Microlivestock at the UW Farm

Closing loops and maintaining a low impact on an urban environment

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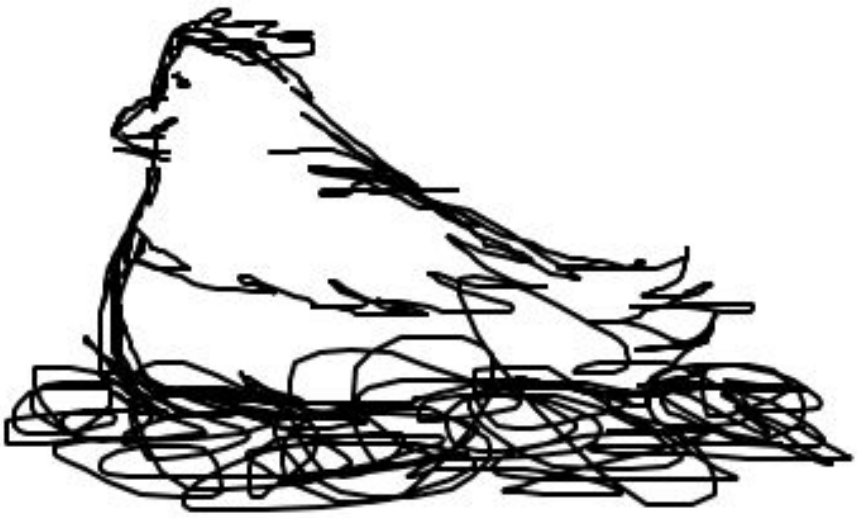
What is Microlivestock?

While a number of folks might think of cattle and pigs when imagining a farm landscape, in many communities smaller livestock is more of a norm. **Microlivestock** is often defined as species that are inherently small, as well as breeds of animals that are smaller than the average breed. For example, most poultry animals are classified as microlivestock==chickens, ducks, turkeys. Even miniature breeds of goats, pigs, and cattle are classified within the term.[1] In communities where space or resources are limited, microlivestock provide excellent opportunity for folks to sustain themselves.

Our question is: how do you sustainably grow livestock in an urban setting? The new chicken program at the UW Farm adds another level to our mission of being a center for urban agriculture and sustainability. We are striving to be productive in this non-traditional agricultural space, but how do we do so in a way that has a low impact on an already heavily impacted environment? This becomes especially troubling with the knowledge that chickens can be expensive to feed and provide veterinary care for.

Perhaps chickens are classified as microlivestock, but we are looking at developing a system of livestock to feed our livestock...micro-microlivestock, if you will. Our question: what can we do to develop a feeding system for our chickens that minimizes cost input but still provides adequate nutrition? The following material explores why and how the farm could develop this system.



[1] Microlivestock: Little-Known Small Animals with a Promising Economic Future. Washington, D.C.: National Academy Press. 1991. Web. http://www.nap.edu/read/1831/chapter/1

Well, why should I?

Incorporating livestock into a farm's system is a sure way of adding nutrients to fields without using synthetic materials. Not to mention the benefit of caring for chickens humanely, and using eggs that are produced in a healthy environment adds great value to the project. Caring for chickens, and other life in general, can be an empowering process that teaches us to value the way in which we interact with other species, our food, and in business. The multiple levels of this project provides UW Farmers with the opportunity to learn about the different levels of a farm system.

Our new chicken coop will spread the manure on our fields, adding much needed nitrogen, phosphorus, potassium, and organic matter to our soils. Along with the vermiculture compost, we'll be able to reduce the amount of off-farm nutrient aids and make another step to a closed-loop farm system. Ideally, we will also be able to sustain our chickens with mostly on-farm produced feed. The catch to all this is: chickens eat *a lot*. And while they will have room to eat weeds, vegetables/field scraps, and other plant material growing at the farm, they have other nutritional needs; protein, calcium, carbohydrates, vitamins and minerals all need a significant presence in a chicken's diet.

There are multiple ways to supplement those nutrients in a way that is more sustainable than purchasing mass quantities of feed. The following are just a few ideas that could be employed by the UW Farm, and provide opportunities for furthering the education of future students and staff.

Important considerations

Before we delve into the nitty-gritty, it is important to acknowledge the difficulties that might arise from implementing a microlivestock system on our farm, because of the requirements of our **Good Agriculture Practices (GAP)** certification and our relationship with Housing and Food Services. The following are considerations to take into account before seriously implementing a microlivestock system:

- Most information regarding the use of insects or insect larvae as feed is outdated by a few years, and difficult to find. The information from the USDA or FDA is difficult to navigate, and the right information is buried deep within their regulation documents.
- **The Food and Agriculture organization (FAO)** has a document entitled, "Edible Insects--Future prospects for food and feed security," which details the benefit of using microlivestock in agriculture and incorporating it into our food systems (at

least, in industrialized countries--many cultures already depend on the benefit of insects in their food systems).[2]

- From exploring the USDA and FDA resource pages, any clear regulation on using insect larvae as feed is unavailable, or not in place (supported by this article[3]).
    - This could mean: there is no opportunity for fault if the farm uses microlivestock because there is no current regulation, however there is leeway for insect parts in feed (loophole).
    - OR this could mean there is no opportunity to use microlivestock because they are not **Generally Recognized As Safe (GRAS**) and in complying with USDA and FDA standards, the UW Farm must only use feed and products that are GRAS.

This does present an opportunity for more research or another project, as it is possible to submit an ingredient or feed supplement to be GRAS.[4]

Black Soldier Fly Larvae:

While many species of flies can be a real pain-in-the-bin for compost, the fly larvae we are considering for our microlivestock system are **Black Soldier flies (BSF)**. Many people have considered using black soldier flies to feed their chickens because they reproduce quickly and can feed on kitchen or garden waste, manure, and materials that can be found on the farm. Another added benefit of BSF specifically, is that they are not attracted to human food waste, and thus do not become a nuisance as house flies or other insects do. Currently, research is going on at multiple universities and within the FAO (see van Huis) to test the efficiency, sustainability, and safety, of using black soldier fly larvae to produce livestock feed.

[2] Arnold van Huis et al. (2013) Edible Insects - Future prospects for food and feed security.
[3] Ana C. Day (2015). Edible Insects: The Current State of Legislation.
[4] Information available at http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/IngredientsAdditivesGRASPackaging/ucm2021277.htm

Photo from *The Aquaponic Source*.

Photo from the *Black Soldier Fly Blog.*

The following images come from the blog, *marketlessmondays*,[5] detailing experiences from a farmer in Hawai'i, who has implemented a black soldier fly system into her chickens' feed regimen. This apparatus would be completely feasible and an excellent project for future UW Farmers.

The main bin is set up similar to a worm compost bin, in that it is covered with a metal lid and food waste is placed inside, but in 12" square segments per 10 chickens. Whatever waste is not consumed by the larvae can be used as compost. The food waste may attract house flies or other flies at first, but they will not survive for long. Additionally, BSF tend to keep other pesky flies away in the long run, adding to their extensive benefits.

The back of the bin has pipes, capped off with bottles or open ended, that lead to a trough in the chicken coop. The larvae crawl up ramps inside the bin looking for light but end up dropping into the coop. There are portals

s-farming-black-soldier-fly-larvae/

for drainage at the bottom of the bin so that the compost tea does not sit in the bin with the larvae.

Again, when you first begin this project, flies and other insects will initially be attracted, but will not stay for long. In order to start the system, the BSF larvae can be purchased[6] or attracted using strong smelling food scraps[7] such as coffee ground, tea bags, beans, etc. Vegetable scraps and bread are not recommended to attract BSF, according to a contributor on the *Black Soldier Fly* blog. This should be done in warm weather, using a box with some kind of paper where they can lay their eggs. Once there is an established population, move them to the bin and make sure the lid is open until there is a female present in the bin (they have wings).

The larvae contain 42% protein and 35% fat[8], and thus serve as an excellent source of feed for the chickens, and if enough larvae is produced, a significant portion of the feed.

Mealworms:

Another potential microlivestock food source comes in the form of **mealworms** (*Tenebrio molitor*). Mealworms are the **larva of darkling beetles** and can act as a nutritious food source for wide range of organisms, chickens (and humans) included. Their feed can be supplemented by food waste from the farm, and will require some initial start-up cost, but after the population has been established, it will be a low-cost chicken feed.

Mealworms are relatively simple to take care of, and it is not necessary to separate them between egg, larva, pupae, and adult stages. In fact, the maintenance of a mealworm population after it has been started only includes: adding food, changing the substrate (feed), and harvesting mealworms.

In order to get started, you will need:

- A large tank or bin to keep the population in (if keeping the mealworms outside, it will need to be mouse/pest proof)
- A **warm, dark** area to keep the habitat (a heating device is necessary in the winter)
- Substrate in the form of wheat bran or oats (wheat bran preferred)
- And, of course, worms!

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[6] Potential, semi-local vendor: DipTerra, LLC (Lake Oswego, OR).
[7] Black Soldier Fly Blog, Getting Started--Attracting the Black Soldier Fly. Available at http://blacksoldierflyblog.com/2008/05/28/attracting-black-soldier-flies/
[8] http://articles.extension.org/pages/15054/research-summary:-black-soldier-fly-prepupae-a-compelling-alternative-to-fish-meal-and-fish-oil

Setting up the tank or bin is a simple task. An aquarium or old harvesting bin would be perfect, as long as the top of the container allows for air circulation. The substrate (which can be bought in bulk at many grocery stores) should be about three inches deep. To start out, add approximately 500-1000 worms. The worms can be purchased online or at feed stores (I would suggest Portage Bay Grange, as they are reputable and will be less likely to carry diseases). To foster population growth, feed them consistently with vegetable or fruit waste (use dry waste, and nothing to moisture rich). Let the worms eat and live for a few months before harvesting. As stated before, there is no need to separate larvae from adults, and the same applies for the dead beetles, as they will be eaten by the worms. Additionally, add more substrate when it starts to look thin and appears to loose depth, they need fresh bedding from time to time.

When you are ready to use the worms, add a new, larger piece of food to the bin (a potato or apple, for instance, and leave it there for a few minutes. Then, remove it from the bin and shake over a new container. At that point you can deliver them to the chickens for a wonderful treat!

It is important to acknowledge that gloves and masks if possible should be worn when handling the mealworms. Some individuals experience allergies due to dust created by the worms, and it could be irritating to the throat or nasal passages.

Photo from *The Happy Chicken Coop.*

Meal worms do require more cost input than soldier fly larvae, for example, but they are easy to maintain, and certainly will be more cost effective in the long run than purchasing chicken feed. It also remains true that by feeding chickens with insects grown on farm, you are cutting out the mystery of where the ingredients in the feed came from, and what they truly are.

Additional thoughts and closing remarks

The two options discussed here are the most efficient for raising ourselves, and also the most widely used and suggested on farmer/gardener forums. Pending research done by official organizations and allowances made by the USDA or FDA, they are likely to be the safest and most efficient. As such, the UW Farm should seriously considering implementing these systems, or experimenting with growing BSF larvae or mealworms to prepare for more long-term systems.

Finally, if there is time, collecting grasshoppers and Earthworms to feed to chickens is another way to diversify their diet. They will likely get plenty of opportunity for foraging during their time in the field, but it is important to give them as diverse a feeding regimen as we can control, to ensure healthy chickens and healthy products for our own consumption, should that be the goal.

References

1. Microlivestock: Little-Known Small Animals with a Promising Economic Future (1991). Washington, D.C.: National Academy Press. [internet] available at http://www.nap.edu/read/1831/chapter/1

2. van Huis, A. et al. (2013), Edible Insects--Future Prospects for Food and Feed Security. Food and Agriculture Organization of the United Nations, [internet] available at http://www.fao.org/docrep/018/i3253e/i3253e.pdf

3. Burtle, G. Mass Production of Black Soldier Fly Prepupae for Aquaculture Diets. University of Georgia, n.d. [internet] available at http://www.caes.uga.edu/commodities/animals/aquaculture/catfish/documents/soldierflymagazinearticle.pdf

4. Day, A.C. (2013). Edible Insects: The Current State of Legislation, 4ento [internet] available at http://4ento.com/2015/02/02/current-state-legislation-edible-insects-food/.

5. Grow Grubs! Farming black soldier fly larvae (2013), marketlessmondays blog, found at https://marketlessmondays.wordpress.com/2013/12/07/grow-grubs-farming-black-soldier-fly-larvae/.

6. Making Your Own Mealworm Farm 101 (2015). The Happy Chicken Coop: Chicken Coop Plans, [internet] available at http://www.thehappychickencoop.com/make-your-own-mealworm-farm/

7. Meal Worms (n.d.). West Knoll Farm, [internet] available at http://www.westknollfarm.com/Meal-Worms.html

8. Del Cielo, G. (2014) How to Raise Meal Worms. Backyardchickens.com, [internet] available at http://www.backyardchickens.com/a/how-to-raise-mealworms.

About the Uw farm

The UW Farm is an entity of the University of Washington Botanic Gardens, serving students, faculty, and the community. We strive to be the campus center for the practice and study of **urban agriculture** and **sustainability**, and an **educational, community-oriented** resource for people who want to learn about **building productive and sustainable urban landscapes.**

The farm is maintained by a farm manager, a seasonal staff of interns, and student volunteers who generously donate their time to sustaining the UW Farm program and cultivating spaces that produce quality, delicious food. With the help of the UW Botanic Gardens, College of the Environment, School of Public Health, and UW Grounds Management, the farm has been able to continue providing students with the opportunity to connect to their food and environment.

2016 UW Farm Staff and leadership

UW Farm Manager
Sarah Geurkink

Education Coordinator
Amy Hughes

2016 Interns
Anna Beebe
Franny Olsen
Ellie Garcia