

THERMOPHILIC COMPOSTING USING A COMPOST FLEECE

Farmers produce a lot of biodegradable waste, and this waste is often dumped anywhere they find a convenient place. This practice of dumping waste not only pollutes the environment through the generation of methane and leachate, but it also facilitates the transmission of many soil-born pathogens. The diseases on one farm, instead of being contained on that farm, are transmitted everywhere.

Also, it makes no sense to collect farm waste, bring it to a centralized composting facility and later transport compost back to farmers. Thermophilic composting temperatures are not high enough to kill all pathogens, and a centralized composting facility, receiving waste from many farmers, creates a high degree of cross-contamination. *Each farm, therefore, should be obliged to compost its own waste.* Raw farm waste should never be allowed to exit a farm.

In dumping waste, the farmer is not only throwing away the means of making a valuable soil amendment, but he is often throwing away one of the most effective means he could possibly have of combating soil pathogens. The idea here is quite simple. Compost allows for the proliferation of beneficial soil microbes, and when present in sufficient numbers, these microbes combat a broad range of soil pathogens.

Clubroot is a serious disease that is quite common in Vietnam, and there is no approved effective chemical control available for this disease. EU composting studies show that when green waste compost is added to the soil at a rate of 30%, this disease is completely suppressed. When onion waste is composted and incorporated into the soil at a rate of 25%, the incidence of *Allium* white rot disease on onions is significantly reduced.

When onion compost is incorporated into the top 15 cm of the soil, this is just as effective in controlling onion white rot as fungicide (Folicur) treatment. Good results were also obtained in the suppression of certain root rots when the right compost at the right amount was incorporated into the soil. These are just a few examples of how compost combats disease.

A sort of “tea” can be made from compost when it is steeped in water. *This liquid is applied as a spray to non-edible plant parts, or as a soil-drench (root dip) for seedlings, or as a surface spray to reduce incidence of harmful phytopathogenic fungi in the phyllosphere. Compost tea has been shown to cause a 173.5% increase in plant growth by mass over plants grown without castings. These results were seen with only 10% addition of castings to produce these results.*¹ All of the beneficial effects of adding compost tea to soil or leaf surfaces are greatly amplified when vermi-compost tea is utilized.

Now that we have some insight into the importance of not dumping waste, of making and using compost and compost tea, we must ask: How do we design inexpensive thermophilic composting units for farmers in Vietnam?

The best and cheapest way lies in laying out farm waste in windrows and covering these windrows with a compost fleece. Making long, sheltered compost bins in cement or brick is far too costly. A compost fleece is a spun-bonded nonwoven fabric that:

¹ <http://en.wikipedia.org/wiki/Compost>

- prevents rainfall from entering the compost (a roof is not needed),
- protects the compost from drying out from sunlight and wind,
- allows for the exchange of gases (the compost breathes),
- retains heat, and
- assures uniform temperatures within the windrow for optimal thermophilic composting.



Note well that rainwater cannot penetrate the fleece, even when all is laid out outdoors. If the waste is properly bulked using rice hulls or some other filler material, the windrow *will not produce leachate*. Therefore a concrete slab for leachate management is not required.

A compost fleece weighs as little as 150-200 g/m². Once or twice a week, the farmer removes this lightweight fabric to turn and aerate the waste. Compost fleece is

inexpensive, and it lasts up to 10 years when manipulated without machines and when not subjected to snowfall. A compost fleece also enables farmers to store manure or even finished compost outdoors without fear of degradation and loss of plant nutrients. It is also commonly used for the thermophilic drying of biomass, as explained previously.

Farmers and scavengers can be easily taught how to create optimal conditions for thermophilic composting. The requirements are quite simple:

- temperature at 65 C for 3 days,
- moisture levels from 55 to 60%,
- CO₂ content not to exceed 20%,
- oxygen level > 5%,
- 30% free air space,
- pH < 8,
- carbon to nitrogen ratio at about 30 to 1,
- undetectable nitrite levels, and so forth.



One 40-foot container will hold about 30,000 m² of compost fleece at a delivered cost of about \$1.00 (20,000 VND) per m² or \$30,000 US (600 million VND) per container. This amount of fleece can cover almost 22,000 m³'s of waste materials at any one time. If the composting process is completed within 40 days, then this amount of fleece can handle over 200,000 m³'s of waste per year.

In the first year, the cost of a compost fleece per m³ of waste composted is roughly \$0.15 US or 3,000 VND. Since a compost fleece can last up to 10 years, the cost of compost fleece per m³ of waste composted is virtually nothing! Keep in mind that brick bins, aeration tubes, concrete slabs and buildings are not needed in composting with a compost fleece. With an investment of less than \$30,000 USD (600 million VND), about two million tons of waste can be composted over the 10-year lifetime of this fleece.

In an urban setting, it is not necessary to transport waste materials over long distances in order to compost them. As we have noted previously, households or even entire streets can be supplied with swatches of compost fleece. Scavengers could collect and transport waste down a street where a small composting site could be made available to them by the city. Scavengers could also scour markets in search of compostable materials, and they could also be provided with nearby sites where they could compost these materials. Composting sites could be set up throughout the city wherever waste transfer stations are currently located, or they could even be set up on empty city lots. The possibilities here are endless.

A good compost sells in Vietnam from 500,000 to 1,000,000 VND per ton or \$25 to \$50 US per ton. If a scavenger sells five tons of compost per month, she would make more money than she is currently making dealing in recyclables. If she collects cured residue from mesophilic bins and vermi-composts this material, she could have a product worth up to \$500 US dollars per ton. She might buy biochar from households and businesses, and blend it with either compost or vermi-compost to create additional high-value products. In all of these scenarios, she makes a lot of money.

Roughly three tons of waste will produce one ton of finished compost.² Therefore two million tons of waste represents about 666,000 tons of finished compost. At a sales price of \$25 USD per ton, this represents gross revenue to scavengers of \$16,600,000 USD or 333 billion VND. This is not bad for an initial investment of \$30,000 USD of compost fleece.

A final note of caution here is in order. When we see the value of compost and how easy it is to produce with a compost fleece, we might be tempted to turn this into a “big business.” Then comes the idea of a centralized composting facility supplied by a large fleet of trucks. On this site there might even be fancy compost turning equipment as well as equipment to manipulate mechanically the compost fleece. All of this looks so modern and so good, but in most instances, it is the wrong economic model for Vietnam and will fail. If somehow this model is successful, it will leave behind a large carbon footprint, the cost of making compost will be high, and many poor people will be deprived of a means of income.

² In most cases it takes two tons of waste to produce one ton of finished compost. But if the raw waste has a moisture content of over 90%, and if no dry filler material is added (as when perforated pipes are used), it might take as much as five tons of waste to produce one ton of compost. In the composting of cabbage waste in Dalat, it takes three tons of cabbage waste plus dry filler to produce one ton of finished compost.