CDFA OEFI: Request for Proposals on New Practice for Consideration under Healthy Soils Program

Proposals Received between June 5, 2024, and August 2, 2024

Practices are listed in alphabetical order. The short description extracted from submissions is intended to only provide a summary and may not fully represent the proposal.

Submitting Organization or Individual	Name of Practice	Short Description
Joe Coelho (American Pistachio Growers)	Application of Live-Native Microalgae	The proposed practice involves isolating a native microalgae species from a farm's soil, amplifying the population size of the isolate, and reintroducing it in living form through the farm's irrigation system. Microalgae serve as the base of the food chain in healthy soil ecosystems, and increasing their presence can significantly expand the microbial community, thereby improving soil health, increasing soil organic matter, and sequestering carbon. The application of live, native microalgae continuously throughout the growing season will improve the chemical, physical, and biological characteristics of the soil.
Douglas Beck (Monterey Pacific LLC)	Biochar Application	Biochar amendment in agriculture has the potential to achieve carbon dioxide removal (CDR) with significant agronomic and environmental co-benefits. The addition of biochar can change physicochemical properties of the soil that enhances plant disease resistance, reduces heavy metal mobilization, and improves plant resilience against environmental stresses. Incentivizing biochar application will accelerate its acceptance and adoption, and result in tangible benefits such as reduced water usage, improved soil health, and increased CDR. As demand grows, more local biochar producers will emerge, decreasing transportation costs and emissions and increasing the regeneration of CA farm soils.
Jack Davis	Biochar + Humic Acid + Worm Castings + Beneficial Bacteria / Fungi	Orchard removal by infield biochar production is the most effective strategy to mitigating majority of challenges pertaining to air pollution in the San Joaquin Valley, climate change, and global warming. Biochar can be combined with other organic materials and sewn into soil planting locations.

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Pacific Biochar (Charlie McIntosh)	Biochar Application	USDA NRCS adopted Soil Carbon Amendment (CPS 336) in 2022 that includes applications of compost, biochar, and other carbon-based soil amendments. CPS 336 outlines implementation guidance to address specific resource concerns including the following: improve or maintain soil organic matter, sequester carbon and enhance soil carbon stocks, improve soil aggregate stability, and improve habitat for soil organisms. Practice implementation follows a similar procedure to the HSP Compost Application, with additional requirements for testing specific parameters unique to biochar materials as well as considerations for mitigating dust and off-site movement of biochar materials during implementation.
Joe Coelho (American Pistachio Growers)	Carbonic Acid Application in Orchards and Vineyards	Carbonic acid, produced by completely dissolving carbon dioxide in water, will be applied through injection at the irrigation mainline ensuring even distribution across the orchard or vineyard. Carbonic acid is used as a safe alternative to sulfuric acid injection for water pH control that prevent scale, adjusts soil pH, and improves nutrient availability. Sulfuric acid is common for pH control but can have harsher effects on soil health. Carbonic acid is the same as rainwater that gently lowers soil pH, making essential nutrients like phosphorus and micronutrients more available to plants. Carbonic acid can be proportionally injected into irrigation systems based on a water pH sensor. Expected benefits include improvements to soil organic matter (SOM), soil structure, microbial activity, nutrient availability, and reduced soil compaction. This practice offers a safer and more environmentally friendly alternative to sulfuric acid while storing carbon in the soil to increase SOM, promoting long-term soil health.
California Safe Soil, LLC	Food Hydrolysate Soil Applications	Soil application of Food Hydrolysates can be done via traditional irrigation systems (drip, solid set irrigation, micro irrigation, etc.) as a means to offset synthetic nitrogen use, stimulate root development, provide a labile carbon source to stimulate soil microbial activity, accelerate nutrient cycling from organic matter, and act as a direct plant bio-stimulant to reduce abiotic stress resulting from conditions of high temperatures and salinity. The proposed practice is most effective in permanent crops where minimum or no till cultural practices are present, to crops grown in soils with low soil organic matter, to fields to aid in the breakdown of re-incorporated crop residues, and as an in season complement to compost applications to accelerate the breakdown and release of nutrients from organic matter. Application times would be early spring to early summer months and would generally follow nitrogen applications and be co-applied or blended with nitrogen fertilizers via traditional irrigation methods, as well as post-harvest applications to aid in loading carbohydrates in permanent crops.

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Joe Coelho (American Pistachio Growers)	Grazing of Orchards	The proposed practice involves integrating livestock, specifically sheep or goats, into orchards for sanitation, weed management, and soil health improvement. The animals graze on the orchard floor, consuming remnant nuts, weeds, and vegetation. This grazing helps control weeds naturally and reduces the number of "mummy" nuts that can harbor pests such as the navel orangeworm. Additionally, the manure left behind by the grazing animals enriches the soil with organic matter and nutrients, enhancing soil fertility and structure. This practice leverages the natural behaviors of sheep and goats to manage orchard sanitation and improve soil health while reducing reliance on chemical herbicides and fertilizers. The implementation timeline includes initial assessments of current orchard conditions and mummy nut densities, followed by the introduction of grazing livestock during the winter and spring seasons when orchard activity is lower. Continuous monitoring of mummy nut densities, weed biomass, and soil health parameters will be conducted to evaluate the effectiveness of the practice. This approach aligns with sustainable agriculture principles, offering a cost-effective and environmentally friendly method for orchard management.
Breaking, Inc. (Jeff Gillis)	Microbial/enzymatic degradation of microplastics in soils	Using specialized enzymes and engineered microbes to degrade plastic particles. Our discovery, Microbe X-32, can degrade polyolefins, polyesters, and polyamides. The solution focuses on restoring soil health and reducing GHG emissions by breaking down micro and nano plastics.
Joe Coelho (American Pistachio Growers)	Mycorrhizae Application	Mycorrhizal inoculation involves the strategic introduction of beneficial fungi to the root systems of plants to enhance nutrient uptake and environmental stress resilience. This biological interaction improves the host plant's growth and health by increasing nutrient and water absorption capabilities, which is particularly beneficial in soils that are deficient in key nutrients like phosphorus. The implementation process can be done during the planting stage or through established plants using a water-soluble form of the fungi, which is applied through irrigation systems. The development of the mycorrhizal symbiosis can take several weeks but remains effective throughout the plant's lifecycle, enhancing both growth and yield.

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Dr. Srabani Das (UCANR)	Occultation/Tarping + No-till on small-scale farms (<10 acres)	Occultation is the use of opaque (typically black) tarps or landscape fabrics to block light, prevent photosynthesis and thus kill weeds. Many small-scale (<10 acres) farmers in Central Valley, CA use this weed suppression practice in conjunction with no-tillage or reduced tillage. It is also used for terminating cover crops, transitioning new fields into production, covering soils (placeholder) to keep low weed pressure and to retain soil moisture and nutrients until planting time. Tarps also protect farm areas from wet winter/spring conditions which make traditional tillage and bed preparation difficult. Tarps help warm the soil that can be used for pre-planting weed management through 'stale seed bedding 'or sprouting. The tarp can be left in place for weeks to months at a time, as applicable or needed. In no-till farms where perennial weeds or biannual weeds dominate, tarping is necessary for several months. Organic amendments are incorporated prior to tarping, soil moisture is controlled and then tarps are secured using various methods. After the trap is removed, the seedbeds are suitable for direct seeding and several weed-free weeks help to establish the crop. It is important to have minimal soil disturbance after the tarp is removed to maintain reduced weed pressure.
California Certified Organic Farmers	Organic Management (NRCS CPS 823)	Managing and improving natural resources on land in and adjacent to organic production using methods which integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.
Michael Jaquez (UC ANR)	Pasture and Hay Planting	Pasture and Hay Planting is an opportunity for livestock producers to be more involved with the Healthy Soils Program, and the Natural Resources Conservation Service has a conservation practice standard published for Pasture and Hay Planting. Pasture and Hay Planting is an opportunity to establish perennial herbaceous plants that are appropriate for pasture or hay production, with the primary goal of improving or maintaining livestock nutrition and health and providing ample forage for grazing livestock. Grazing lands are one of the largest land resources in the United States and represent a huge potential to sequester carbon and mitigate the effects of greenhouse gases. A seed mix that meets the NRCS requirements should be followed. A study suggests that "increasing the number of plant species in a pasture mixture can increase forage yield, improve yield stability, reduce soil nutrient losses and reduce weed competition". Planting before the fall rain is advisable. Perennial grasses take additional time to grow and mature so livestock should be kept from the pasture until the plants are well established.

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Scaling California's Regenerative Almond Practices (Rob Trice)	Practice of development of irrigation and nutrient management plans	The practice of developing irrigation and nutrient management plans can leverage the best-available science to facilitate adaptation to existing Healthy Soils Practices. We expect adoption of Healthy Soils practices will impact irrigation and nutrient management plans and modest financial compensation from the Healthy Soils Program for adapting, monitoring and reporting back changes following implementation will encourage greater participation. NRCS Nutrient Management (CPS 590) provide a framework to follow. More importantly, the addition of harmonized nutrient, irrigation and soil management practices will have a multiplier effect on Healthy Soils investments while achieving improved soil health and GHG reductions.
Sangeeta Bansal (California State University, Fresno)	Vermicompost Application	Vermicompost, produced through the combined action of earthworms and microorganisms on organic waste, is a cost-effective and environmentally beneficial tool. It consists of a mixture of earthworm castings, humidified organic matter and microbial biomass, making it an environmentally beneficial tool for nutrient recovery. Various organic materials, including agricultural and food production waste and livestock manure, can be used to create vermicompost. Red-wiggler earthworm (Eisenia fetida) is commonly used to convert food waste into vermicompost. The vermicomposting system is typically maintained between 55 – 77 ° F at pH of 6.5 – 7. Aerobic conditions with a balance of aeration and water drainage are maintained to provide suitable growing conditions for earthworms. Vermicompost can be harvested after 40 days. The application of vermicompost to crop fields enhances soil fertility and structure, improves soil health while reducing greenhouse gas emissions.
Veronica Suarez Romero, Sabina Dore (UC Davis)	Vermicompost Application	Vermicompost (VC) is a nutrient-rich organic fertilizer and soil conditioner produced through the aerobic decomposition of organic residues. It uses earthworms, soil microbial flora, and earthworms' native gut flora to transform solid and other agricultural waste into vermicast. VC contains macro- and micronutrients available for plant uptake, along with enzymes, antibiotics, vitamins, and plant growth hormones, providing a significant advantage over other composts. Vermicompost application can enhance soil structure, increase microbial activity and nutrient availability, increase soil organic carbon, and mitigate GHG emissions. VC can be incorporated into the soil using traditional method, similar as regular compost application. It can be applied before or during transplanting, as direct sowing, side-dress or top-dress (for perennials). The application timeline varies depending on crop, soil type, and location. It may be used during high-nutrient demand periods as it's high in mineral nitrogen content. Vermicompost application reduces GHG emissions, enhances carbon sequestration, and improves soil health.