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The Natural Farming Concept: A New Economical Waste Management System for Small Family Swine Farms in Hawai'i.

Most Frequently Asked Questions on the IDLS Piggery

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Introduction

One of the most critical issues facing large- and small-scale livestock operations nationwide, including Hawai'i, is the development and implementation of cost-effective pollution-prevention technology. Livestock producers continue to seek best management practices (BMPs) that are effective, economical, and practical and that are also in compliance with new US EPA laws. In Hawai'i, the State Department of Health, USDA Natural Resource Conservation Service, Hawaii Soil and Water Conservation Districts, and the University of Hawai'i Cooperative Extension Service have been working diligently to address both federal and state waste management compliance needs for local pork producers (Deenik and Hue 2004). As a result, the industry currently implements effluent irrigation, composting, deep litter technology, lagoon storage, and solid separation as possible solutions for on-farm nutrient management (Fukumoto et al 2000). Unfortunately, due to new and revised EPA regulations, which now include nuisance odor and vector components, many of these strategies no longer meet federal criteria for BMPs.

In 2006, during a visit to the Janong Natural Farming



Pigs thrive in an IDLS system.

Institute in Korea, two extension agents from Hawai'i (M. DuPonte and D. Sato) were introduced to a system of waste management with the potential to be implemented as a BMP under federal regulations. The combination of naturally collected microorganisms, green waste deep litter, and a piggery design with strategic solar and wind positioning was being practiced in several countries in Asia and the Pacific Basin. Over the past six years, these concepts have been

tested in Hawai'i to provide small swine farms with another BMP that is in compliance with current EPA regulations.

The purpose of this fact sheet is to address the most commonly asked questions about the inoculated deep litter system (IDLS) piggery.

What is IDLS?

Inoculated Deep Litter System, or IDLS, is a relatively new best management practice (BMP) that addresses the manure treatment process for swine confinement-rearing operations. This differs from previous deep litter systems used with swine, which did not involve inoculation, a key component of IDLS.

Who developed the IDLS system, and how long has it been in existence?

Master Kyu Han Cho of the Janong Natural Farming Institute in South Korea developed this sustainable farming method based on generations-old practices from Japan and South Korea combined with his graduate education in agriculture and veterinary science. Starting in 1965, he and some colleagues perfected the Natural Farming method, building numerous livestock facilities throughout Asia including in South Korea, Mongolia, China, the Philippines, Thailand, and Vietnam. Many of these are maintained to this day, reportedly odorless, fly-free, and able to sustain green waste material for up to 10 years without removing it from the system.

How does an IDLS system work?

IDLS incorporates four components: 1) self-collected, site-specific (or indigenous) microorganisms (IMOs), 2) green waste, 3) natural ventilation, and 4) facility positioning relative to sunlight. The livestock facility is kept dry with natural ventilation and sunlight, which promotes proper fermentation of the pen litter, itself a combination of green waste and livestock waste. This in turn prevents nuisance fly breeding and the odors generated by the proliferation of undesirable organisms.

How do I incorporate the different components of the IDLS system when building a piggery?

- **Solar positioning:** The building's foundation is positioned from north to south, with the south end serving as the entrance to the facility. This maximizes sunlight traveling east to west, which provides adequate ultraviolet light, heating, and drying. Sunlight and ventilation help to promote drying, thus preventing liquid accumulation (from livestock waste, watering nipples or troughs, and rain) in the litter. This deters the fermentation process from turning anaerobic and eliminates conditions that promote odors and fly breeding. (Note: This orientation applies to the Northern Hemisphere; positioning should be reversed for application in the Southern Hemisphere.)
- **Natural ventilation:** The building is designed with a high (14 ft) vented roof and walls (10 ft) that have openings to the outside. Cool trade winds are allowed to blow through the building, forcing warm air to rise and be eliminated through the vented roof. This helps



Cut logs in IDLS system.

to dissipate heat generated from microbial fermentation in the litter, keeps the litter dry through constant air movement, and cools the facility during the hot season. During the rainy season, simple roll-down siding can be installed to keep rain out.

- **Deep litter:** In order to fulfill EPA regulations, which require an impervious bottom to all waste-handling facilities, there must be either a concrete slab or a thick (40 mil) plastic liner as the base of the building. Five layers, with a combined minimum depth of 4 feet, are then strategically laid down to start the IDLS. The first layer consists of cinders mixed with bio-char (not charcoal briquettes; Hunt et al. 2010), spread roughly half a foot deep. For more information on biochar, please refer to the CTAHR publication “The basics of biochar: a natural soil amendment” SCM-30 (Hunt et al. 2010). It is available free of charge at <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/SCM-30.pdf>.

The second layer consists of cut logs piled to a depth of 2 feet. Logs should be at least 3 to 4 feet long and a minimum of 2 inches in diameter (larger, longer logs deter pigs from rooting them to the surface). The third layer is comprised of either banana leaves or coconut fronds covered with assorted green waste, spread a foot deep. The next step is to lightly spread about one pound of 1:1 IMO-4 and soil over every 50 square feet of surface area in the IDLS pen. For example, a 100 sq ft pen will require one pound



Green waste layer in IDLS system.

of soil inoculated with one pound of IMO-4 applied as the fourth layer. The final step is to add a layer of sawdust about half a foot deep.

Two weeks before introducing animals into the pens, activate the microbes one time only with a mist spray of lactic acid bacteria (LAB) solution and fermented plant juice (FPJ) (both diluted 1:1000 with water) to lightly moisten, not saturate, the sawdust layer. You can add animals to the pen once you smell a yeasty odor in the litter, a sign that the microbes have been activated and are at work in the pen.

- **Microorganisms:** The only microorganisms that should be used are those collected by the producer from the specific site of the facility. The profile of indigenous microorganisms may vary greatly from island to island, from windward to leeward coasts, and even between neighboring properties. The initial, one-time misting with LAB and FPJ activates the microbes to increase in number. To learn how to make these activators, IMO-1 to -5, and other inputs, please attend a Natural Farming Input-Making class, or contact the Hawai'i Natural Farming Cooperative (drake@farm-science.com).

How do I collect IMOs?

Please refer to the CTAHR publication “How to Cultivate Indigenous Microorganisms,” BIO-9 (Park and DuPont 2008). It is available free of charge at <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/BIO-9.pdf>.

How often do I need to inoculate the IDLS system with IMOs?

The IDLS needs only ONE initial inoculation with IMOs. You will never need to inoculate the system again unless you decide to completely clean out the pens. Once the system is set, the IMOs are self-sustaining (self-propagating, self-limiting).

What kind of green waste can be used?

A producer can use any type of green waste available. Commonly used materials in Hawai'i include tree trimmings, banana leaves, coconut fronds, bamboo, sawdust, and grass and hedge clippings. Do not use treated lumber or sawdust, or any plants that are poisonous (example: oleander, other plants with milky sap) or high in oil content (example: seed or nut oil by-products, including macadamia nuts, shells, hulls, or husks).

Do I need to add more green waste to the system once it is set?

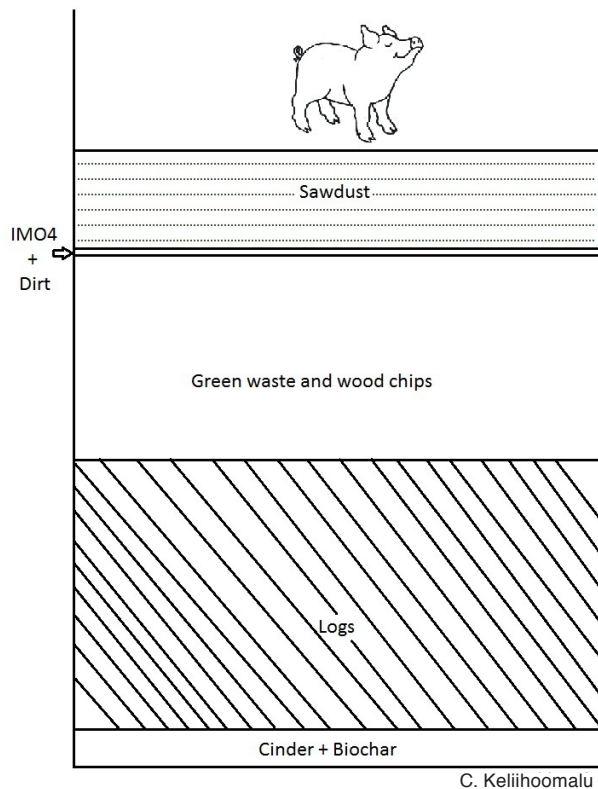
Yes. New green waste must be added periodically to maintain an optimal carbon to nitrogen ratio. Frequency depends on the number and size of animals in the pens and the type of green waste. As a rule of thumb, it is time to add more green waste when the log layer becomes exposed. You do not need to add any more IMO-4 when adding new green waste to existing litter. It is not necessary to add another layer of sawdust over new green waste.

When do I need to clean out the pens?

The system does not need to be cleaned. Continue to add more green waste as the existing layer ferments and composts. IDLS systems are known to go for more than 10 years without being cleaned out.

Can I use the fermented litter as compost in my garden?

The fermented litter can remain in the pens without being removed, but you may use it as compost. However, it should not be sold, as proper documentation of temperature and turning is required by the Hawai'i Department of Health for compost sale. Wait at least 6 months from the start of your system before removing litter to use as compost on your property. Remove only up to one-third of the compost at any one time; allow at least 6 months between subsequent removals.



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Diagram showing layers in IDLS pen.

How do I troubleshoot the system when problems arise?

- **Foul odor:** Any unpleasant odor usually means that excess water has entered your pens, due either to rain or to leaky watering devices. Remember, no pen wash-down is needed with IDLS. If you wash down adjacent walkways or other structures, do not allow runoff water to enter your piggery. Excess water imbalances the microbial fermentation process. To correct the situation, simply spray the pens with diluted LAB solution to lightly moisten the litter.
- **Flies:** Flies should not be present, since conditions in IDLS pens discourage fly breeding. As with foul odors, the presence of flies may indicate that excess water has entered your pens (see above). If flies are being attracted to exposed manure, rake the manure toward the middle of the pen and cover with green waste. Once allowed to ferment, the manure will not attract or breed flies.

- **Exposed logs:** This usually means it is time to add more green waste to the top of the pens. You need not re-inoculate the pens.
- **Compost:** The composted litter should smell earthy, like good soil. No odor of manure or ammonia should be present. If odor exists, spray pens with diluted LAB and FPJ to reactivate the microbes and encourage their proliferation.
- **Other questions:** For more information, please contact the author at mduponte@hawaii.edu.

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