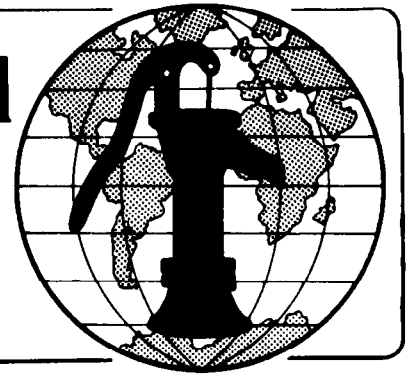


# Water for the World



## Operating and Maintaining a Composting System

Technical Note No. SAN. 3.0.2

A composting system is a means of turning garbage, animal manure, other organic wastes, and, in some cases, excreta into compost. Operating a composting system involves preparing the organic materials, piling the material, turning the pile, and using the finished compost. Successful operation depends on turning the pile to keep it aerated. Maintaining the system involves keeping the site clean and keeping tools in good repair.

This technical note describes how to operate and maintain a composting system. Read the entire technical note before beginning operations.

### Materials Needed

Before operations can begin, the project designer must provide:

1. Location map similar to Figure 1.

2. Design drawings similar to Figures 2, 3, 4, or 5.

3. Materials list similar to Table 1.

You will also need:

4. All labor and tools described in the materials list.

### Useful Definitions

**COMPOST** - A dark, fairly dry, crumbly, odorless material that can be used to improve soil for crops; it is produced from organic wastes.

**EXCRETA** - Human body wastes.

**GARBAGE** - Food and crop wastes from growing, harvesting, storing, preparing, cooking, or serving of food; these materials rot quite quickly.

**ORGANIC** - Derived from living organisms.

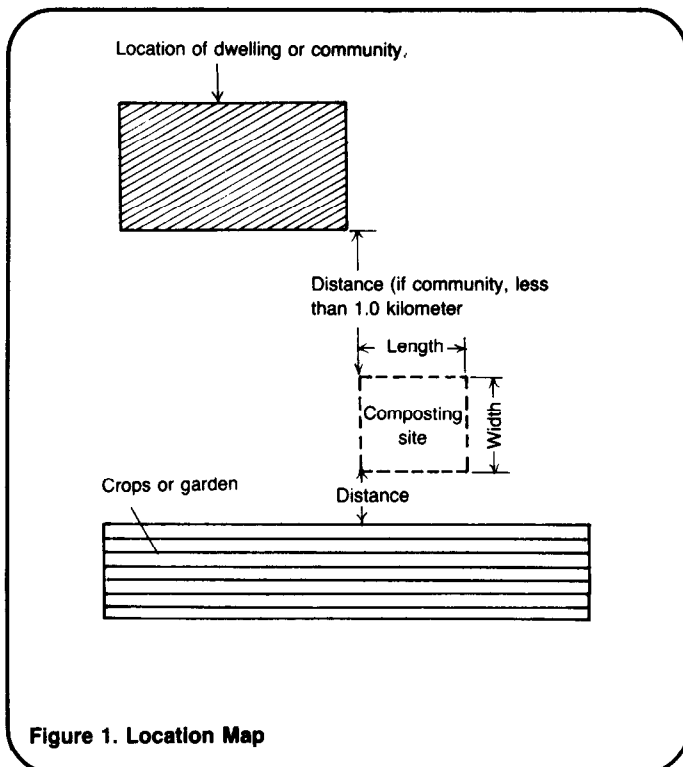


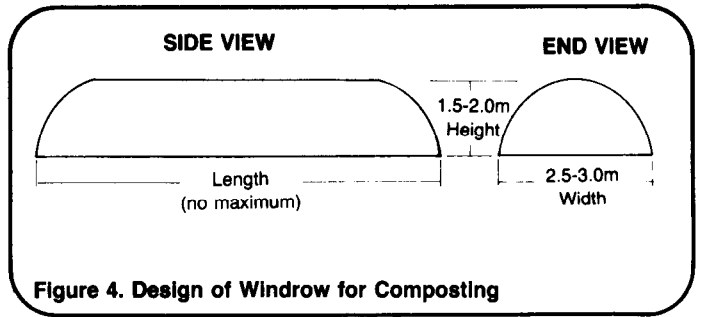
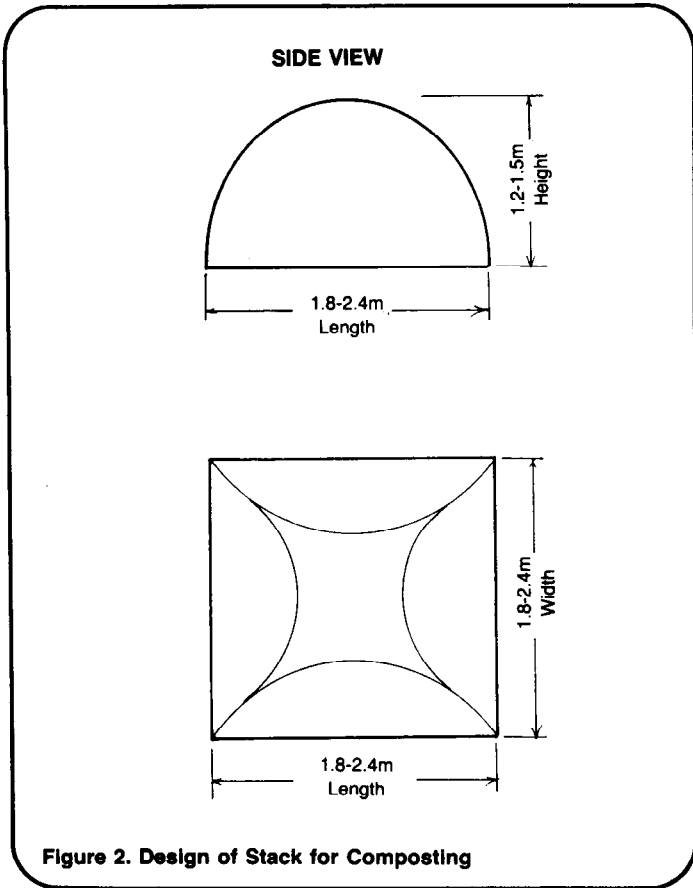
Figure 1. Location Map

Table 1. Sample Materials List

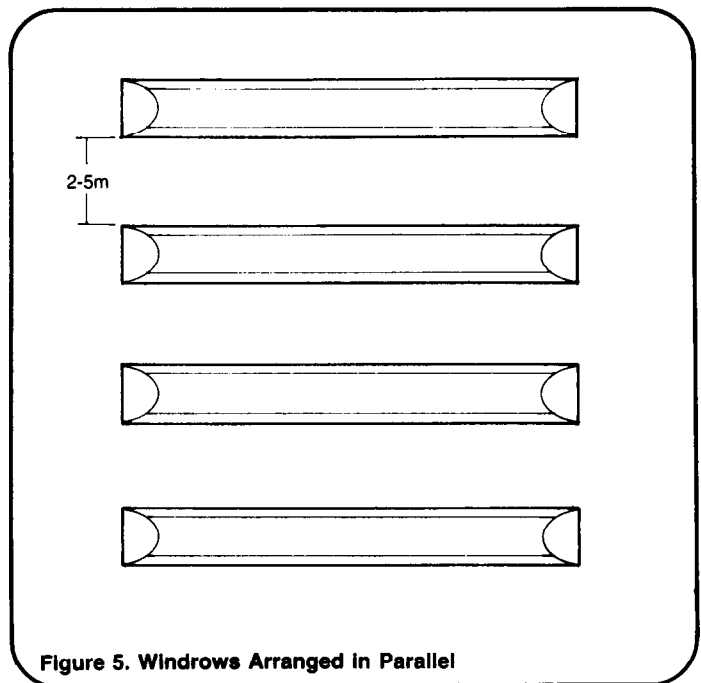
Item	Description	Quantity	Estimated Cost
Labor	Supervisor	1	—
	Laborers	3	—
Tools	Pitchforks	—	—
	Rakes	—	—
	Shovels	—	—
	Brooms	—	—
	Hoes	—	—
	Wood pole: 2m long	—	—
	Carts	—	—
	Boots	—	—
	Gloves	—	—
	Coarse wire screens	—	—
	Shredding tools, clippers, knives, machetes	—	—
	Total Estimated Cost =		

### Preparing the Material

Only organic material can be composted. Separate out inorganic materials, such as metal, glass, plastic, rocks, gravel, and sand. This



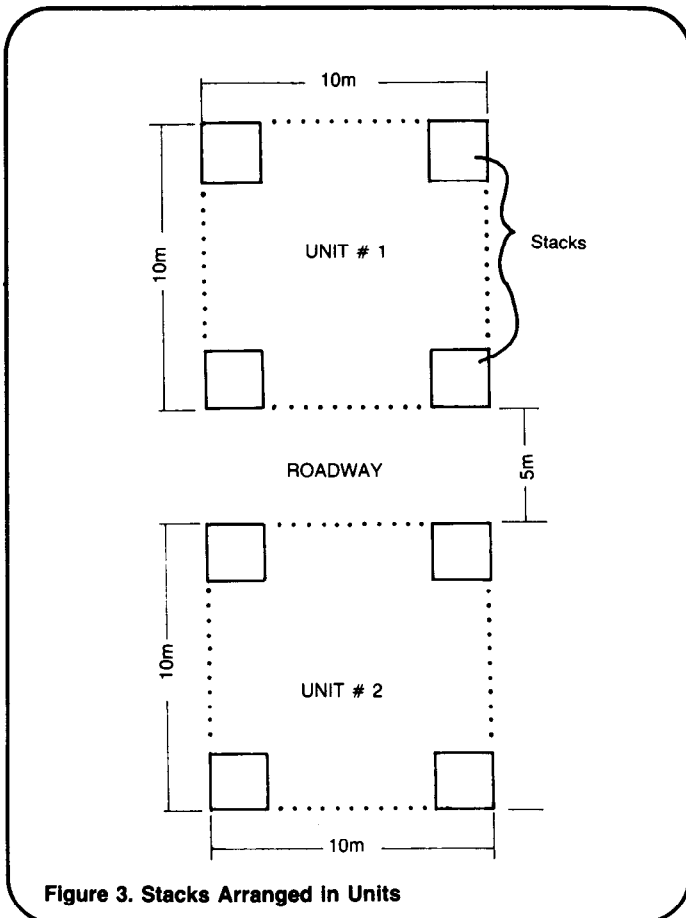
is best done prior to collection at the source of the waste--household, marketplace, or factory. For details on collection, see "Operating a Solid Waste Collection System," SAN.3.0.3.



When garbage and other organic wastes have been transported to the composting site, further preparation may be necessary. Separate out organic materials that will not readily decompose, such as branches, pieces of wood, and animal bones. Or, use coarse wire screen to separate out non-compostables after the compost is finished. Non-compostables should be buried at the compost site. Materials such as cobs, animal parts, and large pieces of organic waste should be chopped up before being added to the compost pile. See Figure 6.

**Piling the Material**

Material to be composted is piled in stacks or windrows. Each pile consists of a balance between two types of orga-



nic waste. The first type includes dry vegetable matter such as straw, cane stalks, pea vines, potato tops, banana stems, dead leaves, and paper. The second type includes excreta, animal manure, and fresh food scraps. The best mixture will be learned by experience in the field. After separating the non-compostables, shred or cut large pieces to speed composting and make turning easier. In general, the mixture should be moist, but not soggy. A person should be able to step on it without his foot sinking in.

1. Begin the stack or windrows with a 200-400mm layer of straw or dry grassy material to soak up liquid. See Figure 6. If the windrow method is used, build the windrow in sections and spread only enough straw for the first section.

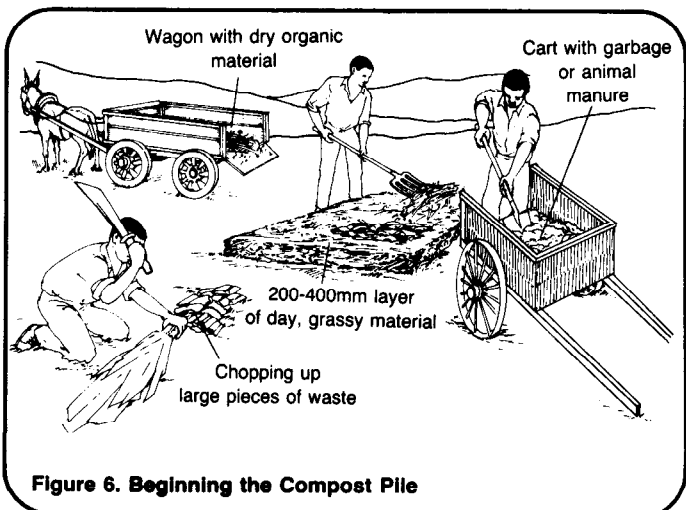


Figure 6. Beginning the Compost Pile

2. If excreta is not to be composted, add a balanced mixture of organic materials until the stack or section of windrow reaches its designed dimensions. Always pile the material loosely to speed the composting process.

3. If excreta is to be composted, the stack method should be used and the stack must be built in layers. See Figure 7.

3a. On top of the 200-400mm layer of straw, spread 300mm of a balanced mixture not including excreta.

3b. Use a mixture of organic materials to build a 300mm thick enclosure around the top of the second layer.

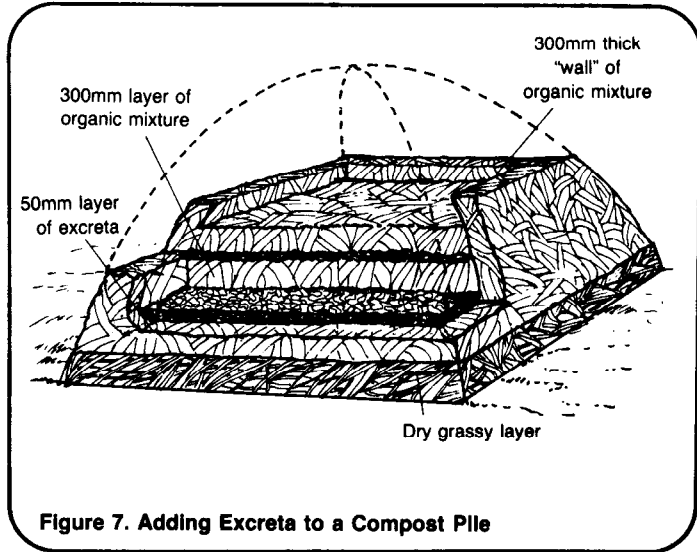


Figure 7. Adding Excreta to a Compost Pile

3c. Spread a 50mm thick layer of excreta within the enclosure.

3d. Cover the excreta with a 300mm layer of mixed organic materials.

3e. Continue building the stack in layers with 50mm of excreta and 300mm of organic materials until the stack reaches its designed height.

4. The entire stack or section of windrow may be covered with about 300mm of dry grassy material to reduce its attractiveness to flies. See Figure 8.

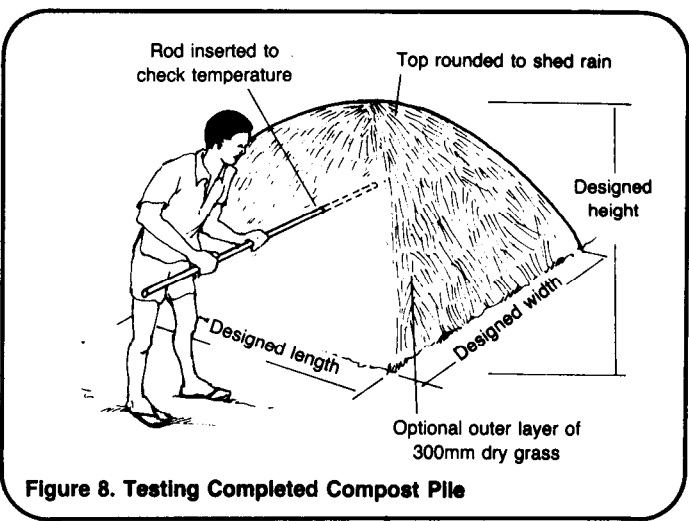


Figure 8. Testing Completed Compost Pile

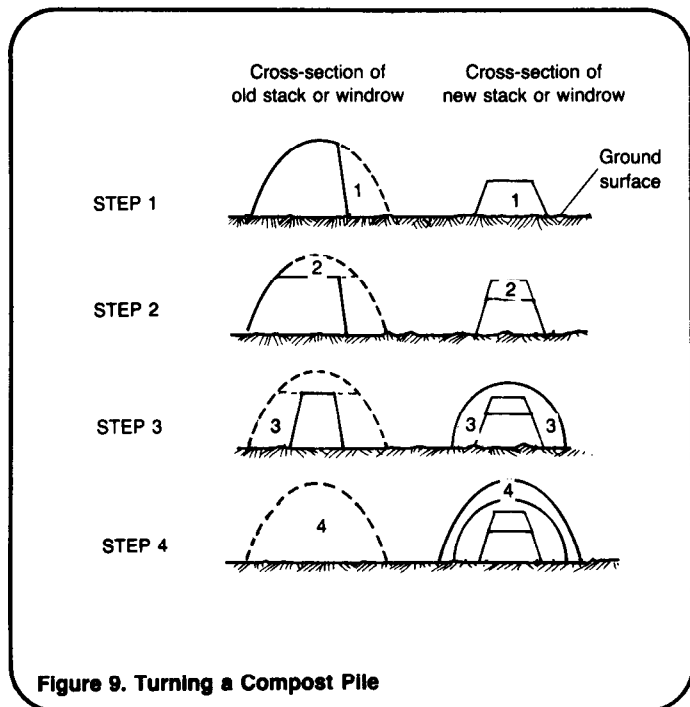
5. Make the top of the stack or windrow rounded to help shed rainwater.

6. As more organic material is brought to the composting site, build more stacks or add sections to the windrow.

## Turning the Pile

Soon after the stack or section of windrow is built, the interior will begin to heat up as biological processes change organic material into compost. The temperature inside the pile should reach about 60°C after a few days. Check the temperature by inserting a long wood or iron pole into the pile. See Figure 8. After ten minutes, withdraw the rod. The end should be too hot to hold in the hand and it should be damp, but not wet. If the pole and the interior of the pile are too dry, sprinkle the pile with water. If they are too wet, add dry grassy material to the interior of the pile. If the pile is still not hot after two to four days, the mixture of materials in the pile is not correct and the pile will have to be rebuilt. See "Piling the Material."

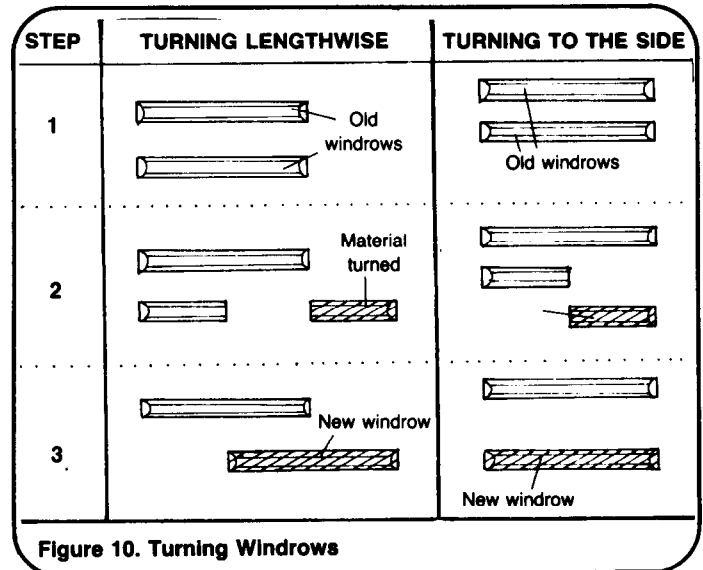
If the temperature is correct, the material inside the pile is decomposing into compost. After no more than five days, turn the pile inside-out with a pitchfork so that the cooler material on the outside of the pile can be turned into the inside. Figure 9 shows one method of turning a stack or section of windrow. Turning is very important since the heat inside the pile kills fly larvae and disease-causing organisms.



Turn the pile a second time after four or five days. By now, the contents of the pile will no longer look like the original organic materials. The composting process is nearly complete. After a third four to five day period, the contents of the pile should be finished compost. If not, turn the pile a third time. In temperate climates, composting takes three to four weeks. In tropical climates, less time is needed.

You can test for finished compost by sight and feel. It is a dark, loose-textured material. Squeezed in the hand, it forms a firm ball with a moist but not wet surface.

If windrows are used, they may be turned lengthwise or to the side as shown in Figure 10.



If a number of stacks are used, two stacks may be combined into one during the first turn, and two combined stacks combined during the second turn. See Figure 11.

## Using Compost

Finished compost will have up to 50 percent less volume than the original organic materials. It may be stored for up to six months before it is used.

Cart compost to the garden or crop land, shovel it on the ground, and work it into the soil with a hoe or rake.

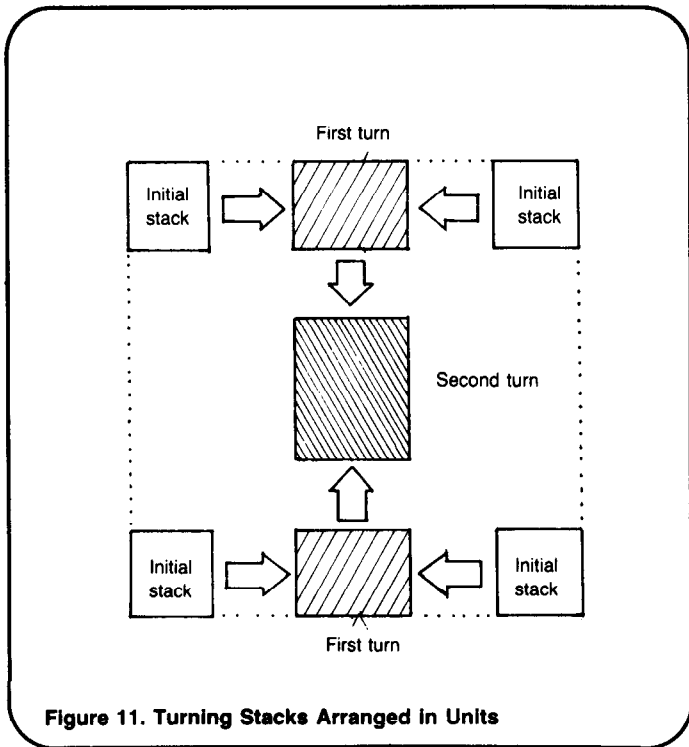


Figure 11. Turning Stacks Arranged in Units

See Figure 12. One  $m^3$  of compost can cover up to  $100m^2$  of ground. The only parasite that may survive composting is the eggs of the roundworm.

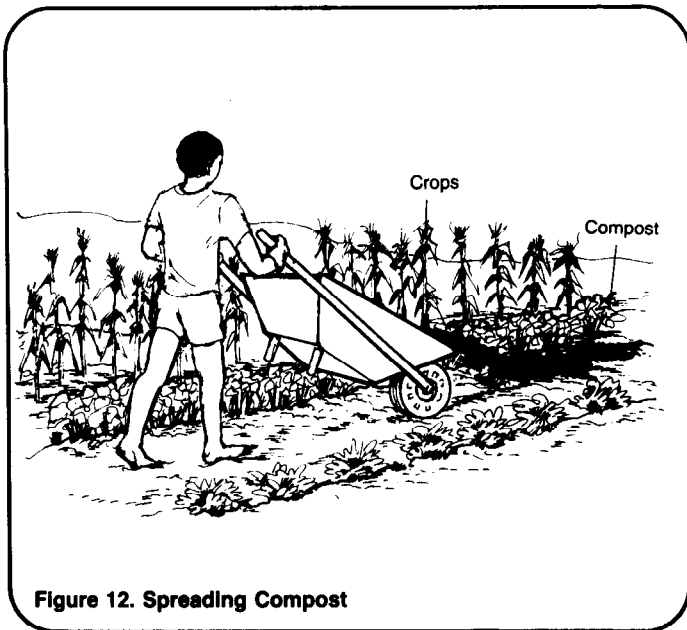


Figure 12. Spreading Compost

### Caution!

Always wear boots and gloves when handling compost.

## Maintaining a Composting System

Keep the composting area clean. Use a coarse broom or small rake to sweep loose debris into the stack or windrow. Plant trees or bushes around the site to prevent wind from scattering material.

Keep pitchforks, rakes, carts, and other tools clean and in good repair.

Maintain a record similar to Table 2 showing all operation and maintenance activities. The turning day records are the most important so that all the piles can be turned on a regular basis.

Table 2. Sample Operations Record for a Composting System

Date	Task
6/1	Built stack A.
6/4	Checked temperature in A. okay.
6/8	Turned stack A. First turn.
6/10	Built stack B.
6/13	Checked temperature in B. okay.
6/15	Turned stack A. Second turn.
6/17	turned stack B. First turn.
6/19	Built stack C.
6/22	checked temperature in C. Okay. <sup>Removed stack A. spread in field.</sup>
6/24	Turned stack B. Second turn.
6/26	Turned stack C. First turn.
6/28	Built Stack D.
7/1	Checked temperature in D. <sup>okay. Removed stack B. spread in field.</sup>
7/3	Turned stack C. second turn.