

Model

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PROTA™CULTURE

Harvesting Waste Naturally

The ProtaPod™
Grub Composter
Manual & User's Guide

ProtaPod™ User's Guide



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Prota™ Culture
PO Bx 660675 #15135
Dallas, Texas 75266
Phone 214-509-6000
Facsimile 214-279-0445
info@compostmania.com

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Introduction

The future of residential food waste recycling

Thank you for purchasing the commercial 4' ProtaPod™ Prota™ Culture System. This unit is the culmination of over a decade of collaborative research with dozens of experts on four different continents. Never before has there existed a sustainable technology that is so quick and efficient at biologically converting kitchen waste into useful and valuable end products. The primary decomposer is the juvenile form of the harmless and beneficial **black soldier fly** (*Hermetia illucens*) – a species native to North America and other regions of the globe. **Black soldier fly (“BSF”) adults do not bite, sting, create a nuisance, or transmit disease. In fact their very presence inhibits the growth of filth flies, like the common housefly and fruit flies.**

The real benefit in using our pods is the patented, self-harvesting ramp mechanism that allows the grower to collect huge volumes of grubs without having to spend labor and time manually separating them from the active waste pile. We hope your experience with the ProtaPod™ is both rewarding and positive. All that we ask in return is that you share what you have learned with others, so that they may benefit by setting up their own sustainable food waste recycling systems.

How to Use This Manual

Anytime you see **BOLD TEXT** in this manual, it means we are trying to emphasize the point. Please re-read the sentence – it means the topic is important and worth remembering.

At the back of this manual in the GLOSSARY section is a list of definitions, in case some of the terminology is unfamiliar. Please review at your convenience. **Keep this guide in a safe place so that you have it for future reference.** In the event this document becomes worn or soiled, the latest version may be downloaded via the internet from the customer service section of our website. For the latest tips, advice and updates, please visit the **FORUM** section of our website (www.TheBioPod.com).

Benefits of the ProtaPod™

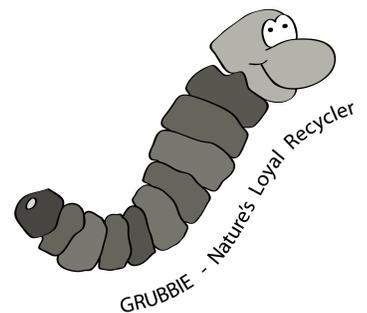
WASTE REDUCTION. By reducing or eliminating the volume of organic wastes currently going to the landfill or incinerators, the ecological and energy impacts of the waste are considerably reduced. Cost savings are achieved as pickup, transport and tipping fees are eliminated. Waste processing now becomes decentralized and managed on site. Wastes that may be bioconverted in a pod include: food and kitchen waste, orchard and farmer's market waste, manure, and offal. Though organic in nature, our pods will not consume textiles, yard debris or paper. Moreover, by removing many of the organic wastes from trash, the recyclability of the remaining refuse increases due to less contamination, while the pathogens causing odors and unsanitary conditions are significantly reduced. Pets and wildlife are also less interested in trash bins that have had the organic components of the waste pre-removed.

VALUE ADDED PRODUCTS. Our pods are designed to **aerobically** recapture the coveted proteins and lipids found in discarded organic materials and bioconverting them into usable biomass, which can then be fed to poultry, fish, amphibians, reptiles and pigs. **The biomass is in the form of living grubs**, which are the **juvenile** form of the Black Soldier Fly. A small quantity of castings and undigested residue are also produced in the process, which may be fed directly to vermiculture systems for final conversion into valuable soil amendments by worms. The liquid effluent is microbe and nutrient rich; however, its full potential has not been definitively determined, other than a means of attracting pregnant females. For every 100 lbs of mixed food scraps added to the pod, approximately 20 lbs (5:1) of grubs and 5 lbs of castings / undigested residue are created (20:1 ratio). Low energy materials such as manure have lower grub bioconversion rates.

Occasionally, subsidies and rebates are available through your local municipality to offset the purchase price of a composting system like the ProtaPod™ that diverts large quantities of food scraps from your waste stream. **Please consult the Solid Waste division of your Public Works department or your trash hauler for details on local subsidy programs and rates.**

Introducing the Soldier Grubs

Soldier Grubs - the highly versatile and nutritious BSF prepupae are the coveted end product of the ProtaPod™. These beneficial larvae have a myriad of uses, and contain approx. 42% protein and 34% lipids (fat), with an impressive amino acid and mineral profile. Soldier Grubs are so user friendly, they can be gathered and dispensed by a child's hand – they do not bite or sting, stain clothes, or possess sharp barbs. During auto crawl off, the mature, dark colored, prepupae naturally cleanse their entire GI tract, and so they are not going to defecate while in your hand. They are normally dry to the touch when harvested out of a collection receptacle, and do not have an offensive odor. Some popular uses for the grubs are as follows:



1. Poultry (primarily chickens but also quails, ducks, turkeys, and guineas).

Solider grubs are an excellent source of complete protein, balanced lipids and available calcium for your poultry. The **‘GOLDEN RULE’** of a balanced chicken diet: **1/3 greens, 1/3 grains & seeds and 1/3 critters & insects.** Based on an average daily consumption of 1/3 lb of food per day per adult chicken, the feed estimates would be 1/9 lb greens, 1/9 lb grains and 1/9 lb critters (or insects). If your pod is conservatively eating 20 lbs of food scraps per day and you have a lower bioconversion rate of 18%, your pod is still producing approx. 3.6 lb of grubs per day, once optimum production levels are reached. That is enough critter matter in a balanced diet for approx. 30 adult chickens, based on the golden rule above. These figures can vary widely based on local conditions, breed and what you are feeding your grubs. We recommend a balanced diet for poultry, with no more than 1/3 of their diet being composed of insect.

Lbs of Feed / Day / Chicken	# of Grubs / Day (1/3 of diet)	Food Scraps Bioconverted Daily in ProtaPod			Conversion Rate of mixed food scraps (ranges from 15-22%)	# of Adult Chickens Supported		
		15 lb	20 lb	25 lb				
.5 lbs	.16 lb	15 lb	20 lb	25 lb	17%	16	21	26
.33 lb (average)	.11 lb	15 lb	20 lb	25 lb	17%	23	30	38
.25 lb	.08 lb	15 lb	20 lb	25 lb	17%	31	42	53

2. Aquaculture or Aquaponics. Growing domesticated freshwater bass, catfish, bullfrogs or tilapia in a small pond or converted pool is a cost-effective and sustainable means of supplying you family with a healthy, year-round protein source. Live, frozen or dried grubs may be fed directly to your stock, reducing demand for commercial grade feed. If you have limited space, all-inclusive integrated aquaponics systems can be purchased or built, giving your family access to fresh herbs and salad greens as well as chemical-free fish. Before you begin, please research local zoning restrictions on non-native fish cultivation and breeding.

3. Songbirds. Soldier Grubs are an ideal food for attracting *bluebirds, orioles, cardinals, goldfinches, thrushes, catbirds, woodpeckers, nuthatches, chickadees, mockingbirds and warblers* – to name a few. The logical and most common means of offering the grubs is to use a specialty bluebird feeder, or similar unit that has been designed to distribute mealworms to birds. Look for units that possess a sloped, overhanging lid or roof which will prevent runoff of rain or dew into the feeding area. Drainage holes and critter guards are also beneficial to a functional feeder.

4. Ornamental Fishpond / Aquarium Feed. Soldier grubs are high in usable protein and low in ash. Your goldfish, koi, large cichlids and other pond creatures will relish the live, fresh grubs that are simple to dispense in a tank or backyard pond.

5. Live Fishing Bait. Home-grown Soldier Grubs are easy to store, simple to transport and a pleasure to bait on a hook – their durable bodies don’t fall apart or get easily

ripped up by hungry fish, unlike earthworms or bread balls. Why dig up your sod and vegetable garden looking for worms when you can have a constant supply of tasty, auto-harvesting soldier grubs?

- 6. Reptiles and Amphibians.** Live grubs are a delicacy and excellent source of bio-available calcium for many species of reptiles and amphibians. Consult with your local herpetology club and the web for more info.
- 7. Pigs.** BSF grubs are a nutritious dietary supplement and excellent source of protein and calcium for pigs.

In review, the ProtaPod™ has multiple benefits:

- Production of impressive quantities of living biomass in the form of grub bodies that self-separate out of the active pile and collect in a harvest bucket or tray
- **Reduce purchase of store-bought feed, for more sustainable, self-reliant rearing of poultry and fish**
- Lowers your trash disposal, waste pickup, hauling and tipping fees
- Mitigates contamination of recyclables, foul odors and vectors in garbage, thus improving recycling and improving sanitation in trash receptacles
- Conversion of BSF castings / undigested residue for vermiculture (worm bins) in worm castings
- Liquid tea that may be used as an acidic, biological active plant fertilizer (if diluted 25:1), repel other fly species, attract pregnant BSF females.
- Extends the time between emptying of septic tanks by elimination of insinkerator waste
- Diverts your food scraps away from landfills, thus preventing the formation of methane
- Helps to improve your municipality's trash diversion ratios and reduces need for centralized pick up via truck hauler
- Lowers the impact on municipal sewer treatment facilities while reducing the volume of biosolids that have to be processed
- Protects streams and waterways that receive treated waste water



Pod Attributes

Always check your pod for damage upon delivery

Do It Yourself Flexibility.

These second generation pods have a few minor improvements over the first batch we manufactured. First, we eliminated the problematic stand and collection jars, as they were not necessary for successful operations and only added to the cost and maintenance time. Two patented, sloped crawl-off ramps direct the mature grubs into a vertical chute when they can be collected in almost any receptacle. The bottom area has been redesigned to allow liquid to drain out faster and more efficiently, with little to no oversight.

BODY – INSIDE VIEW



BODY – OUTSIDE VIEW



DIY Components

PERFORATED DRAINAGE PLATE OR PAD – optional item

5 GALLON BUCKET + LID – optional item

SHADE CLOTH COVER – optional item

CHUTE TUBE – optional item



Installation

Some infrastructure recommendations

STEP 1 - LOCATION

Pick an outdoor spot that has a **level surface** and is located in **full shade**. If full shade is not available, place in part-shade with a shade tarp or canopy so that the radiant heat from the sun doesn't produce excessive temperatures inside. Do not situate the unit on a slope or angled surface – this may result in tipping of the unit or pooling of liquids inside. **Do not place the unit anywhere it is exposed to direct precipitation** – the unit could flood. To avoid possible disturbance or damage, do not site unit too close to play or pet areas. Make every effort to avoid placement near electrical devices (air conditioners, pool filters) that may heat up the pod. Try to keep internal temperatures between **70-110°F** so that the pod continues to perform optimally and within acceptable parameters. A digital thermometer that monitors high and low temperatures at all times is recommended. A full ProtaPod™ can be of considerable weight - make sure the foundation is stable and will not shift or decay over time.

STEP 2 - ELEVATE

The unit should be placed on concrete blocks or timber boards so that there is a sufficient gap between the bottom of the pod and the ground below. You want to be able to unclog any drainage holes that may inadvertently plug up so that liquids drain continually. We do not recommend placing the unit directly on the ground, because it limits your ability to monitor liquid flow and remove blockages.

STEP 3 – EXTERNAL DRAINAGE

The goal of the drainage openings is to prevent any liquids from pooling inside the unit, potentially causing anaerobic conditions, which are not preferred by BSF and lead to foul odors. We do not pre-drill any holes due to the fact that many people want to customize the size and placement of their drain openings (we didn't want to select either metric or imperial sizes, so it was decided to forgo pre-cutting any permanent holes in the body). Several 1 ½ inch to 2" holes (drilled using circular hole bits) cut out of the bottom will suffice and not compromise the structural integrity of the pod. These will allow the effluent to passively drain into the ground below. Unless your goal is to capture every drop of effluent, you do not need to engineer or design any fancy liquid collection system. Less is more, when it comes to external drainage. If you

are interested in capturing all liquids, drill holes that are compatible with plumbing assemblies in your country. Remember to use rubber gaskets if you want a tight seal.

For those who are not collecting liquids, the pods should be placed on a **permeable surface** that will allow gravity-based drainage to occur continually – a generous layer of natural mulch below the pod will greatly assist with liquid dispersal and mitigation of odors. Keep in mind that some grubs will evacuate through the drainage holes – this minor loss will not adversely impact your colony and in fact helps to maintain natural populations of this species. Avoid non-porous surfaces (such as asphalt or concrete) that will result in pooling of the liquid tea. We recommend capturing and collecting effluent if you only have impermeable surfaces available. **Please Note:** the liquid effluent is a strong attractant to pregnant females – they will get confused on where to lay their eggs if there are puddles of tea below the unit.

Landscape Fabric. Small circular pieces of landscape fabric or stiff hardware cloth can be used to directly cover the cut drainage openings, further improving the overall functionality of the drainage system. Landscape fabric also helps control weeds and grass if placed underneath the mulch.

STEP 4 – PERCOLATION / DRAINAGE FILTER PAD

We have received many suggestions over the years on the best method of internal separation of liquids and solids. As you can see there is an outer ridge at the bottom as well as four (4) arms radiating from the center. Collectively, these may be used to support a perforated, polypropylene sheet (“polypro”) that is cut to approximately **809 mm in diameter**. We are hoping to make these available as an optional accessory to pod owners. Because of the weight of food scraps, we would recommend a thickness of at least 1/4” – hole pattern or size is not overly critical so long as liquids can pass through but not the majority of scraps. **Course gravel** will assist with supporting the poly sheet as the weight of the food scraps accumulate above and of course help with drainage. Fill each of the 4 quadrants with gravel and spread evenly so your poly sheet can sit flush on the supports. This is not critical for soft pads or fiber meshes. Another useful material is a stiff drainage pad such as Matala, that may be cut to size and placed on the elevated ridges and radiating arms with gravel below. Matala is chemically inert and may be re-used from year to year, provided it is adequately cleaned of particulate built up. Lastly, a natural fiber pad such as coir mats can be utilized to filter liquids, though it would need to be replaced annually due to biological and enzymatic decomposition. It may be necessary to use several layers as some coir fiber pads are easily compressed. To help prevent large food particles from passing into the gravel layer, we additionally place landscape cloth between the coir and gravel. If nothing else is available, you may use landscape fabric alone as the separation between food scraps above and gravel below. However, it may need to be replaced more than once per season, as it is very thin with minimal structural support.

STEP 5 – COLLECTION BUCKET & CHUTE TUBE

You may fill the bottom of whatever receptacle is used for grub collection with some moistened coir, peat, compost, sawdust, or nothing. This bedding is completely optional but does break their fall into the container and helps the grubs to calm down. A **5 gallon commercial bucket plus lid** is an excellent choice and readily available. To collect the maximum number of grubs, use a clear plastic tube that will connect the top exit portal (chute opening) on the pod body to the

collection bucket below. The ideal size tube is clear, flexible and has a **1 3/4" inner diameter**. (2" outer diameter). For areas with wildlife present, protect the grub harvest from predation by drilling a hole in the bucket lid with the same outer diameter as the tube (2" in this case) and insert the tube through the lid hole and into the bucket. Use a 2", #24 stainless steel clamp to secure the tube to the exit portal.

STEP 6 – BEDDING

Unlike worm bins, bedding is not essential for start up or continued operations. With food scraps that are not overly dry or wet, aeration is achieved through convection currents, evaporation and the constant movement of the grubs. However, if overly wet food waste is being added, shredded office paper can assist with absorption of excess liquids and allow the pod matrix to be less dense and more open. This 'fluffed' consistency helps prevent pockets of stagnation and low aeration that may lead to anaerobic conditions.

STEP 7 – COVER

Originally, we thought about producing a rotomolded lid for the pod, but fabrication of that component would actually cost more than the pod itself -- without producing significant functional benefit -- so we decided against developing one. However, we now make simple covers for all of our test and research pods and we are happy to share our design with you. We'll also explain why a basic cover (not an actual lid) can benefit a pod. To make our cover, we use off-the-shelf, **standard shade cloth** from the local home improvement store. The matrix is somewhat open and thin, so we fold it twice on itself to end up with a quadruple layer piece that we then cut into a round disk with utility scissors. After cutting, we simply staple it around the edges so they stay together. The diameter is not overly critical, but we try to size it so as to minimize the gap between the edge of the fabric and the pod body. We use outdoor-rated zip ties for convenient lid grips (handles). Since this poly fabric is rated for outdoor use, it should last for years and it very easy to clean. Alternately, you can use a **piece of burlap** as a simple, natural covering, with the understanding that it will decay over time.

BENEFITS OF A CLOTH COVER. Having a soft, open weave cover helps increase the number of potential egg-laying sites (1) for the pregnant females to oviposit their egg cases. This species **does not lay eggs directly on food scraps but instead deposits them on a protected site above or adjacent to the waste.** For this purpose, the shade cloth or burlap is ideal. The cloth also helps to inhibit other species of flies (such as houseflies) from laying eggs on the food scraps (2), since the now-covered scraps are no longer exposed. This tends to be especially helpful at the initial start-up, as established colonies are normally able to emit their own repelling factors that keep away other fly species. Newly setup pods have no natural repellants and are susceptible to colonization by other species, so you want to minimize that, if possible. Even if no cover is used, the BSF population eventually dominates the pod and crowd out other competing species (2-3 weeks). Moreover, having a cover helps reduce light penetration (3) (the grubs are negatively phototoxic) and keeps internally generate heat (4) and moisture inside (5) – an added benefit in areas that experience cold spells or it overly dry climates. By helping retain moisture, the top food scraps do not easily desiccate into a crusty surface; pods without covering can form a dried, moldy, blackish layer on top that limits grub activity at the surface.

BEFORE U BEGIN:

1. FIND FULL SHADE
2. NEED FLAT SURFACE
3. DO NOT USE BEDDING
4. COLLECT FOOD SCRAPS

System Start Up

Some recommendations on starting the pod

Adding Food Scraps. This is the most gratifying step in the ProtaPod™ set up process. For the initial ‘seeding’ of your new unit, use ordinary kitchen food wastes minus any meat or fish scraps because of the potential to initially attract unwanted pests. Once the unit is humming (approx. 2 to 2.5 weeks), the meat prohibition is no longer relevant, due

to the rapid speed of digestion by the grubs. Spread the scraps out onto the bottom of the pod, and if you purchased larvae separately, go ahead and add them to the mix at this time. If it is seasonably cool, gently place a rounded piece of cardboard on top of the pile or your DIY shave cover, making sure that if cardboard is employed to leave enough space around the edge for air to reach the pile. **DO NOT start your unit off with too many food scraps; you must start slow, until your population of BSF begins to rise naturally.** Introducing too many scraps in a new setup *before* you have enough grubs to consume them may result in the system going anaerobic (leading to foul odors). Fresh clusters of BSF eggs are normally laid adjacent to or above, but not on, the actual scraps. Egg cases are bright white in color, whereas empty casings are brown. Once your colony is established within a few weeks, feel free to increase the amount of food scraps added to the pod. **You will know your system is sustainable when all or most of the scraps are digested daily - most of the original contents are no longer identifiable.** In dry climates, moisten food scraps before adding to pod. A properly functioning pod can handle up to 25 lbs of mixed foods scraps per day. Small soft bones from birds and fish will decompose and digest over time, but it is not recommended to add large mammalian bones, clams or thick chitin shells like lobster. Keep out hard pits like avocado and mango – they will not be digested nor quickly decompose.

Collection & Storage of Food Scraps. Before emptying them into the pod, the food scrapes stored in the house, barn, shed or garage will need to be exposed to air in some way or they will start to stink, due to anaerobic microbes. A piece of burlap helps keep out critters and insects, but allows oxygenated air to get through. Again, if the collect food scraps sit for any length of time in an enclosed, airtight container, foul odors may result. Keep the storage and transport vessels **breathable for maximum odor reduction.** To minimize fruit or house flies, cover the food with moist paper towels or moist shredded office paper – these unwanted nuisance flies tend to lay eggs on exposed food scraps, so covering the scraps will help mitigate unwanted maggots

TIP: KEEP AWAY FROM BRIGHT LIGHTS

Because the grubs are negatively phototaxic (they naturally shy away from bright light), it is best to keep the unit in full shade and away from bright overhead lights.



from hitching a ride into the pod. Should they appear, do not worry; the BSF grubs will outcompete the other species and eventually take over the pod.

Acquisition of BSF. If you have native stock of BSF in your area, chances are they will populate your unit without active intervention by anyone. This even happens on patios of multi-story complexes in highly urbanized areas. **BSF seem to be present in most areas of growing zone 7 and higher.** Parts of zone 6 also have native populations, though coverage is sporadic. Adult females are attracted to imperceptibly low levels of food odors emitted from your ProtaPod™ and will instinctively oviposit (lay) eggs near (but not on) the waste materials. The subtle scent of food scraps also serves as a guide to newly hatched larvae. Once a female finds your pod and lays eggs, it usually takes about 2-2 ½ weeks before you notice the juveniles actively digesting the contents. Keep in mind the liquid tea mentioned previously is a strong attractant – a small quantity from another pod added to your pile will draw in any gravid females from the surrounding vicinity, and stimulate them to lay eggs. ‘Painting’ the underside of body’s top lip with the liquid effluent from another pod (or saved from a prior year) will entice gravid females to oviposit their eggs.



If you want to start the formation of your colony earlier in the season, or you reside in an area where few to no BSF are present, you may inoculate your unit with egg cases or juveniles from another existing pod or directly from online or local growers.

Protection from Pets & Wildlife. Many animals are attracted to places that emit the scent of food - the ProtaPod™ is no exception. Do not place in a dog run, or where wildlife such as raccoons, vermin and bear can easily access the system. Electronic chasers and chemical deterrents are only marginally effective, and if critters are hungry enough, they will try anything to get into the unit. Due to the height and reverse slope of the unit, opossums, raccoons, vermin and skunks have difficulty entering the main chamber; however, they can still access the collection receptacle / bucket that holds the tasty grub harvest. As long as the flying female adults have access, the unit may be placed in a secure structure where animals cannot enter, like a chain-link pen or open-air shed.

Secure from Wind. If you live in an area where storms are frequent, or where the wind regularly exceeds 50 mph in velocity, it is prudent to use a few bricks or a concrete block to help weigh down the pod. Alternately, a few ground pegs attached to some bungee cords will help to secure the unit. Once your ProtaPod™ has time to establish a significant amount of content, you may remove the blocks and cords. A thick-gauge wire tether may also be utilized to secure the pod to a fixed structure if theft is an issue.



Household Chemicals. Make every possible effort to keep household cleaners, dyes, solvents, or person hygiene products out of the ProtaPod™. These are living ecosystems that may be adversely impacted by many of the chemicals found in and around the office or home. Do not use man made **or** natural insecticides near the unit – these could repel or possibly harm the adult BSF population in the general vicinity. Treat the pod as you would a worm bin or aquarium – they are sensitive to toxins and you are their guardians - they depend on you for survival! Do not add in feces from pets or domesticated animals that have recently been treated for worms, ticks or fleas – these chemicals may harm the grubs.

Operations

Advice on how to maintain your established system



Raising Soldier Grubs. Once mated, BSF adult females lay between 500-900 eggs in their short life span of 5-8 days. Eggs are oviposited adjacent to food scraps, where they remain until the larvae hatch out. To insure survival, the females do not normally lay the eggs on the food scrap contents within the unit – the body and top lip and cover are the most popular spots. It takes only a few days (approx. 100 hours) for the cream colored eggs to hatch into BSF babies, which then drop into the pile below. In ideal conditions, it take approx. 15 days for the juveniles to grow large enough to begin their migration up the curved ramps and out the chute into the collection bucket. In cooler weather, or if sufficient food is absent for continual growth, maturity and thus crawl off may be delayed several months. As long as the grubs are actively digesting food, continue to feed the colony. **A simple rule of thumb on feeding: monitor digestion rates daily and feed accordingly – only add more scraps the next day if most of yesterday’s waste is consumed.**

Once the climate turns cold and the unit goes inactive and dormant, withhold food scraps and divert all kitchen waste to the compost bin. Dormancy may be delayed by using an old wool blanket as an insulation cover and body wrap. Relocation into a greenhouse will also extend the active season.

Self-Harvesting Soldier Grubs. The ProtaPod’s™ patented design with migration ramps allow for efficient collection of grubs by taking advantage of the natural tendency of the mature individuals to self-separate from the feeding area. Unlike vermiculture, this **auto-harvesting mechanism** is so convenient, all one has to do is place a collection container directly under the exit portal, allowing the durable, dark-colored prepupae to fall into the receptacle. Under dry conditions, grubs cannot negotiate an incline greater than 45 degrees, but if the walls of the unit become soaked, the larvae can bypass the ramps and crawl straight out of the pod. Consequently the body of the pod has been carefully designed with a top grub barrier lip to minimize escapes.

Whatever collection receptacle is utilized, you don’t need to add any bedding to the container. If you insist on doing so, we recommend that fresh, slightly moist bedding be placed in the bottom to keep the grubs sedate. Stick with natural beddings that are free from chemicals. If there is too much moisture in the collection bucket, you may see them crawling up the sides.

When grubs are actively engaged in the consumption of waste, the almost frenzied movement can actually be heard, even some distance from the pod. This distinctive noise is indicative of the enormous power of the species. This combined action of eating and churning creates a natural stirring mechanism that keeps the contents well aerated and draining properly.



Accumulation of BSF Castings. Over time, you will have a slow build up of BSF castings and undigested residue at the bottom of the ProtaPod™. The food to castings+residue volume ratio is approximately 20 to 1. In other words, for every **100 lbs of food scraps that you add to the unit, you receive 5 lbs of castings+residue.** The castings are light in weight, friable and possess a healthy, soil-like aroma. Unfortunately, they are not easily separated from the undigested residue. This blend is not fully decomposed and may be added to a vermiculture system (worm bin) for final processing into valuable worm castings (vermicompost). Because of its pre-digested nature and high cellulose content, the castings / residue mixture is ideal for producing top-quality worm castings quickly, without having to wait months. Please remember that **the typical commercial ProtaPod™ produces only a small quantity of castings+residue RELATIVE to the quantity of food scraps added** – most of the harvest is in the form of biomass (grubs) and liquid effluent. However, this mixture will build up during the active months and instead of waiting until the end of the year to empty, it is recommended that from time to time a portion of this accumulate bottom material be transferred to a worm bin for conversion. Use a small garden shovel or spade, being careful not to scoop out too many of the grubs. Alternately, the castings+residue mixture can also be added to a compost pile at the end of the active season.

BSF POOP:
= BioManure
= BioCastings
= BioCompost
= BSF Residue

Storage of Soldier Grubs. To prevent them from transforming through metamorphosis into winged adults, store in a cool, dark, slightly moist location – bedding is not essential (an ideal temperature range is 50-62 degrees F). Do NOT let them desiccate or expose to extreme temperatures, excessive moisture or possible predation. DO NOT compress them under heavy materials. DO NOT place them in air tight containers starving them of oxygen. They are still alive, just dormant. Bringing the Soldier Grubs up to 75-85 degrees F will reactivate their maturation process and allow them to transform into winged adults.



If you live in an area with little or no wild BSF populations, it is advisable to **set aside approximately 5-10% of the prepupae harvest** under protected conditions so that they may be allowed to pupate and emerge as winged adults. This will insure a locally viable community of wild adults that will continue to populate your pod(s) and other pods in your vicinity. In many instances, you will boost the local over-wintering population, assisting with re-colonization of your pod(s) in subsequent years. This is also recommended for enclosed greenhouse operations.

Seasonal Performance. In the colder regions of the US, the ProtaPod™ can only be actively processing food year round if the unit is provided with some type of insulation or climate control, and the juveniles are **continually** fed on a daily basis (the breakdown of waste will produce internal heat inside the pod that is necessary to maintain proper conditions). Like with redworms and vermiculture systems, the ProtaPod™ will only operate if temperatures inside the unit remain are within a preferred range of 70-110°F. Outside air temperatures may deviate from this range, especially at night or during mid-day. Given these functional limitations, if you proper

temperatures cannot be maintained in mid to late Autumn, we recommended emptying the entire contents of your pod into your compost bin or vermiculture system for final decomposition. These piles will serve as an over winter spot where pupae can remain dormant until the spring. If adequate insulation for your pod is provided in the form of a jacket and /or internal Styrofoam cover, and the unit is protected from cold winter winds, functional activity may be extended a few additional weeks. Under normal conditions, little to no crawl-off will occur during the colder months, but will resume as the outside temperature warms.

During the hot months and in arid parts of the US, desiccation and excessive heat may become an issue. To keep the pile adequately moist, add water to your food scraps and let them soak it up. A large circular piece of moist cardboard placed on top of the pile goes a long way at keeping the moisture and humidity levels within functional parameters. We also recommend a DIY shade cloth cover. Soldier Grubs can withstand relatively higher temperatures, moisture levels, and pH fluctuations – when compared to traditional redworms systems. Make every possible effort to keep the internal temperatures below 110°F to avoid premature crawl-out where lighter colored grubs start to appear in your collection bucket.



Accessing the Pod. BSF juveniles do not fancy bright light. Similar to composting redworms, optimum performance is achieved in full shade. Like redworms, they will naturally flee into the depths of the pile when exposed to light, as a means of avoiding possible predation. It is recommended the access to the pod be limited to late afternoon or early morning, so as not to overly stress or disrupt the colony. For those who do not make a shade cloth cover, **a ½” – 1” moist layer or ‘topper’ of shredded office paper will not only help to keep other species of flies out, but will keep the pile dark and moist.** Use any paper sparingly in your pod – it is not readily digestible by the grubs but will be eventually decompose via microbial activity.

Liquid Effluent. The concentrated liquid effluent should be allowed to continually drain into the mulch below. If a foul odor is detected, immediately check to see if your drainage holes are clogged and quickly remedy the situation. Build up of liquids internally can lead to anaerobic conditions.. Do not permit to pool in the open; the liquid is a powerful attractant for gravid females and may confuse and misdirect their egg laying. Like compost or worm bin effluent, pod effluent is a living liquid, and should be treated as such. It tends to be on the acidic side and if you are going to use as a liquid fertilizer dilute at least to a 20:1 ratio. Until more is learned about the actual microbes present in the effluent, play it safe and only use on ornamentals, as a soil drench for plants like tomatoes or in your orchard.

As a standard precaution, it is advisable to wear latex gloves when handling the tea or cleaning the pod. Undesirable pathogens may find their way into the pod by contaminated food scraps or manure, and as a result may be present in the effluent or undigested residue. Additionally, do not use the liquid on plants intended for immediate human consumption, such as leafy greens, root crops or similar edibles.

Rainfall. As stated previously, never expose a working pod to rainfall – it may flood the colony. BSF adults are non-active during precipitation events, so you may not see any adults flying around until after the stormy conditions dissipate. Never let water pool around the unit if you have you system directly on the ground – always ensure that ample drainage exists for the liquid effluent, as well as natural rainfall. If liquid appears in the collection receptacle / bucket due to condensation, simply empty it into the ground, or allow it to be absorbed by some added bedding.

Ventilation. Convection currents and the movement of the soldier grubs throughout the active pile provide sufficient aeration to the working pod. **The drilling of additional holes in the sides of the body or frequent churning of the contents is not necessary or recommended.** It is advisable that if anaerobic odors are detected, lightly fluff occasionally with some shredded paper. This will help aerate and break up stagnant pockets.

Temperature. If the larvae become heat stressed due to higher than normal temperatures, you will notice premature crawl off lighter colored grubs. Add a half a dozen reusable plastic ice packs (thick plastic only, as thin-walled packs may rupture or be chewed) that can be used again and again.



Troubleshooting

Simple solutions to the most common issues and questions

This section is by no mean exhaustive. Please check online for additional information or simply drop our customer service department a quick email. Please allow a reasonable amount of time for our team of experts to analyze your situation.

Are these creatures dangerous in any way?

BSF adults have no mouth parts – therefore they do not feed or bite in any way. They fly slower than other insects, and resemble dark-colored wasps but do not have stingers. Basically, they are nothing more than a breeder with a very short lifespan. As the mature soldier grubs self-harvest out of the active chamber, they auto-cleanse by emptying their digestive track before entry into a collection receptacle.

Do these colonies spread germs that can harm my family?

The flying adults have a very short lifespan; they do not even possess functioning mouth parts necessary to feed. Consequently, they do not harbor germs that may cause and spread disease in humans. They are not like flies or yellow jackets – they will not cause a nuisance at your next picnic. Because they are so efficient at composting wastes, having an active colonies of juveniles actually *inhibits* the growth of insects that do carry germs, like the common housefly. However, as with all garden tools that are outside in the yard, dirt and bacteria are naturally present, so wash your hands with soap and water after handling your pod or any soldier grubs.

Is my system going to stink up a storm?

Established colonies that are actively processing food wastes will not produce noxious odors, so long as they remain aerobic, and the liquids are allowed to drain away. Units that are given too many scraps could overwhelm the colony – do not overfeed. This is doubly true with newly setup systems. Do not add an abundance of liquid wastes like soups or sauces; this may result in pockets of oxygen deficiency, which can lead to stinky smells. Drain off all liquids in your kitchen waste before adding them to the system. If your pod gets too ‘soupy’ add in some dry shredded paper or cardboard to sop up the excess moisture – then fluff. This will be

Units that are given too many scraps could overwhelm the colony – DO NOT overfeed.



digested along with the kitchen waste by symbiotic microbes. Dried soap-free sponges will also successfully absorb any pooling tea, and not add permanent bulk to your system. Just remember to wear gloves when removing the saturated sponges. As a preventative measure, check drainage holes for clogging periodically. Foul odors are a sure sign that something is off balance. Please understand that a functioning pod will emit a unique, trademark odor indicative of BSF (harmless to humans and pets) – this scent smells a little like ripe fruit compost and is created naturally by the healthy grubs. This odor also helps to deter unwanted arthropods like house and fruit flies from taking up residence in your pod. It is not an anaerobic odor and is complete normal.

I can't find any BSF in my new setup, only house flies – what am I doing wrong?

Most new start-ups that allow BSF to find the pod naturally will invariably attract house flies *faster* than BSF – they are much more common, and normally more closely associated with humanity. Except on certain farms, BSF adults tend to be *less* common in nature, so it might take more time for them to detect the scent of food scraps and lay eggs in your system. Additionally, the hatching time and life cycle for BSF is a little longer than house and fruit flies, so it can take more than 2 weeks to establish and populate your unit. If you see babies after only a few days, chances are they are house or fruit flies, and not BSF. They may be left there, as the BSF babies will soon dominate the pod, displacing the undesirable fly species that may have taken up residence in your pod. If tiny larvae begin appearing in the collection receptacle only a few days after setup, chances are they are house fly larvae. Orange colored, hard-to-the-touch chrysalis are a sure indicator of houseflies. To prevent a house fly infestation in your area, take these tiny larvae before they have a chance to pupate and bury them somewhere in the garden. Better yet, feed them to your fish or chickens!

Most localities in zone 7 and up in the US will have native BSF adults present; however coverage is only assumed, not guaranteed. Should you not wish to wait for your colony to develop naturally (2-3 weeks), we can recommend growers that will ship you BSF year round.

Common houseflies tend to lay their eggs *directly on food wastes*, unlike BSF which lay them some distance away (such as on the underside of the top lip). A great way to **mitigate the presence of regular house and fruit flies** and their babies is to take a circular piece of dampened cardboard (1) a piece of burlap (2) and moist 'topper' of schredded office paper (3) or a DIY shade cloth cover (4) and cover the pile of food waste – this will prevent many of the unwanted flies from accessing the scrap and reproducing via eggs laying– just make certain the cover is not air tight, or you can cause the system to go anaerobic. This in some cases, may also provide additional egg-laying opportunities to adult females. Since paper is not eaten by BSF grubs, *use in moderation*. As a rule of thumb, the pod has been properly seeded with BSF when house and fruit flies are no longer present.

Will my ProtaPod™ attract unwanted guests?

The scent of food has the potential for attracting a multitude of hungry creatures; do not place in areas where the unit is susceptible to access or damage by pets, wildlife or curious children. Raccoons are notorious for raiding grub buckets – consider taking added measures to prevent their entry.

Why does it appear that some foods are being ignored?

Some foods will not be completely broken down by the active juveniles but will be decomposed in the lower compost levels by beneficial bacteria and fungi. Animal bones, like those from pigs or cows, are too hard to be digested by either the BSF juveniles or the biologically rich pile; it is best to refrain from placing these inside the units, unless you don't mind having them mixed in with your casting+residue. Avoid adding the following foods: thick chitin exoskeletons (ex. lobster), bivalve shells (ex. clams), mammalian bones (ex. T-bones), hard pits, and coconut husks.

Can I use my system indoors?

These units are not currently designed for indoor use. BSF adults do not have access to the inside of buildings, and it will be difficult to maintain a prolonged colony without fresh eggs or babies. Near the end of the fall when the weather starts to get cold, you can move un-insulated units into a sheltered area like a garage, greenhouse or shed for extended harvesting.

Why can't I use my ProtaPod™ year round?

You can do this in the southern states, Puerto Rico, Hawaii and along the western coast -- as long as the temperature inside the unit remains well above freezing. To do this, provide an insulation cover directly on top of the inside contents of the active pile, making certain to leave a loose gap around the perimeter, so that the system receives enough oxygen, and does not retain (or lose) too much heat. A circular wool pad cut from an old blanket would provide ample insulation and heat retention. Additionally, wool blankets could be used to surround and cover the entire unit on exceptionally cold nights. The warmth to maintain a hospitable climate inside the pod is generated internally by the active juveniles – do not stop feeding them or the temperature could plummet and the whole colony may collapse and go dormant. The major issue with winter operation: providing the system with a consistent supply of ample food. Keep in mind that little to no crawl-off will occur during the colder periods unless hospitable outside temperatures are present. Year-round operations in a greenhouse is possible, provide you have an active breeding regimen to maintain a continual population.

I don't have any shade, what can I do?

Full shade is required for the system to operate correctly. Units placed in direct sunlight will heat up too much, resulting in early crawl-off of premature adults (lighter in color) and may even cause the entire colony to collapse. Even in full-shade conditions, internal temperatures over 110° degrees will cause premature crawl-off. The best solution is to purchase an inexpensive shade canopy or trellis which protects the entire colony from the heat of the sun. During extended heat waves, do whatever is possible to keep the temperature below the top of the temperature range (sealed ice packs, etc.).

I am going on vacation, will my pod be ok?

As long as your pod is free from predation, curious children, and extreme weather, your system should operate smoothly while you are away. In nature, there is rarely a steady stream of food for any species, so the intermittency of scraps will not be an issue. As long as you have been feeding your colony on a regular basis, the grubs can survive for over a week without being fed (provided it is not too cold). To allay your concerns, feel free to add in some additional scraps the day

before your departure. If you have a friend checking in on your place, have them throw in some scraps for good measure. If it is exceedingly cold outside, we do not recommend withholding food for more than a day or two – the continual digestion is what keeps the inside hospitable and the grubs active – if you stop feeding them the temperature in the pod could plummet and the colony will go dormant.

Ants are hauling off my BSF eggs and babies, how do I control them?

Ants are notorious invaders of compost piles, worm bins and kitchens. In a ProtaPod™, ants don't seem to bother the older pupae in an active pile - only the food scraps, eggs, collection receptacle grubs and newly hatched BSF babies. Nonetheless, there are several means of control that will not involve poison sprays or toxic pellets. The first is a barrier paste called **Tac-Gel** that the ants simply will not cross. We have found it to be an effective means at preventing ants from entering the units. Make certain that the application completely circles the base of the pod and chute tube. It is recommended that the user wear latex gloves while handling Tac-Gel. Alternately, many of our users utilize Vaseline instead. Please realize that if you have any shrubbery or tools touching the unit, ants will use that as a bridge and invade the pod. So keep debris free and clear of the pod at all times. A second, more natural means of control would be a circle of **diatomaceous earth** (DE) on the ground surrounding the system. This powder is the skeletal remains of microscopic phytoplankton, and is composed primarily of silica. The DE causes openings at the seams of the ant's chitin exoskeletons resulting in desiccation. Repeat applications are necessary to maintain effectiveness. The third means of control would be some form of **water barrier** that could take the form of a shallow surrounding the unit. Keep in mind that mosquitoes may become an issue in any stagnant or pooling water bodies and that the water can evaporate quickly.

I am getting immature larvae in my collection container. What do I do?

When the ProtaPod™ system heats up to much, larvae that are not yet ready to pupate will vacate the unit, in an effort to find a cooler location. On very hot days, you might see an accumulation of cream colored grubs in your bucket, instead of the normal charcoal grey-black ones. As soon as the temperature drops, simply dump the entire contents of the bucket back into the pod. If it is not too much trouble, feel free to separate out the black pupae, but it is perfect fine to add them all back into the pile – they will simply crawl out again.

Grubs are crawling all over the interior of the pod and / or collection receptacle, what do I do?

If they are crawling up the sides, chances are there is too much moisture / humidity inside. Adding dry foods or some shredded paper to the pod will absorb the excess condensation so that the pupae will be too dry to climb the sides. Dry bedding may be used in the collection receptacle and will also settle them down considerably, providing perceived refuge.

Can the ProtaPod™ be used for pet waste disposal?

Soldier grubs love feces and will devour them as fast as food scraps, though the bioconversion rate is less than that of mixed kitchen scraps. The ProtaPod™ was designed to digest kitchen leftovers or pet waste, or a combination of the two. We do advice and recommend that if feces are added into a functioning system, be conscious of the pathogen issue. The germs that are



associated with feces are a mixture of good and bad bacteria & viruses – we do not want our users to introduce those into a biological system that produces a finished product that may be used in a vegetable garden or fed to domesticated. Though cross-contamination and transmission between species is unlikely, it is best to use common sense when digesting pet waste.

I don't have a yard, can I still use the ProtaPod™?

Yes. As long as you have a shaded area of your property and shielded from rain, you can still use a ProtaPod™ without the need for an actual yard. Pod has already been tested in multi-story buildings in US cities, and will work with a little extra monitoring and care. It will still be necessary to situate the unit in an area that is completely or partially outdoors, such as a covered patio, porch, balcony, shade popup, rooftop or lanai. Indoor locations are not feasible, unless the flying adults have full access through a window or door, since the wild population of females still need to find the unit and lay eggs. Like with yard-based systems, you must insure that the unit is placed in full shade so that the inside is not allowed to heat up above tolerable levels. Radiant heat from concrete and building materials may indirectly increase the temperature of your location – be vigilant about extreme fluctuations in temperature. Keep in mind that the liquid effluent is continually produced as a byproduct of digested food scraps and must be allowed to drain continuously. This liquid is a powerful attractant for the females, and we don't want it pooling anywhere inappropriate because that might confuse the gravid females on where to lay eggs.

I don't see any grub in my unit, how do I attract females to my pod?

Along with fresh food scraps, the liquid effluent or tea from an existing pod may be used attract gravid females to your system. Simply 'paint' the liquid on the underside of the top lip and nature will do the rest. Also, ripe melons, slightly fermented corn and soaked pet kibble are very enticing to the females.

I don't have use for so many Soldier Grubs – what the heck do I do with all of them?

Many people set up the pod for the specific purpose of end product usage. Most feed the grubs to their chickens or fish. Individuals who own specialty pets can save an upwards of \$100 bucks a month by not having to buy live food at the pet store. Anglers use them as free bait instead of purchasing expensive earthworms. A growing number of users are becoming familiar with the benefits BSF grubs bring to the migratory song bird habitats that are springing up in people's backyards. Along with supplying birdbaths and breeding shelters, it is recommended that carnivorous and omnivorous birds are fed a balanced diet including calcium-rich soldier grubs. Any feeder unit intended for mealworms will suffice as a suitable dispenser of grubs. Your birds will thank you in song! As a last resort, you can always give them away as gifts to any homesteader who has poultry or simply allow the grubs to hatch into adults, thus repopulating the native stock in your area. If you are interested in helping to re-establish the local population of BSF, take the bedding and grubs out of the collection receptacle and place in a shallow tray with some moist soil or compost. Protect the bin from rain, sun, and predation. In as little as 2 weeks, you will have newly emerged adults ready and willing to process wastes in your local vicinity.

I am a really busy person. How much time do I need to put aside for one of these?

Well, the initial setup up is really the most time-intensive part of the whole process. To get this unit up in running, you will need to put aside at around 1.5 to 2 daylight hours, preferably when distractions can be minimized so that you can focus. Surprisingly, once the pod is setup, there is not much additional work, other than feeding, harvesting and drainage monitoring. Since effluent is replete with microbes, always wear latex gloves when handling. Since the grubs will auto-separate using the patented migration ramps, there is no additional time or effort spent on collecting huge quantities of grubs from the active pile. If you live in an area that doesn't allow year-round operations, you will have to spend some time (approx. 1-2 hours) cleaning and dismantling the unit, so that it can be put away into storage during the coldest months.

How can I keep my unit from overheating?

Depending on your climate zone, you may experience summer temperatures that exceed the tolerable limits of a functioning ProtaPod™. In order to prevent premature crawl of immature larvae, you must decrease the internal temperature of the pod below the upper threshold of 110°F. Freezing food scraps before adding them will help bring the thermal levels down, as will the addition of frozen, reusable ice packs. We do not recommend using liquid gel packs as these could fail, and depending on the contents may poison the inhabitants of your colony. Find ice packs that have a tough, thick shell and resist abrasion. Use several, and switch them out after they have thawed. Raw ice can introduce too much moisture to a system, so we don't suggest adding it to your colony directly. Use raw ice only if you can keep it separate in a container that will not leak, puncture or spill.

Self-Help Matrix

PROBLEM

SOLUTION

Unpleasant odors are coming from the pod	Your system has gone anaerobic. Ensure drainage holes are not blocked. Mix in some drier food scraps, dried sponges or shredded office paper to absorb excess liquid. Fluff pile. Gently break up any pockets of stagnant air with a compost turner or garden tool. BSF colonies do emit a unique, trademark odor that is neither harmful nor offensive, but its distinctiveness is noticeable by most users.
I have housefly and fruit fly larvae in my pod	New setups can get infested with these maggots initially; this is natural. Over the course of the next few weeks, they will be displaced by BSF larvae, which have a longer life cycle. You can reduce their presence by covering the food scraps.
No BSF larvae	BSF adults may not be present in your general vicinity. IF you have some liquid effluent, coat the top lip of the pod with the liquid. If that fails, order some pupae online to get your system started, or gather some larvae and/or pupae from a friend's pod or compost pile.
Dead larvae in the pod	Toxic poisons such as those found in some medications or cleaners may kill your juveniles. Extreme temperatures or dehydration can also harm your colony. Keep out questionable chemicals and protect from severe weather extremes.
Not all food is digesting fast	Some foods like citrus rinds or the thin chitin shells like shrimp will take longer to digest in your pod. It is necessary for beneficial fungi and bacteria to first neutralize acids and break down the materials before the grubs can devour them. Grind up large fish and poultry bones as much as possible before placing them in the ProtaPod™ to insure decomposition and processing.
My unit is heating up too much	Throw some reusable frozen ice packs into the unit or freeze some of your food scraps.
Adult females are laying their eggs in other places	Make sure that the liquid effluent does not openly pool but drains completely into the mulch below. Females have extremely sensitive olfactory reception and will lay eggs anywhere they detect the scent of effluent.
My unit seems too dry	In hot arid regions of the US, the pod can dry out too much. Replenish the moisture by simply adding some de-chlorinated water to your food waste a few hours before dumping in the pod (the scraps will swell with absorbed water). Misting the contents with a spray bottle will also alleviate some of the dryness. A moist, shredded paper topper will also minimize evaporation. Warning: NEVER pour water directly into your unit!
The sight of an active pod makes me sick to my stomach.	It is normal to have the entire pile moving and wriggling. A soothing chamomile tea or back massage from a friend or co-worker will help calm your nerves. Just keep reminding yourself that all stages of the BSF are completely harmless, and will not transmit disease. Focus on the savings from not having to buy chicken or fish feed.
My mature grubs are not crawling out of the pod	Overly dry conditions and cool outside temps inhibit crawl off. Moisten the active pile with a spray hose nozzle or water bottle to encourage crawl-off. If it is late in the season and you still have loads of grubs, you can force migration by adding bottom heat in the form of a electric seed pad or electric blanket. Don't overheat and make certain the contents are moist.

<p>My entire colony has collapsed – how is that possible?</p>	<p>We have seen active colonies suddenly collapse during the growing season that was not due to the onset of cold weather. While the actual cause may vary, we have traced ours back to the introduction or exposure of the colony to chemicals – it is very important that you are vigilant on preventing harmful substances from entering the pod.</p>
<p>There are small cream colored juveniles in the collection bucket</p>	<p>Heat stress causes early crawl-off. During heat waves or when the pod exceeds 110°F, you may find younger, lighter colored grubs in the collection bucket trying to escape the heat. Simply separate and place them back in the unit so that they may continue to grow. For convenience purposes, you don't even have to separate the two kinds; simply throw the whole batch back in and the mature ones will crawl out again.</p>

Glossary

Definitions to key words and concepts

ProtaPod™ – the name for the polyethylene unit that houses the BSF colony

Soldier Grubs – the self-harvesting, auto-separating prepupae that accumulate in the collection receptacle. They are an ideal bait, fish food, or bird feed - and may also be fed to livestock or pet reptiles. They may also be used to inoculate compost bins that accept food scraps, in order to speed up the process of decomposition.

BioCastings™ – this is the compost at the bottom of the ProtaPod™ unit that may be used directly as a soil amendment, or as a precursor for production of vermi-castings, made by redworms. It is also called BioCompost or BioManure.

Bioconversion – is the conversion of organic materials, such as plant or animal waste, into usable products by biological processes or agents.

BSF – the acronym for Black Soldier Fly

Clay – soils that have a preponderance of fine particles making them almost dough like in texture. They act as a barrier to water, and can prove detrimental to proper drainage. Use soil conditions, humus or gypsum to amend heavy clay soils and improve porosity.

Effluent –the nutritious, biologically active liquid effluent that is the by-product of digestion of food scraps in the ProtaPod™. The primary component of most household food scraps is water, which collects at the bottom of the unit. In order to maintain aerobic conditions, this liquid must be allowed to drain continually.

Gravid – is a term used in entomology to describe a mated female insect that is carrying fertilized eggs

Larvae – the juvenile form of the BSF. These are what hatch out of the eggs and are the main recyclers in the ProtaPod™

Oviposit – the act of laying eggs by gravid females

Metamorphosis – the transition from juvenile to adult form. This process is analogous to the development of a butterfly from a caterpillar.

Prepupae – the dark colored, mature grub that is the life cycle phase, which crawls out of the pod

Prota™ Culture – the process by which a significant portion of the proteins and lipids in a food waste stream are captured and recycled, rather than degraded, into usable biomass by a beneficial decomposer.

Pupae – the dormant, slightly elongated lifecycle phase before the grub becomes a flying adult

Puparium – the pupae enclosed in its semi-hard, chitin skin

Redworms – the most common segmented annelid used in worm bins and vermiculture systems. Also called red wigglers or composting worms.

Vermiculture – the rearing of segmented annelids, specifically composting redworms, for beneficial end products including, castings (poop), tea, and worms.

Vermicastings – the finely ground finish material in a worm bin (also called worm castings)

Vermi-Compost – this is another name for the worm castings, or worm poop.

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Bruce Deuley

Jerry Walper

Mindy Jaffe

How to Contact Us

There are multitudes of ways you can reach us listed below

Prota™ Culture

PO Box 660675 # 15135
Dallas, TX 75360
Toll Free: 866-443-1614

Corporate Office & Research Facility

47-505 Lulani Street
Kaneohe HI 96744
Main Phone: 214-509-6000
Facsimile: 214-279-0445
cs@thebiopod.com

Mainland Offices

755 Darius Pearce Road
Youngsville NC 27587
Main Phone: 214-509-6001 (E.S.T.) – 10-4 M-F
Fax: 949-272-3724
cs@thebiopod.com

Warehouse Facility

368 Harris Jones Road
Louisburg NC 27549
949-933-1625

Internet / World Wide Web

<http://www.TheBioPod.com> - information including public forum
<http://www.CompostMania.com> - sales and ordering
<http://esrint.com> - company history