

# Knowing the Basics Helps the New Gardener Get the Most Out of His Rotary Tiller.

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## DEFINITION

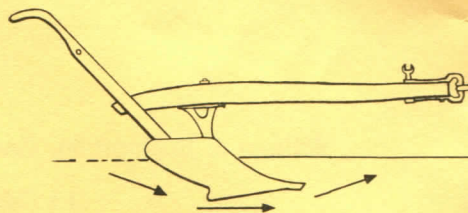
A tiller is simply a mechanism for changing the condition of soil. The familiar moldboard plow performs a tilling function, but where the plow turns the soil in long folds or furrows the rotary tiller turns the soil in chunks or small particles...and therein lies the secret of the tillers' versatility.

Can we learn something about operating modern garden tilling tools by harking back to the horse and plow? I would have to answer that with a rather emphatic "yes!"

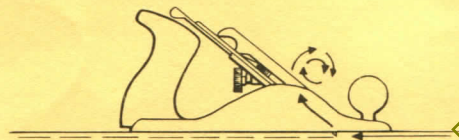
With today's expanded interest in "growing your own" and the thousands of first-time users of tilling equipment, learning or re-learning the basics of moving the earth is particularly timely. Knowing the correct procedures in operating tilling equipment can turn gardening from a chore into a pleasure. And the operator will have a sense of doing a good job the first time.

We can use both a walking plow and the carpenter's hand plane (illustrations 1 & 2) to graphically show the proper operation of a rotary tiller in preparing a seedbed. A plow, working together with "Old Dobbin," is a good example of the relationship of motion to work output—something frequently overlooked by the new operator of today's garden tractor.

The plow exerts little down pressure and has a very nominal weight. But it does, in fact, move a tremendous amount of earth. The two keys to its output are motion and operator direction.



[Illustration 1]



[Illustration 2]

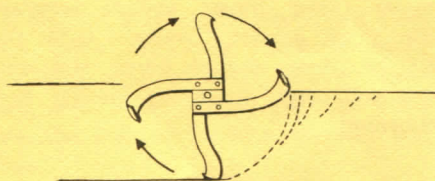
To turn a furrow, the plowman starts at the edge of the field, raises up slightly on the handles to direct the plow point downward, commands the horse to start and as the plow moves forward it penetrates the ground. Upon reaching furrow depth the plowman levels the handles and an approximate balance is then maintained between the plow and the ground, with a continuous furrow turned as long as the horse walks forward. At the end of the furrow the plow handles are lowered to direct the tip out of the ground again. All movements are gradual, dependent upon forward motion and the operator's control throughout.

What does the hand plane have to do with proper operation of a rotary tiller?



Those of us who have done a little carpentry know when planing soft pine you can set your blade for a deeper cut than if you are working with hard maple. Thus the planing operation does illustrate the relationship between available force (whether arm muscle or horsepower) and resistance to the work being done (hard maple vs soft pine).

The same basic illustrations of the plow and plane can be related to in observing, judging and controlling the operation of a rotary tiller preparing a seedbed, even though the tiller blade rotates in an arc instead of moving in a straight line.

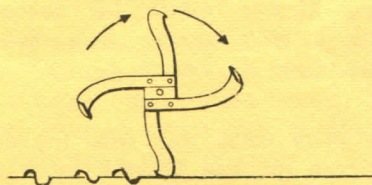


[Illustration 3]

The important factor in tilling is the forward speed of the pulling vehicle in relationship to the RPM's of the tiller. Each turn of the tiller (Illustration 3) is like a cut of the plane with the thickness of the cut determined by the forward motion of the vehicle. If the vehicle is operated too fast or the tine rotation slows down, the relative amount of cut is increased, with the tines having more difficulty making their cut.

As each succeeding revolution of the tiller makes an increasingly thicker slice the tiller slows down under the work load. If forward motion is too fast for soil conditions, the tines climb out of the ground from the desired depth to a point where ulti-

mately they act like a paddle wheel propelling the vehicle with minimal penetration as shown in illustration 4. Therefore, it is important for the operator to constantly monitor the rotational speed of the tiller tines and adjust the vehicle's forward motion accordingly.



[Illustration 4]

On a fixed speed tractor or walking tiller the proper transmission gear must be selected to correlate with the tiller tine speed and soil conditions. A variable speed hydraulic or hydrostatic drive tractor offers an opportunity for the operator to set the forward speed of the vehicle in proper relation to soil conditions. With the "Hydro Drive" tractor there is also the opportunity for a slight reverse holding action in very demanding soil tilling conditions. Thus, the hydrostatic or hydraulic drive tractor with its infinite control of forward speed, offers a superior power vehicle for tilling but is dependent on the operator to utilize that range.

A limited number of tillers offer a selection of relative rotational speeds for various soil or operating conditions. They broaden the range of control afforded to the user by the increase in combinations of tine rotation to forward travel ratios offered. That increases the efficiency and/or soil preparation results achieved by the serious gardener or operator.



New users may expect that just a single pass with a tiller is sufficient for seedbed preparation. In most soils two or more passes will be required before the ground may be properly worked up. In the case of the hand plane, repeated strokes are usually necessary to reach a desired finish on the wood. With hard wood many strokes might be necessary while in soft woods, only two or three might do the job.

The same holds true with the tiller. On hard grounds, three or more passes will usually be necessary before a good seedbed is ready. In softer soils one or two passes might do the job. One pass may be sufficient for cultivation or weed control.

A rotary tiller can be used to perform any of the following functions:

1. Change soil physical conditions, such as in plowing, cultivating and aerating.
2. Control weeds by chopping and churning them into the soil.
3. Preparing seed beds by tilling the soil to a desired texture for optimum germination and plant survival.
4. Mix chemicals or organic matter such as fertilizer, manure, herbicides and insecticides into the soil.
5. Manage crop residue by turning it under to form mulch.
6. Modify soil topography such as in landscaping.
7. Cultivate or level ground around trees, hedges, or in orchards.

8. Blend various soils and soil modifiers for landscaping and greenhouse work.

## **AERATION**

For aeration purposes the tiller should simply disturb the soil surface without completely turning it over...in much the same manner as inserting a spade each few inches and loosening the soil in clumps. The surface of the soil should be left very rough, with occasional holes and deep fractures to several inches. This permits ready penetration of air and moisture with minimum danger of erosion or crusting. Previously tilled garden areas can be aerated by operating the tiller at comparatively rapid travel speeds...wherein the tiller almost "walks" with the tractor...tines should enter and exit the soil with minimum tearing and churning.

## **CULTIVATION AND WEED CONTROL**

Set the tiller for a shallow depth of one to two inches for cultivating and weed control activities. Avoid over-pulverization of the soil since this tends to "crust" with rain or "dust" away with wind.

## **LANDSCAPING**

Using the rotary tiller for landscaping purposes involves tilling the soil to a very fine texture to allow leveling or removal to another area. Several passes are usually required for this operation, particularly if the old lawn or field is well compacted and threaded with a dense root structure. Reducing the tiller width to 32" will also aid in initial surface penetration.



Fill ground should be tilled just prior to the application of top soil to aid in forming an interlaced structure between top soil and fill soil... to aid in water and root penetration.

### **MIXING, BLENDING**

Fertilizers, chemicals, manure, humus, old sawdust, compost or other growth producing soil additives can be effectively mixed into the soil by dispersing this material over the ground just prior to tilling. If the area to be tilled is tough then broadcast the additives between successive tiller passes to obtain most effective blending. Special purpose soil blends for potting, hothouse, greenhouse, or other applications can be quickly and easily developed with this tiller. Similarly, soil structure modifiers such as sand, gravel, sawdust and wood chips can be tilled into the soil to form a desired soil base.

### **ORCHARD CULTIVATION**

Periodic cultivation between hedge-rows or tree rows will provide a continuous rough surface for greatest absorption of water.

Several passes with the tiller under nut trees, just prior to harvesting, will provide a smooth and clean surface for easiest harvesting...the nuts can be easily swept or raked without having to drag through weeds or grass.

### **SEEDBED PREPARATION**

Tilling for seedbed preparation requires a more thorough working of the soil structure to break it up into small enough particles to provide intimate contact between soil and seed. The ideal structure provides a relatively fine grained soil structure

down to seed depth, with progressively coarser grained structure down to the full tilling depth. The interface between tilled and untilled strata should be rough to permit percolation of water...a smooth, interface, like hardpan, tends to serve as a barrier to deep water and root penetration.

When preparing seedbeds it is generally necessary to use successive passes over the same area to achieve desired depth and texture... each successive pass provides a finer texture to the upper layers while adding to depth of penetration. Allow the tiller to "work" its way into the soil by keeping the tractor travel speed slow but steady.

A criss-cross work pattern will also help in preparing a better seedbed. For example till the length of the seedbed first, then till it crossways along the width. This will greatly aid in making the smoothest and most finely prepared soil for the seedbed.

If the soil to be tilled is covered with growth, first reduce it to a short length by mowing or other means. This will greatly reduce long grass or weeds from winding around the tiller tines. Another technique that improves tilling in heavy growth covered areas is to make one or two shallow passes to break up the root systems. Then wait about 48 hours for the material to dry out and for the root systems to weaken. The tiller will then be more effective in returning this material to the soil.

If the soil conditions are difficult or hard going, it is recommended that the outboard set of tines be removed. This will concentrate the tilling power to a smaller area and overcome difficult conditions.



You need to be aware that as soil dries out it increases in strength which will require more tilling to break it up. This is particularly true in clay and clay loam soils. The ideal condition for tilling is when the soil is in a friable condition. This can be identified as when there is enough soil moisture that the clods tend to crumble in your hand when squeezed. Proper soil and moisture conditions will increase performance and your satisfaction.

I want to stress one final point, that of having the right machine for the job. As the gardener would not till an acre or more with a small machine, neither should he till the soil

with a tractor that is not properly outfitted. **Rear wheel weights and even chains are recommended by most manufacturers for tilling operations.** These provide the tractor increased traction and will also retard the pushing action of the tiller.

**Front weights can also be crucial in keeping the front tires on the ground. Without them a complete loss of steering ability is possible.**

In summary, knowledge and practice of basic fundamentals can increase the operator's performance and work accomplishment. For the new gardener it all adds up to more pleasure and confidence in using his earth moving tools.

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