**The Evergreen State College**

**Graduate Program on the Environment**

### Thesis Prospectus

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| --- | --- | --- | --- |
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**STUDENT AGREEMENT:**

**SIGNATURE: \_\_\_\_\_\_\_Leah Randall\_\_\_\_\_\_\_\_ DATE\_\_\_\_12/10/2021\_\_\_\_\_**

**FACULTY READER APPROVAL:**

**SIGNATURE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**MES DIRECTOR APPROVAL:**

**SIGNATURE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Provide the working title of your thesis[[1]](#footnote-1).

Black Soldier Fly Larva, the Key to Keeping Food Waste Out of the Landfill: A feasibility study of small-scale poultry farming composting the average daily food waste from a family of four in Western Washington.

1. In 250 words or less, summarize the key background information needed to understand your research problem and question.

The problem is food waste. Over one third of the food produced in the world is wasted annually (Abdelradi, 2018), that’s over 54 million tons of food in the United States alone. This waste comes at a cost to consumers and the environment (Schanes et al., 2018). The dollar amount projected annually by ReFED, a nonprofit organization set out to cut food waste in the US 50% by 2030 is $408 billion dollars.

Food production requires a lot of resources, when tossing food into the trash you are throwing with it the resources that were consumed during growth, harvest, manufacturing, transport, storing, and often preparing the food (Bagherzadeh, n.d.). Decomposition of food waste in the landfill produces 2% of the U.S total greenhouse gases (Venkat, 2011). Greenhouse gases are major contributors of climate change. I would like to focus on food waste at the home level. Focusing on composting the waste with black soldier fly larva (Hermetia illucens) (BSFL) and using the larva to feed commercial broiler chickens for human consumption (de Souza Vilela et al., 2021). Reframe how people look at waste, see where they waste, and either how to curb their wastefulness or give them another option for what to do with it, looking at food waste more holistically keeping it out of the landfill.

Additional information needed to frame this issue is:

* composting challenges, why composting and recycling efforts fail
* composting benefits
* projected population growth and landfill space
* nutritional needs of poultry
* composition of black soldier fly larva that have been raised on organic material
1. State your research question(s).
* Is raising black soldier fly larva through composting a practical way to mitigate household food waste and raise poultry for human consumption?
* How may BSFL can be raised on the average daily household food waste and how many broilers will that number of BSFL sustain?
* Is this a feasible task for a household to manage, what are the costs, time, and space requirements to maintain healthy compost, BSFL, and broilers
1. Situate your research problem within the relevant literature. What is the theoretical and/or practical framework of your research problem?

Composting with black soldier fly larva, and using the larva of BSF to feed broilers fits right in the middle of sustainability literature. There is a call to reduce the amount of food waste globally, which is a major contributor to greenhouse gas (GHG) emissions (Ramanathan & Feng, 2009). In addition to GHG there are so many resources consumed in the production of consumables (Bagherzadeh, n.d.). Let’s not forget there are 1 in 8 Americans with food insecurities and we are throwing away 54 million tons of food per year (Schanes et al., 2018)

1. Explain the significance of this research problem. Why is this research important? What are the potential contributions of your work? How might your work advance scholarship?

As our population continues to grow, how do we keep people fed as this happens when we struggle to meet the food needs of today (Gundersen et al., 2011)? There is much waste when it comes to food, from production, packaging, food preparation waste, and plate scraps (Bagherzadeh, n.d.). Those scraps are discarded and often end up in the landfill as trash. Decomposing food produces carbon dioxide, methane, and other greenhouse gases that are known contributors of climate change (Ramanathan & Feng, 2009). Climate change is a threat to our current agriculture practices (Aydinalp & Cresser, 2008). Food scraps however can play an important role in nutrient recycling, soil restoration, and can feed larva that in turn can be a food source for things like poultry and swine (ZHANG et al., 2021). There is not going to be more space for farms, more space for trash, and enough space for the projected increase in population. Reusing food scraps and keeping them out of the landfill can help reduce some of the dependence on commercial feeds, reduce landfill space and provide some natural soil benefits through composting. We ask people to take action, knowing if it takes more effort than tossing something in the trash it’s probably not going to last. The goal of this study is to determine if composting food scraps, using BSFL to raise broilers is practicable. Potential contributions of this work could be increased amounts of small-scale larva production as a means of composting and feed production. Each small-scale operation is food scraps kept out of landfills, compost for soil restoration, nutrition for poultry and protein for human consumption, also less dependence on commercial feed and chemical fertilizers. Advanced scholarship for this small-scale larva production could be food waste from state and federal facilities where food is prepared or served- such as schools, hospitals, assisted living facilities, and jails be donated to larva farms or used on site in their own larva production facility.

1. Summarize your study design[[2]](#footnote-2). If applicable, identify the key variables in your study. What is their relationship to each other? For example, which variables are you considering as independent (explanatory) and dependent (response)? Summarize your study design[[3]](#footnote-3). If applicable, identify the key variables in your study. What is their relationship to each other? For example, which variables are you considering as independent (explanatory) and dependent (response)?

This study is three parts. The first to see how much black soldier fly larva can be raised from the average daily household food waste. Larvae produced will be the primary food source for broiler chickens. Leading to the second part of the study, to see how much poultry can be raised secondarily from food waste of the average household. Lastly, modifying the design each broiler cycle to maximize the practicality, making the process as simple and efficient as possible.

Independent variable: Average household daily food waste

Dependent variables: Larva and broiler production

It is still not clear how much waste is produced daily by an average household, but once it is that number will determine how much BSFL can be raised and consequently how much poultry will be produced. With the goal of answering the question “is this a reasonable task for a household to manage?” All time spent tending to compost, BSFL, and or broilers will be tracked daily. My goal is to see if I can get my daily average task time under 10 minutes. This would include feeding, cleaning, and care of compost, BSFL, and broilers. Initial set up and butchering excluded. In addition to tracking task time, I will be tracking any acquired costs and unusual events. I expect there to be minimal costs outside of initial setup. Supplemental heat in the winter and cooling in the summer are potential added costs. Natural disturbances like sickness or predation are potential situations that could add cost and time.

1. Describe the data that will be the foundation of your thesis. Will you use existing data, or gather new data (or both)? Describe the process of acquiring or collecting data[[4]](#footnote-4). Describe the data that will be the foundation of your thesis. Will you use existing data, or gather new data (or both)? Describe the process of acquiring or collecting data[[5]](#footnote-5).

Data needed as the foundation of this thesis is knowing the average household’s daily food waste, caloric and nutritional composition of BSFL, and the caloric and nutritional needs of broilers. The majority of this data will come from existing literature. *New data collected will be the amount of BSFL produced from the average household daily food waste and the realistic cost associated with housing broilers, time needed to tend to the compost, black soldier fly larva and broilers.*

In addition to the literature, I have contacted the Sustainability in Prisons Project that is running a pilot program using black soldier flies as a means to minimize food waste to the landfill. It is still unclear if I will be able to access any of their data. My contact through them is Michelle Klim, fellow MES student. Another outlet I am seeking in hopes of accessing data is Thurston County’s Food Composting Coordinators to see if there is data available on can weights at locations over time.

Collecting new data:

* Larva Production Data Collection

4 different rearing stations will be set up. The setup is simply four barrels open on the top, each inside its own framework covered by chicken wire and bug netting. The framework is there to keep birds, raccoons and other animals from getting in, additionally keeping any maturing flies from getting out. Each barrel will start out empty. Food scraps will be added daily, starting the same day as the eggs are planted. 2 grams of BSFL eggs (actual amount TBD) will be planted in each barrel. Barrels will all be in the same location, under cover in an open-ended barn. The medium humidity will be kept in the safe range for BSFL (per the literature). No other additives or maintenance will be done to the barrels or medium. Data collected daily will be air temperature, medium temperature, medium pH, larva development stage visible, and weight of developed, ready to harvest BSFL. A percentage of the BSFL will be retained for propagation, that number will depend on production. All barrels will receive the same weight of waste per day; however, the type of waste will vary between barrels. Larva ready for harvest will be dehydrated and vacuum sealed and stored in a cool dark place. This will continue daily for 9 weeks. At this point the 9 week daily average larva production will be calculated and preparation for the first round of broiler chickens will begin.

\*Larva produced in the first 9 weeks of the experiment will be kept as supplemental feed if needed, in the case of a framework breach or other disaster.

* Barrels

55-gallon steel drums. Fastened on the inside in a spiral fashion, 1’’ X 1’’ wide angle iron along the edge a platform for larva to wiggle onto as the mature larva work their way out of the compost. Every 8-10’ from the bottom a hole will be drilled into the barrel with a piece of PVC pipe in it extending out of the barrel and into a catch bucket. The ramps on the inside will line up with the holes, acting as a guide the ramp will lead the larva to the hole and PVC pipe where they will land in the bucket for easy handling.

* Cages

Pressure treated2’X 4’ wood will be used to construct a frame used to house the barrels and BSFL. The frame will be 16’L X 4’W X 6’H. The exterior will be covered in chicken wire and bug netting. There will be one screen door on the end for access. There will be 4, 4’ X 4’ sections inside separating each barrel with fly netting.

There will be 4’’ PVC from outside the framework going into each barrel. This is how the food scraps will be deposited into the barrels each day. The PVC pipes that exit the barrel will extend beyond the frame into buckets. One will not need to go into the framework on a regular basis; all feeding and larva collection can be done from outside.

* Observations and time records
* Actual time caring tending to BSFL and broilers daily
* An observation log will be kept, noting things that work and things that could use improvement
* Any unusual situations or changes will also be noted
* Seasoned barrels will not be restarted, the BSFL feeding and tending will continue during prep week before broilers.
* Broiler Production Data Collection
* Broilers, number to be determined by amount of BSFL produced daily and their daily nutritional need (per the literature) will be housed individually in a cage with a solid floor and white pine bedding. They will have protection from weather. The heat will be supplemented if needed using heat lamps and fans if the temperature is either too hot or cold. Post daily cleaning of their area, they will be given fresh water and the recommended amount of BSFL, based on the daily caloric need. Daily data collection: weight of bird, how much water was consumed and if any BSFL remain from the feeding before.

\*If there is overproduction of BSFL, because the broiler nutritional needs are less than production (when they are small) excess larva will be dehydrated and preserved.

* Observations and time records
* Actual time caring tending to BSFL and broilers daily
* An observation log will be kept, noting things that work and things that could use improvement
* Any unusual situations or changes will also be noted

\*Butcher between 7-8 weeks depending on weight

* Post round 1 with boilers an assessment will be made to the process. If there are areas that need improvement, or a more practical option is available the husbandry of black soldier flies or broilers will be adjusted before starting round 2.
* Timeline
	+ January 30th start BSFL eggs
	+ Run 9 weeks end March 27
	+ March 27th start day old chicks on BSFL (round 1)
	+ May 15th Butcher
	+ May 15th -22nd Assessment and modifications to processes
	+ May 22nd start day old chicks on BSFL (round 2)
	+ July 10th Butcher
		- * + Total experiment not to exceed 7 months
1. Summarize your methods of data analysis. If applicable, discuss specific techniques that you will use to understand the relationships between variables (e.g., interview coding, cost-benefit analysis, specific statistical analyses, and spatial analysis) and the steps and tools (e.g., lab equipment, software) that you will take to complete your analyses.

Because this is a feasibility based inquiry, the methods and techniques will be changing throughout the study. The relationships between variables will hopefully improve with every adjustment, either by saving time, saving money, or increasing production of BSFL. Taking detailed notes and documenting time spent on each task will show if the changes made were beneficial.

The initial set up methods are to create a secure framework to house the compost and BSFL. The framework will need to be accessible from the outside for feeding and collection of BSFL, PVC piping will be used for this. There will need to be a large access point, big enough for myself to enter as needed for maintenance or compost removal.

I am trying to source used broiler cages or chicken tractors for housing the broilers. They need to have access to clean water, their portioned food and have space out of the elements. I have a stopwatch and field notebook to track and collect data.

How the data collected will be analyzed is not yet clear. There will be 8 multi-variable data sets to compare. The hope is to see if the changes made between set one and two or two and 6 saved time, money, or produced better yield. I will be working more closely with what analysis options to consider as the data collection begins. Once it is decided which method is best, I will use statistical software and hopefully be able to produce some visual aids to showcase trends or changes between data sets.

1. Address the ethical issues[[6]](#footnote-6) raised by your thesis work. Include issues such as risks to anyone involved in the research, as well as specific people or groups that might benefit from or be harmed by your thesis work, perhaps depending on your results. List any specific reviews you must complete first (e.g., Human Subjects Review or Animal Use Protocol Form).

Ethical issues raised by this thesis project involve one animal species and an insect that will be consumed for nutrition. They will be cared for by myself. Poultry care is well known and documented. There are laws in place that outline humane methods of slaughter of market animals, rcw16.50.120. These processes are overseen by the Department of Agriculture (DOA) chapter 16-24. All rules and regulations of humane slaughter will be followed, making the risks to poultry low. They will be kept in clean and comfortable living conditions, with ample food and water. Their health will be monitored and veterinary care will be provided if needed. They will be butchered and processed with the utmost respect and care, all state and federal regulations will be followed. There is not clearly outlined guidance for insect care, elevating the potential ethical risk to BSFL. Lack of guidance and access to information increases the room for error. There is very little information on raising black soldier fly larva as a feed source for poultry. In nature the flies would be free to lay their eggs in any medium that seemed fit. In this study flies will be caged and only allowed food scraps as a medium for laying their eggs. Because they will not be freely able to lay their eggs in this study there is potentially a need for an animal protocol form filled out for nonstandard husbandry. As the provider of care for both BSFL and broilers, I will use proper sanitation when butchering, and practice good housekeeping and self-cleaning throughout the study to keep the risk to individuals very low.

1. List specific research permits[[7]](#footnote-7) or permissions you need to obtain before you begin collecting data (e.g. landowner permissions, agency permits).

I do not believe I will need any permits before starting the data collection process. One thing I am not clear on yet is if there are any special requirements needed for farming larva as a feed source. That data has been hard to find. It was suggested to me to contact the city council for guidance. I will continue looking for that information.

No permit required for composting, if material on site is less than 5000 gallons. Raising poultry requires no permit, unless the intent is to process and sell the meat. In that case a Special Poultry Permit would need to be retained from the Washington State Department of Agriculture (WSDA).

This research will be conducted on my personal property located outside the City of Centralia limits in Lewis County, Washington so no permission will be needed from the land owner, city, or state agencies.

1. Reflect on how your positionality as a researcher could affect your results and how you will account for this in the research process[[8]](#footnote-8).

The lifestyle I was raised in and the life I live today are very different. Growing up we were considered poor. Although I did not really understand we were poor until I was a teenager, there was one thing that stuck out to me that was different in my house than some of my friends. We did not waste anything. Everything was repurposed or handed down. When it came to food, if there were leftovers, they were incorporated into the next meal that was always homemade. Dinner at a friend's house usually meant we would be eating something that was not homemade- and I thought that was a treat. But when dinner was over the leftover food went straight into the garbage. They didn’t fill mismatched cottage cheese and yogurt containers with what was left and get it quickly to the fridge. This was very strange to me.

As an adult I am so wasteful even if I go through the motions of putting leftover food away, it rarely gets eaten. And I buy food every week that never gets touched until I toss it into the trash. This is something I struggle with and has played a major role in my curiosity of food waste. There are a couple things about my life today that differ from when I was a child and might contribute to my wastefulness. I am no longer poor. Secondly, I am a household of one, when growing up it was my mom, three kids and always a cousin or two.

I have lived two very different lifestyles and believe the change in class has made me wasteful. All of these things have molded me and play a role in my thought process and beliefs. Reflecting on my positionality or belief of classes role on my own wastefulness I need to be mindful of projecting that belief on others, or discrediting them one way or another based on their class.

When designing this research plan, I decided not to use any of my personal data to build the framework of the research to minimize biases. As a middle-aged white woman living in a mostly white community, I have very little understanding of how my purchasing and consumption might vary from someone of another region, race or religion. Using existing literature's findings on the average daily food waste, Black Soldier Fly Larva composition, and composting methods removes my preconceived notions as well as broadens my sample audience providing better representation and variability of the population.

With a solid framework for the research, there are still things that I need to keep in mind when executing the research. I am extremely privileged living in rural Lewis County, on 13 acres. There are no close neighbors to complain about odors associated with raising chickens or composting. Because I have access to so much land, I have the luxury of raising both larva and broilers without worry. This is not afforded to people living in heavily populated urban areas. I need to keep in mind how close living conditions impact the person’s ability to compost, raise BSFL or broilers. I need to consider the scale of the project based on ordinances as well as availability in order to allow access to everyone. Over all I need to keep an unbiased point of view in order to reach people who think they don’t need to be mindful of wasting because they can “afford” to not be and to not make people who don’t have the luxury of wasting feel excluded from being able to contribute to waste reduction and bettering our planet.

1. Provide at least a rough estimate of the costs associated with conducting your research.  Provide details about each budget item so that the breakdown of the final cost is clear.

The cost associated with this project is mostly straight forward. However, some of the cost is impossible to determine until it is clear how many broilers will be housed. Some of these materials I already have, but have included the cost as they would be necessary if this study was replicated.

Known Costs:

|  |  |  |  |
| --- | --- | --- | --- |
| Item/Use | Amount | Cost $ | Total $ |
| 55 Gallon barrel for larva husbandry | 4 | 40.00/each | 160.00 |
| Wire (2’’ mesh) 72’’X150’ | 1 | 99.99 | 99.99 |
| Fly Netting 36’’X100’ | 2 | 184.00 | 368.00 |
| Bucket | 8 | 3.00/each | 24.00 |
| Meat digital scale | 1 | 69.99 | 69.99 |
| 8’ 2X4 pressure treated | 12 | 7.98/each | 95.76 |
|  | **See Totals in Table Bellow** |

Unknown Costs:

|  |  |  |  |
| --- | --- | --- | --- |
| Item/Use | Amount/ use | Estimate | Total $ |
| Broiler Chicks | TBD | 2.50/each | TBD |
| BSFL eggs |  | 25.00 | 25.00 |
| Electricity  |  | 40.00 | 40.00 |
| Packing material for excess larva bags or buckets |  | 50.00 | 50.00 |
| Dehydrator used |  | 50.00 | 50.00 |
| Poultry cages- Plan on sourcing used materials/ free |  | Free | 0 |
| TOTALS | **Sub Total Unknowns** | **165.00** |
| **Sub Total Knowns** | **817.74** |
| **Grand Total** | **982.74 (- taxes)** |

1. Provide a detailed working outline of your thesis.

# Thesis introduction

## Title page

## Signature Page

## Table of Contents

## List of figures

## List of tables…

## Acknowledgements: Evergreen Faculty and others involved

1. Funding
2. Readers / BSFL / Broilers / Eric Wilson, and my employer for being so flexible with my work schedule and access to resources.

# Written Introduction

## Topic introduction

1. Broad: The problem: Wastefulness
2. Narrow: Growing population, food insecurities, landfill space, greenhouse gas emissions from food waste in landfills, commercial feed crop space, soil quality
3. What this thesis will address: Above topics and a potential solution on a small scale, through composting and larva production.
	1. Research Question(s)

How much poultry can be reared on a diet of black soldier fly larva through composting the average daily food waste from a family of four in Western Washington? (Something referencing the cost analysis)

## Positionality statement: see pg. 5 question 11

# Literature Review 4 Sections

## Introduction

1. Thesis Statement

## …Food Waste

1. Sources of food waste: agriculture, transportation, storage, preparation, and table scraps.
2. Landfill space
3. Greenhouse gas emissions
4. Population grown

## …Composting

1. What is composting
2. Benefits of
3. Challenges around the topic- why composting efforts fail
4. Feasibility and practicality at a household level
5. Soil regeneration

## …Black Soldier Fly larva

1. Life cycle
2. BSFL as composters of organics, focusing on food scraps
3. Nutritional composition

**… Broilers**

1. Breeds and life cycle
2. Husbandry
3. Feasibility and practicality at a household level
4. Nutritional needs

## Conclusion and transition

# Methods

## Roadmap

## Site description(s)

1. Maps (?)
2. Pictures

## Method the first: data / sample collection

1. Rationale
2. Description
	1. Example photographs / coding keys / interview questions etc.
3. Benefits and limitations

## Method the second: sample analysis

1. Rationale
2. Description
3. Benefits and limitations

## Method the third: data analysis … (and 3rd, 4th, 5th, et cetera)

## Statistical analyses

1. Test #1 Initial BSFL Production
	1. description & rationale
	2. This method was used to answer <question>
	3. Limitations & utility
2. Test #2: BSFL and broilers round 1
	1. description & rationale
	2. This method was used to answer <question>
	3. Limitations & utility
3. Test #3: BSFL and broilers round 2
	1. description & rationale
	2. This method was used to answer <question>
	3. Limitations & utility

# Results

## Introduction and roadmap

## Data / sample collection details

1. What went wrong
	1. Acknowledge and
2. What went right

## Summary of all data produced

1. Tables!
2. Written description
3. Basic figures (descriptive)
4. Statistical tests and results

## Transition

# Discussion & Conclusion

## Introduction and roadmap

## Summary of key results

1. Recap of Chapter V (highlights)

## Interpretation of results

1. Correlation and / or causation
2. Figures (analytical and / or explanatory)
3. What was expected
4. What was unexpected
5. Conclusions based on just this data

## Connecting results to framework / context

1. What agrees with previously published work
2. What is different than published work
3. Conclusions based on agreement / disagreement with published work

## Final conclusions

1. Big picture meaning & implications for broader work (Local, regional, global?)
2. Directions for future research

# References

## Mendeley / Zotero list

## Additional information / supplementary tables / Raw data / Code or scripts…

1. Provide a specific work plan and a timeline for each of the major tasks in the work plan. Be as realistic as you can, even though you will probably need to alter this schedule as you complete the tasks. Remember that faculty readers take time to return your drafts and that the final polishing and formatting of your thesis for binding will take longer than you ever imagined.

Fall 2021:

1. Prospectuses
2. Literature Review of broilers needs

Winter 2022:

1. Literature Reviews (3) food waste, composting, and BSFL
2. Set up site and finalize the protocol of my research design. The goal is to be ready to start collect data Feb 1
3. Write introduction

Spring 2022:

1. Write introduction
2. Polish methods section
3. Summaries data

 Summer 2022:

1. Interpretations of results
2. Conclusion
3. Finalize
4. Who, beyond your MES faculty reader, will support your thesis? Indicate support both within and outside of Evergreen. Be specific about who they are and in what capacity they will support your thesis. If you are working with an outside agency or expert, be specific about their expectations for your data analysis or publication of results.

Within evergreen resources, aside from my reader will be the writing center, thesis workshops, and my cohort. Outside of evergreen I am planning on working with McFilers Bar, Chehalis WA. They will be providing food scraps to feed the black soldier fly larva over the course of the research January-May. Additionally, I hope to work with the Sustainability in Prisons Project (SIPP). SIPP is currently working with BSFL as composters. Michelle Kilm, a fellow MES student that works for SIPP in another capacity, is facilitating contact between myself and the immediate supervisor of the program. Kilm and I are meeting 11/16 to discuss.

Follow up on meeting with Michel Kilm. SIPP is two years into a pilot program using BSFL as composters. They are also using the BSFL as feed for chickens. Michelle is going to help me navigate accessing data the program might have and connect me with the program coordinator.

1. List the 3-5 most important references you have used to identify the specific questions and context of your topic, help with issues of research design and analysis, and/or provide a basis for interpretation. For each annotated reference, explain how your project specifically connects to the source by extending, challenging, or responding to the conclusions, methods, or implications. For any other sources cited in this document provide a complete bibliographic citation.

A few references that have really helped frame the context and provided the base for interpretation are, Food Waste Behavior at the Household Level: A conceptual framework, Black soldier fly larvae in broiler diets improve broiler performance and modulate the immune system, and Food waste matters - A systematic review of household food waste practices and their policy implications. Food waste is what initially piqued my curiosity, Food waste behavior at the household level: A conceptual framework focused on how one’s lifestyle influenced their waste in four areas, purchasing, storing, preparing, and consuming. This resonated with me because it hypothesized what I believed to be true in my own experience. Stating people with food insecurities and/or were cost conscious, were less likely to waste. While thinking about food waste, I pondered possible solutions. All the while reflecting on my own issues, one of which at the time was poor soil quality in my garden. And that’s when composting came up as a possible solution to two of my problems. Composting however required a lot of work and the process was slow. While I was researching composting, I came across the term “feed insects.” Feed insects are raised as protein for the next trophic level, BSFL were on that list. As it turned out they are not only feed insects, they are incredible digesters of organic material. They are composters.

Black soldier fly larvae in broiler diets improve broiler performance and modulate the immune system, is the second article that really helped expand my inquiry and lead to my research design BSFL as composters sounds great, but no one wants millions of flies buzzing around. This article provided a potential solution that deepened the idea of food waste as so much more than trash. In this study they varied the diet of broiler chickens with commercial feed and BSFL to see if there was measurable difference in their performance based on the percent of BSFL feed. They look at weight gain and conversion, blood markers for immune response and several other factors. They found significant improvement in broiler performance with just 20% of their diet coming from BSFL.

Food waste matters - A systematic review of household food waste practices and their policy implications is the last article I am highlighting. This article circles us back to the main issue. This article recognizes that food waste behavior is multifaceted. Using mapping to help identify patterns in behavior to develop food waste prevention strategies. This article gave me hope that there is room for improvement, but did not show much hope for reducing the margins show a large at the home level waste. This strengthens the call to action- what can we do with household food waste?

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1. You are not locked into this title; its purpose is to help you identify the main point or topic of your thesis at an early stage. [↑](#footnote-ref-1)
2. You might discuss selection of case studies, sampling methods, experimental design, and/or specific hypotheses you will test. You should also address any specialized knowledge or skills that are necessary to complete the research. [↑](#footnote-ref-2)
3. You might discuss selection of case studies, sampling methods, experimental design, and/or specific hypotheses you will test. You should also address any specialized knowledge or skills that are necessary to complete the research. [↑](#footnote-ref-3)
4. If you are planning to use existing data, explain the specific source, contact information, arrangement with collaborating agencies, and expectations about use of data and final products of your research. If you are planning to gather new data, describe specific methods, time, place, and equipment that will be required. [↑](#footnote-ref-4)
5. If you are planning to use existing data, explain the specific source, contact information, arrangement with collaborating agencies, and expectations about use of data and final products of your research. If you are planning to gather new data, describe specific methods, time, place, and equipment that will be required. [↑](#footnote-ref-5)
6. If you’re not sure where to start, consult a ‘Code of Ethics’ or other similar document from an academic society in an applicable field of study. [↑](#footnote-ref-6)
7. If you are collecting ANY samples or data, even observational data, on public lands (city, county, state and/or federal) it is your responsibility to find out the permit requirements BEFORE you collect data. Conducting research with tribal members/on tribal lands will have different and additional requirements. [↑](#footnote-ref-7)
8. Your *positionality as a researcher* refers to the fact that one’s “…beliefs, values systems, and moral stances are as fundamentally present and inseparable from the research process as [one]’s physical, virtual, or metaphorical presence when facilitating, participating and/or leading the research project…” (The Weingarten Blog 2017). [↑](#footnote-ref-8)