



CITY FARMING

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What is Composting?

Composting is the biological decomposition of organic waste such as food or plant material by bacteria, fungi, worms and other organisms under controlled aerobic (occurring in the presence of oxygen) conditions. The end result of **composting** is an accumulation of partially decayed organic matter called humus. It is best medium for growth of plants.



Waste disposal at source

India is likely to face a massive waste disposal problem in the coming years. A closer look at the current and future scenario reveals that waste needs to be treated scientifically and holistically, recognizing its natural resource roots as well as health impacts. The need of the hour is to manage it at the source itself as far as possible. A major portion of the waste generated in households (80%) is organic in nature, i.e., it is biodegradable. The disposal of solid waste can be done effectively through City Farming at the source itself.

City Farming

It is an innovative technology which has been invented and introduced by Padmashri Dr. R.T. Doshi and has been registered under the Indian Patent Act. He invented the drum technique. Dr Uday Bhawalkar invented the Biosanitizer independently. Dr R.R. Deshpande improvised upon the original technology by incorporating the Biosanitizer and developed an efficient system for disposal of organic garbage at source simultaneously growing vegetables, fruits etc. Perceiving the utility of this technology, Ms. Meera Iyer, IFS, Ex- Principal of CASFoS, Dehradun promoted it not only among the trainees but also beyond the walls of CASFoS, Dehradun.

Materials required:

1. Drum (capacity 200 litre)
2. Plants (13)
3. Sugarcane residue /coconut waste (1 sack full)
4. Dry leaves of trees (180 kilograms/2 sacks full)
5. Soil (20-25 kilograms/1 sack full)
6. Bio sanitizer (10 gram)
7. Water (3-4 litre)

Suitable places for installation:

1. Individual households.
2. Schools where meal is served.
3. Rest houses
4. Restaurants
5. Hostels
6. Police/ Forest barracks
7. Housing projects
8. Officers colony
9. Training institutes

Procedure

1. Order the Biosanitizer from the given address.

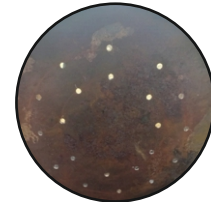


2. Procure a 200-litre capacity drum.

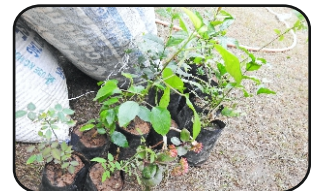
3. Mark 12 holes (10 cm. each) on the drum uniformly (4 in each layer) as shown in figure



4. Get the holes cut using a gas cutter or mechanical cutter. Put few 1 cm diameter holes at base for drainage of water.



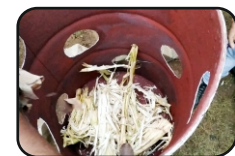
5. Collect other materials such as Plants (13), Sugarcane residue /coconut waste (1 sack full), Dry leaves of trees (180 kilograms/2 sacks full), Soil (20-25 kilograms/1 sack full)



6. Place four bricks at the base and put the drum on it



7. Place 1/3rd of the Sugarcane residue /coconut waste uniformly inside the drum



8. Place 1/3rd of the dry leaf uniformly above it.



9. Compress the layers.



10. Place 1/3rd of the soil uniformly above it. Ensure that these three layers combined reaches the middle of lowest layer hole



11. Plant a sapling in each hole in such a way that its shoot comes out of the hole



12. Repeat step number 8,9,10,11 in above two layers

13. Finally plant the 13th sapling on the top of the drum

14. Put the Biosanitizer uniformly on the top layer

15. Put 3 to 4 litres of water on the top

16. Put 1 to 2 litres of water for next 10 days

17. From the 11th day put 300 grams of biodegradable kitchen waste every day

18. Cover the waste with dry leaves to avoid attention of monkeys

19. Keep watering when required.

Initial cost of establishment

S. No.	Resource /Material	Cost
1	Sun energy	Free
2	Little, water	Free
3	Soil -20 kilogram	Free
4	Sugarcane residue / Coir pith and leaf litter-180 kilogram.	Free
5	Organic waste generated in the house – daily 300grams.	Free
6	Saplings of plants -13	Rs. 390/-
7	Metal drums with 12 holes	Rs. 800/-
8	Biosanitizer-10 grams.	Rs. 1000/-
Total		Rs. 2190/-

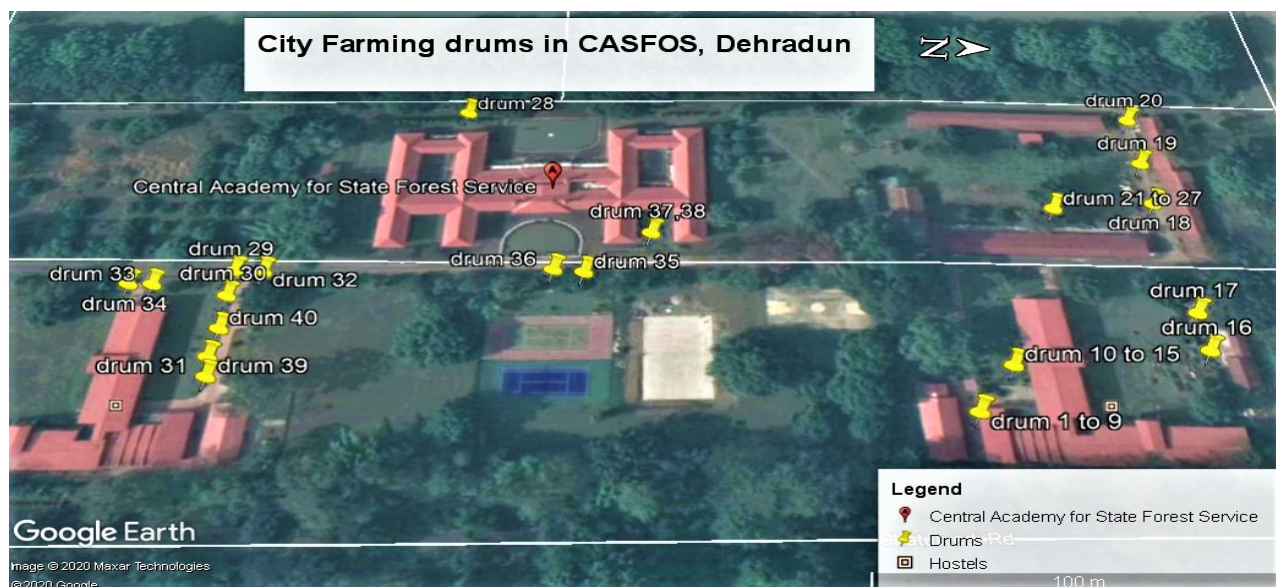
Cost Benefit analysis Per drum:

- Initial Cost of Establishment - 2190.00 Rs
- Total Number of Days - 1825 DAYS (5 years)
- Expenditure for a Single Day - $2190 \div 1825 = 1.20$ Rs/day
- Waste disposal capacity – $1725 * 0.3 = 517.5$ kg

Status at CASFOS, Dehradun (Till 17th April 2020)

S. No.	Date of Installation	No. of drums installed	No. of days	Per day waste disposal (in Kg)	Organic waste used initially (180 kg/drum)	Total waste disposed (in Kg)
1	23-10-2016	2	1272	0.3	360	1123.2
2	28-10-2016	15	1267	0.3	2700	8401.5
3	10-01-2017	1	1193	0.3	180	537.9
4	28-06-2017	8	1024	0.3	1440	3897.6
5	10-11-2017	1	889	0.3	180	446.7
6	24-11-2017	1	875	0.3	180	442.5
7	06-12-2017	1	863	0.3	180	438.9
8	12-12-2017	1	857	0.3	180	437.1
9	20-12-2017	1	849	0.3	180	434.7
10	04-01-2018	1	834	0.3	180	430.2
11	15-01-2018	1	823	0.3	180	426.9
12	23-02-2018	1	784	0.3	180	415.2
13	23-03-2018	1	756	0.3	180	406.8
14	12-04-2018	1	736	0.3	180	400.8
15	19-04-2018	1	729	0.3	180	398.7
16	28-05-2018	1	690	0.3	180	387
17	10-08-2019	1	241	0.3	180	252.3
18	13-10-2019	1	177	0.3	180	233.1
Drums installed		40	Total waste disposed till date			19511.1

Placement of City Farming drums in CASFOS, Dehradun shown through Google Map



Management constrains:

1. Getting the Biosanitizer as it is available in given address only.
2. Mortality replacement.
3. Harvesting of roots.
4. Once installed it is difficult to shift.
5. Lifespan of drum reduces if location is damp.
6. Once rusted or damaged it cannot be repaired.
7. Have to do watering as it can't take water from soil.
8. Line of ants from the drum.
9. Monkey problem if the food materials dumped is not covered with dry leaves.
10. Flies on the wastes if it is not covered properly.



Opportunities:

1. The drums can be painted for beautification or advertisement.
2. Attracts birds and butterfly and increased aesthetics.
3. Can be used for beautification of town along with organic solid waste management.
4. Can be a source of organic vegetable for a household.
5. Can be paired with apiculture if flowering plants are planted in the drum.

List of plants in City Farming drums and their uses:

Sl. No.	Plant spp.	Plant part	Uses
1	<i>Abelia grandiflora</i>	Plant	Ornamental. To prevent soil erosion.
2	<i>Acalyphawilkiesiana</i>	Plant	Anti-fungal ointment
3	<i>Acorus calamus</i>	Roots	Used to make medicine for different types of ulcers, stomach upset
4	<i>Allamanda schottii</i>	Plant	Ornamental, Purgative & folk medicine
5	<i>Aloe vera</i>	Plant	Anti-sunburn agent, shaving gel, used to reduce weight, improve circulation in digestive tracts.
6	<i>Asparagus racemosus</i>	Root	Used for upset stomach (dyspepsia), constipation, stomach spasms, and stomach ulcers. It is also used for fluid retention, pain, anxiety, cancer, diarrhoea, bronchitis, tuberculosis, dementia, and diabetes.

7	<i>Barleria cristata</i>	Seeds, roots and leaves	Antibacterial, diaphoretic and expectorant, anti-inflammatory, seeds as antidote for snake bites
8	<i>Barleria lupulina</i>	Leaves	Antioxidant, anti-diabetic, to stop bleeding, analgesic, anti-inflammatory against insect bites, snake bites, herpes simplex virus
9	<i>Bougainvillea spectabilis</i>	Leaves, stems, flower	Cure diarrhoea, and to reduce stomach acidity. Used for cough and sore throat, Hepatitis & Diabetes.
10	<i>Bryophyllum pinnatum</i>	Leaves	Treatment of diabetes, diuresis, dissolving kidney stone.
11	<i>Calliandra hematocephala</i>	Plant	Anti-oxidant, Blood purifier, Gastro-intestinal protective agent
12	<i>Callicarpa rubella</i>	Leaves, roots	Leaves are used to treat haematemesis, roots are used to treat irregular menstruation
13	<i>Callistemon viminalis</i>	Flowers, Leaves, Fruits, Bark	Antibacterial, Antifungal, Antioxidant, Anti-inflammatory
14	<i>Catharanthus roseus</i>	Plant	Plant extract is useful to treat dysentery and diarrhoea
15	<i>Celosia cristata</i>	Flower and seed	Treatment of bloody stool, haemorrhoid bleeding, uterine bleeding, leucorrhoea and diarrhoea.
16	<i>Cestrum diurnum</i>	Leaves, Aerial parts	Sources of vitamin D3, cytotoxic and thrombolytic activities
17	<i>Cestrum nocturnum</i>	Plant extract	Antispasmodic and as a treatment for epilepsy
18	<i>Citrus limon</i>	Fruit, juice and peel	Treat Scurvy, stomach upset & kidney stone. for common cold, flue and tinnitus.
19	<i>Cymbopogon spp.</i>	Leaves	Antioxidant and antimicrobial properties, Good for Digestion, Regulates High Blood Pressure
20	<i>Dahlia spp.</i>	Flower, Tuber	Economic, Ornamental, Medicinal and nutritional use of tuber (inulin)
21	<i>Elettariacardamomum</i>	Leaves, seeds	treatment of arthritis, sore muscles and lower back pain; cure indigestion, nausea, vomiting; antifungal, antibacterial and antiviral in nature
22	<i>Euphorbia tithymaloides</i>	Latex, Bark, Root, Leaves	Latex: diuretic, purgative, rubefacient and vermifuge, asthma, treat gonorrhoea, applied externally on haemorrhoids, relieve sore throat and cracked lips; Bark: strong purgative; Root: Antiseptic, treatment of snake bites both internally and externally; Leaves: Diuretic, to treat asthma; wheezing in babies; colds; and stomach upset, treat fevers, coughs and colds, and diabetes
23	<i>Excoecaria cochinchinensis</i>	All parts	Treatment of measles, parotitis, tonsillitis, and lumbar muscle strain, to arrest bleeding
24	<i>Gardenium gummifera</i>	Gum resin from leaf buds	Treatment of cutaneous diseases
25	<i>Geranium wallichianum</i>	Root, bark	Used in the treatment of peptic ulcers, toothache, joint pain
26	<i>Hamelia patens</i>	Plant	Used in folk medicine
27	<i>Hibiscus rosasinensis</i>	Flower, leaves	Extract from the flower functions as an anti-solar agent by absorbing ultraviolet radiation. flower and leaves are used in hair care
28	<i>Ixora coccinea</i>	Leaves, Roots, Flowers	Leaves-Diarrhoea, sore and ulcers; Roots-Analgesic, antiseptic, astringent, diuretic, sedative; Flowers- Dysentery, leucorrhoea, haemoptysis and bronchitis
29	<i>Jasminum sambac</i>	Flower, leaves	Anti -depressant, antiseptic, cicatrisant, sedative. Flower are used for removing intestinal worms
30	<i>Lagerstroemia floribunda</i>	Wood	The wood is moderately heavy; moderately hard; somewhat durable, being resistant to termites. Suitable for use under cover, being suitable for purposes such as interior finishing, panelling, sliced and rotary peeled veneer, high class furniture manufacture, carving and domestic flooring
31	<i>Lawsonia inermis</i>	Leaves and roots	Treatment of dysentery and diarrhoea promote menstrual flow. To treat sore throats. Leaves are also treat skin diseases.
32	<i>Mansoa alliacea</i>	Leaves	Analgesic, anti-inflammatory, treatment of arthritis and rheumatism, cold, flu and fever
33	<i>Mentha citrata</i>	Leaves	Treatment of stomach aches, nausea, parasites and nerves
34	<i>Murraya paniculata</i>	Flower, leaves, barks	Oil of flower is used in making medicine, leaves are used to prepare stimulant, tonic and mouth wash, bark are used to make astringent

35	<i>Mussaenda frondosa</i>	Leaves, Juice, Flower, Root, Bark	Leaves-Get rid of intestinal worms; Juice- Eye infections ,jaundice and blemishes of tongue; Flower- Diuretic; Root- Leprosy treatment; Bark- Treatment of body ache, diarrhoea and dysentery
36	<i>Nerium oleander</i>	Leaves, Flower, Root, Whole plant	Wound healing as an antibacterial, Epilepsy, Diabetes mellitus, Asthma, Cardiac illness
37	<i>Pelargonium graveolens</i>	Flowers, Leaves	Prevents nausea, Controls bleeding, Antidepressant & Antiseptic effects
38	<i>Pentas lanceolata</i>	plant	Treat diarrhoea, snake bite, malaria, Ascariasis
39	<i>Prunus avium</i>	All parts can be	Treatment of bronchitis, anaemia, cystitis, oedema
40	<i>Ruellia tuberosa</i>	Plant	Anti-inflammatory, diuretic, anti-diabetic, antipyretic, analgesic, antihypertensive, and gastro-protective, and has been used for gonorrhoea; Also natural dye for textiles
41	<i>Salvia officinalis variegata</i>	Plant	Diuretic, a local anaesthetic for the skin, a styptic
42	<i>Tabernaemontana divaricata</i>	Plant	Antioxidant, antitumor, anti-infection, analgesic
43	<i>Tecoma stans</i>	Flowers, Leaves, Roots	Taken orally for treating diabetes, stomach pains; Root to treat syphilis, Treat intestinal worms
44	<i>Thevetia peruviana</i>	Bark and leaves	Decoction of bark or leaf to loosen the bowels, used as emetic.
45	<i>Tinospora cordifolia</i>	Leaves, Plant	Leaves are expectorant, diuretic. Plant decoction used to treat liver, eye diseases, urinary problems, anaemia, cancer, diarrhoea, diabetes, rheumatism, laxative and cardiac ailments
46	<i>Trachyspermum ammi</i>	Essential oil extracted from Seeds	Rheumatism, Strongly antiseptic, Effective antioxidant and Reduction in blood pressure
47	<i>Withania somnifera</i>	Berry, Root	Attention deficit hyperactivity disorder, Insomnia, Bronchitis, Reduce levels of fat and sugar in the blood

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