

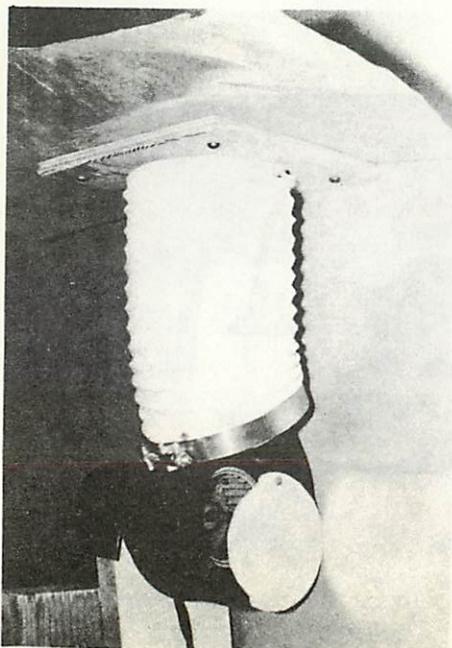
## DOUBLE BUBBLE

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Placing a double polyethylene air inflated covering over glass has proven to be economical for growers in Connecticut. But when an environment is disturbed, there are always some trade-offs to be made. Double covering over glass is no exception.

### ADVANTAGES

The reduction in consumption of fuel is immediate. This has been 40-60% depending on the condition of the greenhouse structure. There is



*Figure 1. Blower for inflation with 100 to 150 cubic feet per minute at 0.5 inch static pressure.*

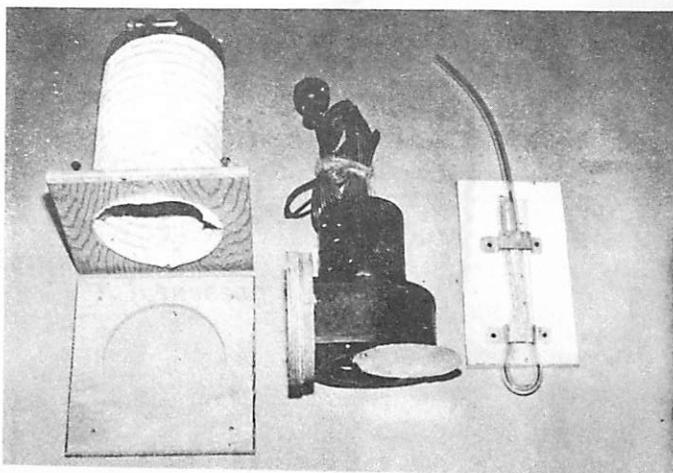
an immediate stop of heat loss and water drip through leaks in older structures although relative humidity and condensation may increase. Some plants grow well in this environment.

Garden centers, as well as commercial greenhouses can adapt this installation with few modifications in structure. Growing or merchandising methods are not affected. Little or no experience is necessary for installation--just plain old common sense and one or two imaginative workers.

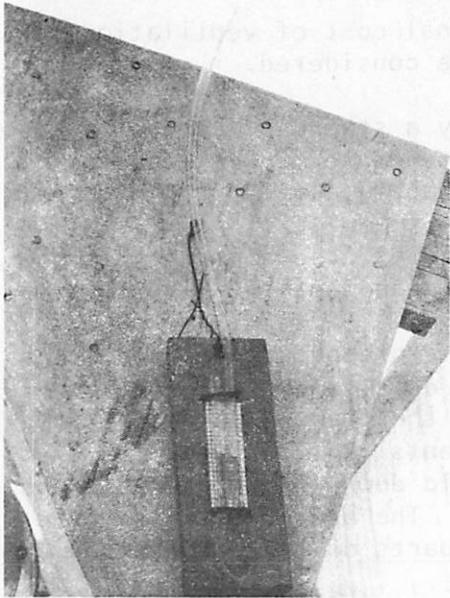
A double bubble can be installed with several options; total cover, cover to one vent, only one roof, side wall, both vents open, etc. The choice is up to the growers.

#### DISADVANTAGES

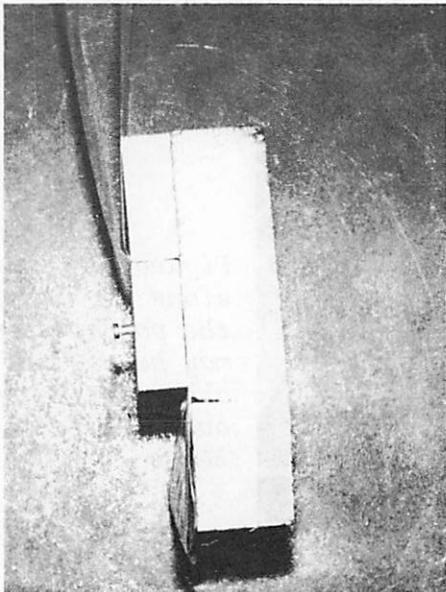
1. Reduction of light on high light crops such as roses, lilies, chrysanthemums, snapdragons, etc.



*Figure 2. Template for attaching blower outlet through inner layer of plastic.*



*Figure 3. An improvised manometer to measure air pressure between the layers of plastic.*



*Figure 4. Method of attachment of plastic to side-wall to reduce air leakage.*

2. It may be difficult to install in tight quarters or on some greenhouse structures.

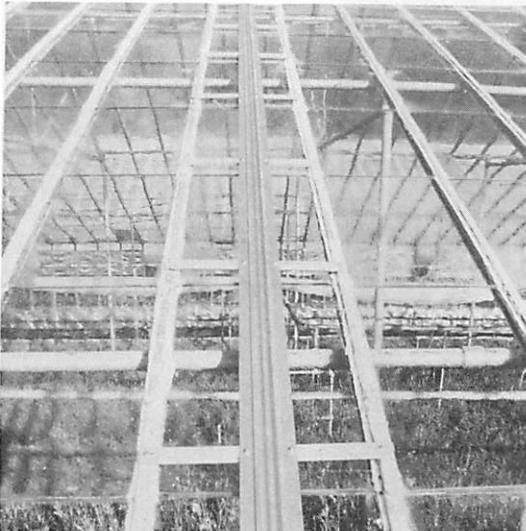
3. The additional cost of ventilation fans and louvers should be considered.

4. This is only a stop-gap measure on older greenhouses as the structure may be weakened by the pressure in the bubble.

Once the part of the greenhouse to be covered is decided upon, the method of covering is simple.

First, survey the greenhouse. Cover all nails and sharp edges with duct tape, styrofoam or protective cover. Wash the glass as clean as possible and make any adjustments in structure. Layers of plastic can be held down with furring strips or metal extrusions. The anchor strips should be bolted to secure parts of the greenhouse.

Once all the sharp edges are covered, glass washed and fastening strips secured, the polyethylene film is drawn over the glass structure. It can be drawn end to end or side to side.



*Figure 5. Extrusions for locking the polyethylene may be mounted as above for houses over 100 feet in length.*

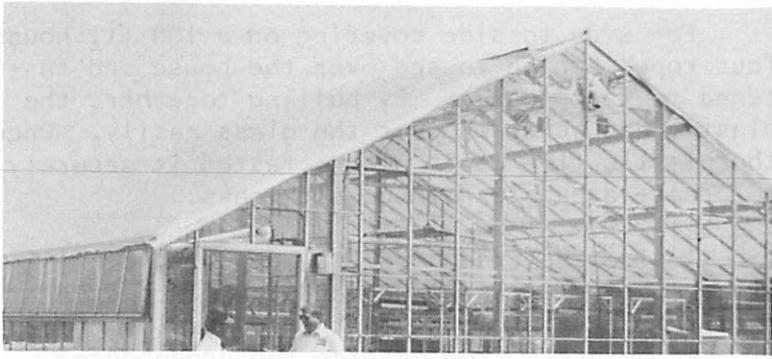
For side to side covering on a 100 ft. house, four ropes can be tossed over the house and fastened to the plastic. By pulling together, the plastic can be drawn over the glass easily. Once the plastic film is in place, fasten it securely to create a bubble with no air leaks.

Inside the greenhouse, remove a pane of glass and install a blower and four inch dryer hose. Mount the blower on the end wall so that air can be drawn from outside the greenhouse. This reduces the amount of moisture that condenses between the layers. The intake should be above the highest snow level so that it is not blocked. Attach the pressure adjusting damper on the intake.

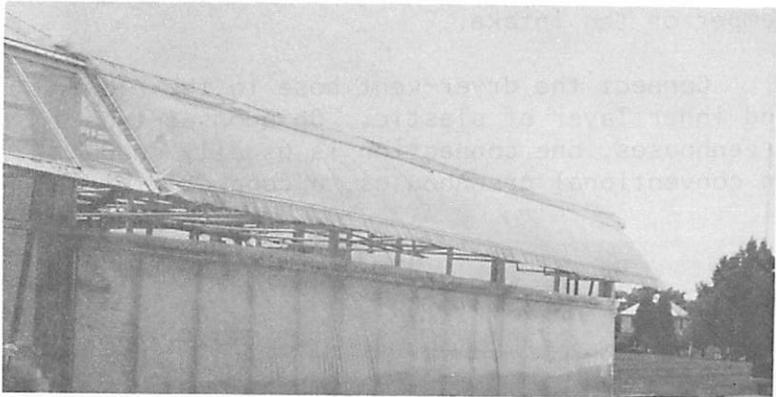
Connect the dryer-vent hose to the blower and inner layer of plastic. On quonset-type greenhouses, one connection is usually enough. On conventional greenhouses, a connector piece



*Figure 6. Polyethylene being locked into the extrusion pictured in Figure 5.*



*Figure 7. A double bubble with vent not covered.*



*Figure 8. Vents may be covered with a bubble for insulation yet permit ventilation.*

of hose should be attached to both sides of the ridge to equalize the pressure. Where two pieces of plastic are used, a connector is also needed to bridge between them.

Connect the blower to a power outlet to begin operation. Adjust the intake valve until a water column difference of  $1/4$  inch is measured on the manometer. Fix the intake damper in this location. The system should maintain this pres-

sure unless leaks develop. Holes in the plastic can be patched with tape. On very windy days, a slightly higher pressure (0.3 to 0.4 inches of water column) should be used.

Double bubble is a practice that can save the grower or retailer money by reducing fuel consumption. Consider this as part of your fuel management plan.