

Boise State University

ScholarWorks

IPS/BAS 495 Undergraduate Capstone Projects

Student Research

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Change the World One Worm at a Time!

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Capstone 492



My Capstone Project aims to blend the old with the new. It's about taking tried-and-true farming practices and breathing new life into them with innovative, sustainable solutions. It seeks to balance making a living from the land and caring for it for future generations.

The project's core revolves around Organic Worm Tea, a natural product we've been developing and testing. This process involves rolling up our sleeves, getting our hands dirty, and observing the tea's effect on various farms, including those run by immigrant farmers who bring unique farming traditions from their home countries.

But this project isn't just about my local farming community; it's also about the bigger picture. My project aims to inspire more farmers to adopt these practices by showing that sustainable farming can pay the bills. Ultimately, this could trigger a ripple effect, transforming the world of agriculture into one that's healthier and more sustainable.

Capstone Goals!

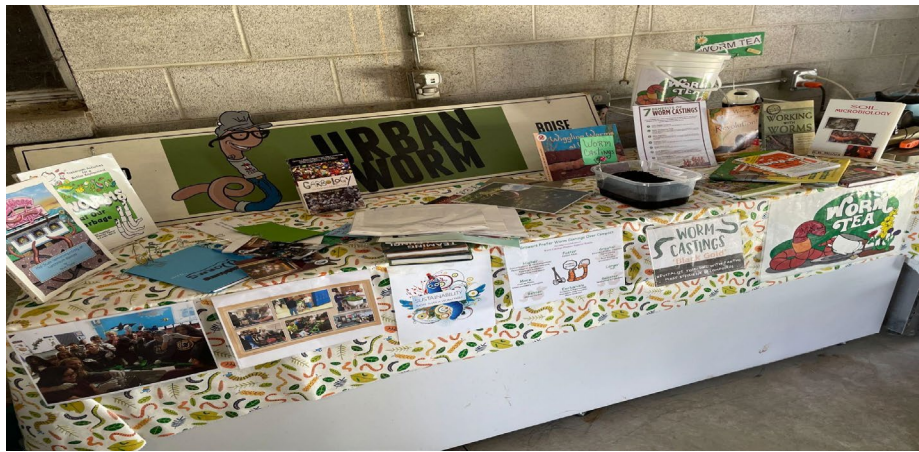
- Regenerative Urban Agriculture
- Worm and worm tea system
- Farmer (Safyia, Chimwaga, Oliver)
- Build New Wash Pads
- Partner with Boise State University to highlight farmers stories!

Regenerative Ag.

For my capstone project, I worked on a project focused on producing and using Organic Worm Tea in traditional farming practices. This initiative's primary stakeholders include me, fellow farmers, and the broader agricultural community, who are directly affected by the choices made on our farms.

The broader agricultural community and environment benefit as well. Organic Worm Tea has a much smaller environmental footprint than traditional fertilizers, often contributing to water pollution and other environmental issues.





Worm Farm (Urban Worm Bittercreek restaurant downtown Boise. We Helped remove equipment rebuild and restore worm health day by day over the last six weeks proving local farmers free worm tea to improve soil health, water quality, plant health... etc)







Worm Farm (8ftx4ft) heated worm hub (built to foster worm life create multi generations of Idaho red worms providing the safety and controlled environment improving worm health.



Second Worm hub set on two piston hydraulics to help with worm casting removal to improve worm tea production. (This will generate 2000 lbs of worm castings a year.



Building the worm system and creating a relationship with multiple farmers can be difficult but these farmers are open and willing to try the worm extract in hopes to produce more veggies, reduce pests and bugs, increase microbiology organisms in the soil.

Fun Fact One Teaspoon of worm casting as six billion microorganisms to improve soil health.

Earthworm Casting Application Rates

New Garden Soil Preparations:

- Mix 1"-4" of Earthworm Castings worked into the top 4" - 6" soil in spring before planting or when the ground became workable.

Seed Starting Mix:

- Add 1 part Earthworm Castings with two parts (fertilizer-free) peat or coconut coir-based seed starting mix.

Annuals, Vegetables, or Perennials:

- Seeding: Line seeding trench, hole, or bed.
- Transplanting: Add ½ - 1 cup Earthworm Castings to the planting hole

Established plants: Work 1 - 2 cups into the top 2 - 3" soil around the plant.

Roses:

- Incorporate 2 - 4 cups into the top 2 - 3" soil in spring. Potted Plants:
- Apply one tablespoon for each 2 - 3" inches of pot diameter, gently work into soil, and water well.

DIY Potting Soil:

- 1 part worm castings
- 1 part coco-coir
- 1 part vermiculite or sand

When Applying Mulch:

- Apply ¼" - ½" Earthworm Castings and cover with mulch to inoculate the mulch. This will significantly increase the nutrient cycling ability of the applied mulch.

Compost Enhancer:

- Broadcast Earthworm Castings throughout each layer of compost and lightly water in. This will ensure a diversity of biology is present to accelerate the composting process.





The Process of Vermiculture is the key to a successful veggies and healthy soil. We partnered with Local Worm experts to build 100% Organic Idaho Red Worms and use the casting to create a soil input that is not riddled with forever chemicals that attach to food, soil and water molecules and cause cancer.



The primary benefit to the stakeholders involved has been introducing a more sustainable yet effective alternative to traditional fertilizers. Organic Worm Tea has proven to not only improve soil health and crop yields but also do so in a manner that reduces environmental harm, contributing to long-term agricultural sustainability. The farmers who participated in this project (Abdi, Safyia, Chimwaga) are reaping the benefits of healthier soils and more robust crops, and these results will encourage wider adoption



Worm Tea results were immediate positive impact on soil health and water quality. (LEFT) as you can see in this simple demonstration testing soil health the soil on the left used the worm tea and the soil on the right did not. The results speaks for itself as you can see soil with proper soil health will not errod into the water.



Worm Castings Application to Specific Crops

CROP

small planters and pots

APPLICATION

Mix 1 part of worm castings with three pieces of soil.

Top dress each plant with a $\frac{1}{4}$ cup of worm castings every two weeks.

Root crops (potatoes, carrots, onions & beets

Apply 1 to 2 inches of worm castings at the bottom and sides of the seed furrows and plant holes.

Set seeds or plants in place and cover with soil. In 4 to 6 weeks, side dress with $\frac{1}{8}$ inch of worm castings

all types of tomatoes, peppers, eggplants, beans, cucumber & melons Mix 1 part worm castings with four parts soil.

Line the newly dug hole with the mixture, place the plant in the spot, and cover it. Top dress each plant or hill with $\frac{1}{2}$ cup of worm castings after budding.

Water and repeat every two months.

Roses, shrubs & trees

Mix 4 cups of worm castings into the surface of each plant and cover with mulch. Herb garden Feems/planter).

Worms will help aerate the soil, and they will help loosen up the dirt inside the planters/pots.

When preparing soil, use 3 to 4 lb earthworm castings per 100 sq ft. Then side dress when plants are 3 to 4 inches high and side dress again in mid-season if necessary for optimum growth.

Note: 1 acre = 43,560 sq ft. If you apply 3 lbs/100 sq ft. You would need 1 300 kg of castings per acre

Mix 30% earthworm castings with organic peat/humus for a potting mix.





With the involvement of nine family-owned farms in Boise, Idaho, I have integrated regenerative land management and innovative farming technologies into these traditional agricultural systems.

My approach combines theoretical and practical aspects with a comprehensive review of the literature on precision farming techniques, a comparison of case studies, and experimental trials conducted on the farm sites. The findings from this work aim to develop an effective implementation plan for small-scale farms going into 2024-2025.

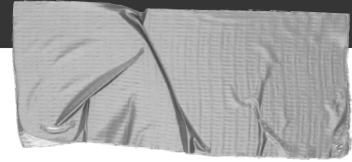
- 2023-2025 Regenerative SOP

The research statement guiding this project is, "Can the adoption of precision agriculture systems and technologies enhance the efficiency and sustainability of traditional farming practices here in the Treasure Valley?" With the involvement of nine family-owned farms in Boise, Idaho, I have integrated regenerative land management and innovative farming technologies into these traditional agricultural systems.

The main stakeholders in this project are Global Garden and the three pilot farmers whose farming practices have been analyzed and reported on for this study. This process included documenting changes every week and evaluating the effectiveness and potential scalability of the organic worm tea solution.



Farmer - Safyia (Safari Farms)



Safyia Abdi is a successful hard working friend who decided to use the worm tea to improve plant/veggie health. Initially the worms scared Safyia due to her fear of snakes she would not go near the worm farm. After some conversations she was happy if i applied her tea I used milk jugs and filled five gallons to apply to her one acre property. The results seem small but her commitment brought two other farmers on board Abdi Haji and Chimwaga all three farmers are local refugees from all over the world.



About our Farmer

Safiya in Action



Safiya Abdi is from Somalia and is one of Global Gardens farmer entrepreneurs. She began working on her mother's farm plot in 2010 and decided to lease

her own plot from us the following year. Safiya's "other" job is at Fred Meyer, so she already knew a lot about produce varieties and safe food handling before starting with Global Gardens.

After a couple of farm seasons, her husband realized that her farm business was at least as profitable as his taxi business, and began helping at the farm too, enabling her to boost production and sales.

In the summer of 2014, Safiya gave birth to her 5th child, a healthy son, and soon after

learned that she had cancer and would need daily treatments at the hospital. She had to take additional time off from her job at Fred Meyer, and she reports that the income from her farm allowed the family to continue paying its bills during her recovery. Safiya is now cancer-free and you'll be able to find her at the Capital City Public Market. She also sells vegetables and manages her own CSA pick up at St. Luke's Pop-up Produce stand every Monday from 3:00-6:00 on St. Luke's Boise Campus.





Farmer Feedback!

As part of my capstone project with Global Gardens, I had the privilege of working with Abdi, Safyia, and Oliver, farmers from East Africa who've immigrated to the U.S. Their participation and feedback have been vital in assessing the effectiveness of our Organic Worm Tea.

The first point of feedback was an observed improvement in the health of their soils. After consistent use of the Organic Worm Tea, they reported that their grounds appeared more fertile and vibrant, an observation backed by soil health tests that indicated increased levels of beneficial microbial activity. These results were promising and led to the second point of feedback.

– Adjustments made!

As for potential adverse impacts, there were some initial apprehensions among the farmers about the effectiveness of this new approach, given the other option is a non organic reliance on traditional fertilizers. However, the positive results and feedback have alleviated mainly these concerns. Additionally, there is a need for continuous education and support to ensure the correct application of Organic Worm Tea and the maximal realization of its benefits.

Abdi, Safyia, and Oliver noticed a considerable increase in their crop yields. They reported that the crops were more robust, and the produce was better quality. Regarding figures, the crop yields increased on average by around 20% compared to previous seasons using traditional fertilizers. This tangible result is one of the strongest testaments to the effectiveness of our Organic Worm Tea.

The positive feedback from Abdi, Safyia, and Oliver suggests that our efforts to promote sustainable agriculture have succeeded. Their experiences have set a precedent for other farmers within our community, showing that the transition to more sustainable practices like Organic Worm Tea is possible and beneficial in the long run. As we continue to spread the word, we hope to encourage wider adoption of this method among our fellow farmers.

Farmer Chimwaga Farms (Chimwaga)



Chimwaga is extremely hardworking his family is a blessing and his veggies are the best in town, He has started to use worm tea and notice a serious reduction in pest and bugs in the hot temperature of July and believes it is from the new Red Worm Tea.

Farmer #3 Albert

- Albert is from Uganda and grows amazing organic crops with min water. His water conservation practices are really incredible he uses less than 50% less water than all other Global Garden Farms some of his water and soil water absorption have improved over the last eight weeks and he believes he will adapt this as a safe healthy input to improve soil health and save money!





Capstone Worm Project (Idaho Red Worms) Resulting in healthy beans and corn crop here in Boise at Liberty Park.

Harvest Time!

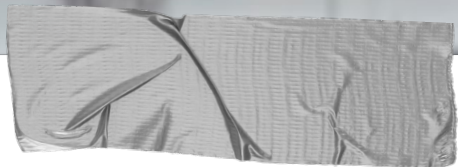
As for the results, we conducted an eight week-long trial on my farm and several others in the community. We found that fields treated with Organic Worm Tea showed a marked improvement in soil health, with a substantial increase in beneficial microbial activity. Crop yields also increased on average by around 20% compared to fields using traditional fertilizers.

Reflecting on the impacts, this journey has been a positive experience. It has allowed me to use the knowledge I've gained at Boise State and apply it directly to my farming practice, thereby bridging the gap between theory and practice. It has also opened my eyes to the more significant role I can play in promoting sustainability within the agricultural community.



The farmers have seen the benefits of healthy soil and the harvest have made happy customers in the Treasure Valley.





New Wash Pad (Improve Food Safety/Distribution)







- While we decided to improve soil health we spent some time over the last six weeks building two new wash pads and cleaning stations. This will improve harvest/production and food safety. This made farmers very happy!





With the help of Boise State University we have filmed videos to introduce the students to farmers from all over the world!







Family!

Breakdown-

1. My capstone project aims to blend traditional agriculture practices with innovative approaches to promote sustainability and economic viability. Organic Worm Tea, a nutrient-rich natural fertilizer produced from worm castings, is at the core of this effort. The innovative aspect lies in its ability to boost soil health and crop yield without the adverse environmental effects associated with synthetic fertilizers.

Emotional intelligence, as it was essential to understand the perspectives of the farmers who might resist changing their conventional farming practices.

Creative thinking was instrumental in developing the methodology for producing Organic Worm Tea. The process involved research and experimentation to ascertain the best composition for the highest crop yield. I also had to devise ways to integrate this new method into the existing farming practices smoothly.

The solution offered by my capstone project, thus, is both creative and innovative. It is a sustainable alternative that helps maintain soil health and improve crop yield and has the potential to influence the broader agricultural landscape toward environmentally friendly practices.

In conclusion, this capstone project has underscored the importance of regenerative sustainable practices in farming. We can support farmers' livelihoods and environmental stewardship by integrating innovative technologies and regenerative land management strategies. As I look to the future, I am encouraged by the potential of small collective changes to bring about significant transformation. This project has been a personal journey and a step towards a more sustainable future for the entire community.