Food and Agriculture Organization of the United Nations

Preparation and use of compost

Source	Technical Centre for Agricultural and Rural Cooperation (CTA)
Keywords	Compost, manure, fertility, organic fertilizer, animal manure
Country of first practice	General
ID and publishing year	6957 and 2010
Sustainable Development Goals	No poverty, zero hunger, good health and well-being, climate action, and life on land

Summary

This document gives information about how compost can be applied in the tropics and subtropics. It gives a simple description of the processes taking place in the soil and during composting. Practical suggestions are given for constructing a compost heap. A few selected compost methods and applications are given and a literature list has been added for supplementary information.

Description

Compost is an organic fertilizer that can be made on the farm at very low cost. The most important input is the farmer's labour. Compost is decomposed organic matter, such as crop residues and/or animal manure. Most of these ingredients can be easily found around the farm.

Agromisa's Question and Answer Service frequently receives questions from farmers who face a problem with a decreasing fertility of their soils. Due to soil fertility problems, crop returns often decrease and the crops are more susceptible to pests and diseases because they are in bad condition. In order to increase soil fertility in the short run, nutrients have to be added to the soil. This is often done by applying chemical fertilizers. Chemical fertilizers, however, are expensive to purchase and for most small-scale farmers, this is a problem. Preparation and use of compost can be a solution to that problem. To really improve soil fertility in the long term, it is necessary to improve the soil structure and to increase the organic matter content of the soil.

Compost is a good fertilizer because it contains nutrients as well as organic matter. The role of organic matter is explained in more details below. Using compost as the only means to maintain soil fertility is possible, but in that case you need a very large quantity of compost. We advise you to apply several practices at the same time in order to maintain the soil fertility in the long term. Some of these methods to improve soil fertility are crop husbandry methods (mulching, green manure, agroforestry and improved fallow) and applying organic manures (compost, liquid manure and animal manure). If animal manure is applied it should have matured for some time, otherwise it might damage the plants. Composting animal manure makes it a better fertilizer.

1. Fertilizing: the role of organic matter and compost

The presence of organic matter in the soil is

TECA
TECHNOLOGIES and PRACTICES for SMALL AGRICULTURAL PRODUCERS

fundamental in maintaining the soil fertility and decreasing nutrient losses. Compost is an organic fertilizer, it adds organic matter and nutrients to the soil. In order to quickly supply a crop with the required nutrients, a chemical fertilizer may be needed. In contrast to organic fertilizers, chemical fertilizers help the plants immediately. Organic manures first have to be broken down into nutrients (by soil-organisms) before they can be utilized by the plants. However, chemical fertilizers are used up by the end of the season, whereas organic matter continues to enhance soil fertility, soil structure and water storage capacity. Moreover, the presence of organic material ensures that the chemical fertilizer is more efficiently utilized by the crop. Organic matter retains plant nutrients and thus prevents the fertilizer from being washed away. It is in fact a waste of money to apply chemical fertilizer on a soil that is poor in organic matter, if it is not done in combination with measures to increase the level of organic matter in the soil.

Figure 1. Turning compost

© FAO/TECA

1.1 Organic matter and soil processes

Organic matter in the soil consists of fresh organic matter and humus. Fresh organic matter can be (dead) plant material, animal droppings, dead animals etc. The fresh organic matter is transformed into fine organic matter and humus by soil organisms. Humus gives the soil a dark color and retains nutrients and water. It cannot easily be decomposed further.

1.1.1 Properties of fine organic matter (e.g. humus)

- It improves the soil structure.
- It improves the resistance of the soil against the erosive action of rain and wind.
- It retains water and releases it slowly, so that water is available to the plants (water storage capacity) over a longer period.
- It retains nutrients and releases them to the plants slowly over a longer period.
- It contains the main nutrients of nitrogen (N), phosphorus (P) and potassium (K), which become available to the plants after decomposition.

The micro-organisms are mainly responsible for further breaking down part of the humus into carbon dioxide, water and nutrients for the plants. This process is called mineralization: nutrients are released and can be taken up directly by plant roots. The rate of humus production and mineralization in the soil depends on a number of factors. In a hot climate the micro-organisms are more active and the organic materials will break down more rapidly than in a cold climate. Also the acidity of the soil, the composition of the organic matter, the humidity and the availability of oxygen strongly influence the rate of decomposition.

1.2 Compost

The natural decomposition process in the soil can be regulated and speeded up by man. Organic material is collected, and preferably stacked in a heap. In the heap the decomposition process is

more intensive and the conditions more favorable, because the heap is made up almost entirely of organic matter. The end product is strongly decayed organic matter with humus and nutrients. This is known as compost. Compost is used as an organic fertilizer which can be added to the soil. Fertilizing with compost means, apart from fertilizing the plants, also making use of the good properties of organic material as mentioned in the section above. Adding compost to sandy soils increases the water retention capacity. This means that water remains longer in the soil and thus remains available to plants for a longer time in periods of drought.

All non-toxic, organic materials can be used for making compost. Superfluous and/or waste material are often applied and in this way can be made use of again. Finally, make sure that the materials used for composting could not be better used for other purposes, such as cattle feed.

2. The composting process

As described in the section on organic matter in soil processes, the composting process happens due to the activity of micro-organisms (bacteria) and other larger organisms like worms and insects. These need certain conditions to live. These include moisture and air.

To make the best possible compost, the micro-organisms must be able to work optimally. This can be achieved if the following four factors are combined to the best advantage: type of organic material, air, moisture, and temperature. The acidity (pH) is also considered by some to be an important factor. Acidity depends on the air and moisture flow. A compost heap which is properly composed will seldom get too acid.

The composting process will be optimal when various materials of different decomposition rates are combined, the different materials are well mixed, and the size of the heap varies from 1 m x 1 m to 3 m x 3 m. This makes it possible for the temperature to stay constant within the heap.

A good composting process passes through three consecutive stages, which are a heating phase (fermentation), a cooling down phase, and a maturation phase. It is not easy to draw the line between these stages. The process takes place very gradually and with the help of continuously changing microorganisms the organic material is converted into compost.

2.1 Heating phase

During the first stage of composting, the compost heap starts to heat up considerably. This effect is known as fermentation and is the result of the breaking down of the complex and tough fibrous material of the organic matter. This fermentation process (decomposition) is strongest in the centre of the heap. To get the fermentation going quickly and effectively, a number of factors are important. In the first place the compost heap should be made of all sorts of organic materials. Secondly, the right micro-organisms have to be present. Thirdly, it is very important that there is adequate oxygen and water. If these three conditions are met, heat is generated quickly. In the next chapter we explain how to meet these conditions when putting compost making into practice. During fermentation the micro-organisms multiply and change at a rapid rate, which adds to the heating up process. In this way, a self-accelerated process is started. The

fermentation stage usually begins after four to five days and may take one to two weeks. Maximum fermentation takes place at a temperature of 60 to 70 ˚C in the compost heap. If the temperature is too high, the necessary microorganisms may die and decomposition comes to a halt. Due to its temperature, fermentation also has a hygienic effect. In the organic material, many pathogenic germs which are a threat to man, animal and plant, are destroyed. It is often suggested that fermentation kills weed seeds and roots too. However, in practice, this is quite disappointing. Many weed seeds are not destroyed in a normal compost heap, because the temperature is not sufficiently high. In some cases, the germinating power of weed seeds has even been known to increase.

2.1.1 Temperature test

A simple way to see if the fermentation process has started is to put a stick in the centre of the heap about five days after completing the compost heap or after the final turning over. Leave it there for about five to ten minutes. After taking it out, feel it immediately. It should be considerably warmer (60 to 70 ˚C) than body temperature. If not, then this is an indication that something is wrong, perhaps the material used or aeration is at fault.

2.2 Cooling down phase

The fermentation phase gradually changes into a cooling down phase. Decomposition occurs without much generation of heat and the temperature drops slowly. During this period new types of micro-organisms convert the organic components into humus. The heap remains clammy and hot inside and the temperature drops from 50˚C to 30˚C. By regulating the temperature, air and water supply, the process can be accelerated or slowed down. How long this cooling down stage takes, depends on the type of heap, the material, the attention given to it, the climate etc. The cooling down period usually takes a few months, but in unfavorable conditions may require up to a year.

2.3 Maturation phase

In this end phase of decomposition, the temperature drops to soil temperature, depending on the climate, 15 to 25 ˚C.

Apart from the micro-organisms mentioned, the large soil fauna are active at this stage too. In temperate regions, earthworms in particular, feed on the strongly decomposed organic material, and in this way contribute to decomposition. In the tropical to semi-arid regions, termites in particular play an important role, although these can also be very troublesome. This phase never really comes to an end, the decomposition process can go on infinitely at a slow rate. The compost is ready for use if it feels crumbly and looks like good brown/black organic soil

3. The practice of composting

In this paragraph, important aspects of compost making are explained.

Attention must be given to the composition of the organic material and the location of the heap. The measurements and the construction of the heap are described separately. In the next paragraph different specific methods of compost making are given.

3.1. Organic material

In general, any type of organic material of plants and animals can be used. It is essential to mix old and tough materials, which are difficult to decompose (crop

residues, small twigs), with young and sappy materials, which are easily decomposable (fruit, vegetable skins, young leaves). This is because different types of organic matter contain different proportions of carbon (C) and nitrogen (N). The micro-organisms which decompose the organic matter need both carbon and nitrogen to function well. In general, young, living material that decomposes fast contains low levels of carbon but high levels of nitrogen. Tough, dead material decomposes slowly and contains large amounts of carbon but low amounts of nitrogen. Too little nitrogen-rich material means the composting process will be slow, too much of it will result in the heap becoming acid and smelly. The ideal ratio of carbon and nitrogen for starting a compost pile is C:N ratio = 25 - 30:1.Be careful not to use toxic materials. For example, plant parts sprayed with chemical pesticides can have an adverse effect on the decomposition and the quality of the compost. Diseased material with rusts and viruses for example, should be kept to a minimum.

During fermentation many disease germs are not destroyed, so the disease cycle continues as compost is added to the soil in the form of manure. A shortage of easily decomposable material is often the reason for slow conversion in the compost heap. The heap may even become completely inactive. An indication of this is the fall in temperature during fermentation, after about two days. A compost heap made up of young plant material (easy to decompose) gets going slowly and soon becomes too acid. An acid compost heap begins to rot and smell. Decomposition takes place very slowly and the quality of the compost deteriorates. The combination of young leaf litter or manure (easy to decompose) with woody plant parts (difficult to decompose) gives the best compost in the shortest time.

3.2 Micro-organisms

The composting process happens due to the activity of micro-organisms and other larger organisms like worms and insects. The first condition for composting is the presence of the composting organisms. Adding these organisms to the heap can be done by mixing ready-made compost with the organic materials. If there is no compost the soil can be added. Collect this soil preferably from a shady and humid place, for example from below trees. Soil that contains moisture, contains micro-organisms. Soil that has been dried out by the sun, usually does not contain many living organisms anymore.

3.3 Air

The micro-organisms in the heap require oxygen to survive and to do their work converting the organic material. The carbon dioxide which is produced by the micro-organisms as a result of their activity needs to be blown out by a flow of air. If there is not enough air in the heap, the useful micro-organisms will not survive.

Other micro-organisms that do not need oxygen will thrive and decomposition of the organic material will slow down. In order to get enough air in the heap do not put the compost heap right up against a wall. When building up the heap put a layer of rough material (twigs) at the bottom, so air can enter the heap. See also section 4.1 with the subsection on air channels.

3.4 Moisture

The micro-organisms need moisture to live and to spread through the heap. The activity of the organisms will slow down if

the heap is too dry. But if the heap becomes too wet, then there will not be enough air and the composting organisms will die. This will cause the heap to ferment rather than compost. Judging the right amount of water requires a little experience.

3.4.1 The moisture test

The moisture level of a compost heap can be tested easily. Put a bundle of straw in the heap. If after five minutes it feels clammy, then the moisture level is good. If still dry after five minutes, the moisture level is too low.

A dry heap has to be sprinkled uniformly, using a watering can or a perforated tin. Water alone can be used or a mixture of urine and water 1:4. Urine enhances the growth of the micro-organisms. Water droplets on the straw indicate that the heap is too wet and it should be opened up straight away. The material can be spread out and dried in the sun. It can also be mixed with other dry material. After some time the heap can be made up again. If it has become too wet by rain then it is better to cover it. Repeat the test in both cases after a few days.

4. Site of the compost heap

Specific points need to be kept in mind when choosing a good place for a compost heap.

- **Climate**
  If weather conditions are mainly dry, the heap must be protected against drying out. A shady place, out of the wind, is ideal. This could be behind a building or behind a row of trees. Moisture in the heap will then evaporate less quickly, yet there will be enough air. A wind-free place also has the advantage that the material is not blown away and the temperature fluctuates less. A water source near the heap is convenient for sprinkling if too dry. Under wet weather conditions the heap will have to be protected against excess water. Choose a protected and well drained place on a higher part of the land. A compost heap under a shade tree (mango or cashew, for instance) will usually be well protected against excessive rainfall. Both types of weather conditions are likely to play an important role in determining a suitable place for making a compost heap. Putting a simple roof above the place where the compost is made protects the heap against the sun and against the rain. The protection against these climatic influences will improve the composting process. Temperature and moisture level will stay more constant.

- **Transport**
  The heap should be situated as close as possible to the source of organic material (for instance, the field or harvesting place). It should also be near the place where the compost is to be used. This saves time and labour in transport or organic material and compost.

- **Space around the heap**
  There should be enough space around the heap to enable the compost to be turned over or examined. A space about two to three times that of the heap itself is the most practical.

- **Vermin**
  A compost heap should always be made outside and not too close to living accommodation or stables. The heap is likely to attract a number of vermin, such as mice, rats, termites and other insects. These transfer diseases to man and animal and attract more dangerous vermin, such as snakes.

4.1 Size and setting up of the heap

Size

The heap has to conform to a certain size; if too broad or too high, aeration is poor. A good basic size is 2 to 2.5 m wide and 1.5 to 2 m in height. The length depends on the quantity of organic material available, but it is better to make a shorter heap quickly than a longer heap slowly. It is strongly advised to start with a heap greater than 1 m^3, otherwise the temperature in the heap remains low and decomposition is too slow and incomplete. During the maturation phase the volume of the heap decreases and the heap sags in, as it were.

- **Setting up the heap**
  The compost heap can be above ground or underground in a pit or a trench. In section 5 different methods are described. Whichever method is used, the heap of organic material has to be set up in a special way. A useful suggestion is to start the heap by a foundation of coarse plant material such as twigs or sugar cane stalks. The outside air can easily flow in under the heap and any excess water flows away more quickly. If the heap is built up in layers, the individual layers should preferably not be thicker than 10 cm for plant material and 2 cm for manure. Apart from the organic material available, the way the heap is made depends also on the individual experience and results.
- **Covering the heap**
  In an area of heavy rain the heap will have to be protected against excess water. Preferably it can be kept dry by putting a simple roof above the heap or even simpler. More precisely this means covering with a layer of leaves, a cloth, jute or plastic etc. If plastic is used then only cover the top, so that the air can penetrate through the sides. Trenches around the heap facilitate the run off of excess rain water. Covering the top with the materials mentioned can also be an advantage in dry areas. It prevents excess evaporation of moisture from the heap and it dries out less quickly.
- **Air channels**
  It is good advice to put air channels into the heap. This can be done effectively by putting stakes or bundles of twigs, straw or other firm material upright in the heap when composing it. The bundles can remain inside, because they let in enough air, but stakes have to be removed as soon as the heap has been completed. These air channels should be about 12 cm in diameter and about 1 m apart. After four to five days the channels have to be closed up. If there is too much ventilation the fermentation process can turn into a detrimental combustion process.

5. Methods to make compost

There are many ways of making compost. In this section different methods are given. We have gratefully made use of materials of HDRA and KIOF in order to be able to present many different methods of compost making in this Chapter. Taking into account the factors mentioned before, such as availability of organic materials and weather conditions, a choice can be made from these methods. In the long run everyone must work out a method to suit oneself. We advise you to experiment and find the method that suits best to your situation. Of course you can always contact Agromisa, HDRA or KIOF ask for specific information.

5.1 Indore method

The Indore method is often used for composting in layers.

- **Building the heap**
  The basis of the heap should consist of twigs and cane shoots. The following four successive layers are piled on top of this:
  1. a layer of about 10 cm tough organic material which is difficult to decompose;
  2. a layer of about 10 cm fresh organic material which decomposes easily;
  3. a layer of 2 cm animal manure, compost or slurry from a biogas tank; and
  4. a thin layer of soil. The soil should be collected come from the top layer (top 10 cm) of clean(moist) soil (e.g. from under trees). This ensures that the right micro-organisms are brought into the heap.

  This sequence of layers is repeated until the heap has reached a final height of 1.5 to 2 m. In this way the heap is composed of many layers. Building the heap should be done quickly, preferably within a week.

- **Turning over**
  During decomposition the heap has to be turned over regularly, in order that it remains well aerated and all the material is converted into compost.
  The first turning over of the heap should be done after two to three weeks. The heap is broken down and built up again next to the old heap. The layers are mixed and the heap is, as it were, turned upside down and inside out. Again, a foundation of coarse plant material is made first. Then the drier and outer, less decomposed part of the old heap is placed in the central part of the new heap. The drier material will have to be watered before the heap can be built up further. This core is covered with the rest of the material. The original layered structure is lost. The second turning over takes place after three weeks and it may even be necessary to turn the heap over again for a third time. Repeat the moisture test and the temperature test a few days after each turning over operation.

- **Time for decomposition**
  Decomposition is complete if the plant material has changed into an unrecognizable crumbly, dark mass. Twigs and thick stems do not decompose completely and can still be seen. Under favorable conditions, the decomposition process in the Indore method takes three months, but under adverse conditions it may take longer than six months. Some substances, such as human urine and wood ash promote the growth of the micro-organisms. A small amount of these in the heap is sufficient to accelerate their growth. If the process has to be speeded up spread some urine or wood ash over the thin layers of soil, but only in small quantities; too much ash kills the micro-organisms. Urine, diluted with water 1:4 is sprinkled over the heap, using a watering can. The Indore method usually gives good results.

5.1.1 Advantages and disadvantages of Indore method

Advantages

- The process can be kept under control and runs smoothly, because the heap is turned regularly.
- Compost is produced in a short time.

Disadvantages

- It requires a lot of water.
- It is very labour intensive.

5.2 Bangalore method

The Bangalore method is another popular composting method. The heap is constructed in a similar way to the Indore method. Here too, a compost heap of several layers is set up in a week's time. It differs from the Indore method.

A few days after completion of the heap, it is completely covered with mud or grass sods, thus closing it off from outside air. Decomposition of organic material continues, but now other types of micro-organisms keep the process going. These micro-organisms decompose the material much more slowly. Therefore, it takes longer before compost is formed than in the Indore method, although the quality of the compost is about the same.

5.2.1 Advantages and disadvantages of Bangalore method

Advantages

- A saving of water.
- It requires less labour, because the heap is not turned over during the decomposition process.

Disadvantages

- More disease germs and weed seeds survive due to the temperature during decomposition.
- The decomposition process is more difficult to control because the heap has to be kept continually covered.
- It is a less suitable method for those with little or no experience in composting.

5.3 Heating process or block method

This method resembles the Bangalore method. However the treatment is different and it can be used to compost large quantities of organic material.

- **A continuous heap system**

The heating process method is based on a continuous heap system. That is to say, new heaps of organic material are being made all the time, piled up and treated in the following manner. On the first day a heap is made of all available material. This heap has a ground surface area of 1 m x 1 m minimum and 3 m x 3 m maximum and a height of about 1 m. Leave the heap to stand for two days. Within the heap decomposition starts on its own accord. After these two days, the air is forced out of the heap by trampling over it.
The heap is deprived of so much air that an almost comparable situation occurs as in the covered heap of the Bangalore method. On the fourth day, a new heap is built on top of the first heap. This new heap cuts the first heap off completely from the outside air. In the heating process method, a new heap is made every day. In fact, on the second and third day a new heap is made next to the first one. On the fourth day a heap is built on top of the first one. It follows that on the fifth day, a new heap is put on to the second one.

5.3.1 Advantages and disadvantages of heating process or block method

Advantages

- It is a simple method for large quantities of organic material.
- It is a continuous method.

Disadvantages

- Only suitable for large quantities of material.
- Requires much labor and material.
- More chance that disease germs and weed seeds survive the decomposition process at lower temperatures.

- The process is more difficult to check.
- Requires much experience and insight in.

5.4 Pit composting

This method involves making compost in pits which have been dug in the ground. The best depth for a pit varies according to local soil conditions and the depth of the water table. A typical pit would measure 1.5 to 2 m wide, 50 cm deep and any length. The pit can be lined with a thin layer of clay to reduce water loss. Often, several trenches are dug next to each other, to allow turning from one pit into the next. Material should be placed in the pit in layers as described below. For a larger pit measuring 2 m wide, 2 m long and 1 m high, 1 to 1.5 liters of water should be poured on before applying the layer of soil, which seals the pit.

The layering is as follows:

- 10 cm of material, which is difficult to decompose (twigs, stalks);
- 10 cm of material which is easy to decompose (green and fresh);
- 2 cm of animal manure (if available);
- add a thin layer of soil from the surface of arable land to obtain the microorganisms needed for the composting process;
- repeat these layers until the heap reaches 1 to 1.5 m high; and
- cover with grass or leaves (such as banana leaves) to prevent water loss.

After two to three weeks, all the contents of the pit should be turned over into the second pit and two to three weeks later this should be turned into the third pit. As the decomposing material from pit 1 is turned into pit 2, new material, which is ready for composting, can be put into pit 1, thus creating a process of continual compost making.

5.4.1 Advantages and disadvantages of pit composting

Advantages

- Pit composting is quick, easy and cheap as it does not require investment in materials. It needs less water so it is useful for dry areas.

Disadvantages

- It is more difficult to follow of the decomposition process than with an above ground heap.

5.5 Trench composting

Trench composting is similar to pit composting except that plants are grown directly onto the pit as opposed to taking the compost out of the pit and spreading it on land. A trench should first be dug. The size depends on how much material you have available and how many plants you are planting in the trench. The width can range from 50 cm to several meters, the depth lm or less and it can be any length. It should then be filled as follows:

- 10 cm of material which is difficult to decompose (stalks or crop residues);
- 10 cm of material which is easy to decompose (fruit and vegetable scraps);
- add 2 cm of animal manure (if available);
- add a thin layer of soil from the surface of arable land to obtain the microorganisms needed for the composting process;
- repeat these layers until the pile is about 50 cm above the ground; and
- cover with soil, grass or leaves (such as banana leaves) to prevent water and nutrient loss and leave to settle for about one month before planting.

Less digging is required if the trenches are dug as shown in the picture. In these smaller, individual trenches layers of soil should be added in between the organic

material. It should be left to settle for about a month before planting. These trenches make more efficient use of organic material because more crops can be grown in the same area as a wider trench.

5.5.1 Advantages of trench composting

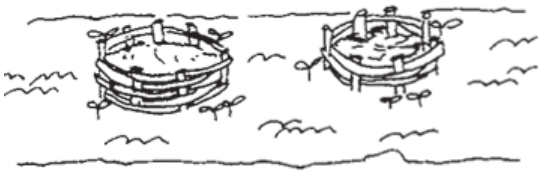
- Trench composting is especially useful against termite attack as most species live above ground level.

5.6 Basket composting

If materials for composting are in short supply, you can still make good use of them by using the basket method of composting. It is especially useful for food production in home gardens. The method of basket composting has specific steps.

- Dig circular holes 60 cm in diameter and 60 cm deep.
- Line the bottom with material which is difficult to decompose (twigs, stalks).
- Add 8 cm of animal manure-
- Add 15 cm of green vegetation (young leaves that have a high water content).
- Add 0.5 cm of ash.
- Repeat steps 3 to 5 until the hole is full.
- Cover with grass or leaves to prevent water and nutrient loss.
- Using thin sticks and weaving them together, mark the circular outline of the pit with a round 'basket', 10 cm in height.

Figure 2. Basket with compost and seedlings



© FAO/TECA

If you build more compost baskets in your garden, place them in different areas every time so that the whole garden becomes more fertile.

5.6.1 Advantages of basket composting

- Basket composting makes good use of nutrients for a small kitchen garden.
- This method is also good for using up small quantities of waste.

6. Boma compost

When a farmer keeps animals, there is usually, a boma (enclosure where the animals are kept all the time or only at night) on the farm. In order to keep the animals clean, bedding is put in the boma. It is advisable to add enough new bedding once a week, so that all urine is soaked up. Any type of dry organic material can be used as bedding. It can be maize stalks, weeds, dry grass or leaves, sawdust, etc. A mixture of materials is best.

Bedding soaks up urine and droppings, which are very rich plant food, and prevents losses through leaching or drying out of manure. The farmer who puts new bedding regularly will make plenty of high quality compost. Well-mixed manure can be taken out either every day or once a week. If taken out daily, the mixture should be put in a pile and a small amount of soil spread on top each day. This can be continued until there is enough material to build a boma compost.

KIOF describes method for making boma compost accurately. Each time manure is taken out of the boma, it should be composted immediately. Sheep, goat, rabbit and chicken manure are all rich manure. Because the bedding is plant material, there is no need to add more greens. It is practical to make the compost next to the boma to save effort moving the manure and used bedding.

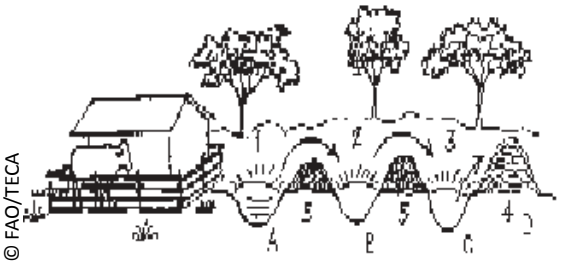
- Like in the drawing, a trench of 30 cm in depth is dug out behind the boma (A). The soil is put next to the trench. The bottom

of the trench is loosened and a layer of dry vegetation is put on the bottom.

- Then a layer of about 10 cm manure and bedding is thrown out of the boma into the trench.
- This is covered by about 5 cm of soil.
- Again a layer of about 10 cm manure is added and again covered by soil. This goes on until the compost pile is completed.
- In the dry season the manure will need watering. During the rains the manure will be very wet. When this is the case, keep the pile low (about one meter). Dry manure can be piled about one-and-a-half meters high.
- When finished, the whole pile is covered with soil and finally with grass, maize stalks or banana leaves to prevent drying up.
- Make sure you use sticks to control the temperature because boma manure becomes very hot. Add water as soon as the stick feels dry or becomes white.
- After two or three weeks the pile is turned into the second trench (B) and after two or three more weeks it is turned into the third trench (C).
- The compost is stored until planting time, in a big, covered pile next to the third trench (D).

If a boma has no roof the manure becomes wet during the rain. To avoid leaching, all manure should be taken out as often as possible and immediately composted and covered. Remember, compost should be moist, not wet.

Figure 3. A boma and compost site



© FAO/TECA

7. Objectives fulfilled by the project

7.1 Labour-saving technology (LST)

Depending on the method used, composting is easy to use, can be effective within a short- time period, is water saving, labour saving, and isn't costly.

7.2 Resource use efficiency

The technology improves soil quality, increases nutrients, and is environmentally friendly.

7.3 Pro-poor technology

The technology improves the quality of yields thanks to improved soil conditions.