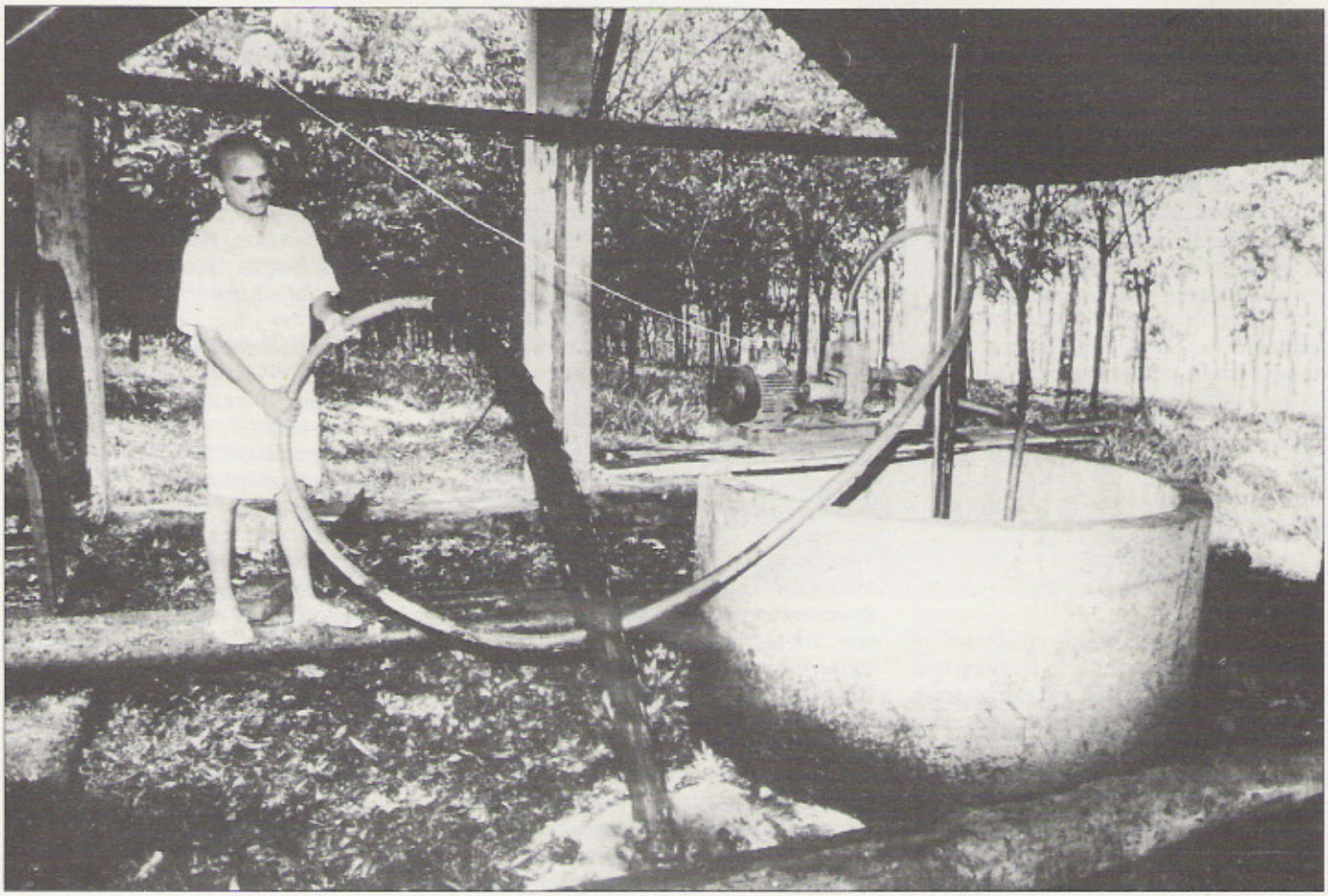


The modified anaerobic composting system

On 28 June 1994, Mr. K.T. Thomas Kuruvinakunnel was awarded the 1994 gold medal for innovations in sustainable farming techniques, sponsored by the United Planters' Association of Southern India (UPASI), the Indian Institute of Management in Ahmedabad and the central government organisation Coconut Development Board. In this article Mr. Thomas describes the compost-cum-biogas technique, which is part of an integrated rubber-based organic farming system.

K.T. Thomas Kuruvinakunnel

I am a farmer from the State of Kerala in south India. The soil is laterite in nature but fairly fertile. Rainfall is abundant, about 150 inches a year. However, more than three quarters of it falls down in the monsoon months of June to early September. I inherited a 19 acre farm monocropped with rubber, on which, in the name of modern agriculture, several unsustainable practices were followed. I had different ideas - I visualised a farm that would be totally selfsufficient. My idea evolved gradually and therefore also the various components of the system. Organic manuring was introduced gradually and increased till after several years chemical manuring was stopped altogether. I did not experience any drop in yields whatsoever. My underlying concept in farming is to encourage the growth of visible soil organisms like the earthworm and also fungi and bacteria that are not visible. The entire operation on the farm focuses on integrating various systems by which the productive capacity of the land could be utilised with minimum use of outside inputs.

Composting

The composting system which I have named the "modified anaerobic composting system" (MACS) is operational since 1986 and different from other methods of composting. The most important advantage of the anaerobic system is that the material's volume is not much reduced as a result of composting. In other words, from a given quantity of raw material, a greater volume of compost can be obtained by the anaerobic process. This relative increase in compost volume means an increase in the population of microorganisms.

The system consists of a pit of 21 feet long, 16 feet wide and 17 feet deep. A well-like structure is built in the middle of the pit by lowering down precast concrete rings of 3 feet high, 5 feet in diameter and 3 inch thick. The well is constructed so that it rises 3 feet above the surrounding ground level. The floor of the pit is plastered and slanted towards the well. The well floor is also plastered and is 3 feet deeper than that of the pit. Large holes are made towards the bottom of the well to help the easy movement of liquids from the pit into the well. The pit is gradually filled with materials as shown in table 1, as and when they are available. Because from my neighbours organic materials are easily available, I use similar materials generated on the farm for mulch. The cost mentioned in the table is for the labour of weeding and transportation of materials to the MACS site. The ratio between carbonaceous and nitrogenous material thrown into the pit is kept at such a level that decomposition is not retarded. If too much carbonaceous material is added, decomposition will slow down. This optimum ratio I have learned through experience. It takes about a year to fill, but the

time for decomposition is only about 30 days. Since all material is emptied out together, the lower layers lie in the pit decomposed for quite some time. This year, because of the large quantities of market wastes available, the pit has been filled a second time. Water is added periodically so that the height of the water column is always maintained at a level 3 to 4 feet below the surface of the material being put into the pit. The water passes through the many layers of material and rises up in the well with a dark brownish colour and a slightly viscous nature. A slurry pump operated by electricity is engaged to pump this liquid from the well back onto the material in the pit. The operation is carried out for 2 hours every day.

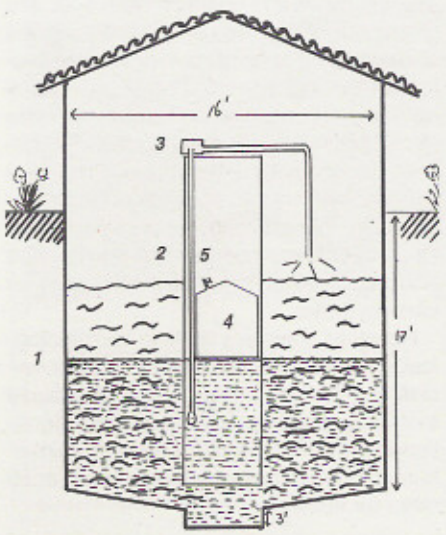
Table 1:
Materials to fill the pit

Material	Pre-treatment, if any	Source	Percentage wght	cost
Weeds, twigs	cut into 1/2	own	6%	nil
& green matter	inch size	neighbours	53%	32%
Poultry manure	no	own & broiler farms	25%	25%
Fish manure	no	market	1.5%	13%
cow's dung	no	own		
cow's urine	no	own	2.5%	4%
cow shed wash	no	own		
Pineapple waste	cut into 1/2 inch size	market	3.0%	nil
Kitchen waste	no	own	0.3%	nil
Dead rats & snakes	no	own	0.2%	nil
Vegetable waste	cut into 1/2 inch size	market	8%	12%
Water weeds	no	own	0.5%	nil
Labour for pumping & excavating				14%

How does it work?

At any given point of time only the upper level of material in the pit undergoes aerobic decomposition while the rest of the material which is underneath and not in contact with air undergoes anaerobic decomposition. All material thrown into the pit undergoes aerobic microbial activity followed by anaerobic microbial activity. Aerobic as well as anaerobic bacterial activity is regulated as per requirements. For example, in case there is a long time gap between two fillings, the frequency of pumpings is increased thereby making the material soggy which in turn smothers aerobic organisms. The well was constructed mainly for collecting the liquid so that it can be pumped back on to the material. The liquid in the well is an ideal breeding ground for bacteria, they multiply at a faster rate. When pumped out on the material in the pit, this liquid rich in bacteria hastens the decomposition process. A modified chaffe cutter which can alternatively be run manually or by electricity is used to cut the material before it is thrown in. The basic requirement is that the liquids that ooze out of the material in the pit be collected and spread over the fresh material on top. The top layers are almost impermeable and hence do not allow gas to escape. Each time the pumping is done, the accumulated methane in the pit, along with the liquid is forced down through the large holes at the bottom into the well where it rises up and is collected in the dome.

The MACS in my farm is fairly large, producing about 80-100 tonnes of finished compost per filling. I was able to complete the whole system for Rs. 21,970 (US$ 1 = Rs. 32). The costs of the fibre glass reinforced gas holder (Rs. 8,000) are included in this. The cost of keeping it operational on a monthly basis is Rs. 50 for electricity charges and Rs. 200 for labour. A scaled down version will be cheaper. The slurry pump can be eliminated, instead the farmer can use a bucket, rope and pulley to pour the liquid over the material. Actually, there are a few small farmers who are using MACS successfully. I feel the main reason is that farmers here are not practising organic farming and hence do not need the compost.



1 = water level
2 = well, concrete rings
3 = motor
4 = methane gas holder
5 = gas outlet

Community level composting?

Since the technology involved is quite simple, the system can be scaled down for use by very small farmers and scaled up to suit the requirements of a large farmer or garbage processing concern. Many farmers have told me that they find making compost very laborious when compared to using inorganic fertiliser. It should also be mentioned that all the small farmers who have constructed MACS are not interested in the gas production. MACS would be more suitable at a community level. The gas production would be much more cost effective in a large sized plant. I myself am trying to work out a deal with the local municipality wherein they would give me sorted decomposable wastes from the market. In return they would have the advantage of not requiring waste dump. I would also persuade the authorities to let the labourers involved in the scheme have the sale proceeds of the sorted iron, plastic and glass (there is a market for it). Further refinements are required, like shortening of composting time, improving nutrient content of the compost and making the system more mechanical so as to make handling easier. ■

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