

pumping charges.

Hermes liked the soil warming system that he saw demonstrated in the research greenhouse so he installed it throughout his own structure. The warm water heat exchangers are very similar to those in the SherCo greenhouse, with some improvements and refinements added. Herme's 1½ acre building is being used to grow roses.

The second commercial operator, again building and financing his own greenhouse, is Tom Lange. Lange grows vegetables, tomatoes, spinach, lettuce and cucumbers in his ½ acre unit, using the nutrient film (hydroponic) technique.

The Company has reserved approximately 50 acres adjacent to the power plant for warm water greenhouse development. With construction for 1980 completed, there are 2.5 acres of greenhouses at SherCo, with more scheduled for 1981. In fact, Tom Hermes has an additional 1.5 acres under construction at the present time. Fifty acres is enough land to support 14 to 15 acres of greenhouses. A pipeline has been built to connect Unit II to the complex, which gives operators two-unit reliability. The Company is pleased with the results of the waste heat project and feels that as the cost of natural gas, propane, and fuel oil continues to rise, the alternative energy in the form of waste warm water will look increasingly attractive.

KEN MUDGE: I was wondering how the cost compares to standard methods of heating.

HAROLD PELLETT: I am not sure of the exact cost; however it is considerably lower than common methods.

KURT TRAMPOSCH: What would happen if you have all those greenhouses tied into this system and it goes down for 6 weeks in February?

HAROLD PELLETT: The first 3 greenhouses built had backup heating systems, so your initial costs are greater. The SherCo system has 2 separate power units so now if one goes down the other can supply the needed hot water.

## **GRAFTING APPLES**

**STANLEY M. FOSTER**

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Greenleaf Nursery Company is headquartered approximately 90 miles southeast of Tulsa, Oklahoma, at Park Hill. Our Texas division is located in south Texas approximately 70 miles southwest of Houston at El Campo. Both nurseries are exclusively

producing container grown ornamentals, growing a broad selection of narrowleaved and broadleaved evergreens, trees, and shrubs.

At the present time we at Greenleaf graft 16 cultivars of fruiting apples, crabapples, flowering pears, and fruiting pears. This year we will graft a little over 100,000 trees. Of these grafts, we expect 85 to 90% to be high enough quality to be planted in the field.

Our apple grafting season starts about January 2nd each year. We use the whip or tongue method of grafting on both apples and pears. Preferably, the scion and understock should be of equal diameter. The scion should contain 2 or 3 buds with the first graft cut made in the smooth internode area below the lower bud. This first cut should be a long smooth, sloping cut 1 to 2 inches long, preferably made with one single stroke of the knife. Then a reverse cut is made. It is started downward at a point about  $\frac{1}{3}$  of the distance from the tip and should be about  $\frac{1}{2}$  the length of the first cut. This cut is then matched with an upward cut starting at the crown of the understock. The cuts made at the top of the understock should be exactly the same as those made at the bottom of the scion. The understock and scion are then inserted into each other with the tongues interlocking. It is extremely important that the cambium layers match along at least one side and it is much better if they match on both sides.

After the understock and scion are fitted together, they are held securely in place by  $\frac{1}{2}$  inch grafting tape. They are then tied into bundles of 50 and packed in chicken boxes using brown kraft paper as a box liner. Moist shingle-toe or long fiber sphagnum moss is used to cover the roots.

These boxes are then placed in a warm area (70°F) to allow as much callusing as possible before the buds start to swell, forcing us to put them in a walk-in cooler which is kept at 36-38°F. The grafts are then inspected on a weekly basis until they are potted in a 3 inch peat pot and placed in a quonset. They are grown in the quonset until after the danger of frost is over — approximately May 1. At this time they are planted in the field. This procedure allows us to take the losses on our grafts in the quonsets and to send the highest quality plants to the field.

Other than the matching of the cambium layers, sanitation has to be given the highest priority. Our scion wood and understock is washed with clear water and dipped in a fungicide solution before they are sent to the grafters. The grafting knives are dipped in a disinfectant solution after each cut and the grafters are told not to touch the open wounds of the grafts with their hands.

We do not pay piece work on our grafting because we feel

the grafters would try to hurry too much and turn out lower quality grafts. Instead, we use close supervision to keep everyone busy and producing high quality grafts.

This program we use on apple grafting is nothing new or fancy, but if done properly, it can produce excellent results. It is directed at one main objective: "Produce the highest quality liner possible at a reasonable economic level."

TOM McCLOUD: You mentioned leaving a gap in the tape to look for problems. What problems are you looking for and how do you correct them.

STANLEY FOSTER: One thing we hope to find is a lot of callus growth. If none is occurring we will check for proper alignment. You also find mold growing sometimes. In that case we dip them in fungicide and repack. That often means that the sphagnum moss was too wet when packed. You can also see fireblight at this stage sometimes. The checking is done on a spot basis.

RALPH SHUGERT: I notice that you were doing both piece root and whole root grafting. Have you checked both ways for survival?

STANLEY FOSTER: Yes, and we basically found no difference.

RALPH SHUGERT: What pear stocks are you using?

STANLEY FOSTER: We use *Pyrus calleryana* only.

VOICE: Do you have problems with your scions rooting?

STANLEY FOSTER: No. We have more problems with the understock sprouting. We control this somewhat by planting them deep.

## **COST ACCOUNTING TO PROPAGATE PROFITS**

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The principal reason for being in the propagation business is to make a satisfactory profit. A satisfactory profit level does not occur as a matter of chance but is a result of careful management of the activities of the firm. This, of course, includes the controlling of costs and the determination of realistic prices for products and services in line with competition in your market area. Production and sales should be undertaken with full recognition of all costs involved to maintain a profitable business operation.