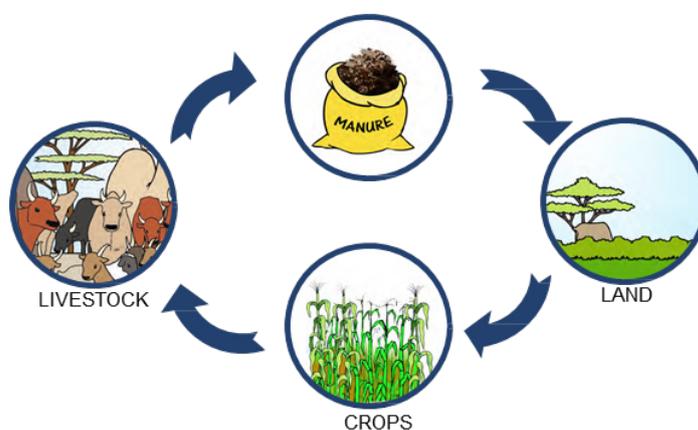


How to manage manure and use it as fertilizer

Animal manure consists of excrements from animals and can be mixed with leftover feed, litter, bedding material, water, etc. The amount and quality of the manure obtained depends on the animal housing system, the manure collection and storage system, the amount of feed, the method of feeding (pen rearing, kraaling the animals at night, or free range), the quality of the feed and the efficiency of manure and urine collection.



Nutrient cycles in crop-livestock systems

Nutrient cycling in crop livestock systems (Source: Goopy and Gakige, 2016)

- Manure is a valuable source of nutrient, organic fertilizer that should not be wasted.
- Bio-digestion of manure produces clean and cheap energy.
- Applying manure to soils saves on purchase of synthetic fertilizer, increases crop yields and saves water.

Handling of manure

The manure handling system comprises of the following:

- **Collection:** Initial gathering of manure from animal confinement area
- **Transport:** Movement of manure after collection
- **Storage:** Containment until treatment or utilization
- **Utilization:** Land application

- The type of animal holding facility on the farm frequently determines how manure is handled on a farm.
- Dairy-cow manure containing a fair amount of bedding, usually around 20% dry matter or higher, is spread as a solid.
- Solid manure is manure that is devoid of urine or washout water that can be stored as a solid and stackable product.

Manure collection

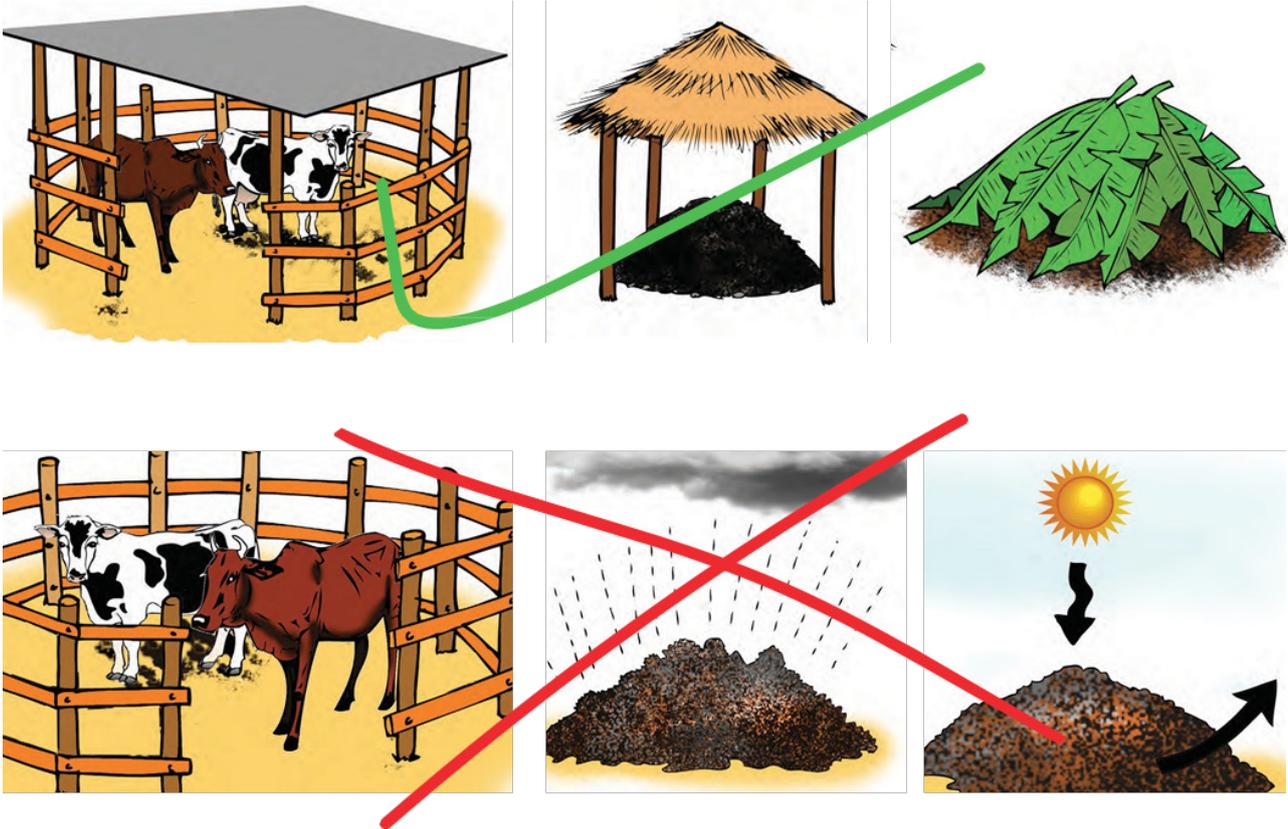
- The housing system determines the major manure characteristics and collection systems.
- Animal housing should allow the collection of all dung and urine and prevent nutrient losses.
- Solid manure should be stored on a waterproof floor and with a cover against rain.
- Urine should be collected because it is a valuable source of nitrogen and potassium fertilizer.
- Manure should always be collected for use as a fertilizer or energy production.
- The manure from the housing facility should be removed regularly and covered during storage to facilitate maturity and reduce nutrient losses.

Manure transportation

- An appropriate method for transporting manure should be put in place.
- The transport ensures that manure can be removed from the housing and put at a location where it can easily be utilised.
- The transport method used should ensure that cleanliness of the compound is maintained.
- In smallholder farms, manure can be transported using a wheel barrow, wagon or hand cart.

Manure storage

- Manure storage is necessary to bridge the gap between the moment of excretion and the optimal moment of application on cropland.
- This is also the period in which nutrients are very susceptible for losses to the environment.
- Manure needs about 2–3 months to mature before it can be used as fertilizer. The maturation time allows the organic matter to be broken down so that the nutrients are in a form that these can be easily used by plants/crops.
- The amount of nutrients in the manure tends to decrease over time. Nutrients can be lost in gaseous form and via leaching - contributing to environmental contamination and climate change.
- To prevent such losses, manure should be covered during storage.



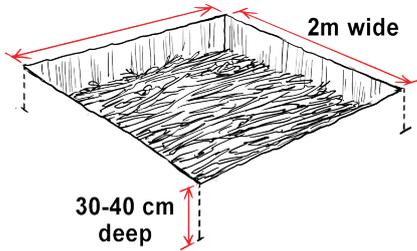
- Proper storage preserves crop nutrients until the time of application.
- Storage roofing prevents runoff of nutrients to the soil and water.
- Storage flooring prevents leaching of nutrients into the soil and water.
- Air-tight storage covering prevents nutrients from volatilization to the air.

Manure treatment

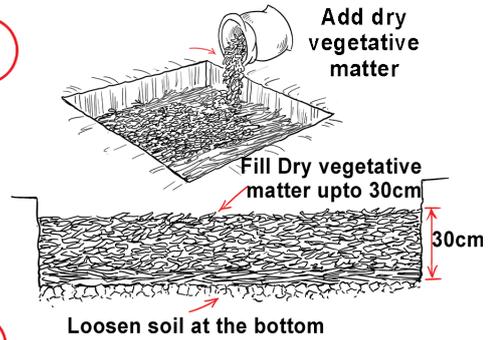
- Manure may be treated to reduce the volume, to improve the applicability, to prevent losses during storage, and perhaps to increase the value.
- Air drying is an easy method to reduce the volume of liquid manures like slurry and bioslurry. A major disadvantage of air drying is that practically all nitrogen will be lost due to volatilisation.
- Composting is an attractive proposition for turning on-farm organic waste materials into a farm resource and is suitable in all farm situations, large or small and with solid and liquid manure types.

Building and maintaining a small-scale compost heap or pile

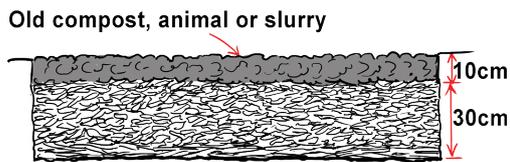
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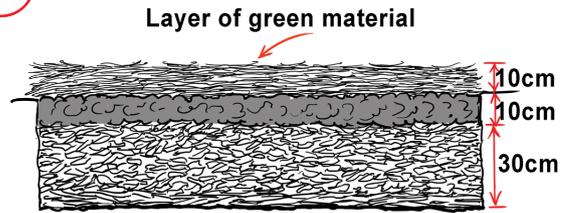
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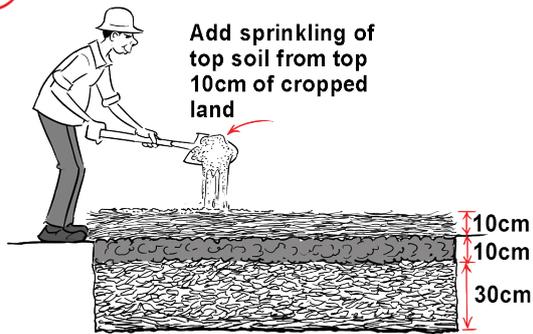
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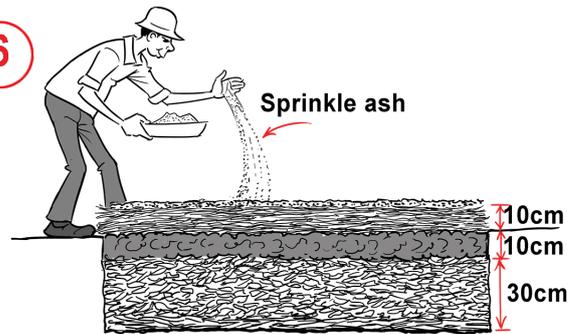
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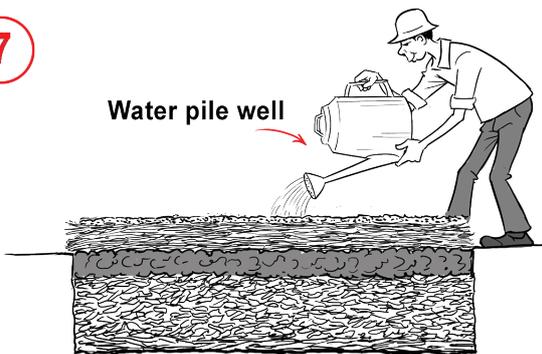
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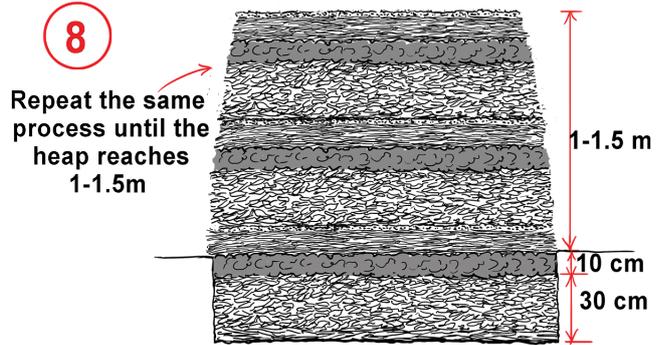
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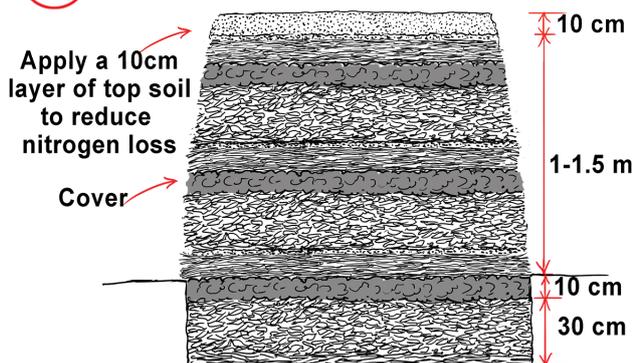
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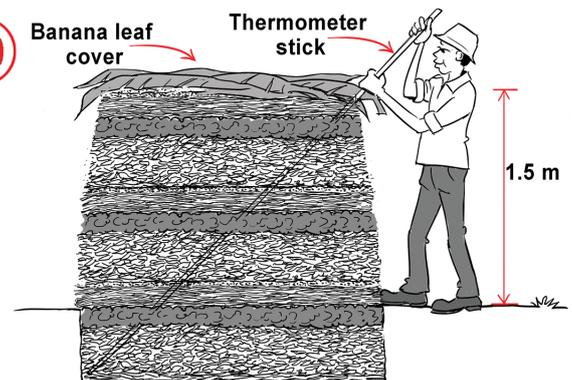
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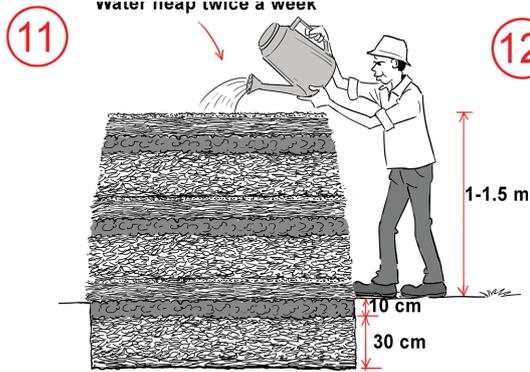


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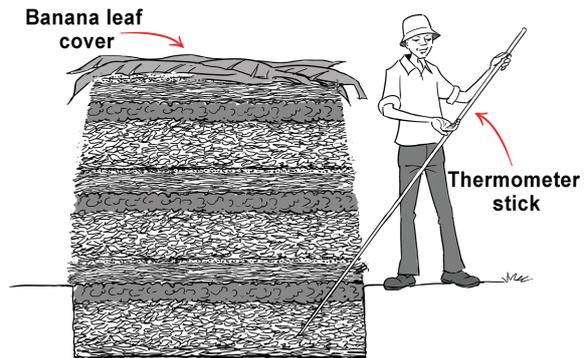


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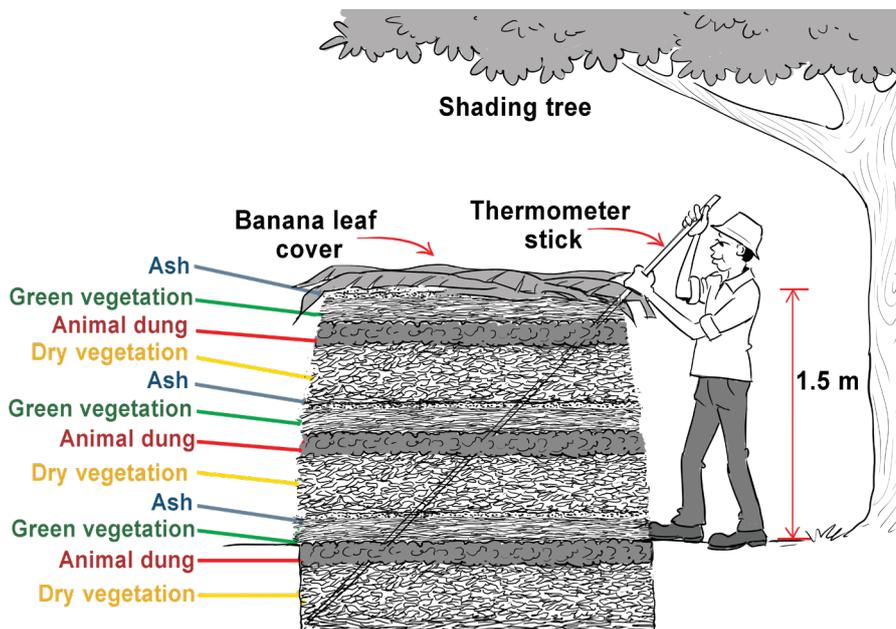
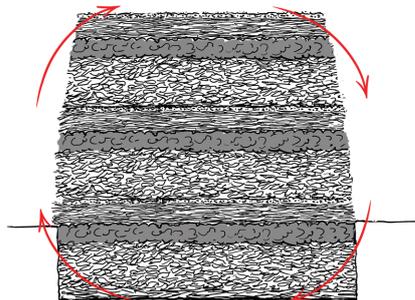




12 Use stick to measure. A hot stick means decomposition. Cool it down by compacting heap, or adding water. White stick means fungus. Add water



13 Turn the compost heap every 1-2 weeks to ensure that outer layers also decompose



Layers of compost heap

- The heap should always be covered (for example with banana leaves) after turning to protect the wash-away of nutrients by rain. Duration of compost making varies depending on the quality of materials used, but on average 6-8 weeks are enough to prepare provided the material is not too fibrous. Note: if the material is very fibrous, additional time may be necessary.

Characteristics of mature compost

- Coarse materials become finer over time until a fine, loamy material is produced.
- The different materials are no longer recognizable.
- The material has a slight ‘earthy’ and inoffensive smell.
- Temperature drops and the compost is cool.
- Compost is dry.

Manure application

- Preferably use composted or well decomposed manure, which smells “earthy” and where the original bedding material cannot be recognized.
- When applied to the fields, manure should be quickly incorporated into the soils (e.g. ploughing), since exposure to sunshine for long periods causes loss of nutrients. Heavy rains can also wash some of the nutrients away through erosion.
- The best time to apply manure is 2–8 weeks before planting so that the nutrients will be available when the plants germinate.
- Manure can also be surface banded (applied to the field in a “band” beside the actively growing plants) when the plants are actively growing, however the plants should be a minimum size (e.g. for maize, the plants should be at least 30 cm high).
- Manure applied while plants are actively growing should be combined with a synthetic fertilizer.
- Manure application rate varies based on soil fertility. 5 t/acre is appropriate for most fodder crops.

Benefits of using manure

- Easy to make and is very effective at improving overall soil health. Less expensive compared to other soil amendments.
- Improves the structure of the soil. This allows better aeration of the soil, improves drainage and reduces erosion.
- Improves soil fertility by adding nutrients and by making it easier for plants to take up the nutrients already in the soil. This produces better yields.
- Improves the soil’s ability to hold water. This stops the soil from drying out in times of drought.
- Can reduce pests, diseases and weeds on the farm. This is because, unlike raw manure, the high temperatures that occur during composting usually kill the disease-causing organisms and the weed seeds.
- Large amounts of vegetation, such as crop remains, garden weeds, kitchen and household wastes, hedge cuttings, garbage, etc., are put to use.
- When properly made, compost nutrients become slowly available as plant food.
- Good crops can be obtained with reduced need for extra chemical inputs.
- All farmers, regardless of their financial abilities, can make and use compost.