Organizing your transplanting operation

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For most growers, over half of the labor to produce a flat of bedding plants is in the transplanting operation. It is slow, tedious, repetitive work that does not lend itself to mechanization.

Transplanting rates vary widely depending on the skill of the transplanter, convenience of the materials and the number of seedlings per flat. Rates range from 8 to 50 flats per person per hour. Through proper methods and work station arrangement, a doubling of rates near the low end of the scale can be obtained. What should you look for?

Location

Transplanting can be done either in the greenhouse where the plants are to be grown or in a separate area, usually a headhouse.

For the small grower with separate freestanding greenhouses it is usually most convenient to work right in the greenhouse. Seedlings and flats are supplied to each greenhouse as needed. Transplanters working on movable potting benches stick the seedlings and then set the completed flats directly into the growing space. To reduce the walking distance, the potting tables are moved from back to front as the greenhouse is filled.

A couple of disadvantages to this system are 1) the work benches must be moved from greenhouse to greenhouse and 2) the working environment for the transplanters may be hot and dusty.

To save time in the spring some growers fill their flats during the slack winter season. These are then placed on pallets, moved to each greenhouse and covered with plastic to retain the moisture.

Generally for gutter-connected greenhouse or for individual greenhouses connected to a headhouse, a central transplanting area is more efficient. A permanent set-up, usually containing the media preparation equipment, flat filler, and transplanting benches or assembly conveyor,

allows for convenient movement of materials. Once the flats have been transplanted, either conveyors or carts are used to move them to the growing area. Although the cost of such a system is high, the convenience and comfort to the workers increases the output.

Method

Significant differences in transplanting output result from the system used. I've seen tables made from a piece of plywood supported by sawhorses or 55 gallon drums. Although inexpensive, this system lacks organization and is difficult to move.

If setting up is left to the transplanters, frequently they will pick a corner of the greenhouse or an area that requires considerable walking to get the empty flat or to set it down once it has been transplanted.

A better method is to build some portable benches. These should be adjustable from 30 to 36 inches in height, convenient for most workers. One inch of height difference can have a great effect on worker output and fatigue at the end of an eight-hour day. Frequently you see workers standing on mats, planks or boxes so that they can reach the flats easier.

Whether transplanters should stand or sit to work is a matter of individual preference. If comfortable footing is provided standing is generally preferred. This allows a larger radius of free arm movement and easier lifting of the flats.

Research done at Pennsylvania State University on workbench design showed that maximum dexterity and performance occurs when the flat, seedlings and other items used are located with a 16-inch horizontal and 17-inch vertical radius of the normal elbow location. Objects that are placed outside this zone slow the worker by causing him to stretch. A shelf or rack can be located just to the side or rear of this zone to hold labels, a dibble or other tools. A convenient storage for non-planted flats is also needed. For permanent installations a roller conveyor located above the table works well. Completed flats are either carried to the growing area or are placed on a conveyor in front of or to the rear of the transplanter.

In addition to proper placement of the items, other things to consider include tilting the flat slightly toward the worker, providing a foot rest and eliminating all sharp edges and corners. A light level of 50 foot-candles at bench height should be provided.

The development of plugs has opened the way for increases in transplanting speed. The singulation of broadcast seedlings takes time. Singulation is done for you when you grow them in plug trays. Seedlings can now be planted with both hands.

As in the electronic and other industries, assembly conveyor methods can be used. Filled and dibbled flats are placed on one end of a slow-moving belt conveyor. Workers on one or both sides of the belt are responsible for inserting plugs into one section of the flat as it moves by. By the time the flat reaches the far end of the belt it is complete. A greater accuracy results as it is easier to stick a dozen seedlings in the same area of each flat rather than planting 70 to 100 over the whole flat.

In larger operations the flats can be supplied directly from a flat filler and dibble. On the other end a method of handling up to six flats per minute is needed. An accumulating conveyor can be used to hold the flats until they can be loaded on carts for transport to the greenhouse. All motors should be variable speed to synchronize the conveyors and other equipment and to adjust for operator speed and transplanting conditions.

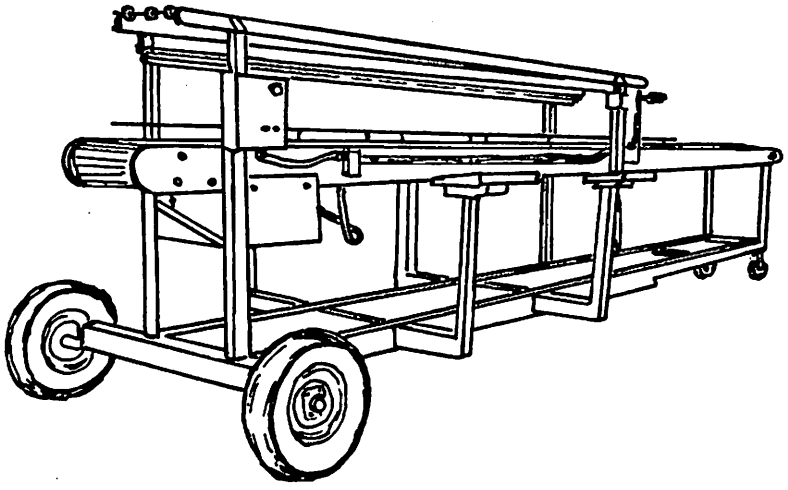
For growers who don't want to assemble a transplanting conveyor system, Krieger Industries, Jefferson IA can provide one that will move flats at a rate of 50 to 300 per hour, water the seedlings as soon as they are transplanted and count the finished flats.

Another semi-automatic system developed a number of years ago by Blackmore Transplanter Co., 725 N. Huron, Ypsilanti, MI 48197 uses rods to push selected seedlings from the top through the plug flat into the transplant flat underneath. The seedling flat is then indexed to a new position to locate new seedlings. It will handle 36 and

72-count seedling flats. Some seedlings may be damaged as they are pushed through the flat and non-germinated skips need to be replaced by hand.

Automatic transplanters are on the horizon with several companies working on designs. The delay in getting a trouble-free machine on the market is in developing mechanisms to handle the various types and sizes of seedlings.

The use of robots is being evaluated by researchers at Purdue University. Although robots can do repetitive tasks such as transplanting with ease, day and night, they are relatively slow, for example, taking 3.3 minutes to transplant a 36-cell growing flat using a commercially-available PUMA 560 robot. Final designs will probably use devices that will have computer controlled fingers that will pick up and plant the desired number of seedlings, a row at a time.



With all materials within easy reach, the transplanting rate is increased with this four person assembly belt conveyor.

Getting back to what you can do to improve your present transplanting operation review the following:

1. Determine present transplanting rate.
2. Is the work surface at a convenient height?
3. Are the seedlings, flats and labels within easy reach?
4. Can the distance the flats have to be carried be reduced?
5. Will an automatic dibble save time?
6. Can watering of the flat after it is transplanted be automated?
7. Will the use of conveyors eliminate carrying materials?
8. Can the work-area temperature or lighting be improved?
9. Can plugs be used to increase planting speed?
10. Revaluate rate after changes are made.

Labor Costs

Two common methods of paying transplanters are by piecework or by straight, hourly wage. Paying between 20 and 35 cents per flat, the piecework method compensates workers for experience, skill and motivation. The advantage to the grower is a fixed cost for each flat and the ability to attract good workers. With some systems, groups of workers making up a team are paid on the number of flats produced above a minimum.

Some growers pay on a straight, hourly wage. Here the convenience of the system used is more important as the greater number of flats that can be transplanted per hour, the less the cost per flat. As seen in the Table, significant savings can be obtained over a season by increasing production 5 or 10 flats per man hour.

TYPICAL LABOR COSTS FOR TRANSPLANTING

Transplanting Rate	Cost Per Flat	Cost Per 1000 Flats
10 flats/hr.	50	$500.
15	33	333.
20	25	250.
30	17	167.
40	12 1/2	125.
50	10	100.