

ZERO WASTE NEPAL

Manual for Composting at Domestic Level



ROTARY CLUB OF MT. EVEREST, LALITPUR, Nepal

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Composting at Domestic Level

1 Introduction and Background

Table 1: Composition of Solid Waste in Kathmandu valley

	Distribution by category, %			Quantity, Ton		
	Average	Max	Min	Average	Max	Min
Green Waste	58%	67%	52%	252	372	150
Market Waste	35%	40%	30%	135	120	117
Hazardous Waste	2%	3%	1%	9	18	3
Inert Waste	12%	20%	10%	54	90	30

Source: Kathmandu Municipality, 2001/04?

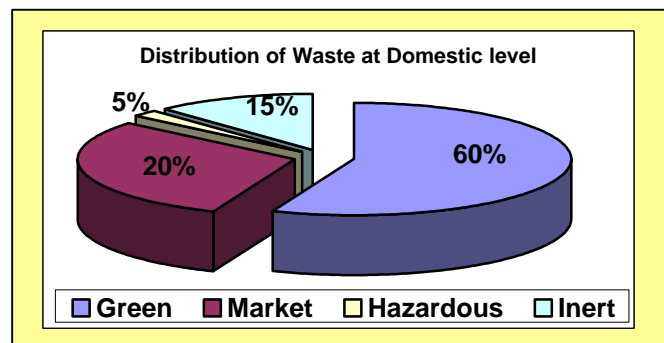
The biodegradable or green waste is the major part of the solid waste contents for Kathmandu Valley. Various studies indicated that green waste has a share of around 52% to 67%. The average content of urban solid waste for Kathmandu Valley is presented in Table 1. The biodegradable component of the solid waste has been the major hazard affecting the landfill site and creating hazard on the streets. The sources of SW generation is assumed as follows:

Table 2: Average Waste Generation by Sector in Kathmandu Valley, Ton

Waste Category	Quantity, Ton	Distribution of Average Quantity by Source, Ton				
		Residential	Commercial	Industrial	Institutional	Others:
		52%	20%	3%	9%	16%
Green	252	131.04	50.40	7.56	22.68	40.32
Market	135	70.20	27.00	4.05	12.15	21.60
Hazardous	9	4.68	1.80	0.27	0.81	1.44
Inert	54	28.08	10.80	1.62	4.86	8.64
Total	450	234.00	90.00	13.50	40.50	72.00

2. Domestic Biodegradable waste

The figures shown above precisely indicate that the residential areas shall be the focus point for waste management and shall be given highest priority. This will give immediate benefit in terms of reducing waste hazard and help producing clean recyclable waste from market waste. The burden to the landfill site and nature will be reduced to a great extent.



3 Composting at Household Level

Practicing Composting of Green Waste at Household level particularly in the urban areas is a difficult task because of following reasons:

- Lack of space and time
- Lack of willingness and difficulty in Handling
- Nuisance of smell, insects and pests
- Degraded aesthetical look
- Lack of Knowledge, Technology, awareness, Motivation and Encouragement
- Lack of Technical Assistance and Management Support

Various organizations operating in Solid Waste Management in Nepal have tried to use various devices for composting at Household level. These devices comprise of composting vessels of various sizes. These devices are functionally in operation but are not fully accepted by the community and used only in limited cases. To date, though there are no authentic figures, but believed that the composting devices in used urban areas are accepted. The composting devices used are indicated in the Table.

Urban Areas	Composting Bin, No
Kathmandu	60
Thimi	30
Dharan	120
Hetauda	120
Biratnagar	40

A team of Zero Waste officials together with GTZ/UDLE staff visited some of the areas where certain composting devices are practised. It is concluded these composting devices need to be improved in order to make it more elegant, nuisance less and user friendly.

4 Composting Bin proposed by Zero Waste Nepal

Based on the experience from various projects, ZWN has developed a type of composting bin that would fulfill the Criteria listed herewith.

- Composting Bins shall be usable where space is a constraint
- Composting Bins shall be Easy to use, elegant, slick, and aesthetically acceptable
- Reduce the need to touch and handle the waste during formation of compost,
- Reduce Nuisance of smell, access of insects and pests to composting materials.

The composting bin is designed comprises of:

- A container that houses the composting material
- A system of Air supply stacks to supply air to the center of compost pile
- Vertical drop hatch
- Bottom grating to hold compost and allow air circulation
- Sideway Opening at lower part with vertical opening flap
- Sideway Hatch at lower part for recovery of matured compost and storage of tools,
- Thermometer to monitor temperature in the compost pile inside the container.
- Scraping hook for getting compost from the grating
- Pan to receive the final compost and Strainer for screening the compost
- Airtight Plastic Bucket for sterilization of matured compost.

ZWN has developed the Knowledge and Technology that would take care of the associated problems and developed a programme to raise the awareness among the users and to raise Motivation and Encouragement. ZWN would also provide support for extending Technical Assistance and Management Support.

5 Materials used for composting

Following table provides some indication of materials to be used for composting. There are some detrimental materials harmful for composting since they may destroy the bacteria that generate heat and convert the materials into compost. Caution should be made that too dry or too wet condition of compost may reduce efficiency of compost production or generation of bad smell, which is normally not noticed.

6 Benefits

Reducing Garbage - Up to 60% of the garbage thrown out each day could go in the compost bin. Cutting down domestic waste generation means that the streets are cleaner, less need for landfill sites, extending life of existing landfill sites and better environmental management for the entire community.

Protection from weather, pests – Normally, there is no need of a container as ZWN BIN for composting organic matter. It will eventually decompose without human help. But a container of ZWN BIN will keep the compost pile neat, protect it from the weather and pests, and make the job of handling it much easier.

Helping Plants Grow - The lawn, garden and houseplants can never get too much compost. It gradually releases a variety of nutrients just when the growing plants require them. Insects and diseases don't seem to do as much damage where the soil is enriched with plenty of decayed organic matter. And there's another bonus: dark compost draws the sun's heat to warm the garden soil, making our short growing season a few days longer.

Building Up the Soil - Plenty of compost added to the soil will also act like a sponge, soaking up water when it rains and releasing it in dry spells. It improves the structure of both sand and clay soils, protecting them against drought and erosion.

Generating Income – Good compost (97% humus without silt and sand) sales at rental for Rs. 10 per kilogram. This is a good income for those who want to produce compost at domestic conditions.

7 Advantages of Composting in a Bin

Some of the advantages of the composting in bins are explained herewith:

Composting Type	Advantages	Disadvantages
In-vessel	<ul style="list-style-type: none"> -Space efficiency. -Better process control. -Protection from adverse climate conditions. -Good odor control. -Potential heat recovery depending on the system design. -The elevated temperature is maintained and the bin keeps the heat from escaping. 	<ul style="list-style-type: none"> -Potentially higher capital costs. -Potential for incomplete stabilization due to short residence time in the biologically active system. -Less flexibility in operational mode than with windrow and static pile systems.
Windrow	<ul style="list-style-type: none"> -Rapid drying of wet material during turning. -Drier compost resulting in easier handling of the finished product. -Capacity to handle high volumes of material. -Good product stabilization. -Relatively low capital investment: pads for piles (optional), a windrow-turning machine, and generally a front-end loader and a screen (optional). 	<ul style="list-style-type: none"> -Greater land requirement than in-vessel systems. -Equipment maintenance costs may be high. -Requires careful monitoring to assure aeration and temperature rise are adequate to assure pathogen destruction. -Work may be delayed by weather conditions.
Static Pile	<ul style="list-style-type: none"> -Relatively low capital costs: paved surface for piles (optional), front-end loader, and a screening device (optional). 	<ul style="list-style-type: none"> -Greater land requirement than windrows or in-vessel systems. -Work may be delayed by weather conditions. -Composting occurs more slowly than in other systems.
Forced-Aeration Static Pile	<ul style="list-style-type: none"> -Relatively low capital costs: requires a paved surface for piles, front end loader (optional), screening device (optional), blowers and associated piping and monitoring equipment. -A high degree of pathogen destruction due to uniform pile temperatures. -Odor control through uniform aerobic conditions in the pile (yard trash composted alone does not present odor problems unless it is mainly grass). -Good product stabilization. 	<ul style="list-style-type: none"> -Greater land requirement than in-vessel systems. -Work may be delayed by adverse weather conditions.

8 Tips for Composting

The composting process speeds up when materials are chopped or shredded.
Water and air are important for composting success. Bin contents should be moist like a wrung out sponge.
If compost smells, there may be too much green waste in the bin and not enough air. Add dry leaves and twigs and mix together. Dry leaves and twigs (smaller than 2 cm in diameter) serve as bulking agents and make spaces for air.
Kitchen waste can attract rodents and pests, cover with ash or saw dust. Consider a worm bin or food composter may also be used.
Use your finished compost to build healthy soil in your yard by mixing into planting beds or as a mulch on top of garden beds.
Avoid adding any seed. Not to add materials from diseased plants.
Add old compost (10% of raw material) to the composing materials or Spray EM (1 ml of EM pollution/L + 1 gm Sugar/L) over the raw material.
Check to see the compost becomes hot (over 60°C).
Check moisture content is 50% when a handful of compost is squared 1-2 drops of water comes out. Check to see whether compost is properly aerated (50% aeration). Check the odor.

9 Basic Composting Instruction:

The basic principles of composting applied in all sorts are the process occurring in Nature. We just try to speed it up by creating environment that support more efficient microbial activity. The basic steps of Composting at domestic level are as follows:

Step-1: Select a suitable place: Terrace, Balcony near Kitchen, Courtyard, Garden or Farm Land. The place may be selected where some sunlight is available and rainwater from roof does not reach the Bin.

Step-2: Select a suitable method of composting: appropriate Size of Bin, Pit Composting, Garden Fence Composting or Wall Composting.

Step-3: Prepare yourself for composting: Get a copy of Composting Manual and other literature. Study thoroughly and understand the fundamental principles and troubles in Composting. Prepare Queries, if required. Ask specialists at WWW.Zerowaste.org.np or other websites.

Step-4: Acquire following basic materials and accessories:

- a) a Composting Bin or Prepare the Composting Place as appropriate
- b) a scraper rod,
- c) bucket for collection of compost,
- d) garden shovel,
- e) Gloves if required
- f) Inoculation materials as Old compost or Enhanced Microbes (EM)

Step-5: Place a stiff layer of organic waste as paddy straw or card board as supporting base layer in the composting Bin (In other methods it is not required)

Step-6: Prepare the raw waste as Brown Waste as straw, dry leaves, hay, maize stalk, sawdust and Ash by chopping into small pieces of 2-3 cm size. It will help to raise the temperature in the composting material upto 71°C. Place a first batch of composting materials as Kitchen waste or grass clippings or green waste in the Bin or in the Pit and cover immediately with Brown Waste. Ideal size of bin or heap of waste is 120-180 litres and Keep a bag of Brown (C) near the bin to cover the kitchen scrap and grass clippings.

Step-7: Second batch of organic material shall the other type of waste as brown waste. It is desirable to place Green and Brown waste alternatively.

Step-8: Place garden twigs (Chopped into small pieces of 2-3 cm size) or loose materials in between the layers to allow air migration, retain moisture and keep loose the composting mass

Step-9: Distribute the Inoculants (Old compost of EM at the rate of 10%-25% of composting mass) in the composting mass from time to time based on the composting mass accumulated. The composting material will become hot in mass in 1 or 2 days.

Step –10: Manipulating the combination of various ingredients in the composting material is the next important step. This means it is important to learn how to keep balance between various ingredients of composting as maintaining C: N ratio, Air circulation, Moisture content, volume of composting material, Temperature, and Time.

Step –11: Keep a bag of Brown (C) near the bin to cover the kitchen scrap and grass clippings.

10 Trouble Shooting and Diagonosis

<i>Symptoms</i>	<i>Problem Associated with symptom</i>	<i>Proper methods to solve the problems</i>
Compost has bad odors of – sulpher – ammonia	<ul style="list-style-type: none"> • sulpher odour occurs when pile is too wet • when excess of Nitrogen 	<ul style="list-style-type: none"> • mix in dry soil, grass, leaves, add Brown (C) straw, maize stalk • other methods: turn the pile, : mix in materials like green twigs and plant stems that do not compact
Compost does not heat up	<ul style="list-style-type: none"> • it lacks moisture • batch is too small 	<ul style="list-style-type: none"> • moist the dry spot, add table scrap • maintain optimum size (120 to 180 litre)
Process is too slow	<ul style="list-style-type: none"> • particles in the pile are too large 	<ul style="list-style-type: none"> • cut the waste materials into small size 2-5 cm • add livestock manure
Compost pile is too wet	<ul style="list-style-type: none"> • lack of air 	<ul style="list-style-type: none"> • add dry leaves, turn the pile to circulate air and remove the lid of bin to allow evaporation.
White mould appears	<ul style="list-style-type: none"> • not enough water 	<ul style="list-style-type: none"> • moist and turn the pile
The heap is sweet smelling and will not heat up	<ul style="list-style-type: none"> • lack of nitrogen 	<ul style="list-style-type: none"> • add nitrogen source and mix
Compost is damp in the middle but dry every where	<ul style="list-style-type: none"> • batch is too small or too dry 	<ul style="list-style-type: none"> • collect more materials, moisture
There are ants in the compost	<ul style="list-style-type: none"> • compost is dry • compost is too wet 	<ul style="list-style-type: none"> • add moisture • add dry organic materials
Flies in the compost	<ul style="list-style-type: none"> • food scrap is exposed 	<ul style="list-style-type: none"> • put food waste in the middle of the pile and cover it by brown materials.
When Compost is finished	<ul style="list-style-type: none"> • When volume of compost is reduced to 25-40% of the total volume of original waste • When individual material can no longer be identified. • When finished compost resembles dark rich soil and smells sweet and earthy. • Composting process can take from 3 months to 2 years. 	
Harvesting of Compost	<ul style="list-style-type: none"> • Harvesting of finished compost is initiated from the bottom of bin. • With help of scraper finished compost is taken out and sifted through sieve (7-21 mm) depending on desired coarseness of the compost and collected in receiving pan. • The incompletely decomposed and recognizable materials can be put back into the top of the bin. 	
Utilization of Compost	<ul style="list-style-type: none"> • It can be added directly to flower and vegetable beds. • It can be applied on the base of fruit trees. • Top dress the lawn. • It can be used for bedding plants. • Use compost as soil conditioner. 	

Box 1: Basic Principles of Composting

Natural Process

When leaves drop from a tree, they decay into soft black humus over time, without any help from people. When an animal dies, its remains slowly return to the earth. Anything that once lived will eventually decompose.

Workforce of bacteria, fungi, and insects

Composting is based on this natural process and begins with the thousands of micro-organisms which live naturally in soil. They feed on a moist heap of organic waste materials, generating considerable heat in the process. At temperature below 48°C, mesophilic organisms do the decomposition.. Other groups of "decomposer" organisms called thermophilic organisms go to work as the temperature rises from 48 to 70°C. This is an ever-changing work of **bacteria, fungi, and insects**. Colonies of bacteria will reproduce of their own accord and convert the food into their own bodies and by-product.

Oxygen Supply, Earthworms and Ants

When the temperature drops, turning or stirring the pile gives the decomposers more oxygen and the heat builds up again, helping to kill harmful bacteria. Macro-organisms such as earth worms, nematodes, beetles, insect and host of invertebrates graze upon the culture of micro-organisms. When all the easily decomposed material has been consumed, the temperature drops for the last time and earthworms and ants may move in, signalling that the compost is ready to feed new plants with its "recycled" nutrients.

Methods of Composting

There are two methods of aerobic composting, depending on whether or not the pile heats up. A "cold" compost pile will decompose as surely as a "hot" one, but it'll take much longer time. Cold composting is slow but it's easy. Someone with more space for compost than physical energy and time to devote to it may opt for the "cold" approach. This could also be the method to choose if your primary concern is reducing waste, rather than making quantities of compost. In contrast, hot composting is a fairly fast method of creating compost and makes efficient use of smaller spaces. It does take more physical effort than cold composting, but users who want as much compost as possible will usually choose this method.

Finished Compost

Finished compost has the distinctive fresh smell of newly-turned soil or a forest floor in spring, and won't heat up again no matter how often you turn air into the pile. The ideal result of the composting process is crumbly, dark, soil-like humus where none of the original material can be identified. The nutrients stored in compost depend on the richness and variety of its ingredients, and on its exposure to harsh weather. The dark appearance of compost is actually billions upon billions of dead micro-organisms. Compost doesn't need to be sterilized or screened for the garden. For use indoors, it should be put through a strainer or 5mm screen and sterilized in the oven for 1 hour at 90°C. To screen the compost to be used to top-dress the lawn would be an advantage.

Living Eco-system

Composting is an entire ecosystem of mould, fungi, actionmycetes and others that feed upon the organic matter and the by-product of other organisms. This decomposer food chain is vital living system that connects the soil with plants and animals. The decomposer organisms have four basic requirements: **air, water, food and adequate habitat**.

Composition of Compost

The food for the decomposer micro-organisms come from the Green, Brown and Dark Wastes. Compost is prepared with blending of these **Green, Brown and Dark** waste. The richness of nutrients in compost is measured with **Carbon and Nitrogen ratio**. An ideal CN ration is taken as **30:1**. There is no bad compost as such. So the ratio of CN may vary to large extent based on the availability of the ingredient waste materials. Various materials belonging to the different type of waste as Green, Brown and dark materials could be as follows:

Green waste

Green waste is considered as good sources of nitrogen. They are: Kitchen waste, Fruit, Vegetable, Grains, Blood meal, Bone Meal, Algae, Grass clippings, Weed, Coffee grounds and filter, Manure from herbivores, Egg shells, Tea Leaves and bags, Hair, Feather, Sea weed, Flower.

The green leaves and grass clippings are already contain Essential micro-organisms that decompose organic materials.

Brown waste

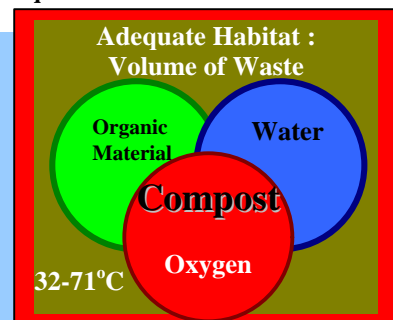
Brown waste is good source of carbon. They are: Leaves (dead), Straw, Sawdust, Rice Hush, Yard waste, Paperboard, Dried grass, Wood ash, Coffee filter, Tea bags, Cotton/Silk/Wool scraps, Wheat Hulls, Straw, Wood Chips, Corn Cobs, Pine needles, Grass Clippings (dried)

Dark waste

Dark waste is good source of various other chemicals and minerals as calcium, phosphorous, potash, and are very useful for supplementing good nutrients. They are:

Inoculation

Inoculating is a step to start composting that will help to accelerate the composting process. Inoculating materials contain high concentration of biological culture. If the active culture is not thoroughly blended with composting material at the start of composting process, the composting process is delayed due to the need of migration of organisms up or down from a mass of composting materials. The best inoculant is old compost which can be put together at the rate of 10% to 25% of the total row materials. Among the best inoculants Enhanced Microbes (EM) is the bacterial concentrate that can be sprayed over the row materials. EM solution is prepared at the rate of 1.0 ml of 1st EM solution + 1gm of sugar per liter of water.



Box-2: Composting Mechanism

Balancing the ingredients

The decomposing Organisms require balanced diet. The decomposer organisms work best with as varied a diet as you can feed them. The ingredients are all around us -- almost anything that once lived is a candidate for the compost, so try for lots of variety to get a good mix of textures and plant nutrients. Organic materials are the basic food but not all organics are equally nutritious. The materials like grass clipping are high in nitrogen while woody materials like dry leaves saw dust, wood chips are high in carbon. Micro-organisms need nitrogen and oxygen to decompose carbon and convert it into carbon dioxide. Foul smell of ammonia can be produced with excess presence of nitrogen. If there is little nitrogen, carbon is decomposed very slowly.

C:N ratio

For successful results, you can use the simple rule that compost needs to be about half "brown" and half "green" by weight. Don't bother to weigh your ingredients, though: an estimate is fine. Composting soon becomes a matter of instinct, like the cook who bakes without a recipe. If the pile doesn't heat up, you know there's not enough "green" in the mix, while a smell of ammonia means it needs more "brown."

All organisms need a large amount of carbon and smaller amount of nitrogen in order to sustain themselves. The organic materials can be rated according to their carbon to nitrogen ratio. C:N ratio a 30:1 ratio is considered as the ideal composting blend. However 40:1 is also recommended to prevent odors. Equal parts of leaves (60-1) to grass (25-1) plus wood chips for free air make an ideal composting mix. Leaves are less prone to become odorous than grass clippings. When composting, addition of Nitrogen and phosphorous containing fertilizer (10-10-0) at the rate of 100 to 400 gms / 120 to 180 litre of compost and organic fertilizer 10% to 25% of compost can accelerate the rate of decomposition. To help supplement Nitrogen, cotton seed meal can be used. Addition of granite dust or rock phosphate powder, which is solubilised by organic acid produced during the decomposition process make the nutrients more available.

All these growth, reproduction and decomposition generate heat. The hotter the pile becomes the faster it decomposes. At 30:1 the compost pile reaches 71°C while at 40:1 it reaches 60°C but at 60:1 only 48°C.

Adding Water

Light watering or gentle moistening of dry composting materials is essential. Excess or lack of water slows down the decomposition process. Excess of water causes foul odors. The composting materials should hold 50% of water by weight. Mixing dry leaves and old compost can help absorb excess water. There should be enough water that is almost, but not quite, drops when you hold up a handful of composting materials.

Aerating

Air provides oxygen and enables bacteria to carry out "aerobic" decomposition. Without oxygen, "anaerobic" decomposition of the waste may take place instead. This is something we normally want to avoid, since anaerobic bacteria produce the rotten-egg smell often associated with decay.

In a normal compost pile, Air penetrates only the first few inches of the pile, so it needs help to reach the centre. A vile smell around the compost tells you that anaerobic bacteria are moving in, and the pile may simply need to breathe. In hot composting, plenty of air is essential to develop the high temperatures that kill pathogens and speed the process of decomposition.

Under ideal condition of a balanced composition of carbon and nitrogen, proper air and water, the microbes work hard to break down the materials efficiently. Air and water ratio of 50:50 is considered optimum. Adding air means providing oxygen to microbes to accelerate break down process. The perforated pipe alignment inside the ZWN bins will properly aerate round the whole composting materials.

Maintaining Temperature

The optimum temperature for fast decomposition of organic material is between 32°C to 58°C. It is necessary for the compost to reach the temperature of 54°C for three days. Micro-organisms become passive above 55°C and below 32°C. After cooling stage, compost humus is formed. If the temperature does not rise up, compost will still decompose but slowly. Environmental temperature will effect the rise & fall of temperature of compost.

Volume of Compost

For a hot or active composting at the household level, a size of 120 to 180 litre has been reported to be an ideal size.

Time

Composting process can take 3 months to 2 years. Hot composting time will be considerably less than cold composting.

List of Equipment and Tools

- Shovel , Pitch fork, Chopper, clipper, Garden glove, Compost shifter
- Hydrometer, Thermometer

List of composting materials

WASTE	Waste Category	May be/ Yes	No
Algae	Green	Shred into 2-5 cm pieces	
Ashes	Brown	From untreated wood or paper in small amounts;	From barbecues, plywood, coloured or glossy paper
Banana Skins	Green	Decompose rapidly; can help to activate a slow compost; loaded with plant nutrients	
Buckwheat hulls	Brown		
Blood meal	Green	extremely rich in nitrogen	
Cardboard	Brown	Shred, soak, and mix with "greens"; but try first to reuse or recycle it	
Charcoal (briquettes)			will not break down in compost
Citrus Fruits	Green	Shred rinds; bury in compost to discourage fruit flies, cover with ash or wood dust	
Coffee Filter	Brown		
Coffee Grounds	Green	Good earthworm food; use directly on many plants; compost shredded filters, too	
Cotton/wool/silk/scraps	Brown		
Corn Cobs	Brown	Shred; adds both fibre and nutrients to compost; good mulch; slow to break down	
Dairy Products	Dark		Fats seal off air from compost; odours attract pests
Diseased Plants			Compost heat may not destroy disease; destroy or discard to avoid spreading
Dishwater			If water doesn't contain grease or chemical cleansers, use it to wet pile
Dog or cat faces	Dark		may carry parasites and diseases that infect humans
Dried grasses	Brown	good source of carbon	
Dust and Lint		from vacuum cleaner debris and lint from clothes dryer, if mostly natural fibres	From street and floor cleaning
Egg shells	Green	Dry and crush first; good earthworm food; slow to break down; help neutralize acidity; as mulch, may discourage slugs , adds calcium	
Evergreen Needles	Brown	Highly acidic; better yet, use as mulch	
Grains	Green	Rich in carbohydrate	
Fabrics	Brown	Small scraps of wool, cotton, felt and silk;	Synthetic fibres or blends
Fats, oils, grease	Dark		attract animals and keep anything they coat from breaking down
Feathers	Green	Keep somewhat wetter than usual; extremely high in nitrogen	
Fish	Dark	Odours and pests are problems with fresh or smoked fish, but dried fishmeal is fine, cover with ash or wood dust	Odours and pests are problems with fresh or smoked fish,
Flowers	Green		
Grass Clippings	Green	mix well to avoid clumps; leave some clippings to feed lawn	
Hair		Both human and pet hair; keep quite damp;	Hair coloured with chemicals

Hay and Straw	Brown	Very good fibre, nutrients usually low	
Leaves (dry)	Brown	Shred and soak; adds both nutrients and fibre; tend to be slightly acidic, improves aeration	
Leaves (Green)	Green	Shred and soak; add both nutrients and fibre; tend to be slightly acidic, improves aeration	
Manure from herbivores	Green	Cow, horse, pig, rabbit, poultry -- the fresher the better -- helps any compost	Dog manure and manure of sick animals
Meat and Bones		Odours and pests are problems; but dried, ground bone meal is fine source of nitrogen, cover with ash or wood dust	
Newspaper	Brown		
Nutshells	Brown	Crush delicate shells like peanuts; heavier shells are better used as decorative mulch	
Paper	Brown	Shred;	Glossy/coloured which contain chemicals; better to recycle if possible
Paperboard	Brown	cereal boxes, paper boxes, paper plates and napkins, break into small pieces	
Pesticide, Toxic chemicals	Dark		will harm or kill beneficial soil life
Rhubarb	Dark		Raw leaves poisonous to humans; composted leaves may harm insects and other plants; stems are fine; roots may continue to grow
Sawdust (from untreated wood)	Brown	Hardwood sawdust, yes, in very small quantities;	softwoods may inhibit composting; plywood may contain chemicals
Seafood Shells	Brown	Crush or grind very finely; break down very slowly; reduce acidity; good mulch	
Seaweed	Green	Rinse off salt so it won't contaminate soil; great fertilizer	
Sod	Brown	Knock off excess soil; pile upside down; cover to prevent rooting; compost separately to avoid compaction	
Soil		Adds decomposer soil organisms; scatter lightly through pile to avoid compacting	
Soup		yes;	with cream or meat-based broths to avoid odours and pests; read labels on canned soups.
Straw	Brown	a good source of bulky material	
Tea Bags	Brown		
Tea Leaves	Green	High in nitrogen; can be applied directly to some plants; compost tea bags too	
Vegetables	Green	all vegetables & peelings	
Weeds	Green	Shred; . Seeds or bits of root may survive and sprout in garden if compost doesn't get hot enough to kill them.	Mature seeds, persistent roots, weeds treated with herbicides/pesticides
Wood Chips/Ash	Brown	Shred if possible and soak; use big pieces as mulch first, compost when weathered	

Types of Compost Bins

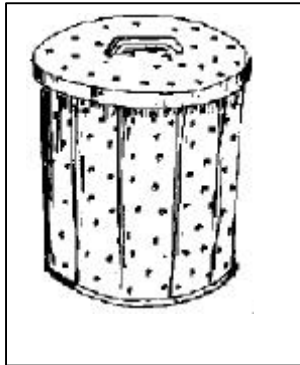
Type 1: ZWN Bin

Zero Waste Nepal has made an exclusive design of an environment friendly composting bin. The design is provided below. The aeration system and grating design placed in side the bin is shown in the picture given in the side. The bin can hold waste material quantity about 120 litres and is based on hot composting. This type is good where Households do not have adequate space for heap composting or other type of composting.



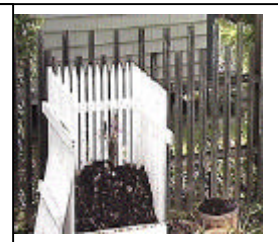
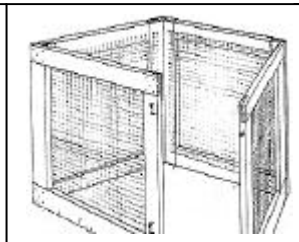
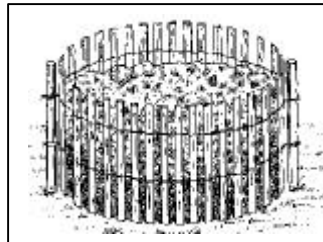
Type 2: Low Cost Bin

Low cost bins are available in the market or could be made by the users without much difficulty. Because of the holes made in the body of the bin for air circulation, heat is lost and the bin works with cold composting principle, attracts insects as flies and leachate may be observed.



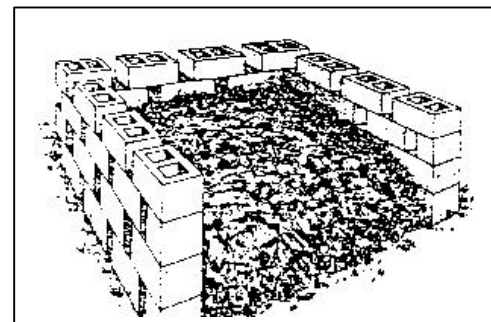
Type 3: Garden Bin

The Garden Bins are used are where space is available and the households can afford some more time for working for making composting as mulching, mixing from time to time.



Type 4: Large Bin Composting (Fenced)

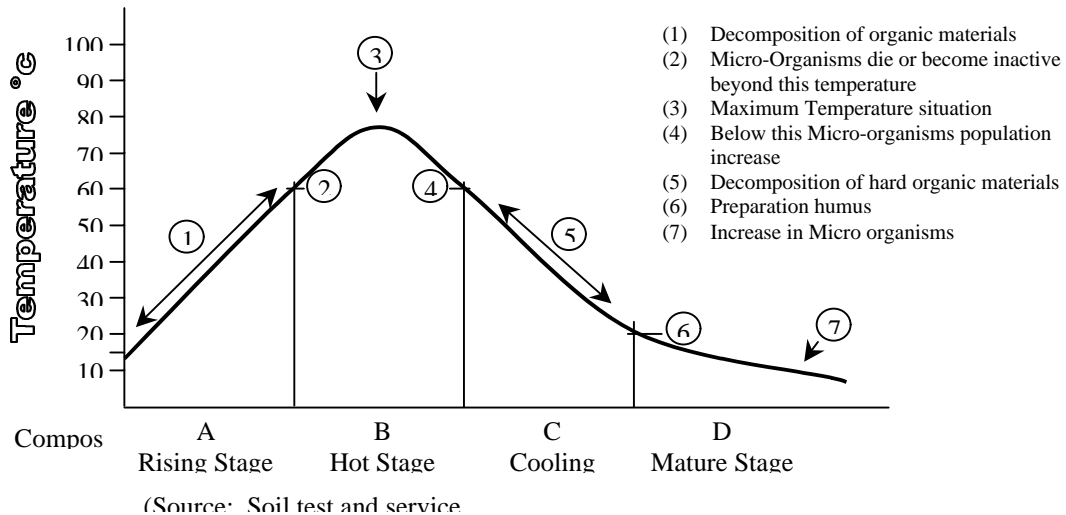
This type of composting may be practiced where limited space is available in the backyard. It allows to maintain the backyard in a neat and clean condition. Depending upon the size, Hot composting may be practiced. Two sides of Fence wall may be used as two sides of the bin. It is one of the effective and economic types of composting bin.



Type 5: Pit or Heap Composting

This type of composting may be practiced where large space is available and quantity of organic waste is significantly large. This requires frequent turning of the composting heap in order to allow aeration of the composting mass.

Figure 5: Effect of Temperature on Decomposition of Organic Materials



Reference:

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- Seattle Solid Waste Management Compost Information Centre; Alamanda County, USA.
- A lot of Internet Materials