

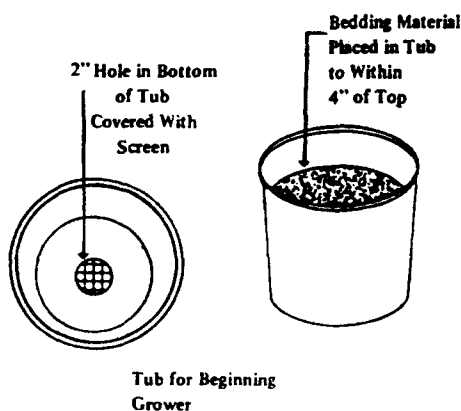
RAISING FISHWORMS FOR BAIT

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A fishworm bed in the backyard can supply worms all during the year, and no time will be lost getting bait for fishing. A good supply of fishing worms fits well into any fish-production program, particularly when grown for home use in farm ponds. Thousands of worms can be raised for personal use with little trouble and expense. Commercial production of worms for wholesale and retail trade also can be interesting and profitable.

Building a Worm Bed

The size of the container for raising fishworms depends directly upon how many worms will be produced during the year. For the beginning grower, an ordinary galvanized wash tub or similar water tight container is excellent. A tub 2 feet in diameter and 10 inches deep should produce about 4,000 to 5,000 fishing-size worms a year. Since some must be left to produce the next crop, the grower should use about 3,000 worms from a single tub a season. Many producers use two tubs because earthworms should not be disturbed too often. Several tubs should be used for a small commercial production or to provide a supply of bait worms for several persons.



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To prevent rust, tubs and other metal containers should be painted on the inside with hot asphalt, acid-proof paint or any good house paint. Drain holes are needed in all containers. Make a 2-inch hole in the bottom of the tub, and cover with a patch of fine-meshed copper or aluminum screen. Seal this screen down with hot tar or ordinary paraffin wax. This allows good drainage and prevents earthworms from leaving.

For large-volume production, large rectangular troughs are best. These worm beds may be constructed of concrete block, brick, pine or cypress boards on the ground, or they may be placed on a concrete slab. If you use pine or cypress, use at least 2-inch thick boards. Any convenient length is satisfactory, but the width should not exceed 30 to 40 inches, which permits reaching the center of the bed when harvesting the worms. The sides of the worm bed should not exceed 10 inches in height, and the worm beds should be separated by a walkway to permit easy harvesting.

Next, consider a location for the worm beds. They may be located outside in heavily shaded areas, under a roof or inside a shed. The painted tubs may be placed in the basement, garage or any protected location. They also can be buried to within 4 inches of the top of the ground in well-drained sandy soil. In clay-soil areas, the bed should be placed on top of the ground to allow water to drain away. Although outdoor beds require less initial expense, they have several disadvantages. Shade is essential because worms will not grow in a bed exposed to hot sun. If beds are placed under trees to provide shade, roots may spread into the beds and must be removed periodically. The greatest disadvantage to exposed outdoor beds is the loss from rain. After several days of heavy rain, the bed and soil become so saturated with water that many worms leave the bed and thousands of others die. An uncovered bed usually results in loss of the spring crop about one year of every three. Construction of a roof over the bed, or covering the beds if they are in tubs, provides protection from both rain and sun. A cover may be constructed inexpensively and provides assurance against loss

from heavy rains. Some producers have found that a simple roof of lumber slabs and Spanish moss or switch cane woven into chicken wire is adequate if small wattage light bulbs are placed directly over the beds at night. Where beds are not protected by a shed, board covers should be placed over the tubs or beds.

The type of soil used in filling worm beds is of great importance. A clay loam, a porous clay or a fine loam containing lots of humus or well-decayed organic matter is good. Sandy soils cannot be used. If the soil does not contain a large amount of organic matter, approximately one-fourth of the volume of the worm bed should be comprised of leaf compost, rotted straw or peat moss mixed with the soil. However, it is important to remember that raw manure often goes through a heating process, and excess heat injures worms.

Peat or peat moss should not be used alone because it is too acid, and often it is too inert to allow high production. Some types of peat apparently are so toxic that worms kept in these materials die within a short time. Decaying feed provides a peat-like substance in which worms live and do very well. It is superior as a growing media because worms are easier to harvest and come out of the beds clean and bright. Cottonseed hulls, peanut hulls and lawn clippings also may be added to the soil in the bed.

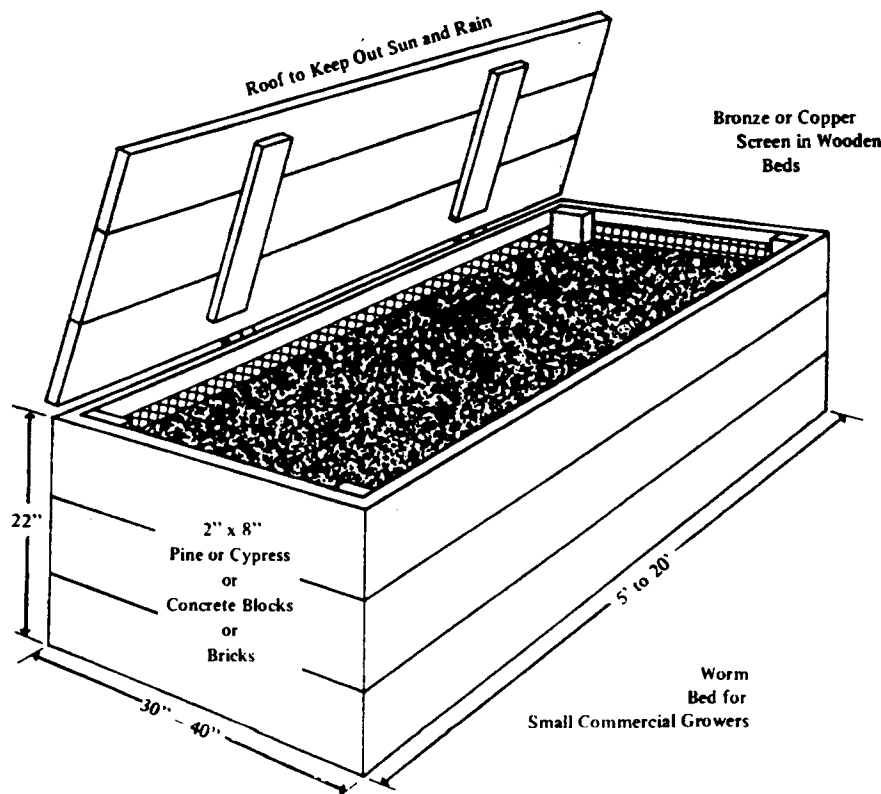
Feeding the Worms

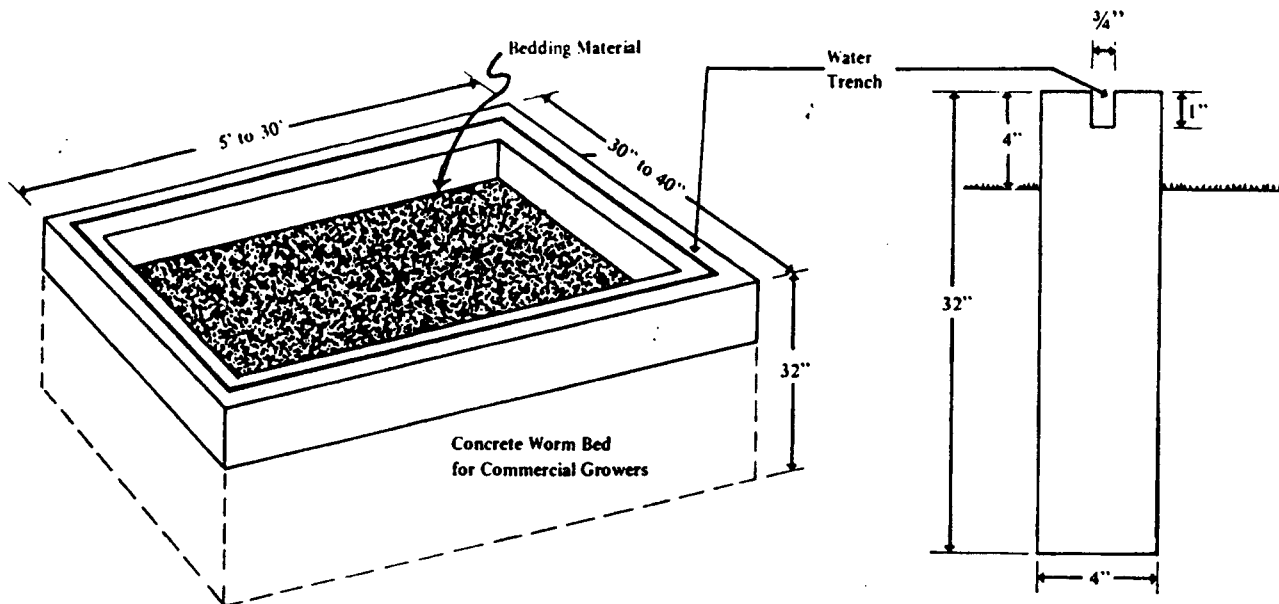
Earthworms eat a variety of foods. Since they will eat soil from which they digest organic matter (both animal and vegetable), a number of feeds are

feasible. In tubs, excellent results are obtained using a mixture of a cheap grade of vegetable shortening or lard and cornmeal. When the bed started, add 1 pound of cornmeal and about $\frac{1}{2}$ pound of vegetable shortening or lard. Mix these with the top 2 to 3 inches of soil. Kitchen grease may be used if heated with some water to extract excess salt before mixing in the worm bed. After about 30 days, as the small worms begin to hatch and grow, it is necessary to add feed to the beds every 2 weeks, adding about the same amount each time. The leaves of celery, lettuce, cabbage, turnips or other vegetables are readily taken as food when small amounts are mixed into the top soil.

For larger beds or commercial beds, other feeds should be considered. One ration often used consists of 1 part cottonseed meal, 1 part laying mash and 2 parts alfalfa meal. Broiler chick mash or regular laying mash may be used alone. In this case, apply small amounts to the top soil, work into the surface with an ice pick or other pointed instrument and wet it. Frequent and light applications are better because this protects against souring and excessive heating. Feeding normally is done at weekly intervals in commercial beds.

The protein content of the total feed should not be less than 9 percent and no more than 15 percent. If too little protein is present worms do not grow well, and the beds become too acid for eggs to hatch. With too much protein, feed decays quickly, and the beds become too hot for the worms. Soured beds become filled with maggots from flies. Using feed with about 10 to 12 percent protein gives best results. If reasonable care is taken not to overfeed, worms can be raised without growing flies.





Considerable fiber in the feed mixture is needed to keep the bed loose and porous. Cotton linters, cottonseed hulls, ground hay, ground peanut shells and similar materials supply needed fiber. Other materials have been tried with less success. Barnyard manure is objectionable because it attracts flies. Ground corn plants, including the ears and foliage, are not good because the beds become too acid. Corn and cob meal and cottonseed meal mixtures must be used carefully because the mixture tends to heat too rapidly if used alone. Peanut oil, cottonseed oil, and cottonseed oil meal have been tried. Care must be taken to add oils sparingly, or the beds become too sticky for easy harvesting.

Selection of Brood Stock

Once the bed is ready, breeder worms should be selected. The small English worm or red worm is the best. Sometimes they are called "red wigglers." These worms are very active and are preferred by most fishermen. Under proper conditions they reproduce prolifically throughout the year. They will live under a wider variety of conditions than most other earthworms, and breeders may be obtained from bait stores or local fishermen who have private worm beds. These worms mature in about 6 months, but can be used for fishing 3 to 4 months after hatching.

For a tub 2 feet in diameter, about 100 worms is adequate for stocking. For larger beds, a stocking rate of about 25 worms per square foot is adequate. However, at least 100 worms should be used to start any bed.

Worm Bed Management

The worms soon deposit small brown cases about $\frac{1}{8}$ inch in diameter which contain at least three to ten eggs. Young worms hatch in about a month and may be seen feeding in the beds. If the

eggs fail to hatch, it usually is an indication that the beds are too acidic. To correct this condition, compost or cottonseed meal should be added.

About once a week after young worms are first seen, dust food over the surface of the bed and water it immediately. As the worms grow and feed more rapidly, they eat most of the feed within a few days and finally eat holes through the crust from the previous feeding. When this happens, feed again immediately. If feed begins to build up at the surface of the soil, turn it over carefully with a spading fork or other small tool. This mixes the partially decayed feed throughout the bed and keeps the bed from packing tightly.

Beds should be watered immediately after each feeding. They must be kept moist throughout but should not be soggy. During hot weather, this often means two or three waterings a day. A sprinkler can be used for watering, and the beds can be covered with sacks, cardboard or boards to reduce evaporation.

If worms become too crowded because too many have hatched at one time, they cannot grow as rapidly as desired. In this case, some small worms should be moved to a new bed or to an old bed that does not have as many young worms.

Harvesting the Worms

Worms can be used from the beds in about 60 to 90 days. After 6 months, the soil will be saturated with earthworms of all sizes, making it possible to select whatever size is needed for a particular fishing expedition or for sale.

To remove worms from the tub, take some of the soil containing worms and place it loosely into a 10-quart bucket. After about 30 minutes, remove the top soil from the bucket and place it back into the bed. Most worms will be found in the bottom few inches of the bucket.

Since earthworms feed mostly at night, early morning is the best time to remove the worms from the beds, since they will be near the surface. For fishing, the worms should be placed directly into a small can with some soil from the worm bed to carry to the water. However, if the worms are to be sold, they normally are placed into a small container. Worms large enough for sale then are picked out and counted into containers specifically made for this purpose. Usually 105 worms are counted and sold as 100.

Twenty boxes or about 2,000 worms can be picked out and counted per hour by one person. Although the worms can be measured by volume, little or no time is saved because the large worms must be separated from the small ones. As soon as the worms are placed in the packaging container with some of the bedding, the remainder of the cup should be filled with damp peat moss that has been soaked overnight in water. Excess water is squeezed out by hand just prior to use. The peat moss provides moisture and helps keep the worms clean. Worms normally will survive in these containers about 2 weeks. In hot weather, the bottoms of paper cups will rot away. A heavier coating of paraffin or piece of wax paper in the bottom of a cup reduces this problem.

Control of Parasites

In addition to fish worms, several other animals enjoy the cornmeal and lard diet and other feeds used in worm beds. These include mites, ants, rats and mice.

The earthworm mite becomes a problem for most worm producers. This troublesome pest is grayish or brownish, and three or four can sit on the head of a common straight pin. Under ideal growing conditions, these mites reproduce rapidly and in a short time completely cover the top of the bed. These mites do not attack healthy worms. However, they probably feed on injured or dead worms. Their main source of food is the feed being fed to the worms. Heavy infestations of these mites eat enough feed to necessitate feeding worms every day, whereas one feeding a week should be enough. The standard recommendation has been to dust the tops of the beds with sulfur. This sulfur dust often is sold as "flowers of sulfur." This treatment is not completely satisfactory, and continued use often results in the bed becoming so acidic that worms cannot survive. A thin or light application usually is sufficient, and a restricted application does not

injure the worms. For large beds, other materials can be used. But since most of these are poisonous, they are not recommended in this publication. Information on stronger applications can be obtained from your county Extension agent.

Ants can be kept from the worm bed by supporting the tub on legs placed in water or oil, or by dusting the floor around the tub with pyrethrum dust whenever ants appear. Do not use any soil in the worm beds that might contain insecticides.

The fly growth problem can be controlled by reducing the rate of feeding and applying sufficient water to prevent heating.

If rats or mice become troublesome, the tub may be covered with screen or some other porous material that permits air.

Restarting a Worm Bed

The pit soil and other material in the worm bed should be removed at least once a year and the bed refilled. Late fall normally is considered a good time for earthworm bed replacement. This is at the end of the summer fishing season and before the worms bed down for the winter. Since old beds contain thousands of small worms, it often is desirable to save most of them before disposing of any bed material. By spading the beds or digging up the surface area and leaving the bedding material loose, the worms will tend to migrate downward. After about 30 minutes, remove the top soil and respade the bed. Repeat this process until only about an inch of the old bed material is left along with many of the worms. The bed then is ready to be made again.

Discarded bedding material is a peat-like substance excellent for use on flower or vegetable gardens. Some larger operators sell this material to nurseries or gardeners.

Marketing

If the worms are to be sold commercially, most can be marketed locally through sporting goods stores, hardware stores, bait shops, filling stations and similar outlets. They also can be shipped by parcel post or express for long distances provided they do not become too hot or cold in transit.

Since the demand for worms is quite seasonal, relatively few are sold from November through March. While the fall months also are excellent sale periods in Texas, the heaviest demand develops during April, May and June.