



## GOVERNMENT OF KERALA

### Abstract

Local Self Government Department - Specifications, Standards, Unit Costs, O&M Protocol, etc., for household level/ small units - Solid Waste Treatment Plants to be permitted by Local Bodies using various type of composting and biogas plant - Modified Guidelines - Approved - Orders issued.

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### LOCAL SELF GOVERNMENT (DC) DEPARTMENT

G.O (MS) No.239/2012/LSGD.

Dated, Thiruvananthapuram, 20.9.2012

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- Read :-1) GO(MS) No.73/2011/LSGD dated 1.3.2011.  
2) GO(Rt) No.1597/2012/LSGD dated 12.6.2012.  
3) GO(Rt) No.1370/2012/LSGD dated 17.5.2012.  
4) GO(Rt) No.718/2012/LSGD dated 9.3.2012.  
5) GO(Rt) No.1457/2012/LSGD dated 28.5.2012.  
6) GO(Rt) No.1691/2012/LSGD dated 21.6.2012.  
7) Letter No.SM/G/2724/2010 dated 13/8/2012 of the Executive Director,Suchitwa Mission.

### ORDER

Government vide order read as 1<sup>st</sup> paper above have issued detailed guidelines for specification, operation and maintenance protocols, unit costs, contract conditions, subsidy norms, etc., for technologies/devices that can be adopted for treatment of solid waste, at household/ institutional level.

Government vide order read as 4<sup>th</sup> and 5<sup>th</sup> above have specified the various indigenous technologies that can be adopted along with other conventional type of technologies, at household level, and as per the Government order read as 3<sup>rd</sup> above have accorded sanction for specifying units cost for pipe composting at household level.

As per the Government Order read as 6<sup>th</sup> paper above, it has been permitted to enhance the unit cost of biogas plants of capacity 0.5m<sup>3</sup> to 30% increase over the unit rate of those fixed based on 2009 PWD schedule of rates specified in the Government Order read as 1<sup>st</sup> paper above. Executive Committee of Suchitwa Mission held on 24.2.2012 (11<sup>th</sup> Meeting) had decided to examine the unit cost specified for various technologies/devices based on the current schedule of rates for facilitating easy adoption. Requests were also received from various Local Self Government Institutions to revise the unit cost of composting units and biogas plants in consideration of increased rate based on the present market values. Considering the above aspects, a workshop was conducted by the Suchitwa Mission on 15.6.2012 at Municipal Hall, Thiruvananthapuram participating the Accredited Agencies and Service Providers approved by the Government, for getting their suggestions for revising the units cost of those items. The Mission had constituted an Expert Committee for evaluating various technologies/ devices and their unit costs based on the above details.

The Expert Committee had evaluated the unit costs and noted that the unit cost already fixed as per G.O read as 1<sup>st</sup> above is based on the PWD scheduled of rates 2010, and therefore it need to be revised. The Committee had suggested that the revised unit cost for various technologies that can be adopted at household level/ small units and recommended for revision of the guidelines in this regard. The recommendation of the Expert Committee has been submitted to the Government as per the letter read as 7<sup>th</sup> paper above.



The proposal for modification of existing guidelines for unit cost, specification and O&M Protocols approved by the Expert Committee were considered by the Government in detail. Now, in suppression of Govt. Orders cited 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> above, Government are pleased to approve the modified guidelines as appended to this order on unit cost, specification, standard and O&M protocols for various treatment technologies, at household level/ small units, for promoting source level treatment of waste in Kerala.

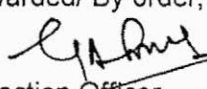
By order of the Governor,  
V.S.Senthil  
Principal Secretary to Government.

To

- 1) The Mayors/ Secretaries of all Corporations.
- 2) The Chairpersons/ Secretaries of all Municipalities.
- 3) The Director of Panchayats, Thiruvananthapuram.
- 4) The Director of Urban Affairs, Thiruvananthapuram.
- 5) The Commissioner of Rural Development.
- 6) The Presidents/ Secretaries of all Grama Panchayats.
- 7) The Presidents/ Secretaries of all Block Panchayats.
- 8) The Presidents/ Secretaries of all District Panchayats.
- 9) The Chairpersons of all District Planning Committees.
- 10) All District Collectors/ Member Secretaries, District Planning Committees.
- 11) The Chairman, Kerala State Pollution Control Board.
- 12) The Director of Public Relations (for immediate press release)
- 13) The Executive Director, Suchitwa Mission, Thiruvananthapuram.
- 14) The Chief Town Planner, Thiruvananthapuram.
- 15) The Director, Kerala Institute of Local Administration, Thrissur.
- 16) The Executive Director, Kudumbashree.
- 17) The Director, IKM, Thiruvananthapuram (for publishing in the Official Website)
- 18) All District Planning Officers.
- 19) All Deputy Directors of Panchayats.
- 20) All Assistant Development Commissioners (General)
- 21) The Director, Local Fund Audit, Thiruvananthapuram.
- 22) State Performance Audit Officer
- 23) General Secretary, Kerala Grama Panchayat Association.
- 24) Secretary, Kerala Block Panchayat Association.
- 25) Secretary, Chamber of Municipal Chairpersons.
- 26) Secretary, Chamber of District Panchayat Presidents.
- 27) The Principal Accountant General (Audit), (A&E)/(LBA&A), Kerala, Thiruvananthapuram.
- 28) Stock File/ Office Copy.

Copy to: The PS to Minister (UA & WM)  
The PA to Principal Secretary, LSGD.  
The PA to Secretary, LSGD.  
LSGD (DA/DB/DD/FM) Department.

Forwarded/ By order,

  
Section Officer.

**Guidelines on  
Decentralized Waste Management: Specifications, Cost and Operation  
and Maintenance Protocols of Household Devices/Small units**

**1. GENERAL CONDITIONS**

**1.1. Details of the unit cost :**

The unit cost approved against each technology is including cost of materials, labour conveyance including installation at the house-hold/user location and commissioning the facility. Cost is also inclusive of all taxes payable. All incidental expenditure including cowdung and other expendable items required for completing the unit has to be provided and it is inclusive of the unit cost. The agency undertaking the supply shall also train the beneficiary in operation and capacity building of the unit. The agency should also provide one year free warranty period from the date of installation of the unit during which they shall repair/ replace all defective items free of cost. The entire facility shall be designed /fabricated/supplied /installed using appropriate technology for the safe use by the beneficiary.

**1.2. Implementing Agency :**

The work shall be executed through Approved Service Providers through competitive tenders/quotations or through Accredited Agencies as per laid down procedures. In any case the rates should not exceed the approved unit costs.

**1.3. Payment Conditions:**

Payment will be made by the local body/institution concerned after completion of the installation and commissioning of the facility. Part payment can be done fortnightly for the number of units completed up to the date of payment. However 25% of the EMD shall be refunded only after completion of the free warranty period of the entire contract/order.

## 3. VARIOUS COMPOSTING UNITS

### 3.1. Vermi Composting Units (1.5 kg/day waste feed)

No.	Specification and Size	Unit Cost in Rs.
<b>Vermi tank of any one set of the following specifications and sizes</b>		
1.	Two numbers of broad mouth PVC, basin 25 litre capacity each or one PVC basin of 50 litre capacity with a partition at the centre, minimum weight of the combined unit be 2.5kg	1,200
2.	Two numbers of broad mouth fibre basin 25 litre capacity each or one Fibre basin of 50 litre capacity) with a partition at the centre (minimum thickness of the fibre body 3mm).	1,400
3.	Mud pots country burnt two numbers capacity 25 litres each	950
4.	Terracotta jars with lids two numbers, 25 litre capacity each	980
<b>Infrastructure requirements common to all units above</b>		
<ul style="list-style-type: none"> <li><input type="checkbox"/> Base layer with coconut fibre and gravel/sand with cow-dung (~5 kg) powder</li> <li><input type="checkbox"/> Wire-mesh lid covers</li> <li><input type="checkbox"/> 200 worms in each tank</li> <li><input type="checkbox"/> Holes at the bottom of the basin/pot/tank to drain leachate/vermi wash to a vessel if kept below</li> <li><input type="checkbox"/> Arrangements for protecting the basin/pot/tank from mouse, red ants, etc.</li> <li><input type="checkbox"/> Thick wet cloth or wet sack piece for covering the waste</li> <li><input type="checkbox"/> Surgical hand gloves for handling waste &amp; manure</li> <li><input type="checkbox"/> Vermi wash collection system is optional</li> </ul>		
<b>O&amp;M Protocols common to all units above</b>		
<ul style="list-style-type: none"> <li>- Chop the waste to size less than 5 cm before placing in the Basin/pot/tank</li> <li>- Thickness of waste layer should not exceed 15cm</li> <li>- Use one basin/pot/tank for the first 15 days and then use the second basin/pot/tank after filling the first</li> <li>- Sprinkle cow-dung powder along with waste</li> <li>- Protect the vermi basins/pots/tanks from mouse, ants and other pests</li> <li>- Keep the waste covered with wet sack or cloth piece</li> <li>- Sprinkle water over the cover sack/cloth to maintain moisture of 50- 55%</li> <li>- Avoid over sprinkling of water and stagnation of liquid at the bottom of the basin</li> <li>- Vermi Basin/pot/tank should not be exposed to direct sun light or rainfall</li> </ul>		



	<ul style="list-style-type: none"> <li>- Prevent introduction of excessive hot, sour and oily substances and also bones, meat &amp; fibre materials</li> <li>- For removing the vermi compost, expose the basin/pot/tank with contents in shaded sunlight for 2-4 hours and remove the compost from the top and use the basin/pot/tank with earthworms for further composting of bio- wastes</li> <li>- Compost taken out should not be dried under sunlight</li> <li>- Renew the base layer annually</li> <li>- Collection of wash out from the basin in the final stages of composting for vermi wash</li> </ul>
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## 2.2. Ring Composting Unit (1.5 kg/day waste) :

No.	Specification and Size	Unit Cost in Rs.
<b>Ring Composting Unit with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>a. Ferro- cement ring of internal diameter 0.7 m, thickness 2.5 cm and height 0.5 m placed over a circular Ferrocement slab of dia 0.75 m and thickness 2.5 cm (without fixing). The ring to have a 30cmx30cm opening on the side at the bottom with a Ferro-cement slab cover of the same curved shape which can be removed and refitted back tightly with a locking arrangement for removal of compost when ready. The ring will also have a hole of dia 2.5cm at the bottom for the leachate to flow out.</li> <li>b. Circular Ferro- cement cover slab of 0.75 m diameter and 2.5 cm thick with central circular hole of 0.30 m diameter to cover the ring. The hole will have a lid cover which can be removed and refitted back for loading the waste into the ring and closing it tightly after loading the waste.</li> <li>c. Option to provide HDPE sheet 0.15mm thickness in lieu of Ferro- cement slab at the base can also be given .in such case the cost can be reduced by Rs350/-</li> </ul>	
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li><input type="checkbox"/> Two sets of circular ferro - cement rings resting on circular ferro- cement slabs and covered by another circular Ferrocement slab with provision for loading the waste from the top and removing the Com- post from the bottom, when ready.</li> <li><input type="checkbox"/> Base layer with cow-dung (~5 kg) powder</li> <li><input type="checkbox"/> Surgical hand gloves for handling waste &amp; manure</li> </ul>	

<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Chop the waste to size less than 5 cm before placing in the basin</li> <li>- Remove the top central lid cover of the ring and drop the waste inside the ring</li> <li>- Spread the waste evenly in within the ring</li> <li>- Use one ring for the first 90 days and then use the second ring set after filling the first</li> <li>- After 175 days, compost from the first ring can be emptied from the side opening and the ring can be used for further waste feeding</li> <li>- Renew the base layer annually</li> </ul>	

### 2.3. Pot Composting Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Pot Composting Unit with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>- Mud pots country burnt about 50cm height and about 35 cm diameter at the centre, with lid covers -2 Nos</li> <li>- Tripod stand 15cm high of appropriate design made of steel/ wood /plastic/steel or brick pedestals for keeping the pots - 2 Nos</li> </ul>	500/-
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Plastic vessel 10 cm high half litre capacity, for collection of leachate coming out of the pots - 1 No.</li> <li>- Trowel small size - 1 No</li> <li>- Painting brush ½ “ size - 1 No</li> <li>- One brick cut into two pieces</li> <li>- Plastic covers - 2 Nos</li> </ul>	
<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Make a small hole on the bottom of the pots carefully without breaking them</li> <li>- Place the pots with lids on the tripods at a convenient place</li> <li>- Place the ½ litre capacity plastic vessel below one of the pots, selected for filling the waste initially</li> <li>- Start filling the segregated bio- waste (do not put slow degrading items and non-degradable items into the pots) daily into one pot and keep the pot closed. This type of</li> </ul>	

	<p>waste treatment is capable of treating 1 to 2 kg of waste per day only</p> <ul style="list-style-type: none"> <li>- Leachate coming out of the pot gets collected inside the plastic vessel placed below the pot. Put some salt powder into the plastic vessel to avoid entry of flies into this vessel. The leachate collected can be diluted with water and used as manure in the garden.</li> <li>- Once the first pot is full, start using the second pot</li> <li>- Once the second pot become full, the waste in the first pot gets converted into compost.</li> <li>- After first week of commencement lot of worms will be seen in the pot. Do not try to kill them, they activate the composting process and they die after 3 weeks</li> <li>- During rainy season open the plastic packets and spread the sheets obtained over the pots and place the brick pieces over the sheet to protect the pots from rains</li> <li>- If the quantity of water inside the pot is more use some saw dust to absorb the water</li> <li>- If too much of flies seen around the pot, make a solution of 'camphor' in coconut oil (Dissolve two Tablets in 25 ml of oil) and apply it on the bottom and top cover of the pot, by means of the brush.</li> <li>- Sprinkling diluted rotten curd /cow-dung solution etc into the waste will speed up the composting process</li> </ul>	
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#### 2.4. Bio-pedestal Composting Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Bio-pedestal Composting Unit with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>- Plastic bucket /vessel with open mouth around 25 litre capacity - 2 Nos</li> <li>- PVC pipe of 2.5 kgf/cm<sup>2</sup> ,ISI marked 200 mm diameter-1.0 m long - 2 Nos</li> <li>- A plastic/ferro cement lid cover for closing the open end of the pipe - 2 Nos</li> </ul>	1,150/-
<b>O&amp;M Protocols common to all units above</b>		
	<ul style="list-style-type: none"> <li>- Take a pit bigger than the size of the plastic bucket/vessel</li> <li>- Keep the plastic bucket/vessel inside the pit</li> </ul>	



	<ul style="list-style-type: none"> <li>- Fill the plastic bucket /vessel with earth upto half the height</li> <li>- Place the pipe vertically into the vessel/bucket above the earth filling</li> <li>- Fill up the bucket/vessel and the pit with earth keeping the pipe portion inside</li> <li>- Keep the open end of the pipe seen above ground, closed with cover</li> <li>- Keep putting the bio- waste (easily digesting items only) into the pipe</li> <li>- Occasional sprinkling of cow-dung solution or approved inoculums into the waste will be good</li> <li>- The bio-waste gets digested inside the vessel and gets distributed evenly into the ground</li> <li>- Plant a tree by the side of the pit which will absorb the manure</li> <li>- Shift the Bio-pedestal column to a different location after a year or so, if required</li> </ul>	
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## 2.5. Mose Pit Composting Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Mose pit composting with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>- Pit of size 60cm diameter and depth 1 m for a family of 5 members.</li> <li>- Diameter of the pit may go up to 1.5 metre for institutions.</li> <li>- Restrict the depth to 1metre in all cases as methanogenic activities get reduced at lower depth.</li> <li>- The bottom of the pit of oval shape</li> <li>- The cover slab of size 75cm diameter (for a pit of 60cm diameter) and thickness 7.5cm.PVC pipe of 100mm dia for domestic type and can be up to 200mm diameter for bigger size pits.</li> <li>- Cover the pit with the cover slab and spread earth over the slab .Only the pipe will be visible above the ground</li> <li>- This method is not suitable where strata are loose</li> </ul>	900 (For family of five members)
<b>Infrastructure requirements</b>		
	- Circular pits of required diameter and depth 1 metre in a	

	convenient location - 2 Nos – Circular /rectangular slabs to fully cover the pit, with PVC pipe of required diameter, 50cm long, vertically placed centrally into the slab - 2 sets – PVC caps to close opening of the pipe - 2 Nos	
<b>O&amp;M Protocols</b>		
	– Ensure methanisation before putting the waste into the pit by sprinkling cow-dung/decomposed waste into the pit – Drop the shredded bio-waste into the pit through the pipe opening daily and keep the pipe end closed always – Pouring of warm water of 35 to 45 C temperature once in a week will accelerate the decomposing – Occasionally pouring of cow-dung mixture or any methanogenic seed into the pit will also be helpful – Keep using the pits alternately for six months each	

## 2.6. Bio-digester Pots Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Bio-digester Pot Composting with the following specifications and sizes</b>		
	– The pots are locally moulded with clean clay/terracotta and oven dried are to be kept vertically one above the other and the pot on the top is covered by a lid. – The pot number 1 and 2 are kept at the top and middle position and are open on the top as well as bottom .The bottom open portion is weaved with plastic wires – Pot number 3 is kept at the bottom and is open at the top and closed at the bottom	1,300 /set
<b>Infrastructure requirements</b>		
	– Clay pots -3 Nos of apex 30cm internal diameter and 30cm high each – Earthen lid cover for pot -1 No – Old news paper – Hand pump (sprayer) – Bio-compost or saw dust (Mavu, Rubber and Aryaveppu dust are not to be used) – Specially prepared bio-culture – Steel fork	

## O&M Protocols

- Sufficient to treat 2 kg of bio-waste per day.
- Place news paper sheets at the bottom of pot numbers 1 and 2 over the plastic thread to form a bio- platform
- Spread starter material 1" thick over the bio-platform (Either prepared bio-compost or saw dust treated with bio-culture be used as starter material. Mix saw dust with diluted bio-culture (bio-culture water ratio 1:50) like preparing rice powder for "Puttu " and keep it in a sack bag duly tied. After two days, saw dust mixture becomes hot inside by the activities of the bacteria. This hot mixture can be used as the starter).
- Spread the shredded waste over the starter layer.
- Spray diluted bio-culture mixture over the waste
- Before closing the pot with the lid sprinkle starter mixture over the waste layer. Ensure water used for mixing the bio-culture does not contain chlorine. For that keep the tap water in a open vessel for two days before use.
- Keep spreading the waste daily as above.
- Third day onwards stir/mix the old waste layer by using a fork without tearing the paper at the bottom, before placing the fresh waste on the top
- Each time spray bio-culture mixture and then sprinkle starter over it before closing the lid.
- Once the top pot is full, shift the middle pot to the top and the top pot to the middle portion and repeat the process of spreading the waste into the new pot on the top in the same way as done earlier.
- Once the second pot also becomes full, tear the paper layer on the first pot (now in the middle position) and push these semi-decomposed waste into the bottom pot.
- Shift this emptied pot to the top position and the top pot to the middle portion. Continue filling the waste into the top pot as per the same procedure done earlier.
- Now all the pots are full and the waste inside the bottom pot must have become compost and ready for use as manure in the garden. Empty it and continue the process as a routine.
- Do not use excess water
- This type of composting is suitable for a family of 4 to 5 members, generating 2 kg waste per day.

## 2.7. Portable house-hold Bio-bin Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Portable house-hold Bio-bin unit composting with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>- Bio - bins are made of HDPE sheets each capable of composting 35 kg of bio- waste. Each bio-bin consists of three parts, one bottom tray to collect the leachate, the main bin compartment for depositing the waste and the top cover to close the bin</li> </ul>	Rs.2,200 (for set of two bins)
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Portable bio-bins - 2 Nos</li> <li>- Cow-dung, black soil, jaggery, yeast, saw-dust or coconut husk</li> </ul>	
<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Cut the segregated bio-degradable kitchen waste into pieces and deposit it in one of the Bio-bins as a layer.</li> <li>- Spray specially prepared bio-culture diluted with water in the ratio 1:100 into the waste layer</li> <li>- Sprinkle a mix of cow-dung, curd, black soil, jaggery, yeast, saw-dust or coconut husk(prepared mixture of these items is available at a cost of Rs.25/kg) over it</li> <li>- Next day deposit the waste of that day over the first layer of waste followed by bio culture mixture Sprinkling of the mix of cow-dung, jaggery, etc.</li> <li>- This bin gets filled up at the end of the month.</li> <li>- Close the bin and keep it separately and start filling the second bin in the same way as done in the case of the first one, till it gets filled up.</li> <li>- After completion of two months, the waste in the first bin gets converted into compost and is emptied and dried before using it as manure. The emptied bin is used to deposit the waste in the third month</li> </ul>	



### Mini Bio-pedestal Unit

Specification and Size	Unit Cost in Rs.
<b>Mini Bio-Pedestal Composting unit with the following specifications and sizes</b>	
<ul style="list-style-type: none"> <li>- Pit size sufficient to bury a domestic type waste basket - 2 Nos</li> <li>- House-hold waste basket with perforations - 2 Nos</li> <li>- PVC pipe 2.5 kgf/cm<sup>2</sup> ISI marked 1.0 m long 20cm diameter - 2 Nos</li> <li>- PVC /Ferro cement cap for 20 cm pipe -2 Nos</li> <li>- Broken stone 12/20 mm size</li> <li>- Tripod –top circular ring with 30cm high 3 legs fabricated out of 8mm TMT bar and three 3mm thick flat iron pieces 30x30mm welded to the ring for fixing of the 200mm pipe by means of screws-duly painted.</li> </ul>	Rs.  1, 50 0/-
<b>Infrastructure requirements</b>	
<ul style="list-style-type: none"> <li>- Pit size sufficient to bury a domestic type waste basket - 2 Nos</li> <li>- House-hold waste basket with perforations - 2 Nos</li> <li>- PVC pipe 1.0 m long 20cm diameter - 2 Nos</li> <li>- PVC /Ferro cement cap for 20 cm pipe -2 Nos</li> <li>- Broken stone 12/20 mm size</li> <li>- Tripod stand.</li> </ul>	
<b>Mini Bio-Pedestal Protocol</b>	
<ul style="list-style-type: none"> <li>- Cut a hole 20 cm diameter on the bottom of the waste basket</li> <li>- Place the waste basket upside down into the pit</li> <li>- Insert the pipe into the basket by 10cm, the pipe has to be tightly fitting into the basket (fix the tripod to hold the pipe centrally after filling up the pit).</li> <li>- Fill up the gaps between the basket and the pit sides with broken metal</li> <li>- Close the pit with earth and only the pipe with the lid cover and the tripod will be seen outside.</li> <li>- Two sets of such mini-pedestals for a house-hold.</li> <li>- Keep dropping the waste into the pipe and keep the open end closed with the lid after dropping the waste</li> <li>- Use one pedestal for one week and second pedestal for next week.</li> <li>- Keep using the pedestals alternately.</li> <li>- Taking out the waste may be done only if required.</li> <li>- Grow a plant near to the pit.10</li> </ul>	



## 2.9. Portable HDPE/Plastic Bin/Bucket Composting Unit

No.	Specification and Size	Unit Cost in Rs.
<b>Bucket Composting with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>- Plastic or HDPE buckets/pots 40 litre capacity with lid cover duly fitted with a tap outlet on the side at the bottom most point .(The tap should be removable and fitted by means of a socket/coupling)- 2 Nos</li> <li>- Coconut shells - sufficient numbers</li> <li>- Bricks 4 Nos for placing the bucket/pot inside the tray.</li> <li>- Small plastic vessel/mug 15 to 20 cm high for collection of leachate</li> <li>- Plastic net 0.5mx0.5m size</li> <li>- Plastic tray appx 0.5m diameter to keep the bucket inside</li> <li>- Wooden spoon (Thavi)</li> </ul>	Rs. 1000/-
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Plastic or HDPE buckets/pots 40 litre capacity with lid cover duly fitted with a tap outlet on the side at the bottom most point - 2 Nos</li> <li>- Coconut shells - sufficient numbers</li> <li>- Bricks 4 Nos for placing the bucket/pot inside the tray</li> <li>- Small plastic vessel/mug 15 to 20 cm high for collection of leachate</li> <li>- Plastic net 0.5mx0.5m size</li> <li>- Plastic tray appx 0.5m diameter to keep the bucket inside (optional)</li> <li>- Wooden spoon (Thavi)</li> </ul>	
<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Stack a layer of coconut shells in inverted position at the bottom of the bucket/pot. Place the plastic net cut to the shape over the layer of coconut shell.</li> <li>- Place two sets of bricks inside plastic tray and keep the prepared bucket /pot as (i) above over the bricks for convenience of draining the leachate into a plastic vessel to be placed inside the plastic tray just below the tap outlet. Placing the bucket inside the tray is optional.</li> <li>- Start loading the bio -waste into the bucket/pot on the</li> </ul>	

	layer of coconut shells daily – Occasionally mix the fresh waste with the old waste by using the wooden spoon. Keep the bucket/pot closed with the lid cover. – One bucket/pot will become full in 25 to 30 days time in a family of 5 members – Close the bucket/pot with lid cover and start using the second set – Keep pouring a mug of water into the waste inside the bucket once in a week .Drain the leachate as it comes out. The drained leachate can be used as manure in the garden – Once the second bucket gets filled, the waste in the first one will be ready as compost. Empty it and reuse the bucket/pot for further storing the waste.	
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### 2.10. Pit Composting Unit

This is the most conventional type of composting prevalent and can be adapted where there is adequate space available in the backyard and located away from drinking water source.

No,	Specification and Size	Unit Cost in Rs.
<b>Pit Composting with the following specifications and sizes</b>		
	– Pits of adequate size to bury the bio-degradable waste of 6 months in each pit – Pits of length 1m and width 60 cm and depth 1m for a family 5 or 6 members. – Bigger size pits for bigger families according to the requirements. – Dig the pits in an elevated place where there is no chance of water getting collected. If not take adequate precaution to avoid ingress of rain water into the pits like raising a small bund around the pits etc.	The work to be got done through MGNREGS Scheme.
<b>Infrastructure requirements</b>		
	– Two pit of adequate size be dug – Tarpaulin or PVC roofing sheets to cover the pits – Cow-dung, loose earth – Tools like showel, mumty etc	

<b>O&amp;M Protocols</b>	
	<p>Spread a layer of cow-dung slurry or decomposed waste on the bottom of the pit before start dumping the waste</p> <ul style="list-style-type: none"> <li>- Start spreading the waste (only bio-degradable) over the cow-dung or decomposed waste layer</li> <li>- Bigger sizes of the waste are to be cut into small pieces for easy de-composing</li> <li>- Sprinkle a small earth layer over it daily to avoid bad smell from the pit.</li> <li>- Repeat the procedure daily -spread the waste first, and then the earth layer.</li> <li>- Once the pit is filled up fully, close the pit by spreading a layer of 15 cm of earth.</li> <li>- Once the first pit is closed, keep dumping the waste in the other pit on the same way.</li> <li>- Once the waste in the first pit becomes compost after a period of 4 to 6 months clear the pit and make it ready for further use. The compost can be disposed off or used as manure.</li> <li>- Protect the pit from rainwater, keep it covered by means of tarpaulin or PVC roofing sheet</li> </ul>

### 2.11. Pipe Composting Unit

<b>No.</b>	<b>Specification and Size</b>	<b>Unit Cost in Rs.</b>
<b>Pipe Composting with the following specifications and sizes</b>		
	<ul style="list-style-type: none"> <li>.- The PVC pipe of 2.5kgf /cm<sup>2</sup> pressure rating ,ISI marked 200mm size-1m long</li> <li>- Length, diameter and number of pipes be increased as on required basis. Other types of pipes like Ferro cement etc can also be used.</li> </ul>	Rs. 900 /-
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Pipe pieces of 200 mm diameter, 1.0 metre long each. - 2 Nos</li> <li>- Top lid cover made out of Ferro cement/Fibre/GI for 200mm pipes. - 2 Nos</li> <li>- Pit of 200mm diameter and depth 30cm</li> </ul>	

O&M Protocols	
	<ul style="list-style-type: none"> <li>- Erect/fix the pipe vertically inside the pit.</li> <li>- Activate the mechanization process by sprinkling small quantity of fresh cow-dung mix into the pipe</li> <li>- Cut the segregated bio-waste into small pieces and drop it into the pipe.</li> <li>- Do not pour any liquid waste into it.</li> <li>- Keep the pipe closed with the lid cover</li> <li>- Occasionally sprinkle fresh cow- dung or approved inoculums into the waste layer to activate the decomposing process.</li> <li>- Keep the lid always closed</li> <li>- Once the pipe is filled up to the top close it and start using the second pipe</li> <li>- When the second pipe is filled the first be removed from the pit and push the decomposed waste out by inserting a steel/bamboo rod from the other end.</li> <li>- Decomposed waste has to be dried at shade and used as compost.</li> <li>- This arrangement for a small family of 4 or 5 members.</li> <li>- More number of pipes/bigger diameter pipes for bigger families</li> </ul>

**3. Portable Biogas Units**

**3.1. Portable (Prefabricated) biogas unit -0.5 m3 capacity**  
 (Digester and gas holder with any one of the following specifications)

No.	Specification and Size	Unit Cost in Rs.
<b>Specification of digester and gas holder</b>		
	i. Unit without water jacket : PVC/LLDPE/HDPE Tanks with circular shape as digester and floating gas holder with total volume 0.5m <sup>3</sup>	8,000
	i. Unit without water jacket : FRP Tanks with circular shape as digester and floating gas holder with total volume 0.5m <sup>3</sup>	8,500
	ii. Unit with water jacket : PVC/LLDPE/HDPE tanks as per (i) above but with water jacket in between the digester and the gas holder	9,000

	iii. Unit with water jacket : FRP tanks as per (ii) above but with water jacket in between the digester and the gas holder	10,500
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Treatment capacity – 2.5 kg of solid waste per day</li> <li>- Digester with gas holder of any one of the specifications listed above</li> <li>- Inlet device with PVC pipe of diameter 110 mm</li> <li>- Inlet chamber with a plastic/FRP mug having circular shape and with a lid.</li> <li>- Outlet devise with PVC pipe of 63mm</li> <li>- A plastic can of 10 litre capacity to be used for collecting slurry/effluent for safe disposal.</li> <li>- If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.</li> <li>- Rubber hose of 25 mm diameter for conveyance of biogas for use with a maximum length of 10 m</li> <li>- Stove with single burner</li> <li>- Control valve for regulating gas</li> <li>* Plant to be established in a place fully exposed to sunlight and away from drinking water source.</li> </ul>	
<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Start up by adding 25kg of cow dung with equal quantity of water</li> <li>- Waste feeding after chopping and mixed with water or part of waste water in the ratio of 1:1</li> <li>- Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water. Rice water, other waste water used for washing of rice, vegetables or meat in the kitchen be used in place of water.</li> <li>- Limit the maximum quantity of daily feeding of waste to 2.5kg/day. A plastic can to be used for collecting slurry/effluent in case of portable units for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.</li> <li>- Clean the inlet chamber after each feed and keep it closed Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana</li> </ul>	



	leaves, coconut shells, coconut coir, pseudo stem etc. Feeding of toxic substances like Fungicides, insecticides, pesticides, detergents, and disinfectant like phenyl, dettol etc. are also Prohibited. – Mix the substrate or rotate the drum at least weekly for preventing scum formation	
<b>Standards</b>		
	– Minimum waste retention time of 40 days – All PVC pipe of class 4 kg/cm <sup>2</sup> – Rubber hose stove and control valve with ISI mark – Particle size of waste not to exceed 20 mm 14	

### 3.2. Portable (Prefabricated) biogas unit -0.75 m<sup>3</sup> capacity

(Digester with gas holder of any one of the following specifications)

No.	Specification and Size	Unit Cost in Rs.
<b>Bio-digester Pot Composting with the following specifications and sizes</b>		
	i. Unit without water jacket : PVC /LLDPE/HDPE Tanks with circular shape as digester and floating gas holder with total volume 0.75m <sup>3</sup>	10,000
	ii. Unit with out water jacket : FRP Tanks with circular shape as digester and floating gas holder with total volume 0.75m <sup>3</sup>	10,500
	iii. Unit with water jacket : PVC/LLDPE/HDPE tanks as per (i) above but with water jacket in between the digester and the gas holder	11,000
	iv. Unit with water jacket : FRP tanks as per (ii) above but with water jacket in between the digester and the gas holder	12,000
<b>Infrastructure requirements</b>		
	– Treatment capacity – 5 kg of solid waste per day – Digester with gas holder of any one of the specifications listed above – Inlet device with PVC pipe of diameter 110 mm – Inlet chamber with a plastic/FRP mug having circular shape and with a lid. – Outlet devise with PVC pipe of 63mm	

	<ul style="list-style-type: none"> <li>- A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal. (If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.)</li> <li>- Rubber hose of 25 mm (¾ inch) diameter for conveyance of biogas for use with maximum length of 10 m</li> <li>- Stove with single burner</li> <li>- Control valve for regulating gas</li> </ul> <p>*Plant to be established in a place fully exposed to sunlight and away from drinking water source.</p>	
<b>O&amp;M Protocols</b>		
	<ul style="list-style-type: none"> <li>- Start up by adding 25 to 50 kg of cow dung with equal quantity of water</li> <li>- Waste feeding after chopping and mixed with water or part of waste water in the ratio of 1:1</li> <li>- Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water. Rice water, other waste water used for washing of rice, vegetables or meat in the kitchen is used in place of water.</li> <li>- Limit the maximum quantity of daily feeding of waste to 5 kg/day. A plastic can to be used for collecting slurry/effluent in case of portable units for safe disposal. If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement.</li> <li>- Clean the inlet chamber after each feed and keep it closed</li> <li>- Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir, pseudo stem etc. Feeding of toxic substances like Fungicides, insecticides, pesticides, detergents, and disinfectant like phenyl, dettol etc. are also prohibited.</li> <li>- Mix the substrate or rotate the drum at least weekly for preventing scum formation</li> </ul>	
<b>Standards</b>		
	<ul style="list-style-type: none"> <li>- Minimum waste retention time of 40 days</li> <li>- All PVC pipe of class 4 kg/cm<sup>2</sup></li> <li>- Rubber hose stove and control valve with ISI mark</li> <li>- Particle size of waste not to exceed 20 mm 15</li> </ul>	

### 3.3. Portable (Prefabricated) biogas unit - 1 m<sup>3</sup> capacity

(Digester with gas holder of any one of the following specifications)

No.	Specification and Size	Unit Cost in Rs.
	i. Unit without water jacket : PVC/LLDPE/HDPE Tanks with circular shape as digester and floating gas holder with total volume 1m <sup>3</sup>	12,000
	ii. Unit without water jacket : FRP Tanks with circular shape as digester and floating gas holder with total volume 1m <sup>3</sup>	12,500
	iii. Unit with water jacket : PVC/LLDPE/HDPE tanks as per (i) above but with water jacket in between the digester and the gas holder	13,000
	iv. Unit with water jacket : FRP tanks as per (ii) above but with water jacket in between the digester and the gas holder	13,500
<b>Infrastructure requirements</b>		
	<ul style="list-style-type: none"> <li>- Treatment capacity – 7.5 kg of solid waste per day</li> <li>- Digester with gas holder of any one of the specifications listed above</li> <li>- Inlet device with PVC pipe of diameter 110 mm</li> <li>- Inlet chamber with plastic container, having circular shape of 30 cm diameter and with a lid.</li> <li>- Outlet devise with PVC pipe of 63mm diameter.</li> <li>- A plastic can of 10 liter capacity to be used for collecting slurry/effluent for safe disposal ( If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement)</li> <li>- Rubber hose of 25 mm (¾ inch) diameter for conveyance of biogas for use with a- maximum length of 10 m</li> <li>- Stove with single burner</li> <li>- Control valve for regulating gas</li> </ul> <p>*Plant to be established in a place fully exposed to sunlight and away from drinking water source.</p>	
<b>O&amp;M Protocols</b>		
	- Start up by adding 50 kg of cow dung with equal quantity of water	

	<ul style="list-style-type: none"> <li>- Waste feeding after chopping and mixed with water or part of waste water in the ratio of 1:1</li> <li>- Daily feeding of easily degradable waste in slurry form or solid waste mixed with equal quantity of water. Rice water, other waste water used for washing of rice, vegetables or meat in the kitchen is used in place of water.</li> <li>- Limit the maximum quantity of daily feeding of waste to 7.5 kg/day. A plastic can to be used for collecting slurry/effluent in case of portable units for safe disposal. (If toilet waste is also treated in biogas plant, slurry from biogas plant to be treated in a septic tank soak pit arrangement).</li> <li>- Clean the inlet chamber after each feed and keep it closed</li> <li>- Prohibited to feed wastes of slow degrading nature like straw, soil, egg shells, fibrous materials like banana leaves, coconut shells, coconut coir, pseudo stem etc. Feeding of toxic substances like Fungicides, insecticides, pesticides, detergents, and disinfectant like phenyl, dettol etc. are also prohibited.</li> <li>- Mix the substrate or rotate the drum at least weekly for preventing scum formation</li> </ul>	
<b>Standards</b>		
	<ul style="list-style-type: none"> <li>- Minimum waste retention time of 40 days</li> <li>- All PVC pipe of class 4 kg/cm<sup>2</sup></li> <li>- Rubber hose stove and control valve with ISI mark</li> <li>- Particle size of waste not to exceed 20 mm</li> </ul>	