

Healthy Soils Program 2020

*Training Healthy Soils Leaders on Small-Scale Farms
and Using the Johnson-Su Bioreactor Compost*

Sponsored by:

NMDA





Overview

- The purpose of this project is to provide an opportunity for local farmers and ranchers to test the use of the Johnson-Su bioreactor composting method and learn about the 5 Healthy Soils Principles to then inform peer growers or ranchers in the community on their experience.
- By piloting the use of the compost at various local sites that use various healthy soils practices, we can learn more about best practices to share with the community.



Goal 1

To train 10 local farmers and gardeners on the use and benefits of Johnson-Su Bioreactor compost conjunction with healthy soil practices to act as healthy soils leaders for their communities.

- *Objective 1:* By Oct 2020, using the train-the-trainer model, VSWCD and NRCS will train and mentor 10 growers on implementation and benefits of the 5 healthy soils principles, construction and maintenance of a bioreactor, application and benefits of the compost, and soil testing, so they can then demonstrate practices to growers in the community.





Goal 2

To train 15 VSWCD Youth Farming Interns on the use and benefits of healthy soils practices and the Johnson-Su Bioreactor compost to then teach their communities.

- *Objective 2:* By Oct 2020, using the train-the-trainer, VSWCD train 15 interns at the two East Mesa community demonstration gardens how to build and fill a bioreactor, apply the compost and monitor for success and to then co-lead at least 2 soils classes at the Kids Gardening Program in the summer and one hands-on bioreactor demonstration in Sept at the gardens.





Goal 3

To develop practical and feasible methods for applying the Johnson-Su Bioreactor Compost that can be recommended to a diversity of growers throughout the District.

- *Objective 3:* By Oct 1, 2020, the District will produce a guidebook for growers with recommendations and case studies that are practical for a diversity of farmers on how to implement the healthy soils principles and use the Johnson-Su Bioreactor compost.





Goal 4

To demonstrate to growers throughout the District multiple examples of how to incorporate the 5 Healthy Soils Principles and the Johnson-Su Bioreactor Compost into their farming or ranching practices.

- *Objective 4:* In Sept 2020, VSWCD will provide a workshop and farm tour of the trainees' growing spaces and the community demonstration gardens.



Pilot Study Methods

Participants

- 1 rancher – livestock, chickens, pigs, Rio Grande floodplain, 4 acres.
- 2 production farmers, certified organic – 1-2 acre plots, Rio Grand floodplain
- 1 production farmer, non-organic -12 acres
- 3 community gardens – 1 located in the Rio Grande floodplain, 2 located on the East Mesa of Valencia County
- 2 backyard gardeners – East Mesa location



Pilot Study Methods

Timeline

Jan – May 2020

- Recruit participants/interns.
- Train on the use of the bioreactor compost and incorporating healthy soils practices.
- Test soils for base measurements.
- Apply the compost to crops and leave an area without the compost as a 'control' site to compare results. (Compost was made at Whitfield Wildlife Conservation Area prior to study)

May – Aug 2020

- Participants monitor results of use of the compost.
- Interns teach kids on the 5 Healthy Soils Principles (canceled due to Covid restrictions)

Sept – Oct 2020

- Soil testing of both the areas with the compost and the 'control' areas.
- Compile results

Oct – Nov 2020

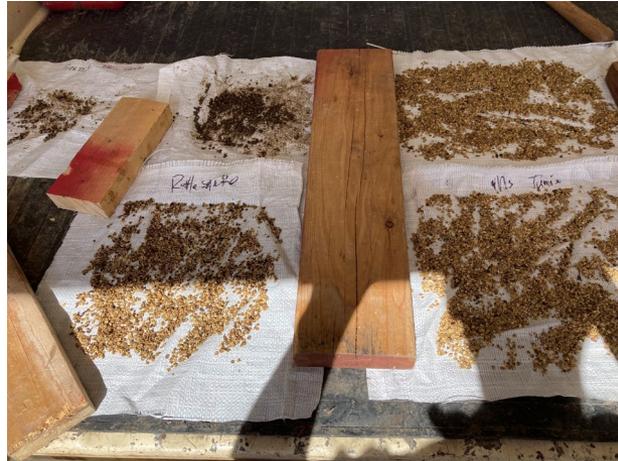
- Create booklet
- Provide workshop and farm tour (canceled due to Covid restrictions)
- Create online presentation of results as alternative to the workshop



Application Methods



Spraying a slurry of the compost onto a pasture to be then watered in generously.



Slurry of compost drying on seeds to be planted soon after.



The compost being applied directly to the soil to the soil and then covered generously with leaf mulch.

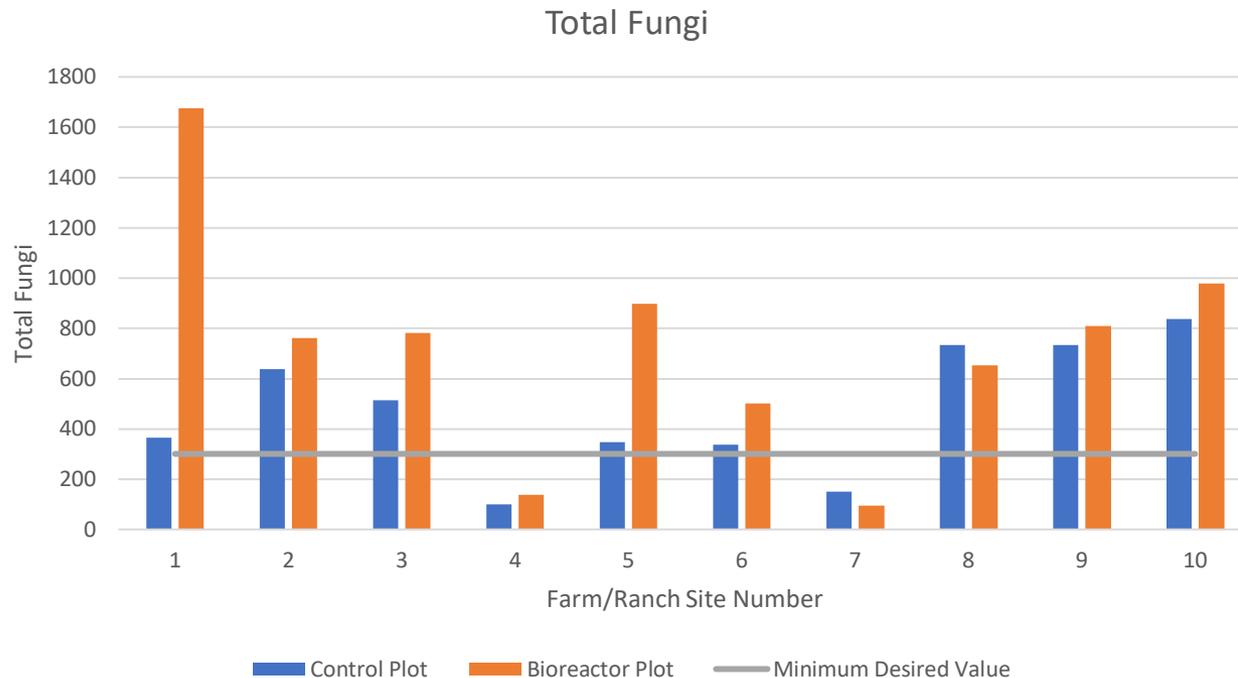
*For specific directions see “Best Management Practices – Johnson-Su Bioreactor Composters”

Participants and Soil Health Principles

	<i>Soil Health Principles (SHP)</i>					
Site #	Keep this Soil Covered	Minimize disturbance	Maximize biodiversity	Maintain living roots	Incorporate livestock or pollinators	Total SHPs
1	Yes, winter cover crop, perennials	no - tilling spring/fall	Yes, perennials	winter cover crop, perennials	pollinators	4
2	Yes, year-round living roots	yes	yes, mixed pasture	year-round living roots	livestock/ poultry	5
3	Yes, winter cover crop / mulch	yes	No, minimal	winter cover crop / mulch	pollinators	4
4	Yes, year-round living roots	yes	No, minimal	year-round living roots	Pollinators, minimal livestock 1x/yr	4
5	Yes, year-round living roots	yes	yes	year-round living roots	Pollinators, minimal livestock 1x/yr	5
6	Yes, year-round living roots	yes	No, minimal	year-round living roots	Pollinators, minimal livestock 1x/yr	4
7	Yes, winter cover crops / mulch	yes	No, minimal	winter cover crops / mulch	pollinators 1x/yr	4
8	Yes, winter cover crop	no - tilling spring, disking fall	some	winter cover crop, fallow yr	pollinators	3.5
9	Yes, year-round living roots	yes	some	year-round living roots	poultry/ pollinators	4.5
10	Yes, year-round living roots	yes	some	year-round living roots	poultry/ pollinators	4.5

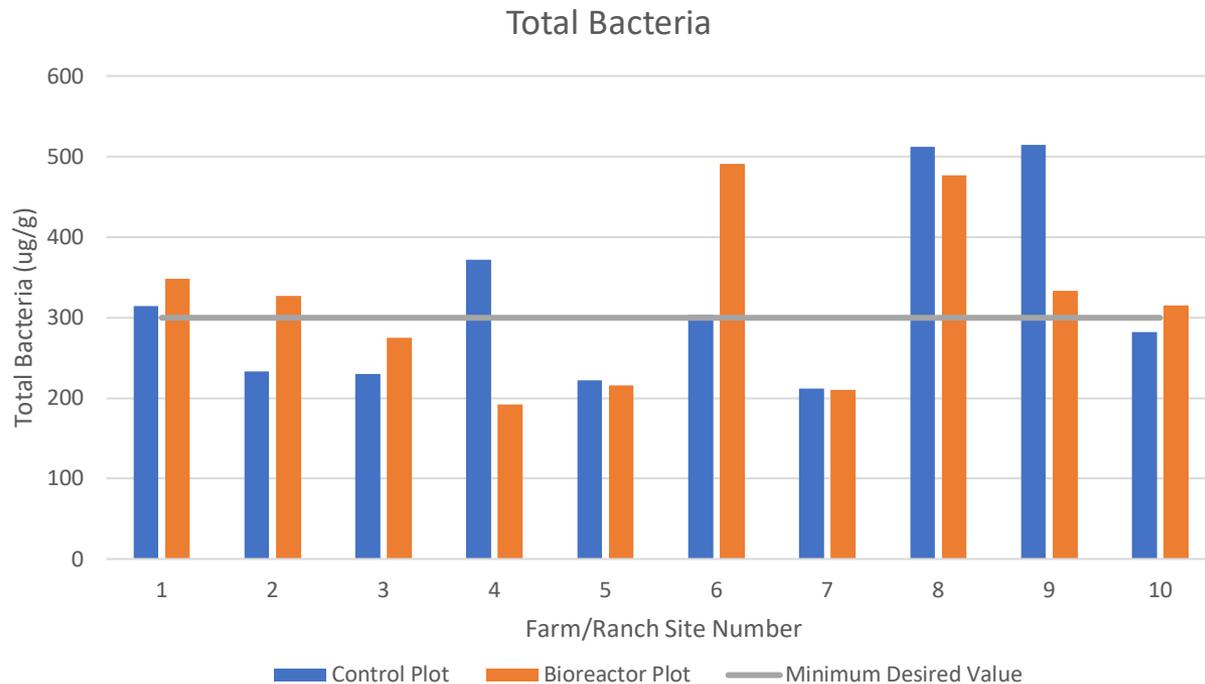
Results

- 80% of sites showed an increase in fungal populations with the use of the bioreactor compost.
- 80% of the sites had levels of fungi populations above the minimum desired value.



Results

- 50% of sites showed an increase of total bacteria with the use of the bioreactor compost
- 50% of sites had levels of bacteria above the desired minimum value for most crops



Other Results

- 2 Sites showed increased growth in the areas with the bioreactor compost used.
 - 1 pasture area showed increased cover.
 - 1 organic farm showed increased produce size compared to last year's crop where the compost was not used.
- Otherwise, no significant changes in the crops observed with the use of the compost.
- Active fungi and active fungi results varied between sites with no trends visible. More information is needed.





What We Learned

Fungi and Bacteria

- Fungi appears to increase within the first year of use of the bioreactor compost.
- Fungi is highest in sites with perennials or a diversity of living roots, year-round.
- While bacteria increased at 50% of the sites, it is unclear what the correlations between management practices are, if any.
- Sites with consistent moisture, living roots, incorporation of animals and cover crops appear to have the greatest results in the first year.
- The site with the highest levels of organic matter showed greater consistent levels of fungi and bacteria.

What We Learned

Application Methods

- Application methods did not appear to effect the outcome of the study, all methods showed increased fungi and bacteria.
- Consistent moisture and cover of the compost so it doesn't dry out appeared to be of significant importance.
 - If applying the compost directly, cover generously with mulch or mix into soil, so it doesn't dry out.
 - If applying the compost directly by spraying, generously water the slurry into the soil immediately, and apply during a cool part of the day.
 - Applying the compost directly to seeds/transplants showed to be effective.



Future Potential Projects

This was an informal study to provide an example of what the average farmer or rancher would see for results. For more in-depth data to review, the following improvements could be made:

- This study could be conducted over multiple years to get more accurate results.
- Larger control plots and consistently larger test sites would allow for more reliable results. (some sites were small)
- Repetitions throughout one site would provide more reliable results.
- Comparison of more similar sites.
- This study would be very interesting to conduct on rangeland, and on a large scale. There were no rangeland sites included in this project.



Case Studies



Sublime Pastures, operated by Kirsten and Nate Coueves, is 4 acres of pasture for grassfed beef products in Tome using all 5 Healthy Soils Practices. They practice rotational grazing and no-til, planted a diversity of pasture crops, and do not use chemicals. They applied the bioreactor compost using the slurry method on the pasture seed. Bacteria and fungi increased as well as ground cover. They had substantial moisture in the soil in mid-October, 1 month after irrigation stopped.

El Cerro Mission and Meadow Lake Community Gardens are 1/4 acre community learning spaces coordinated by VSWCD on the East Mesa. Using leaf and wood mulch to cover soils, cover crops in the winter, rotating crops, no-till practices and drip irrigation, there showed increased total and active bacteria and fungi in both sweet corn and onion crops with obvious increase in corn growth after applying the compost directly to soil with mulch.



Roots Farm is a 1.3-acre organic farm in Tome owned by Ron Moya. Living roots and diversity are attained by using cover crops and rotating crop plots. The soil around crops is covered with a white plastic reducing weeds and conserving water. Roots Farm had significant increase in crop size of peppers, melons and tomatoes this season and they partially attribute this to adding bioreactor compost as a slurry to seeds and transplants. Fungi and bacteria levels were at desired levels at the end of the season.



Valencia Community Gardens (VCG) in Tome tested the compost on their tomatoes and beans by adding the compost directly to the soil in the spring. Their practices include using compost, digging soil not tilling, allowing chickens, creating abundant habitat for perennials and pollinators, and having a grass cover all year between beds. Both plots showed increases of fungi and bacteria with the Johnson-Su compost and their total fungi and bacteria were well into the desired range in the fall.



Adobe Farm, in Belen, is a food forest, vegetable gardens and pasture where Jeff Goebel and Myrna Castro (Soil Health Champions) practice all 5 Healthy Soils Principles. Bacteria and fungi increased - after spraying the bioreactor compost as a slurry - more in areas with more perennials or ground cover and consistent moisture. Fungi was especially high near the perennial trees. Emphasis on goat grazing, no-till and pollinator diversity may also have contributed to overall increases.

Armijo Farms, owned and operated by Ken Armijo is an organic farm that sells various crops. The compost was sprinkled around garlic crop and blackberries. Cover crops are grown in the winter and tilled into the soil and pollinators around the site. The garlic is flood irrigated. There were no changes to plant growth and minimal differences in total fungi and bacteria were shown in the garlic plot. But the blackberries, a perennial, showed significant increases in both.



Further Resources

- Johnson-Su Bioreactor Information
 - Materials for purchase from Valencia Soil and Water Conservation District
 - Instructional videos and documents
 - <https://regenerationinternational.org/bioreactor/>
 - <https://www.csuchico.edu/regenerativeagriculture/bioreactor/bioreactor-instructions.shtml>
- The 5 Healthy Soils Principles Information
 - <https://www.nmhealthysoil.org/2019/09/07/principles/>
- New Mexico Healthy Soils Program
 - <https://www.nmda.nmsu.edu/nmda-homepage/divisions/apr/healthy-soil-program/>
- Become a Healthy Soils Champion!
 - <https://www.nmhealthysoil.org/category/champions/>
- Public Funding Sources for Growers/Ranchers
 - VSWCD Assistance Program: <https://www.valenciaswcd.org/assistance-programs/>
 - NRCS Programs: <https://www.nrcs.usda.gov/wps/portal/nrcs/site/nm/home/>
- Local Cover Crop Seed Vendors
 - Old Mill Farm & Ranch Supply
 - Chical Haystack
 - Plants of the Southwest
 - Curtis and Curtis



Thank you!!



Lindsey Diaz

Conservation Program Manager

lindseydiaz@valenciaswcd.org

(505) 864-8914

