



How to make compost to rebuild soil health

**This playbook has been designed for anyone who is going to
directly train farmer(s) to do composting**

This playbook is intended mainly for the use
of Trainers of Trainers (ToTs) and Community
Resource Persons (CRPs)



This playbook was created using **Soil Vasu's** resources

What need/pain point is this playbook addressing?

Organic manure is essential for maintaining good soil health. After a cropping season, it's good practice to apply manure to the soil. For farmers using organic methods of farming, it's recommended that they make farm yard manure (FYM) using waste from their cattle. However, not all farmers have access to cattle and especially for small and marginal farmers, FYM has many drawbacks:

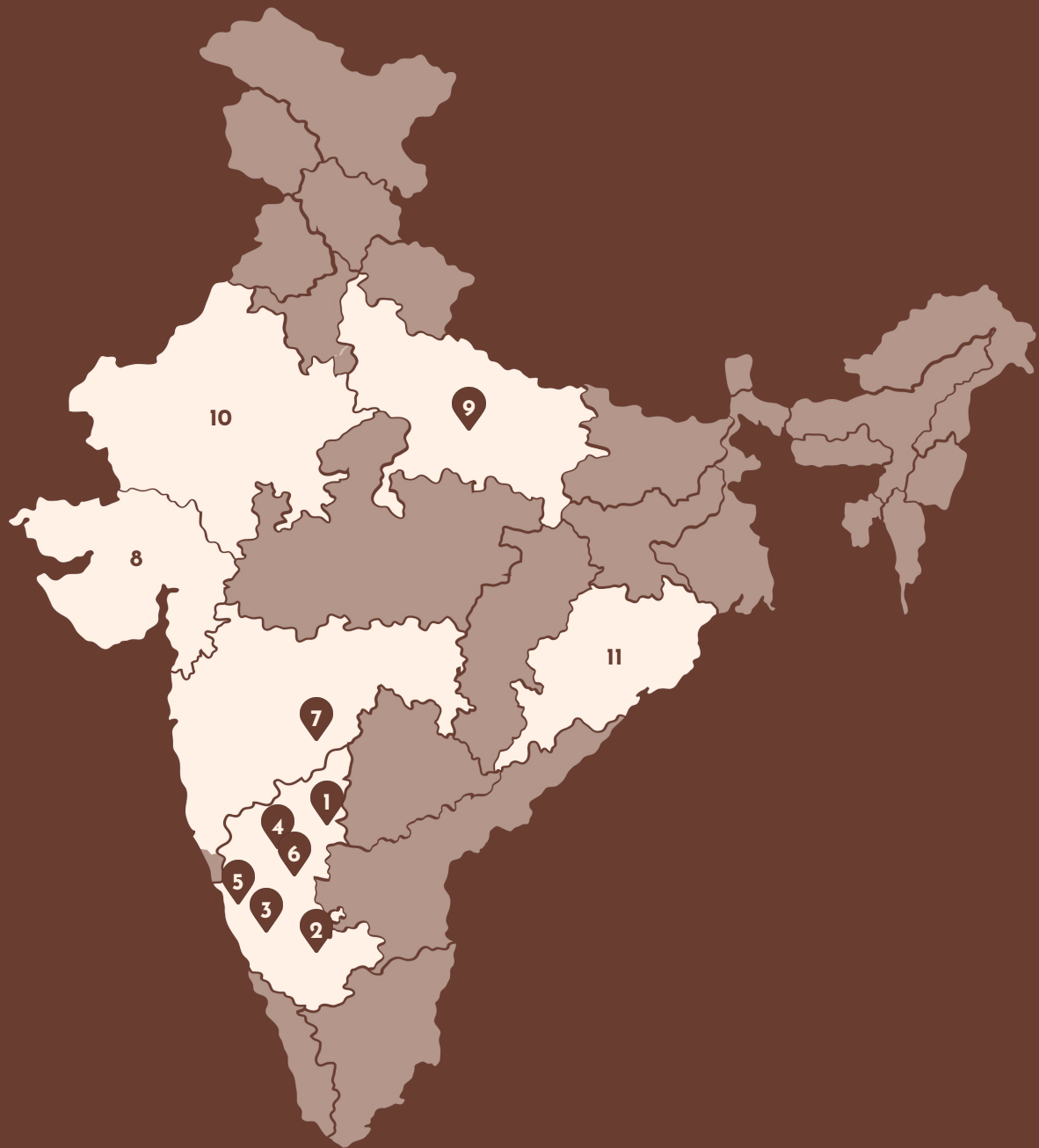
- FYM is not easily available and takes a year to make.
- FYM has no clear proportions of material, and as a result some toxic material also ends up entering the farm.
- Weed seeds also get into the FYM heap and then germinate when you apply manure to the farm.
- Plant pathogens can also remain active in FYM and can affect crops negatively when manure is applied.

A cheaper and more accessible alternative to FYM is composting. However, farmers are not very aware of composting. There are gaps in knowledge, availability of resources, and execution at ground level – this playbook is meant to fill the knowledge gap.

What are the benefits to stakeholders?

Composting helps the farmer to recycle wet-waste near their farms/houses to build high quality manure for their soil. Compost creates stable soil aggregation, improves soil moisture and stops soil erosion. It improves aeration in the soil and adds micro-biota, minerals and humus.

Success Stories



1. Nanjungoad, Bellary, Magadi-ICRA

2. Chitradurga

3. Challakere

4. Parts of Mysuru

5. Chamrajnagar- Purnarchith

6. Kolar-Gram Vikas

7. MH- Kaneeri Math

8. Gujarat

9. Lucknow, UP

10. Rajasthan

11. Odisha

What steps does this solution take?

Option 1 PASSIVE COMPOSTING

Process:

Heap organic materials in a designated space or pit in a corner of a farm. Over a period of time, it will naturally break down and form compost.

Benefits:

- Compost will be ready in 6 months to 1 year
- Minimal effort, you just have to collect organic waste and farm waste and add it to the pile

Drawbacks:

The compost takes a longer time to be ready and we cannot assure quality of manure

Option 2 HOT COMPOSTING

Process:

Heap materials together in layers to maximise biological activity. As bacteria multiply and feed on the organic waste, they respire, generating heat. This heat encourages in turn leads to an increase in bacteria. The heat also kills weed seeds and pathogens and breaks down the waste quickly. Compost can be completed in 3 weeks to 3 months, depending on the waste materials used.

Benefits:

- Ready within 3 months
- 1 cubic metre space yields 800 kg compost.

Drawbacks:

Needs regular attention and 6-8 hours of efforts for maintenance.

Materials required for Hot composting



Dry or Carbonaceous Materials, (High carbon content materials) such as hay, straw, shredded pruning, sawdust and other wooden waste, dried leaves, etc.



Cowdung(as a starter for decomposing the dry and green materials)



Soil



Green or Nitrogenous materials (high nitrogen content), for example green plant materials, kitchen wastes etc)



Hydrated lime and Ash



Water

Optional: Trainer can show a sample of ready compost to show what the end product will look like.

Common materials used in compost heap

The list below by no means complete! Materials recommended should be based on the availability of materials in the area/farm/locally available resources where the compost is going to be made.

Generally, materials with high C:N ratio tend to be dry/brown materials. Low C:N ratio material tends to be green or nitrogenous.

Material	Type (Brown/Green)	Note
Banana residue	Both	Rich in phosphoric acid and potash Rich source of nitrogen for bacteria
Citrus waste	Green	Skins are rich in phosphoric acid and potash
Cocoa bean shells	Brown	Rich in nutrients, particularly nitrogen
Coffee waste	Brown	Earthworms loves coffee grounds
Fish scraps	Green	Good source of nitrogen and phosphorus Do not use too much in a heap as it will attract rodents and flies Use in a layer with plenty of dried material to stop the heap from becoming anaerobic
Grass clippings	Green	Fresh grass is extremely high in nitrogen, but also in moisture. Too much can make a heap turn slimy. Add in a thin layer
Kitchen waste	Green	Mix well with dry material Do not use meat scraps, fat or bones
Dry leaves	Brown	Tree leaves are rich in nutrients and high in carbon. Shred the leaves to make composting easier
Legume crop waste	Green	Rich source of nitrogen, as well as good source of potash and phosphorus

Material	Type (Brown/Green)	Note
Maize cobs	Brown	Must be chopped up before adding to the heap
Manure	Green	Chicken, pig or cow or cattle manures are a rich source of nitrogen
Paper	Brown	Good source of carbon- must be shredded
Phosphate rock (powder)	-	Approximately 65% calcium phosphate, but needs to be broken down before the plant can absorb it. Sprinkle a thin layer on each manure layer when making a heap if available.
Rice husks	Green	Rich source of potassium- breaks down readily
Sawdust	Brown	Good source of carbon- breaks down slowly- allows good air penetration in the heap
Seaweed	Green	Rich source of micronutrients. Higher potassium than manure, but less nitrogen and phosphorus. Mix well with other green layers deep in the heap, as it decomposes rapidly. Good for activating heap
Weeds	Green	Weed seeds will be killed in the heap. Anything that grows can be turned back into the heap
Wood ash	-	Valuable source of potash. Apply only a thin dusting on each layer, as too much can cause a nutrient imbalance
Wood chips	Brown	High nutrient content and a good source of carbon

Proportion of materials



Dry matter

3 parts
(750 kg)



Green matter

2 parts
(1500 kg)



Cow dung

1 part
(50 kg)



Water

To drench the
dried matter
before using
and to make
cow dung
slurry (200
litres)



Lime & Ash

10 kg Ash
and
1 kg Lime



Soil or Silt

To plaster the
compost
after each
layer (500 kg)

Step 1: Select a site



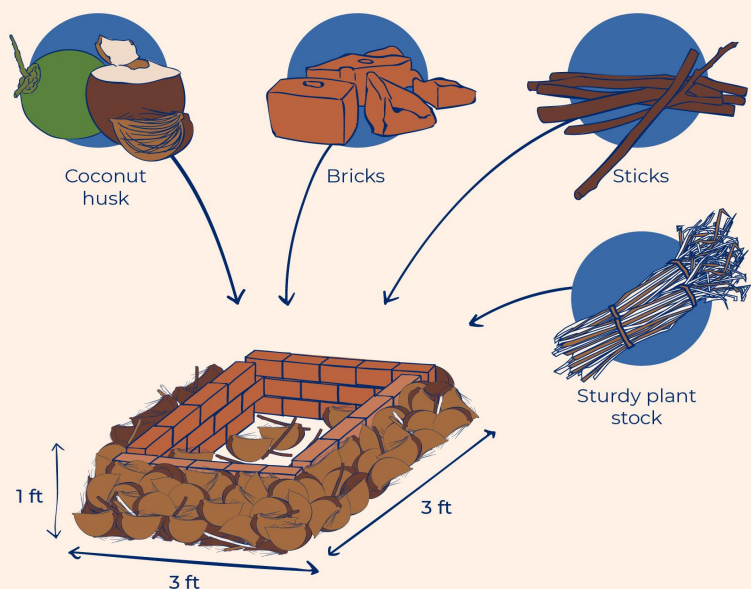
Select a site where a 3 x 3 x 3 ft space is available for composting.

The site should have shaded – space under a tree but not too close to the tree is advisable. Avoid direct sun. If there is no tree, create a small shed with scrap material.

The site should have good drainage where compost can be protected from heavy rain and water logging. Mark the site and clear it by removing any weeds, roots, grass, etc.

Step 2: Create a boundary of 3 ft x 3 ft, slightly elevated off the ground

Collect coconut husk, bricks, sticks, sturdy plant stock or any other material within the marked site to make a base of dry woody material of about 1 ft thickness. This is called tunnelling for aeration. Use local resources only - no need to buy any material for making the pit boundary and elevation.



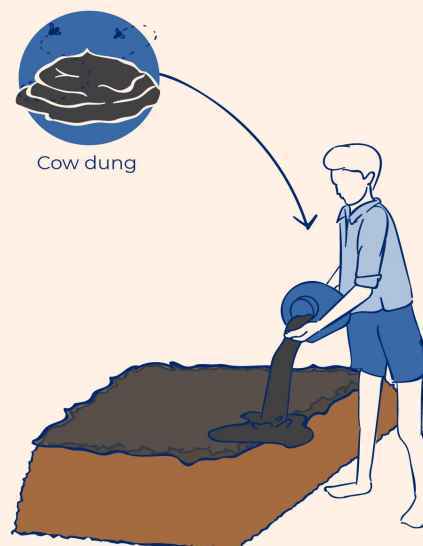
Step 3: Make first layer with dry material



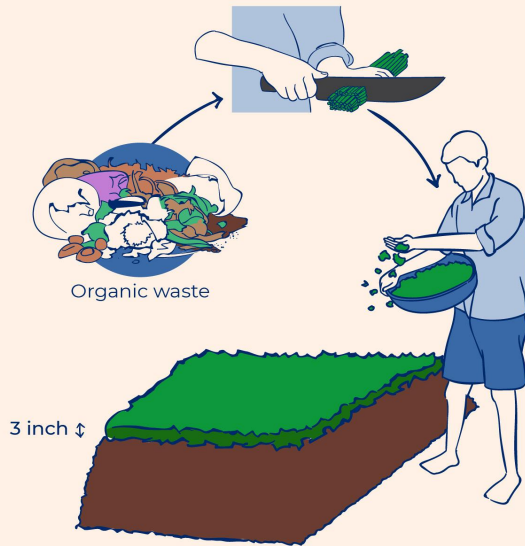
Chop the dry material (hay, straw, shredded pruning, sawdust and other wooden waste, dried leaves, etc.) into small pieces. Soak the chopped dry material up in water, squeeze it, and spread it between the compost boundary.

Step 4: Apply cow dung slurry

Apply cow dung slurry (sufficient to drench the dry material) as a starter for decomposing the materials used.



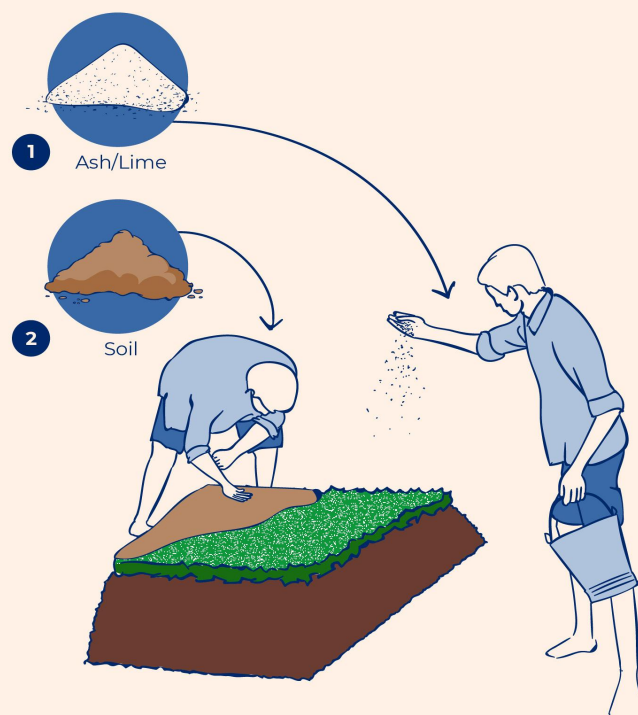
Step 5: Add first layer of green material



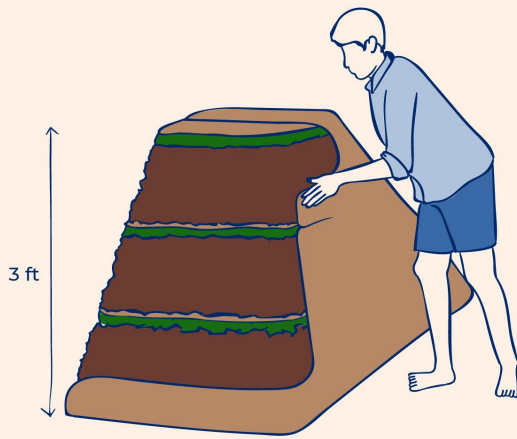
Chop green material (organic waste that needs to be composted) into small pieces. Spread it on top of the first layer of dry matter and cow dung slurry. Keep adding to it till the green matter layer is approximately 3 inches thick

Step 6: Top up with ash/lime and soil

Sprinkle a small amount of lime powder or ash (like adding pepper and salt on food) on the green material. Then add a thin layer of soil on top.



Step 7: Keep topping up compost pile, plaster with soil when complete



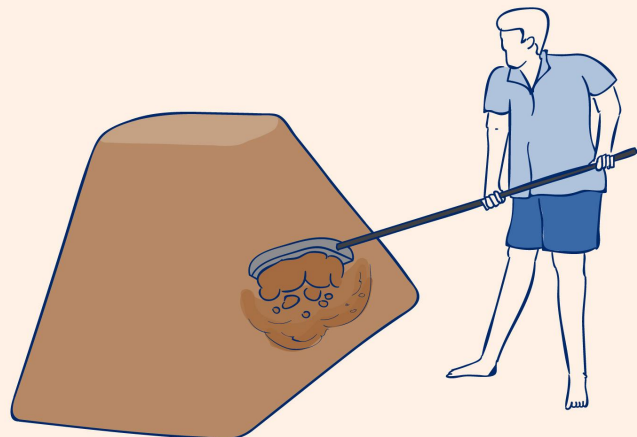
Repeat this sequence from step 2 to step 6 layering up in a dome shape till the compost pile is 3 ft high. The dome shape will allow water to flow down the sides and help the pile to stay stable. Then plaster the pile with wet soil so that the heat generated inside will not escape.

Step 8: Maintenance - turning, aeration and watering

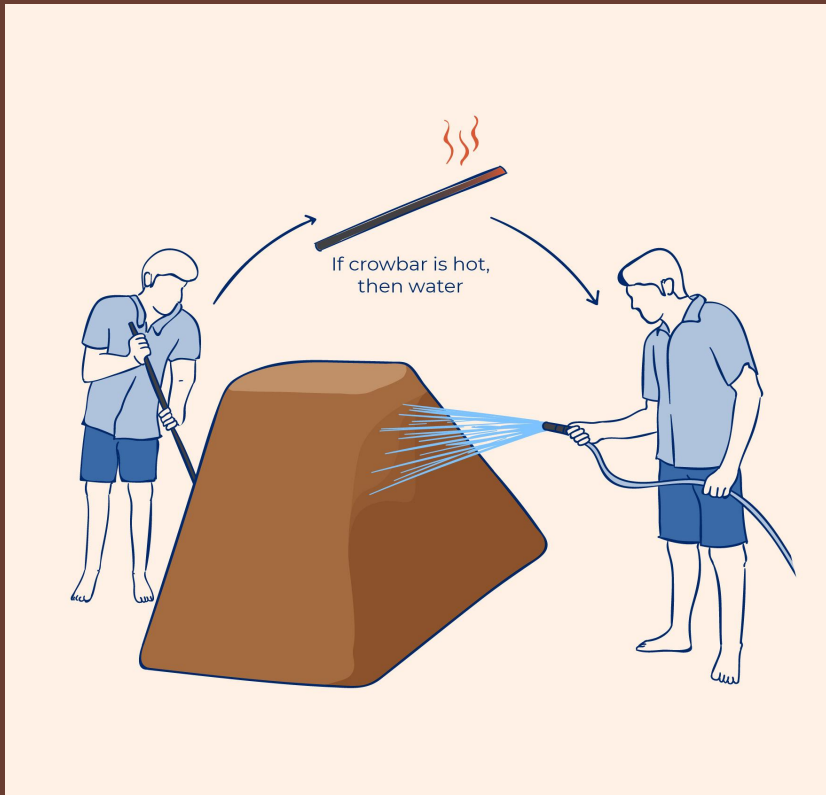
Turning:

If all waste is chopped finely, turning is not needed.

If material is coarser and not decomposing properly, turn the heap once a month (or shorter intervals if required).



Step 8: Maintenance - turning, aeration and watering



Watering:

Place a crowbar in the center of the pile for 3 days- remove this and check temperature by hand. If it is hot, water the heap enough to make it a little damp (not too wet).

Keep monitoring:

Here is a list of indicators to look out for

Problem	Solution
Wet, foul smelling or slimy heap	Turn the pile, add more dry material and protect compost from rain
Dry center, no decomposition	Turn the pile, spray with water and seal properly with soil to retain moisture
Compost becomes clumped up or compacted	Break up clumps and turn the heap to aerate
Temperature of compost pile is too low or cold to touch	Add more green matter and turn the pile to mix it in
Un-decomposed layers	Relayer the pile. Avoid adding heavy leaves without shredded.
White fungus on the pile, compost is too dry	Spray water on the heap every 2-3 days in the dry season
Lack of microorganisms, composting process is too slow	Add old compost or cattle dung or organic manure to the heap

Step 9: Harvesting

Harvest and use when ready. This usually takes 3 weeks to 3 months.

The time for composting varies depending on location, climate, materials being used and process of composting. Note that in winter, the composting process is slower.

Signs that compost is ready for use:

- **Volume and weight reduction:** The height of the compost heap will be reduced significantly, it will also be lighter.
- **Change in colour and consistency:** Compost heap will have turned black in colour and will look like coarse grained powder.
- **Change in smell:** Compost heap will emit earthy odour like soil. It should not smell of rotting garbage.
- **Change in Temperature:** Compost should feel cool to touch and not hotter than soil.
- **Change in moisture content:** Compost should feel damp to touch and should clump slightly when held in a fist. It should not be wet or slimy or dry.

Care should be taken while harvesting compost from the pit/pile as worms and other organisms may live in the compost. Some of these may be harmful to humans so the farmer should extract compost using spade and not hands.

Sieving is recommended to remove these worms as well as particles like glass shards, plastic, stone etc. which may have entered the compost pile by mistake. Sieving also removes twigs, bone shards and other organic waste added to the compost which takes longer to compost

How to store compost:

If the compost is not going to be used immediately, store it in a open, cool place, to retain moisture, so that beneficial microorganism present in the compost will not die. Store the compost in jute bags to ensure aeration.

Once in a month, sprinkle water over the compost material to maintain moisture.



What caveats/disclaimers do we need to keep in mind?

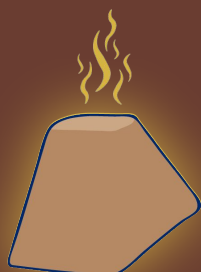
Do you have any other remarks /suggestions?

Understanding the science of composting is important for trainers and CRPs. This knowledge can help them answer questions about substitute materials that farmers can use and solve any challenges they face during composting.

The process of composting has 3 main phases: HEATING, COOLING and MATURING



3 days



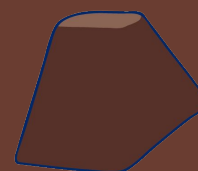
2 - 3 weeks

THE HEATING PHASE

Once the material easily digested by the bacteria has been converted, the temperature in the compost heap declines slowly and will remain at 25 - 45 degrees Centigrade. This phase lasts for 4 - 6 weeks.

What is happening in the heap?

- Fungi become active
- Temperature decreases
- Woody material decomposes



THE MATURING PHASE

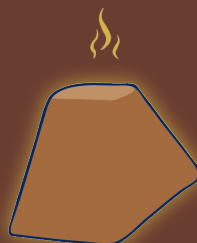
This is the most important phase of the compost process. If a compost heap has been made correctly, a rise in temperature after 3 days can be observed. The temperature rises to 60 - 70 degrees Centigrade and usually stays at that level for 2 - 3 weeks. Most of the decomposition occurs during this phase.

What is happening in the heap?

- Bacteria are active
- Heat increases
- Most of the fine material decomposes

THE COOLING PHASE

4 - 6 weeks



During this phase, nutrients are mineralized and humic acids are built up. The heap now becomes inhabited by larger organisms, such as earthworms. The heap will be dark brown in colour and is now ready to use.

What is happening in the heap?

- Nutrients are being mineralized
- Earthworms and other larger organisms move in the heap



What prerequisites does implementing this playbook need?

A shaded and well- drained site of 3 ft x 3 ft space - in an easily accessible corner of the farmer's field

What internal and external resources (human and financial) were needed to make this happen?

No financial resources are required as farmers are meant to use kitchen waste and farm waste. Other materials like bricks, coconut husk can also be reused (broken bricks from construction sites, husks from coconut trees on own or neighbour's farms).

Are there companies that provide services available?

NA- meant for the farmer to do for themselves

