SONOMA-MARIN Resources

Compost Application to Rangelands and Croplands

Based on a webinar presented by Jeff Creque (Carbon Cycle Institute), Jonathan Watcher (Marin Agricultural Land Trust), and Michelle Katuna (Marin Resource Conservation District). Article compiled by Michelle Katuna, June 2020.

What is photosynthesis and how is it the foundation of agriculture's interaction with the atmosphere?

Photosynthesis is the process by which plants transform solar radiation into biochemical energy through the synthesis of carbohydrates from carbon dioxide (CO2) and water (H2O). Carbon is the backbone of nearly everything found in our farms and pastures. The starch in our grain, the leaves of our crops and forages, the protein in our livestock, the organic matter in the soil, are all made up of carbon that originated from the atmosphere. Agriculture, simply put, is sunlight-driven carbon harvesting, and is the way humans can engage, through plants and then animals, with managing carbon in the atmosphere.

The process of photosynthesis feeds both the plant and the soil ecosystem. Up to 40% of the carbon photosynthesized by a plant is excreted by its roots into the soil, with the remaining 60% eventually being deposited onto the soil surface as decaying plant matter. A healthy soil ecosystem in turn supplies living roots with the nutrients, water, and other ecosystem services necessary for plants to survive and grow.

What is compost?

One example of deliberate carbon management is the production and use of compost.

We define compost as the "end product of a managed, aerobic (happens in the presence of oxygen), thermophilic (large quantities of heat are generated during compost production) organic matter decomposition process, suitable for beneficial application to soil" (Jeff Creque, 2020).

Organic materials, water (H2O), and oxygen (O2) (added passively or by forced air or pile-turning) are added to a composting system. Heat is generated in the process of microbes breaking down raw materials. Compost piles typically reach between 130 and 170 degrees Fahrenheit. CO2, water vapor, and other gases are produced by microbial respiration and are recycled or leave the pile. The finished product, compost, can be used as a stable and safe soil amendment.

How does compost relate to soil health and fertility?

"Fertility is the ability of soil to receive, store, and release energy" – Aldo Leopold, "The Land Ethic", 1949.

Most importantly and fundamentally, compost is a source of energy (in the form of complex carbon compounds) for the soil ecosystem. It is energy that drives soil-plant-water relations and underlies a host of ecosystem processes.

Rather than gauging soil health by asking only if our soils are nutrient-limited, we should also ask whether our soils are energy (i.e. carbon) limited. Farming practices can deplete or build soil carbon. Compost application is one way to build soil carbon.

What does the research say?

In 2006, the Marin Carbon Project (MCP) was born as a collaboration among Marin agricultural organizations and Dr. Whendee Silver of UC Berkeley, to explore the potential to increase the carbon content of working-lands soils in Marin County by applying compost, and to measure the effects. In 2008, MCP ran their first trial, applying ½" of compost to grazed grasslands in Nicasio, and replicated the trial at the UC experiment station in Yuba County.

MCP saw, right away, that cattle were gravitating to compost-treated plots. When the group analyzed forage in compost-treated plots, they found it was higher in protein than control plots, likely the direct result of the small amount of nitrogen in the compost they applied.

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The group also saw a significant increase in forage production (exceeding control plots by 40-70% every year following the single ½" compost application in 2008) (Ryals and Silver 2013).

Results also showed an increase in total ecosystem carbon over time in response to the initial single application of compost. Models suggest that this increase in total ecosystem carbon will continue for 30 to 40 years before it begins to gradually decline. The increase in total ecosystem carbon in response to compost application is driven by increased plant growth and thus increased photosynthetic carbon capture (Ryals et al. 2015).

Compost application improves soil water holding capacity by increasing soil organic carbon. For every 1% increase in soil organic carbon, we gain approximately 20,0000 gallons of soil water holding capacity per acre (USDA-NRCS 2016). The rise in soil carbon from compost application, may also lead to increased water infiltration in soil, and a lessening of soil compaction (Brown 2020).

A full life assessment (DeLonge et al. 2013) reveals that compost production and use has significant GHG mitigation potential. The production of compost from organic waste materials reduces emissions by diverting organic materials from landfills, where they would generate methane (CH4), a GHG thirty times more potent than carbon dioxide (CO2).

Compost application is a simple and fast way to increase soil carbon to levels that might take a decade or more to achieve with farm management changes alone. Applying compost to soils directly adds carbon to the soil ecosystem, and can increase plant growth (and thus their photosynthetic carbon capture).

BEST PRACTICES FOR COMPOST APPLICATION

Application Rates: For grazed rangeland, apply about ¼" of compost one time every 10-20 years. For cropland, compost application rates should take into account crop, soil conditions, compost availability, compost quality, etc. Assuming tillage, we suggest a minimum ½" application per cropping cycle; that is 70 cubic yards (35 tons) per acre.

Grazing after compost application: Use best grazing management practices, including adequate rest periods. Grazing can be your best tool in ensuring a healthy plant community post-compost application.

Compost Type: When applying compost to rangelands, use a high carbon to nitrogen ratio (15-20%) compost to avoid undesirable species changes, maximize carbon (energy) input and reduce costs. High nitrogen composts are most appropriately used on high N-demand crops. If used on rangelands, high nitrogen composts may increase weedy species.

Waterways: Allow an appropriate buffer (about 30 to 35') from the edge of waterways when applying compost. Nutrients in compost are typically less soluble than amendments such as manures or synthetic fertilizers, but it is good practice to maintain an appropriate buffer, dependent on slope, vegetation, etc.

Avoid Applying Compost in These Scenarios: Slopes over 20%: for safety reasons if using machinery (however, compost can serve as an erosion control measure on much steeper slopes); special status soils such as Serpentine and Histosols; special status plant communities including native-dominated plant communities (such as coastal prairie).

FUNDING AND OTHER RESOURCES

To learn about current funding sources, and for general technical assistance regarding compost application, contact your local RCD. For other tools including a compost cost calculator and local resource lists, visit the Marin RCD website at marinrcd.org or e-mail michelle@marinrcd.org.

AGRICULTURAL Resources

For up-to-date COVID-19 information, please visit https://sonomafb.org/coronavirus-resources-2020/

Sonoma County Economic Development Board

The Sonoma County Economic Development Board has three program managers available to offer virtual business assistance. If you need assistance navigating all the COVID-19 related resources, please contact one of the program managers listed below.

Lauren Cartwright
- Email: lauren.cartwright@sonoma-county.org
- Phone:(707) 565-7298

Marcos J. Suarez
- Email: Marcos.Suarez@sonoma-county.org
- Phone:(707) 565-6402

Christine Palmer
- Email: christine.palmer@sonoma-county.org
- Phone:(707) 565-7296

Small Business Development Center:

Mary Cervantes and her associates are also available to speak with people and walk them through available resources, answer questions. Call (707) 595-0060 or email mcervantes@napavalley.edu

Post Job & Internship Opportunities on SonomaWine.com

Unfortunately, many wineries have recently had to furlough or release staff. As intern season approaches and wineries begin to reopen, Sonoma County Vintners wanted to provide an additional resource for members to post openings and opportunities.

To help support your needs Sonoma County Vintners has created a new winery job posting board page that will appear on their website. Visit https://scv.typeform.com/to/CGXXEl?mc_cid=1f2dc02be5&mc_eid=d8633f6103. To submit a job or intern opportunity to be included on this page please click on the button below. The page will be promote to the public through social media channels.

NEW DATES ADDED! Free Remote Delivery Produce Safety

Food Safety Training Partnership is pleased to offer FREE Produce Safety Training (required by the Produce Safety Rule) offered through Web-based live remote delivery by Produce Safety Alliance-approved instructors from the Food Safety Training Partnership's Safe Food Alliance!

A high-speed internet connection and confirmed attendance for the full course will be required. Space is limited!

- July 7 & 8, 2020
- July 13 & 14, 2020 (NEW!)
- July 15 & 17, 2020 (NEW!)
- July 30 & 31 (NEW!

Register at Food Safety Training Partnership; visit for more information or call 916-561-5672

Face Shields

NEW- Sonoma County Farm Bureau

We have 7,000 face shields available for free at our office (3589 Westwind Blvd., Santa Rosa) thanks to a generous donation from SCFB Premium Member Scott's Miracle Gro! Please call (707) 544-5575 if you are interested.

JSC Agricultural Supply

JSC Ag Supply recently restocked their supply of disposable multi-layered masks and hand sanitizer with aloe. Protect your team with these essential supplies. Masks and hand sanitizer can be purchased through our online store found here. You can also contact your local sales rep at 707-483-1974 or 707-293-9552.

No Trespass Signs

Do you need "No Trespass" signs? Farm Bureau has you covered. Signs are available for purchase at our office. We are open M-F 9:00 a.m. - 4:00 p.m. Signs are $20 each or $18 each if you buy 3 or more.