INNOVATIONS IN PROPAGATION HOUSE CONSTRUCTION

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Three years ago we commenced relocating our main propagation department from the present site in New Plymouth to our 176 acre production nursery 10 miles north. This was to be completed in three stages. Stage 1, which consisted of 8,000 sq ft was completed 2½ years ago. Stage 2, of an additional 10,000 sq ft is now operative.

The old propagation department is largely made up of glass, rigid type plastic structures, and polythene houses of a variety of shapes and sizes built over a period of 70 years. The cost of re-building in glass was prohibitive so we decided to seek a cheaper substitute for our million plus cutting production per annum. Plastic with it's low level of capital investment seemed to be the best alternative.

The Lee Valley Experimental Horticultural Station started work on film plastic structures in 1968 and has largely overcome the resistance to plastic tunnel developments. We based our design with modifications, on their prototypes as described in Station Leaflet No. 17 and No. 20. There are many differences between the use of glass versus plastic film, and as previously mentioned the main one is cost. The annual cost of resheeting a polythelene house amounts to approximately the same as the annual labor cost of cleaning glass! The lightness of structure requires fewer supports and although plastic transmits heat rays more effectively than glass and is colder in winter, heating costs are similar because of the relative airtightness of plastic structures.

With rapid advancement of technological changes and new materials the use of plastics allows greater flexibility. A grower would think twice before replacing an acre of glass with a substitute material.

Stage 1 consisted of 4 separate polyvinyl chloride (P.V.C.) houses 100′ long and 20′ wide; 3/4″ diameter (1″ in later structures) galvanized pipe frames 4′ apart supported the plastic. Bed heating was supplied by thermostatically controlled electric cables embedded in a concrete slab. Each house holds from 50,000 to 100,000 cuttings.

I will discuss some of the various changes and innovations which we have made in Stage 2 of the project.

P.V.C. – (12 gauge). The covers of the first four houses are still in a reasonable condition after 2½ years of use and will last for the expected 3 years.

Present cost for a cover 100′ × 32′ with 4″ pockets for rope fixing is approximately $570.00.

Polyethylene Film (5 gauge) — Last for a year under our conditions and present cost for a 100′ × 32′ sheet with pockets is $175.00.

Ethylene Vinyl-Acetate — E.V.A. Unfortunately we have not yet covered a house in E.V.A. but results in the U.S.A. and Europe have proved the durability of this film with it's more elastic, anti-fog and anti-dirt properties. Costs are 1/4 cent per sq ft more than polyethylene.

Reducing Poly-Cover Degradation. Where polythene comes into contact with the galvanized pipe frames 'hot spots' occur, causing breakdown of the film.

We are engaged in trials with painting 4½″ wide protective strips of an acrylic paint over the outside of the film. This will be compared with our traditional method of sleeving the 1″ galvanized pipe with shade cloth.

Double-Skin Houses.

	Heat loss: Btu ft² °F/hr	
Material	**Single Skin**	**Double Skin**
Polythene	1.6	0.8
P.V.C.	1.4	0.5
Glass	1.25	—

Heat loss by convection and radiation calculated by Walker & Cotter (*Acta Hort.* 6:26-46).

Trials are in progress with P.V.C. and polyethylene doubleskin houses. An insulating layer of pressurized air created by a continuously running blower separates the two sheets. As can be seen by the above table we hope to save costs of heating due to the improved insulation which is very important with recently announced fuel cost increases. There will be some reduction in light transmission and in ventilation requirements in hot sunny weather.

Sunclear. This American anti-condensate spray has proved very effective on preventing water globules from falling onto cuttings. A film of moisture is formed on the inside of the cover and there may be some reduction of heat loss which occurs through the air spaces between the water droplets.

Environmental Controllers. Instead of the mass of thermostats and individual controls used in the past, we decided to incorporate the following for each propagation house into one control unit cubicle:-

1. *Cooling*	Staged control of two 24" fans.
2. *Air heat*	Control of a 50,000 Btu gas-fired blower.
3. *Floor Heat*	Control of two halves of the propagation house floor.
4. *Misting*	Calibrated control of two separate 230 VAC water solenoids by a sensing element with an adjustable time control from 0 to 10 seconds.
5. *Provision*	For the future addition of two controls, e.g. CO_2

The control units incorporate a siren and visual lamp indicationg for high and low temperature extremes and mist failure which would cover sensor, fan and heater faults.

We are finding that although this control equipment is complex and initially expensive at approximately $1,200/ cubicle, it's use is highly desirable both to obtain the correct environment and to effect the maximum economics.

Floor Heating. Comparisons were made a year ago of the relative costs of the various heat sources and are not necessarily at the current rates.

Heat used Prop. House/hr.	Fuel amount used		Unit Price	Running cost of heat used
100,000 Btu	Electric	29.3 Kw/h	0.97¢ Kw.h	28.42 cents
100,000 Btu	Gas	1.33 therms	12.0¢ therm	16.0 cents
100,000 Btu	Oil (diesel)	0.8145 per gallon	35¢ gallon	28.5 cents

The above is based on 1 kw = 3412 Btu and that electric heating is 100% efficient compared to gas and oil having an overall efficiency of 75%; i.e. 100,000 Btu heat used in propagation house = 1 therm used in propagation house = therms of gas used by boiler.

Data received from various sources showed that alkathene piping used in the beds would make a cheaper alternative in material and laying costs than steel pipes.

Although the capital costs for the hot water system (120°F) versus electric cables was 25% higher it was estimated that the lower running cost would soon re-coup the difference.

CONCLUSION

Although "actual" costs are still to be calculated for Stage 2 of the project we feel that we are stepping in the right direction as far as type of construction and materials used. Even in the relatively short time of 3 years many changes have occurred in the horticultural equipment field. Who knows how Stage 3 will develop?

DESCRIPTION AND PROPAGATION OF THE NEW ZEALAND SOPHORA SPECIES (KOWHAI)

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The Kowhai, pronounced by the Maori, kor-f-eye, means yellow and this is most evident throughout both islands from August to November when plants of this genus burst into flower often on sparsely-leaved branches, according to the species and district. Some overseas visitors have referred to the Kowhai as the New Zealand laburnum while many enthusiasts have proposed that it should be the national flower. The golden, drooping flowers, symbolic of spring, provide abundant nectar and pollen for such visitors as the tui, bellbird, kaka, silver-eyes, bees, butterflies and night-flying moths. No wonder the Kowhai never fails to gain the admiration of the horticulturist or of anyone who appreciates the beauty of nature.

The following descriptions and comparisons within the New Zealand genus should help to clarify some of the uncertainties that may have existed in understanding the Kowhai.

The genus *Sophora* (from sophera, an Arabic name for some leguminous trees), is not confined to New Zealand, there being some 38 species scattered throughout Asia, North and South America, the north-east of Africa and Australia, also on islands of the Pacific, Indian and South Atlantic Oceans. The New Zealand species of *Sophora* are not very well defined and