts that utilize both waste streams better and provide products that work better for cultivated agriculture ➢ Impacts on greenhouse gases, criteria pollutants, water quantity and water quality from substituting synthetic fertilizers with manure, including no-till systems

Biodiverse Agriculture	➢ Complete biodiverse systems, rooted in biological inputs instead of chemical, as with cover crops, conservation tillage, pollinator plants, and compost ➢ Benefits of habitat and cover crops, especially in combination, considering pollinators and natural enemies ➢ Benefits of systemic agroecological and permaculture design approaches compared to application of individual practices ➢ Connectivity between hedgerows and rodent/predator populations, to develop remediation techniques and promote true biodiversity ➢ Cover crop mixes and pasturage options that support above-ground biodiversity, considering factors such as cost, availability, indigeneity, allelopathy, mowability, durability, and rainfall patterns ➢ Optimization of the health of crops and agricultural ecosystems to combat pests and disease, as the basis of successful Integrated Pest Management ➢ Benefits of cover crops for biodiversity, and as elements in broader agricultural systems like Integrated Pest Management (IPM), groundwater recharge, minimum till, and organic nitrogen provision ➢ Plants that work as cover crops, pollinators, or other habitat providers in dryer growing regions
Organic Production	➢ Organic agricultural research and technical assistance, which has seen limited government dollars - underinvestment has constrained farmers' ability to adapt to increasingly variable and extreme weather conditions and pest prevention challenges ➢ Quantifiable benefits of transitioning from conventional to organic farming practices
Life-Cycle GHG Emissions	➢ Farmers' and other participants' input on how transportation emissions could be reduced ➢ GHG and soil carbon effects from reducing or eliminating conventional pesticides
Enteric Methane Emissions	➢ Use protocols for methane-reducing feed additives
Landscape	➢ Input from indigenous groups to identify recommendations for agricultural practices and social systems suitable for Long-term maintenance of land at the landscape level
Labor Conditions	➢ Farm labor rates of pay, benefits, availability of year-round employment (achieved through diverse year-round cropping cycles), and indicators of access to food, housing and health care
Grazing	➢ Benefits and optimal intensity of grazing, especially in integrated systems
Livestock	➢ Differences in methane emissions between pasture- and feed-raised animals ➢ Validity of IPCC quantification of livestock methane impacts and the underlying assumptions