The energy requirements for ventilated high humidity propagation as compared to intermittent mist with bottom heating are lower both in terms of propagators efforts and equipment energy requirements.

OUTDOOR PROPAGATING AT ANGELICA NURSERIES

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The least expensive method of propagating cultivars would be the direct sticking of unrooted cuttings into beds or field rows. With cooperative weather conditions, this will work well with some plants, usually quick-to-root species handled as dormant hardwood cuttings. With the majority of Angelica's production done as softwood or summer cuttings, the procedure becomes a bit more difficult, because success would necessitate some type of watering system to keep the plant tissues turgid during the rooting period. A deep, well drained especially sandy soil might present the proper medium, but since our area has a heavy loam soil, which becomes waterlogged quickly under continuous watering, soil propagation under mist proves unsatisfactory.

Angelica Nurseries took the next most logical step, which was to create raised beds of sand, while providing more than adequate subdrainage, into which cuttings are stuck for rooting from March until September, as proper timing and scheduling permits.

For four years we have been testing and refining our setup in order to observe its potentials and limitations, and have developed a propagating setup consisting of six units, each unit consisting of two side-by-side beds, each bed measuring 6 x 100 ft constructed of salvaged railbed ties, giving a minimum bed depth of 8 inches (Figs. 1 and 2). Each unit has a water line down the middle, with its own solenoid valve and time clock, with the watering applied through nozzles on 30 in. risers spaced at intervals to provide total coverage of the stuck cuttings. Each unit is separated from the next, and the whole setup is enclosed by 6 foot tall reed matting. This effects a reduction in air movement across the sandbeds and moderates the drying effects of wind and wind interference in the nozzle watering pàttern; this prevents dry areas and dead cuttings. Each unit, with a spacing of 1¾ inches between cuttings, holds approximately 60,000 cuttings.

At present we are using a salt hay blanket as winter protection for the rooted cuttings to prevent desiccation of narrowleaf evergreens, and stem splitting of deciduous cuttings. As with any covering there is rodent control to contend with. The cuttings

must be observed closely in early spring so that they can be processed before breaking dormancy.

The potential economic benefits of such a setup would primarily include the elimination of energy usage for winter rooting and storage. It precludes the need for expensive greenhouse structures with plastic or glass coverings. There is less moving

Figure 1. Outside propagating facility at Angelica Nurseries, Kennedyville, Maryland.

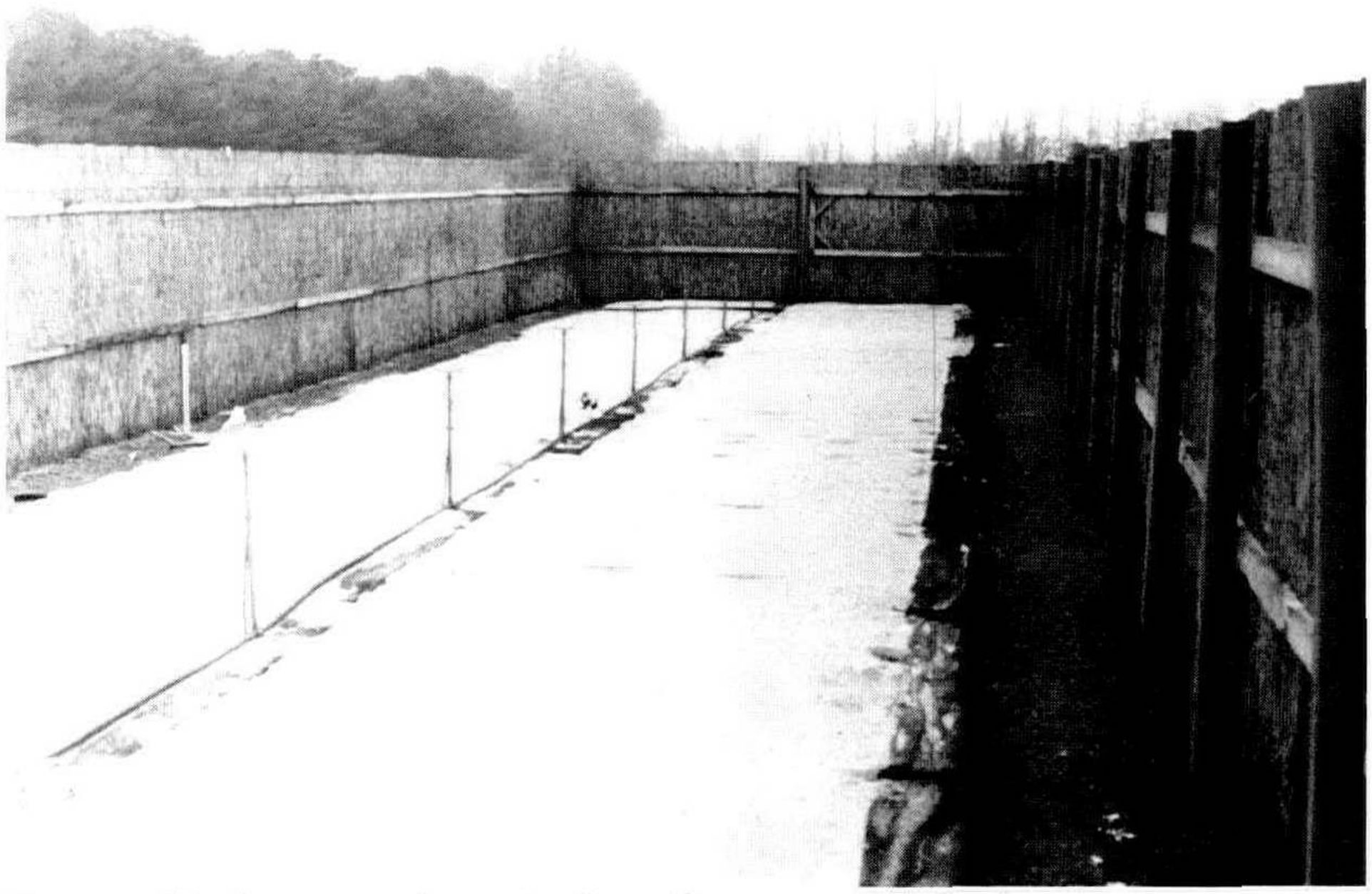

Figure 2. Single propagating unit of outside propagation facility.

and rehandling of cuttings or flats and, if proper drainage is established, no loss from overwatering. It is fairly easy and inexpensive to construct, easily modified for particular requirements, and uses an inexpensive rooting medium. With dormant narrowleaf cuttings we are able to prepare cuttings during the late winter slack period and hold them in cold storage until they are able to be stuck.

This sandbed technique is not new or original. It is just our adaptation of an old principle in outside propagation made more efficient by modern advances in electric solenoid valves and time clocks. More important is that whatever we find can be propagated successfully in our outside sandbeds will use less energy, and be just that much more economical and cost effective to produce. We think that is a worthwhile endeavor and in a positive direction.

ENERGY SAVING PROPAGATION GREENHOUSE

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In 1972 a poly tunnel 15 x 180 feet was constructed at Spring Hill Nurseries to propagate evergreen cuttings. The house was designed and built to accommodate CPVC plastic pipe for bottom heat. A pit was dug and the house was placed two feet into the ground to cut down on heat loss.

The ½ inch CPVC pipe was placed on 6″ centers and buried halfway in 8 inches of sand. A boiler was installed midway in the house so each end could be controlled separately. Circulating pumps run continuously to give even heating throughout the house. We circulate 140°F water for bottom heat in the house. The boiler water temperature is controlled by thermostats. Details of consturction are available in the 1973 Proceedings (1).

We have used the greenhouse for 6 years to root evergreen cuttings. We have always had good results. In 1979 we discontinued rooting evergreens and switched the greenhouse to perennial production. At the present time, it is full of newly dibbled perennials. These plants respond well to the 70°F temperature. The air temperature will be between 40 and 65°F this time of the year. After establishing, the perennials are moved to a cool house for hardening off.

We feel that submerging the house and insulating the side walls made this a very economical house to heat. During the winters of 1972-73, 1973-74, 1974-75 the house was heated with propane. The three year annual average usage of propane was