IMPROVING LABOR EFFICIENCY

Every grower can find ways to reduce labor costs. A career of extension work has taught John Bartok some of the best.

BY JOHN W. BARTOK, JR.

A home-made device that aids in placing or removing hanging baskets. (Photos courtesy of John Bartok)

Everyone strives for labor efficiency, whether operating a greenhouse alone or with the help of many employees. A good starting point in evaluating labor efficiency is to collect data on which operations require the greatest amount of time. Transplanting, hand watering, plant selection for shipping and moving plants into and out of the growing area often use excessive labor. Evaluate these first to see if improvements can be made.

Equipment is available for almost all the tasks that take place in the greenhouse, but not all tasks should be mechanized. This is especially the case for the small grower because the initial capital outlay on some of this equipment is very high.

Purchase carts with large pneumatic tires for operation over non-paved surfaces.

BUYING GUIDELINES

Before purchasing equipment or making changes to an existing system, consider the following basic concepts that apply to all businesses:

Keep things simple. Equipment or systems that you and your employees understand work best. These generally have fewer adjustments that need to be made, require less maintenance and use standard parts.

Analyze your needs thoroughly. Equipment is expensive to own. Consider your resources and what will give the greatest return to your business. For example, an automatic watering system that can be used year-round may be a better choice than a precision seeder if you use it only 10 days a year.

Mechanize jobs that are repetitive, tedious or time-consuming. Considerable equipment has been developed for most of these jobs. Filling containers, spacing and moving plants, and watering are good examples of repetitive tasks that make sense to automate.

Install equipment that reduces peak-period labor requirements. The spring season and holiday shipping periods are usually the busiest. Carts or conveyors will move plants quicker than hand carrying. You also reduce the need to hire and manage more employees.

Select equipment that will pace workers. Conveyor belts work well ➧

for potting, transplanting and packaging, providing uniformity and consistency. A variable-speed motor adjusts the belt speed for different operations.

Reduce the amount of walking that employees do. Walking adds considerable time to the cost of plants. An average time to pick up or set down a flat of plants is 1.5 seconds. Carrying or walking can be figured at four feet per second. At an $8 per hour labor rate, making a round-trip 15 feet away to place a flat of plants on a bench adds about 2 cents to its cost.

Standardize your operations. Keep the number and types of containers that are used to a minimum to reduce inventory and the time needed to make changes to equipment. Where possible, ship in standard units such as carts or pallets.

Potting table with door through endwall for loading with a bucket loader.

Consider alternatives to purchasing equipment. Renting, leasing or sharing with a neighbor allows the use of equipment for short periods of time without a large investment. Consider purchasing pre-filled containers, plugs or pre-planted flats to eliminate the need for equipment and reduce peak labor needs.

Select equipment that is manufactured with standard parts. Delays in getting special parts made to repair a down machine can interrupt a production schedule. Standard parts such as belts, drive chain, pulleys and sprockets can frequently be found locally.

Workstation design. A workstation is an area where an employee does a series of repetitive tasks such as transplanting, potting or preparing plants for shipping. The layout of this area can have a large influence on efficiency. A good layout, where everything is within easy reach, can decrease needed labor by as much as half.

A good transplanting rate for 48-cell flats is 20-25 flats per hour. Based on an $8 per hour labor cost, the cost of transplanting 10 flats per hour is $0.80 per flat, 15 flats is $0.53, 20 flats is $0.40 and 25 flats is $0.32.

The top of the table should be at elbow height. Adjustment should be provided for different-height workers. It is best to provide for both standing and sitting positions as greater efficiency is achieved when workers change positions.

The reach from the normal armrest position to get materials should be limited to a 24-inch radius to the side and front for women and 27 inches for men.

The work area is best if within 16-24 inches of the resting elbow position.

A workstation space of 3 x 3 feet is adequate for most operations. Space to the rear and sides can hold pre-filled containers, a cart for placing transplanted containers and movement of the worker. Adequate lighting of 40-60 foot-candles over the work area will increase productivity and reduce eyestrain. Where multiple stations are employed, a belt conveyor to the front of the workers will carry the completed containers to an area where they can be loaded for transport to the growing area.

Low-cost roller conveyors have many applications in a greenhouse business.

An alternate workstation is a movable transplanting table placed in the greenhouse next to the growing area. The table is moved as the greenhouse is filled. Pre-filled containers can be supplied on pallets near the work area.

Carts and wagons. The use of carts can speed up handling and reduce labor needs. One person can push a cart loaded with 40-60 flats from an efficient transplanting area to the growing area.

Select a cart that has large wheels. Tire size should be at least two inches wide and six inches diameter for use on paved floors and 2 3/4 inches wide and 10 inches diameter for use on unpaved areas. One that has fixed casters at the center of the cart with a swivel caster at the center of each end will allow the cart to be turned within its own length.

The cart shelves should be made of a lightweight material that is strong enough to carry the load without sagging. A smooth metal or plywood shelf allows easier loading than a wire mesh material. Shelves should be removable and adjustable for different-size plants.

There are many types and styles of wagons for greenhouse use. Most have pneumatic tires for transport over unpaved surfaces. The standard wagon has a fixed rear axle and pivoting front axle on a fifth wheel. Where wagons will be used in tandem in narrow aisles, select a tracking design where both axles are connected together and one wagon will follow in the tracks of the other.

When the distance between the work area and the greenhouse is greater than 200 feet, carts and wagons should be pulled in tandem in multiple units to save time. An electric

A trolley conveyor will move 20-40 flats at one time.

cart or garden tractor can provide the power.

Conveyors. An alternative to carts is a trolley conveyor. The system consists of a tubular or angle track suspended from the greenhouse or headhouse frame and a trolley-mounted rack that is pushed along manually. Suspending the track over the benches and plants means that no additional aisle space is needed. Curved sections of track carry the cart around corners. Switches can be located anywhere in the system to allow transfer from one track to another.

The rack should be designed with removable shelves for different-size plants and should hold from 20-40 flats at one time. Several racks can be connected together for movement over long runs. Cost of the system is about $3-5 per linear foot.

GROWER-BUILT EQUIPMENT

Growers are very ingenious when it comes to adapting existing machines or building new devices to make their job easier. Here are a few examples I have seen over the years.

Flat filler. Attaching two short-belt conveyors together side by side in an X configuration makes a pot or flat filler. One conveyor is fitted with a hopper at the lower end that holds about a bale of growing mix and a shoot at the top end to direct the mix to a platform below that supports the container. Excess material falls into a containment that drops it onto the second conveyor that carries it back to the hopper. Each conveyor has a separate motor. The speed of the conveyors can be controlled by the size of the pulleys used.

Watering Tunnel. This can be made using two or three fan-type nozzles attached to a piece of PVC or metal pipe and suspended over a chain or roller conveyor. Water is supplied to a solenoid valve that controls the water. A lever-type microswitch activates a 24-volt solenoid valve that turns the water on whenever a flat or pot is conveyed under the nozzles. A transformer converts 120-volt electricity to 24 volts to reduce the potential for shock. The excess water can be collected with a pan and piped to a drain, or the unit can be placed directly over the drain in the floor.

Plant carriers. A simple pot carrier can be made by welding lightweight, 3/4-inch aluminum ➧

or steel square tubing perpendicular to a piece of 3/4- x 3/4-inch angle iron and spaced just far enough apart to catch the rim of the pots. The length of the tubing is slightly less than a multiple of the diameter of the number of pots carried in each slot. A piece of 1-inch conduit bent into a "U" and welded to the angle forms a handle. This concept can be adapted to almost any pot size or shape.

Tractor carry. This box, welded from angle iron and sheet steel, can be designed to fit any tractor. It is attached to the 3-point hitch on the tractor so it can be lowered to load materials such as flats, bales or boxes and then raised for travel.

A tractor-pulled cart train speeds handling for distances over 200 feet.

Plastic roll support. Generally, the easiest way to apply plastic to a hoophouse is to support the roll above the peak of the greenhouse at one end and pull the leading edge the length of the greenhouse before unfolding it over the frame. A frame, fabricated from steel angle or channel can be attached to a bucket loader. It should be wide enough to fit the length of the poly roll. The roll is supported by wood- or metal-bearing blocks and a steel pipe shaft.

The smaller grower with limited resources has many opportunities to reduce labor input without purchasing expensive equipment. A good understanding of the basic principles that affect labor usage and the adaptation of low-cost purchased or home-built equipment will make operations more efficient. GPN

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