Backyard Composting

by: Helga Olkowski

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50¢

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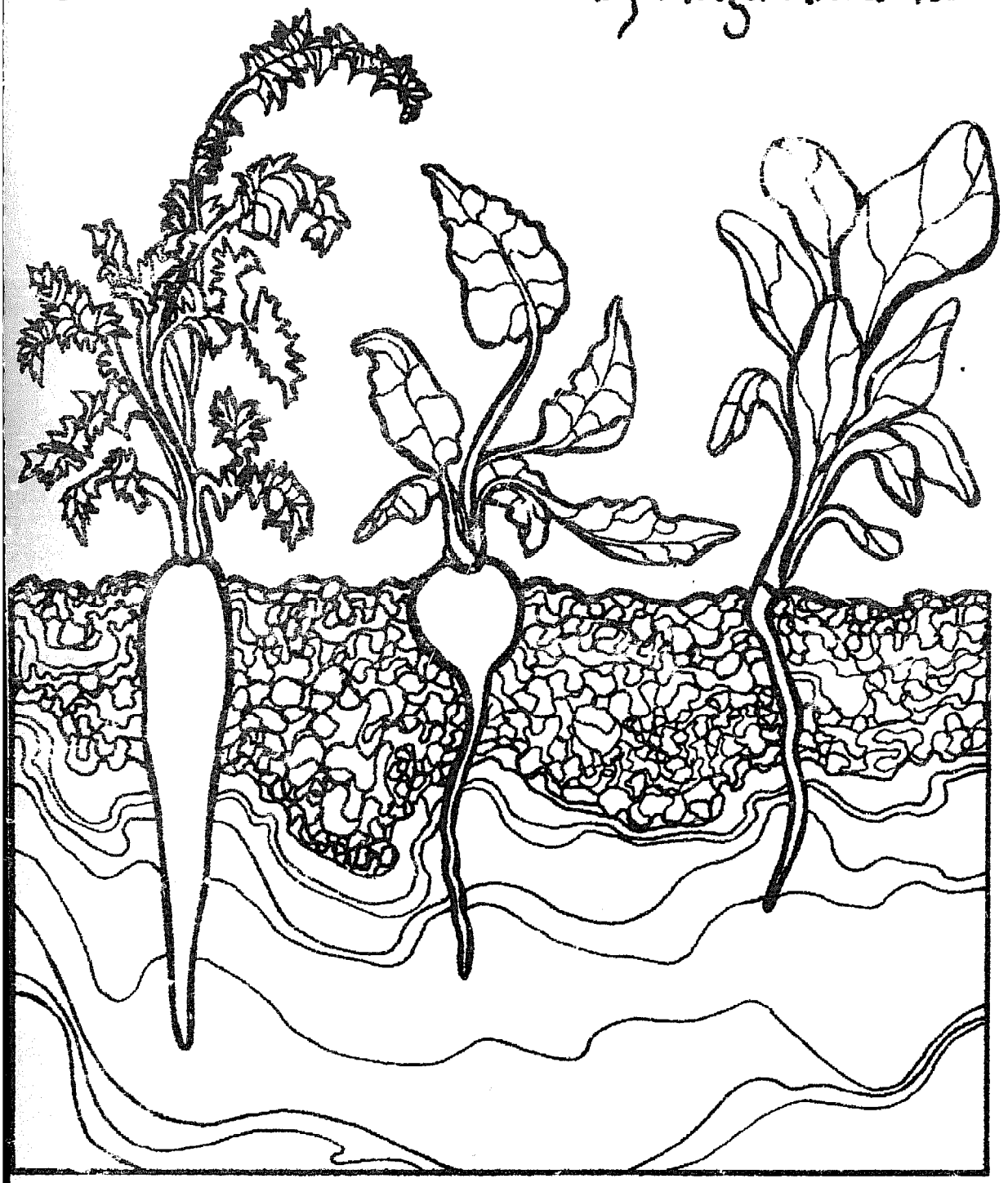

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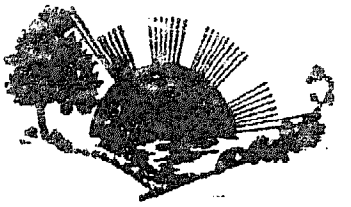

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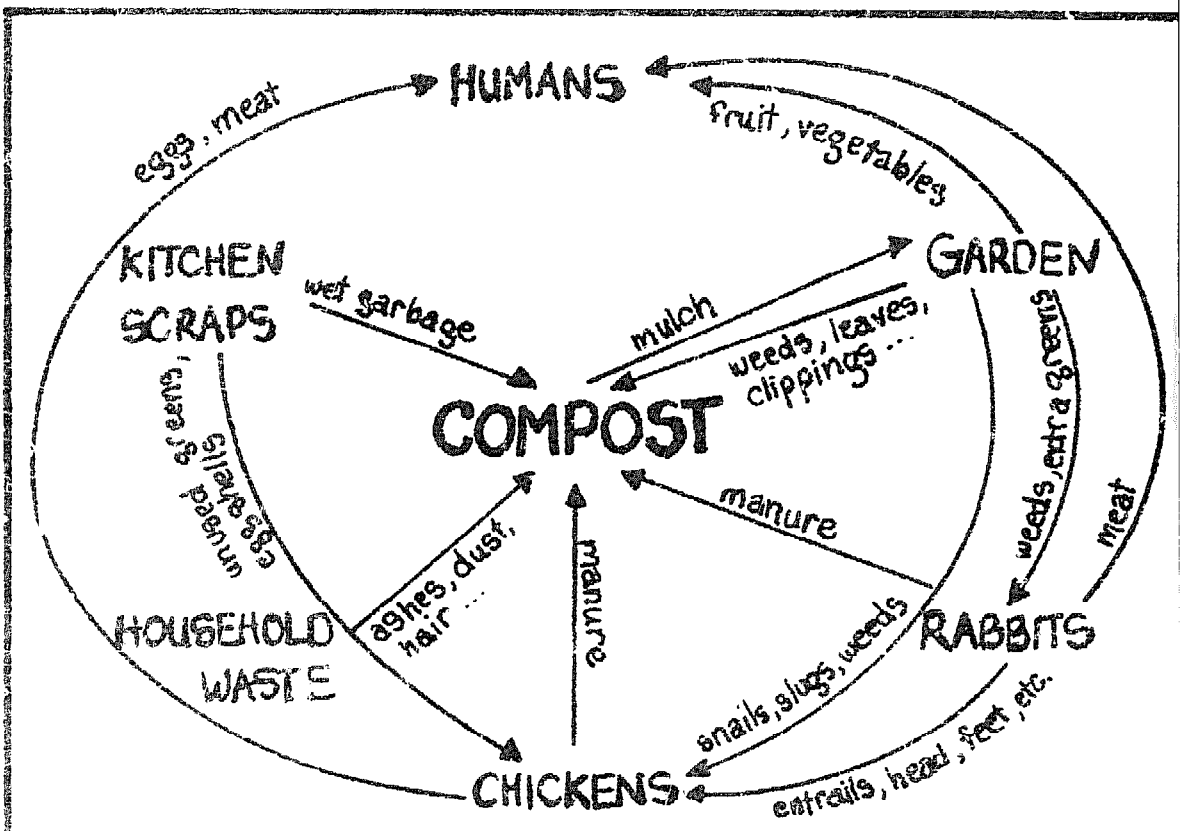


Compost is part of a whole system of energy pathways in the urban garden.

METHODS -- SLOW AND FAST

There are many methods of composting, they all have their advocates, their advantages and disadvantages.

The slow methods have much appeal. They are simple and require little thought or energy. In one variant, leaves, grass clippings and weeds are heaped in a pile, with or without occasional sprinklings of soil, and left to decompose by themselves. The pile will rarely heat to a high temperature, with most of the decomposition being provided by fungi.

This method proceeds well in cool moist weather. If a windrow, or a row of little piles, is begun in the early spring and completed by the late fall, when the snows melt again the material will be ready to use. The advantage, besides simplicity, is that one does not have to worry about a nitrogen source.

Composting is a process in which bacteria, fungi and other organisms break down complex organic materials into simpler compounds, thereby making their components available for plant use once again.

This process may be aerobic, in the presence of oxygen, or anaerobic without oxygen, involving different groups of microorganisms with different by-products.

The method recommended here for urban gardeners is aerobic process. The finished product is useful as a mulch -- to conserve moisture, modify the surface temperature changes of the soil, protect the soil from erosion by water and compaction by foot traffic, and provide habitat and food for numerous soil organisms. The finished compost may also be incorporated into the top six inches of soil with a digging fork to improve the soil structure -- developing soil aggregates and pore space for oxygen and other gas exchanges necessary for plant roots, as well as increased water and plant nutrient retention.

If carefully made, this compost may also serve as a fertilizer providing nitrogen and other nutrients needed for plant growth. Nitrogen is frequently the plant nutrient in shortest supply since it is used in large amounts by plants, is easily leached from the soil by water and is replenished very slowly by the soil organisms under most natural conditions. To make good compost that is high in nitrogen is somewhat like making a fine stew -- a mixture of science and art.

often perfect. The ideal set-up would be a ground area 3 or 4 feet wide and from nine to twelve feet long so that at least three wooden bins can be constructed, each approximately a cubic yard in size.

The fronts of the bins should be made of removable boards, allowing easy entry as the contents are emptied. The sides and floor of the bins should be as tight as possible so that bits of organic matter cannot fall through and provide overlooked fly breeding material underneath and outside the bins. Tight lids will be needed to keep out the rain. One of the bins can be kept for the storage of matter to be composted -- general garden debris, but not manures or kitchen garbage -- while the going pile is tossed back and forth with a pitchfork between the two remaining bins.

Experience has shown that the average compost made by the following method takes about three weeks to complete and another week to be used up -- assuming the average urban gardener is pretty busy and has relatively little time for gardening. Thus, with this scheme a new compost would be made once every three and a half to four weeks. If your family accumulates too much organic kitchen waste to store for this length of time, then a second compost can be started two weeks after the first in the bin orginally suggested for storage and either the materials stored somewhere else or a fourth bin built. Then, if the bins are labeled A, B and C, on one day the contents of compost bin B is turned into C, and that of A into B. Two or three days later B is turned back into A and C into B. When one compost is finished and moved out into the garden, another is started. This way there is always one compost finishing and ready to be used and one just made and cooking.

The disadvantage of this easy method is that the resulting pile is very low in nitrogen, the piles take up considerable room, the temperature rarely rises high enough to kill the pathogens that cause plant disease, and one cannot use the pile to recycle kitchen garbage because this will cause fly breeding and rodent problems. Even slow piles that contain no garbage, but have too high a percent of grass clippings or become too moist, may encourage fly production without the compost maker realizing it.

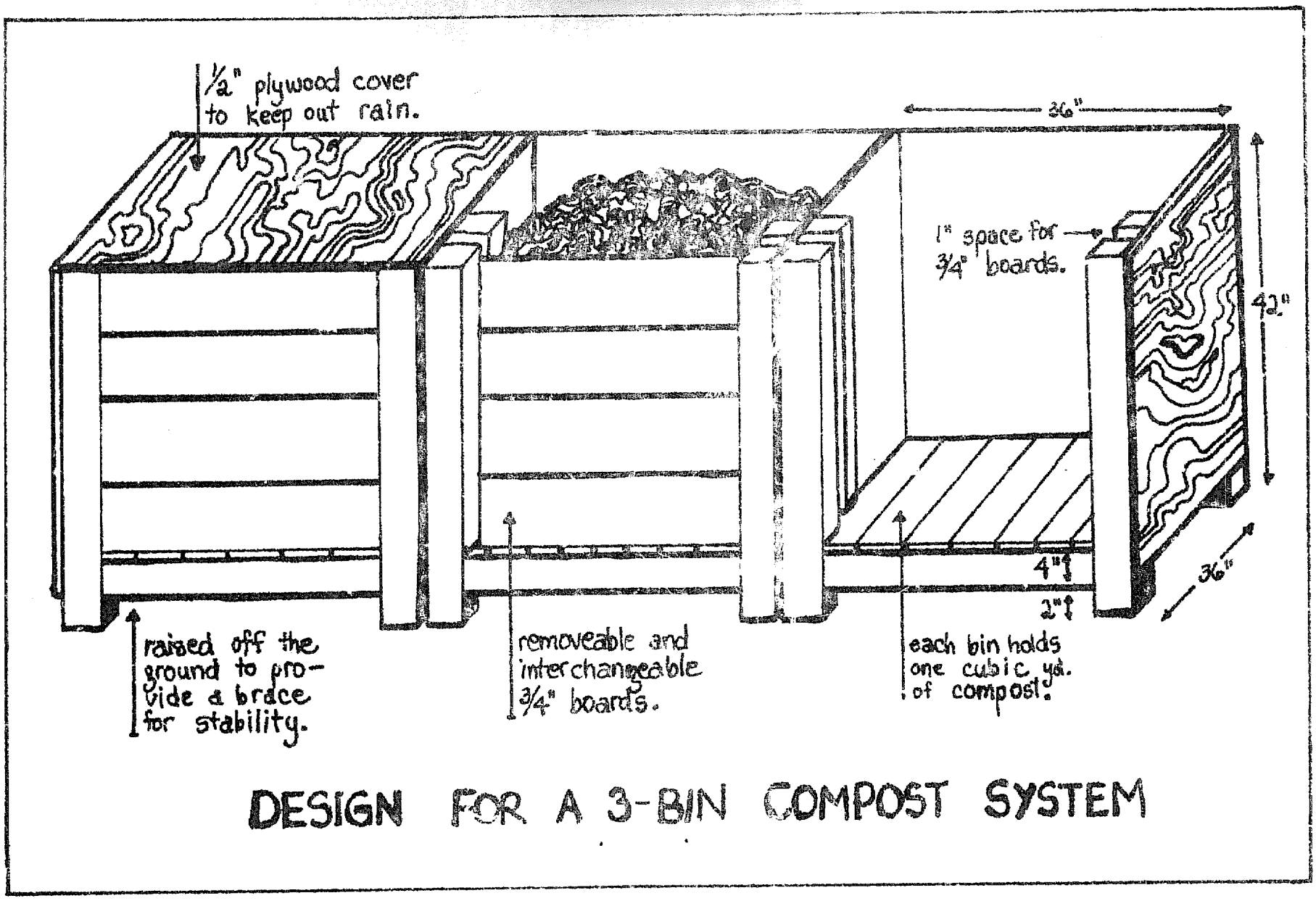
A RECOMMENDED FAST COMPOSTING METHOD

There are a number of methods of fast composting. They all take attention and energy. Because of the high quality product you can obtain, you may decide it is worth the effort.

The following method is recommended to the city dweller for a number of reasons: If the directions are followed carefully, and the basic theory is understood, one can learn to produce a high nitrogen compost out of the materials generally regarded as a waste product and a nuisance. This compost will provide a plant fertilizer as well as act as a soil amendment and mulch; fly and rodent problems will be kept to minimums; high temperatures will be reached that will kill most plant pathogens, and even take apart pesticides. This allows the gardener to safely dispose of diseased plant material through the compost as well as recycle all organic kitchen garbage; and the composting area will appear sufficiently neat so as not to antagonize neighbors or your local public health authorities.

CHOOSING A LOCATION AND MAKING BINS

If possible, select a shady place so that the piles will not dry out too quickly. The north side of the house or garage is



DESIGN FOR A 3-BIN COMPOST SYSTEM

TEMPORARY STORAGE OF ORGANIC KITCHEN WASTES

The average garbage can in urban areas produces a thousand flies a week -- even if you keep a tight lid on the can or wrap your kitchen wastes in a paper bag. Flies are attracted by smells, can go through a space of 1/8th of an inch, and in warm weather produce a new generation in four days.

Fly eggs are laid in moist organic material and that is where the maggots will develop. When they are ready to pupate and turn into adult flies they will seek a drier medium. Usually the maggots crawl out of the can and into the ground or debris nearby.

However, you can separate and store your organic kitchen wastes for the compost (or the regular weekly city garbage collection) without producing smells or flies if you follow the following procedure:

1. You will need at least two containers. If they are kept outside, each must have a lid sufficient to keep out the rain.

2. Fill one with sawdust. This is a waste product created in quantity by lumber yards and cabinet shops and then taken to the dump. There are many places in every city where it can be obtained freely and easily.

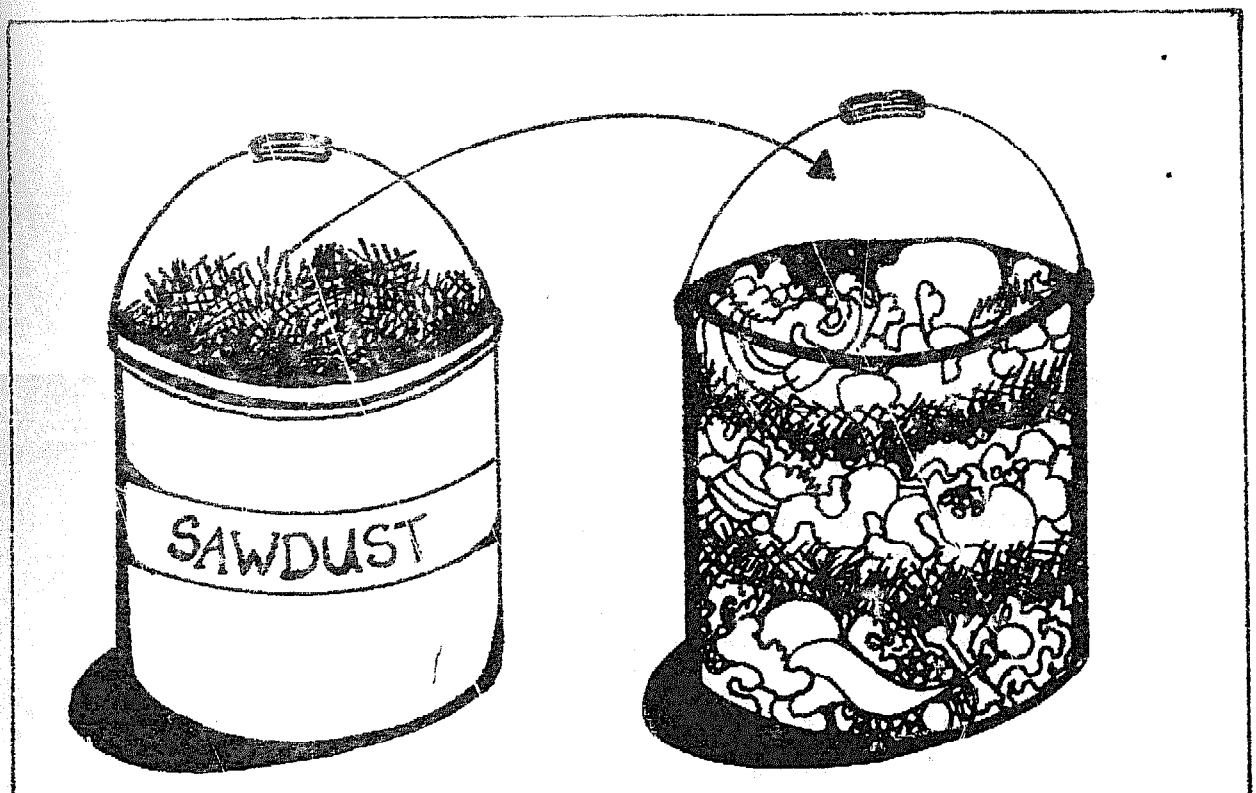
    a. In the sawdust container keep a little can for dipping out the shavings.

    b. If you keep the sawdust container near your regular garbage can, mark it plainly "Do Not Empty," so that it will not be emptied by mistake.

3. The other container will be for the organic kitchen wastes. Each time you bring some out from the kitchen after a meal, thoroughly cover the material with at least

an inch of sawdust. Make sure that no scraps of food are poking through the sawdust, giving off a smell that will attract flies.

4. As you fill the garbage can, there will be alternate layers layers of garbage and sawdust. When you reach the top, finish with a layer of sawdust. The entire contents of this container can be used to make your compost. The sawdust will give the compost an excellent texture and the kitchen wastes will furnish some of the necessary nitrogen for decomposing it. There will be no odor while you are storing this material and no production of flies.



Storage of kitchen scraps: cover each layer of wet garbage with at least one inch of sawdust to help prevent the attraction and breeding of flies.

BUILDING THE PILE

Start with some absorbent material on the bottom of the bin. Sawdust is good and easily obtainable from the sources previously mentioned. Then put down layers of green and dry matter and manure, if you are using it. If some other nitrogen source is used, sprinkle it over the layers as you go along. Make a 3 to 5 inch layer of each of your materials until the bin is full.

The smaller the size of the materials you put in, the more surface area you expose to decompostion, the faster the pile will go. For this reason you may wish to chop up the coarse materials -- melon rinds, dry weeds, stalks or straw, etc. -- into shorter lengths of 5 to 8", with a cleaver. Some people use compost grinders or run electric lawn mowers over the pieces to cut them fine. This uses fossil fuel, makes a lot of noise and is not necessary.

No commercially sold materials need be added to the pile. Lime will promote the loss of nitrogen, and unless your soil is known to be deficient in phosphorus there is no need to add bone meal or phosphate rock. Commercially sold compost starters have not been shown to make any difference in small piles -- the spores of the organisms that decompose organic material are everywhere and need only the proper environment to germinate and begin work.

When you have finished building the pile you should have about a cubic yard of material. A smaller pile does not hold the heat adequately, a larger pile is rather much to turn.

COLLECTING THE MATERIALS

All organic materials can be decomposed by microorganisms, but some, like proteinaceous wastes, can be particularly attractive to rodents and neighborhood pets. For this reason, you will want to avoid placing meat scraps, grains and the like in your compost unless you are confident that it is heating up to the high temperatures and that your bins are well-contained.

In addition, some materials break down much more quickly than others. Fats go so slowly they should probably be kept out of the compost pile altogether at least in large amounts. Many plant resins are resistant also. Eucalyptus leaves, conifer needles and similar plant materials should probably be left to decompose slowly under the trees where they drop, rather than put in the compost pile. You may need to do a little experimenting to learn which of the organic materials available to you in your area are too difficult to compost by the following method.

Usually the various materials for the compost are accumulated over a period of time in different ways. Your kitchen wastes should be stored daily as recommended. Grass clippings may be obtainable weekly or less frequently. Occasionally there will be weeds and other pruning from your garden. If your household does not supply enough, you may obtain some from your neighbors.

All the materials just mentioned will probably be fresh or green; they will supply nitrogen to the bacteria that will decompose the pile. You will also need some dry material -- dried grass and weeds, dry leaves, hay or sawdust. These are mostly carbon, low in nitrogen, and will absorb moisture and keep the pile from becoming compacted.

HOW MUCH DRY TO HOW GREEN OR FRESH MATERIAL?

Organic material, both fresh and dry, contains both carbon and nitrogen, but in varying amounts. The microorganisms decomposing the pile use the carbon in respiration and to build their own body tissues. For every 30 parts of carbon they assimilate, 20 goes into respiration and 10 into body tissue. And, for every 10 parts of carbon used to build their body tissue, one part of nitrogen is needed. So, the microorganisms end up using approximately 30 parts of carbon to one part of nitrogen, or a carbon-nitrogen ration of 30 to 1. This ratio must be kept in mind.

Sawdust has a very high carbon-nitrogen ratio. Such materials decompose very slowly because of the shortage of nitrogen. Under those conditions it is only through the death of some of the bacteria that nitrogen, fixed in their tissues, becomes available to others. Thus, if too much high carbon material is added to the pile, it will take a long time to compost, and will not heat up to high temperatures.

On the other hand, if materials, such as chicken manure, which are high in nitrogen, are added to the pile in such quantity that there is more than 1 part nitrogen to approximately 30 parts carbon, the excess nitrogen will be respired by the microorganisms as ammonia. In this case you will be able to smell the gas coming off the pile.

SOURCES OF NITROGEN

Kitchen garbage is usually very high in nitrogen, as are grass clippings, and if your pile contains a very high proportion of such materials then little or no additional sources of nitrogen may be needed.

If not, you will want to know what is the cheapest and best source of nitrogen. Hold on to your hats,now ... it's urine. That's right. That very stuff we and other animals produce every day in considerable quantities and flush away to cause waste management problems somewhere else -- "Out of sight, out of mind."

Human urine is perfectly safe to use in the garden int the manner we are suggesting here. You need not fear there is some pathogenic bacteria in the urine that could spread disease to anothter person, as can happen in the use of human feces for fertilizer. I checked this out very carefully before reccommending this method to you.

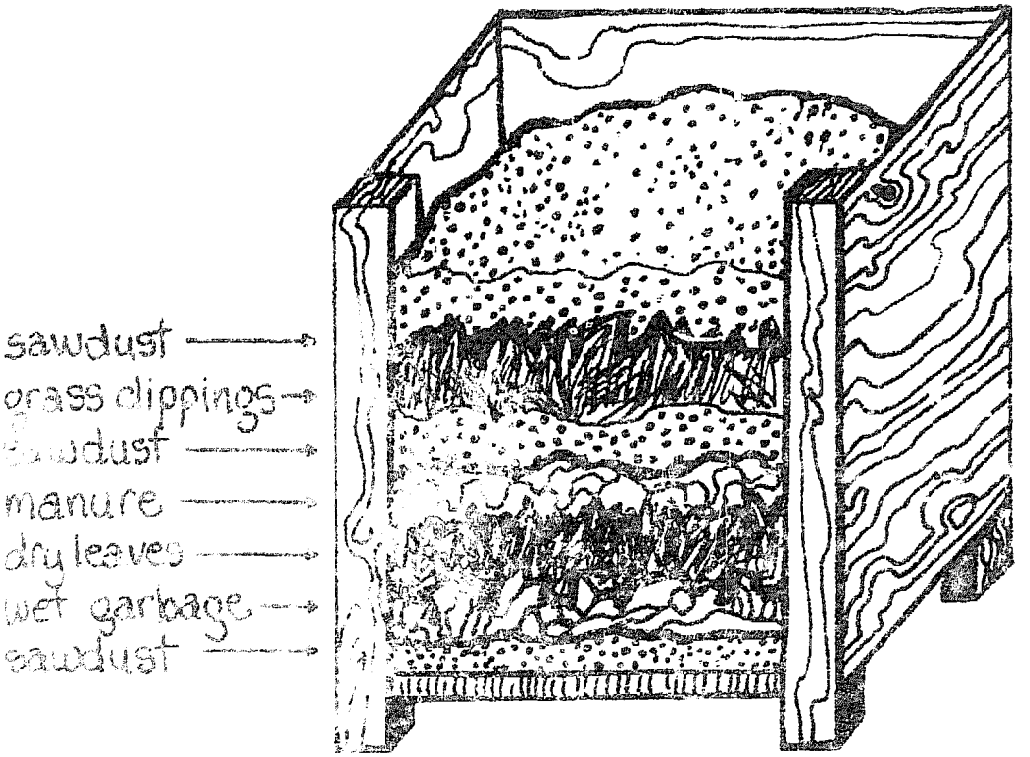
The average daily output of urine is one to one and a half liters (1 3/4 to 2 7/8 pints) per day. In dry weight this is about forty to sixty grams (.09 to .13 pounds), and this contains 46.7 percent nitrogen. That means approximately fifteen grams of nitrogen in every liter of urine, or about twelve pounds of nitrogen per year per person. Enough to fertilize about 3,000 square feet at a rate of 200 pounds per acre.

While urine is a valuable additive to your compost, it can also be placed directly into your soil. The farmer commonly adds nitrogen in amounts of 100 to 300 pounds per acre. So, to add 200 pounds per acre by using your own urine, spread two quarts of urine for every twenty-seven square feet (3' x 9') twice a month. If possible, dilute the urine five times with water in a sprinkling can. Urine is low in calcium, but has a fair amount of salt which may be left in the soil. To help leach this away, once a year add approximately a quarter pound of lime or gypsum to every twenty-five square feet of soil. Dust it on the soil and water it in.

Animal manures, as everyone knows, are also a good source of nitrogen. Poultry droppings are the highest in nitrogen, about 6 percent, since they contain urine and feces together. Fresh steer manure is good, usually about 2 percent. Horse manure may be very low because of the way it is obtained from many racing stables, mixed with so much bedding. It may use more nitrogen to decompose the mixture than the manure itself contributes. Rabbit manure is also good and may be sprinkled directly on the beds around the growing plants.

In any case, if you are still balking at using urine (I know perfectly well that confronting your own wastes is something society finds very difficult), and you are finding manure difficult to obtain in your urban area, you can consider synthetic additives. Blood meal, for example, is a good source, but expensive. The microorganisms will work happily with the cheapest source of nitrogen with which you can supply them, ammonium sulphate, for instance. The problem with these synthesized fertilizers is that it takes energy to produce them, and in terms of using them exclusively as a fertilizer directly in the soil, they are inadequate because they do not return organic material to the earth. Organic material incorporated in the soil has many crucial functions besides supplying plant nutrients. However, in the compost pile such a synthetic fertilizer is acceptable. The microbes do not seem to distinguish between the synthesized and naturallly occuring forms of nitrogen and the finished compost will be satisfactory.

Building the pile in layers helps to keep track of how much of each type of material is being added. Estimate the proportions as best you can -- some corrections can be made during the first or second turnings.



Build your compost with alternating layers of fresh materials, dry matter and manure.

After the pile is built you may need to water it. It should be moist, but not too wet as there needs to be plenty of air throughout the pile. No water should be running out the bottom. If this should happen at any time, put a thick layer of sawdust into the adjoining bin and turn the pile over into that to trap the juices.

TURNING THE PILE

After it is built, let the pile sit a day or so, then, with a pitchfork, turn the compost into the neighboring bin, examining it while you do so. The top, bottom and sides of the old pile should be turned into the center of the new bin, the center of the old around the edges of the new. This should be done each time the pile is turned to ensure that all materials are exposed to the heat of the center, killing any fly eggs, larvae and plant pathogens.

The turning also introduces air into the pile, which is essential for the growth of the desirable microbes. If this is not done, the bacteria will exhaust their oxygen and then a different group of organisms anaerobic that can live in this new environment, will start to grow and multiply . These anaerobic bacteria will not heat the pile and will produce highly objectionable odors.

The pile should be mixed and turned in this fashion at least every third day -- turning it more often, up to once a day, will speed the process of decompostion. If the pile is properly made, for the first few days the temperature in the center will rise, reaching approximately 160 degrees F. by the third or fourth day. It will return to this temperature each time the pile is turned for many days and then begin to cool slowly. When it has cooled down completely it is finished, however, it can be put out in the garden as soon as the temperature has gone below 100 degrees.

SUMMARY OF COMPOSTING PROCESS

1. Select and prepare composting area.

2. Assemble materials.

3. Chop as fine as possible, filling bin with alternate layers of green matter, dry or high carbon materials and source of nitrogen.

4. At intervals while building the pile, or when finished, add sprinkling of water.

5. Turn compost every second or third day into neighboring bin using pitchfork. In turning, mix materials thoroughly -- former top goes to bottom, outside matter into the center. Avoid spilling material outside of bins, as this may be a source of fly breeding

6. While turning examine pile for fly larvae. Center heat will kill them.

7. Notice differences between piles as to age, particle size, moisture, odors. Does the pile smell like ammonia? Is it almost too hot to touch in the center? Is it moist?

8. Finish turning pile with flat shovel and broom, if necessary. Bin should be clean when it is empty, or before introducing next pile.

IF THE COMPOST DOES NOT HEAT UP HIGH (160 F.) WITHIN TWO DAYS, CONSIDER THE FOLLOWING POSSIBILITIES:

a.) Not enough nitrogen -- add some blood meal, urine, etc.;
b.) Too dry -- add water while turning;
c.) Too much water -- add a little sawdust while turning;
d.) Not enough oxygen -- turn more frequently.

IF THE PILE IS GIVING OFF STRONG AMMONIA SMELL:

a) Too much material high in nitrogen -- add sprinkling of sawdust while turning.

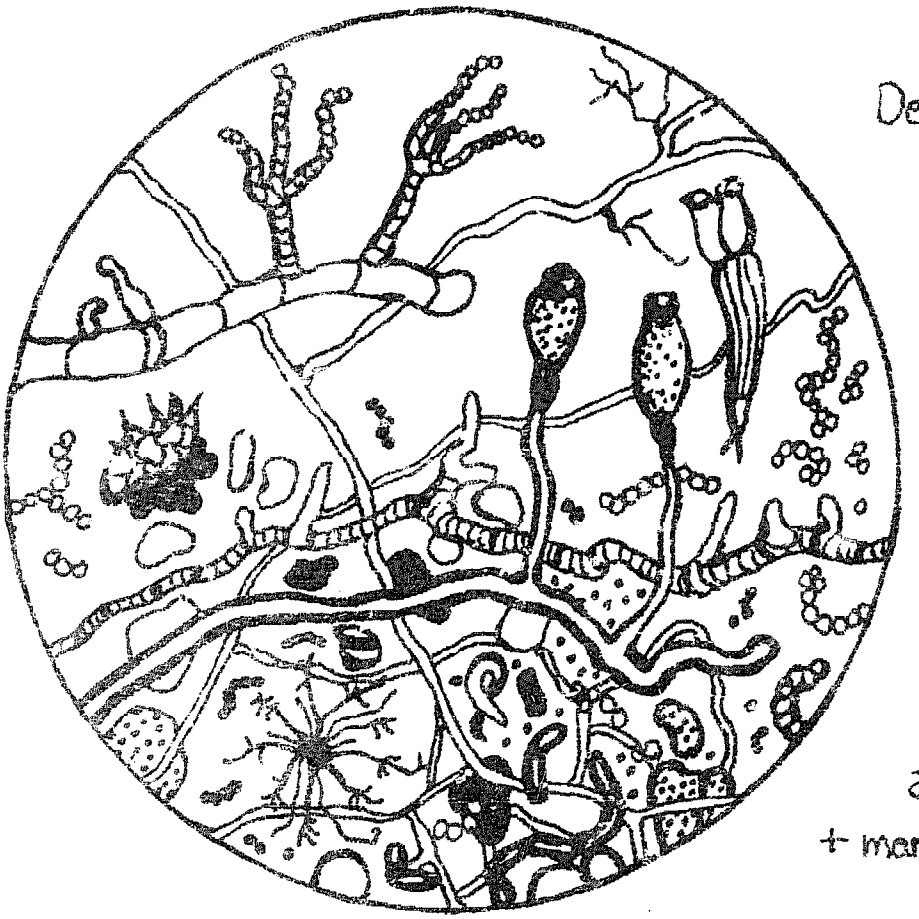
IF PILE COOLS DOWN BUT CONTAINS SOME CHUNKS OF UNDECOMPOSED MATERIALS:

a.) Sift through coarse screen and return uncomposted materials to new pile to go through process again.

XI: USING YOUR COMPOST

1. Compost may be used on top of beds, around plants as a mulch.

2. Finished compost may be spread out on newly harvested beds and turned before re-planting.



Decomposing organisms in an aerobic compost: bacteria, fungi, worms, insects, protazoa, algae, actinomyces, + many others.

3. Finished compost may be sifted. Sifted compost can be used in seed beds or flats. In carrot beds, for instance, a good mixture is one third sand, sifted dirt and sifted compost. Coarse particles should be returned to new compost pile to break down further.

4. Unfinished -- still hot -- compost may be spaded into ground <u>only</u> if it has had least a week of composting and if no planting in that spot is to follow immediately. The further decompostion of the material in the soil by bacteria requires nitrogen, just as it does in the bin. Thus, raw compost may cause a temporary deficiency of nitrogen in the soil if it is low in this nutrient. If the compost contains much manure that has not broken down sufficiently, or if there is a strong ammonia smell coming from it, this may cause damage to the plants from excessive nitrogen.

Caution: If ammonia smell persists heavily after compost has cooled, do not use close to plants (within four or five inches of stems) as you risk causing nitrogen burn. Next time use proportionately less manure or more vegetable matter when making the compost pile.

FOR FURTHER INFORMATION

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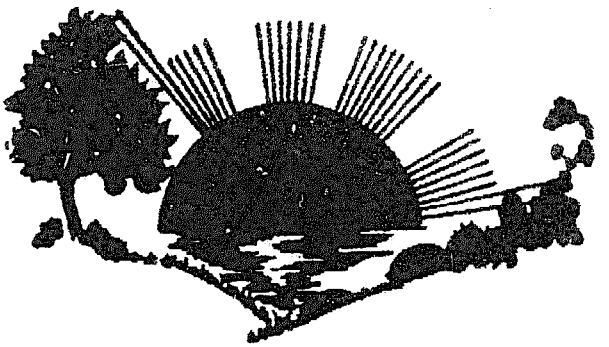

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