

MATERIALS HANDLING AND MECHANIZATION OF HARDY NURSERY STOCK

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The decision to mechanize any one aspect of a nursery must be tied to various other factors if it is to be effective.

1. A production flow line should be worked out.
2. Be sure of worker participation.
3. Can any of the equipment be used to advantage elsewhere?
4. If extra production is envisaged as a result, can it be sold?
5. A carefully planned training program.
6. A costing system.

The benefits that can be achieved are:

1. To reduce the heavy work done by staff.
2. To speed up work done by staff and thereby reducing the number of staff required, or increasing the volume of production with the same staff.
3. To reduce the number of menial and unpalatable jobs performed by staff, thus making the total job more desirable.

An efficient approach to the "manufacture" of plants will help to encourage the right type of people to come into the industry. As with farming, it should not be the type of job that school leavers decide to take up because they can find nothing else. We should aim to make horticulture one of the most desirable and attractive of professions as it is certainly possible for it to be.

The concept of mechanization is discarded by some because it sounds as though it involves the spending of considerable sums of money. There are however a number of ideas which cost very little but can be very useful; for example: hand-operated tying machines, the square pot "fork" and the ring knife, etc.

Other larger and more expensive items include a variety of planting machines, lifting machines, potting machines and internal handling systems such as the Tilhill Nursery pot standing trailer and the Nisula Roll system. Other U.K. innovations are the Hillier tractor-mounted seed picking platform and the National Institute Agricultural Engineering gantry system. Each of these sys-

¹ Richard Flint is a Nuffield Farming Scholar to whom the Management Council of the United Kingdom Farming Scholarships Trust awarded the Eric Gardener Memorial Fund traveling scholarship to study commercial horticulture and production.

tems can increase the efficiency of a nursery and thereby help to produce a product which is more competitively priced in the leisure industry market.

Automated irrigation, liquid feeding, ventilation and temperature controls, etc. all have a place in freeing labor for other tasks and will probably do the job more efficiently.

Grafting machines and budding guns etc., mean that long years of expensive and intensive training are not necessary.

All this does not mean that skilled persons will no longer be required. On the contrary, the skilled man or woman must be even better and will have much more responsibility. If, for example, an automated irrigation system is not programmed correctly considerable damage could occur. If the mechanical grafting is not done at the correct time the "take" may be worse than if done by hand. When a large number of plants are grafted by hand the prolonged duration of the job will mean that at least some of the plants are handled during the optimum period. When done mechanically the time taken will be much shorter and must therefore be done at the correct time — timing is critical.

One of the potential benefits that I have not yet mentioned is the sharing of ideas on mechanization. On individual nurseries throughout the world, individual people have their individual problems and solutions. As IPPS members are already convinced of the benefits of sharing ideas on propagation I would like to make a proposition:

Would it be possible to form a "register" of current ideas and systems? Anyone who had an idea or a problem could approach the register. Would IPPS, as a respected, unbiased, international idea-sharing Society be prepared to be "caretaker"?

If we as an industry are not prepared to help each other, nobody else is likely to come to our aid, nor can we hope to become a more dynamic, enlightened and progressive industry. Any nursery worthy of its name must be a well organized unit, displaying not only the excellence of its products but also the well thought out systems of planning, operation, mechanization and good husbandry. These things are the "Shop Window" on the business generally and are vital to the trade and the general public we seek to interest.

MODERATOR SHUGERT: We now have time for questions for the first panel of speakers on this morning's session.

HUDSON HARTMANN: On the Nisula roll used in England, are unrooted cuttings put in there to root, or are they rooted cuttings, or seedlings?

RICHARD FLINT: They are seedlings.

MODERATOR SHUGERT: The roll technique that Richard nicely described in his paper was observed by several of us who attended the 1973 conference in Great Britain. They are rooted seedlings that I refer to as a "jelly roll wrap." They would wrap plants for storage for winter and then take them back out into the field. The tops are sticking out; the seedlings are merely rolled in polyethylene and a slicing machine slices the roll right in half. And then you set each half on the truck. It has tremendous amounts of advantages, as Richard pointed out in his paper, for storage as well as the handling of the plants. They can stay in these rows for a good number of months; they pick up the roll, take the whole roll through the reforestation area, which saves a lot of flat and lug handling. Only one small roll of plants has to be carried.

BARRIE COATE: Regarding the tilt bed trailer that Richard demonstrated; was that a motorized trailer, or was just the weight of the cans used to tip them off the trailer with the belts to help them — or is that belt motorized?

RICHARD FLINT: No, I think it is a hand-operated mechanism.

JOHN TRAAS: Would heat inside the air-supported structure prevent the snow collapse which we saw in the slide?

BRUCE BRIGGS: Actually we didn't try heat in this house. There has been a lot of basic research done over at Washington State University at Pullman on air-supported houses. Dr. Charles Pfeiffer worked on this when he was a teacher there. They recycled the warm air under the house but they had the same problem. Whenever you have a snow fall you have to sweep it off. I am not sure how warm you have to go to get the snow off but in their work at Pullman there was not enough heat to melt the snow. The house would go down with the snow. We use the air-supported house in the spring after the snow is over.

LARRY CARVILLE: Just a comment on those doublewalled air-inflated houses. We are using them in New England quite successfully both for propagation and for growing. They are typical quonset houses. We have a lot of slope at the sides of our houses. The ones in Bill Curtis's pictures look to me to be very flat on the top. I can see where you might get into problems with snow. We do get snow in New England; we get wet snow. But with the quonset house it will shed off.

JEAN WHALEY: I would like to ask Dr. Anderson about his cuttings that have the roots emerging from just one side. Do they develop from the other side, too? We have always discarded cuttings of conifers that were what we call one-rooted. We take the root off and start over again.

DR. ANDERSON: We are getting a much better rooted cutting

if we put them in a peat pot and put them in gravel. We get a much more fibrous-rooted cutting than the ones with tap roots you saw in the pictures.

MODERATOR SHUGERT: About the polyethylene container that Richard Flint showed. That is not a rigid wall container as we know it in the states. Are there any questions about this type of container?

JOLLY BATCHELLER: What are the costs as compared to gallon cans?

RICHARD FLINT: Approximately \$30.00 per thousand in England for the polyethylene containers; 3¢ apiece as against 23¢ for a gallon can here.

VOICE: Will these poly containers with plants stack one upon the other in a truck without damage — or do you have to shelve them?

RICHARD FLINT: Well, they will, in fact, stack at least 2 or 3 high — but we do normally shelve them.

VOICE: First of all, about actual handling of the poly containers, is there any way of carrying more than one at a time? Do they carry them by the rim of the container without having the poly just tear? If you are to set them out in beds where you want spacing — say, you are growing something like junipers — that are spreading wide around the container. Can they stand up by themselves without each other for support?

RICHARD FLINT: The polythene is really quite strong. You can easily carry two in each hand with your fingers; the poly doesn't tear. As far as spacing is concerned, they are heat-sealed and it has a square base.

VOICE: Do you have problems with ripping of the seam?

RICHARD FLINT: No — maybe an individual one.

MODERATOR SHUGERT: We saw a very large rose operation — potted roses in full bloom. We saw them in the growing state and we saw them loading the lorries (trucks) and moving them into the containers. The slide Richard showed was one which I had never seen before showing the loading of the bed of his truck — backing the truck under the bed. They have these all lined up so that the truck would go out, unload the carriage of the truck, if you will — the actual bed right out from underneath it; then swing on back, picking up another one, and leaving the sold containers in a customer's yard. Beautiful way to ship stock.

VOICE: I would like to ask Barry Eisenberg what his mortality rate was, and what was the replication on that project that he did.

BARRY EISENBERG: None.

VOICE: How many plants did you actually use in the experi-

ment? How much replication did you have?

BARRY EISENBERG: Thirty plants in each group. That is what I started with. Then I took 5 that were showing the best characteristics out of any of them to use as the samplings.

VOICE: Has it ever been used in large replication?

BARRY EISENBERG: This is the San Fernando valley of California that we are talking about — just north of Los Angeles. Summer temperatures are 85° to 110°F. We used direct rooting with oleanders and we have tried it during the winter months with some of the junipers and we did it also with all of our perennials — Marguerite, Shasta Daisy, etc. We have had real good success with direct rooting, but the owner of the operation is hesitant to change methods because he has been successful using Jiffy Pots. This seems to be the biggest drawback. Everyone is already satisfied with what they are doing. In the San Fernando area everything they are growing they are selling anyway. So why change?

MYCORRHIZA EFFECTS FOLLOWING SOIL FUMIGATION

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Fumigation of citrus nursery soils has come into general use during the past 10 or 15 years. The increasing difficulty of finding suitable citrus soil which is free from harmful nematodes and phytophthora fungus has made it necessary to treat nursery sites in order to grow disease-free plants.

The first attempts at soil fumigation of seed bed soil at our Thermal, California nursery resulted in a near disaster. Citrus seed planted in either methyl bromide or Vapam-treated soil sprouted and grew normally at the start, but when the seedlings reached a height of 3 to 4 inches, growth stopped or was retarded in large areas of the beds. In some small areas of varying size the seedlings grew normally. Similar stunting of citrus seedbeds has been observed following soil fumigation in Spain, Peru, Venezuela, and Florida.

Studies made at the Citrus Research Center of the University of California at Riverside showed a deficiency of phosphorus as well as some of the micronutrients in the stunted plants. A pro-