to reach the point where we feel we are allocating these expenses correctly. The more diverse your business, the more difficult is the calculation. Briefly, think about the ramifications of vehicle expense. We have seven vehicles. How much of the expense relates to our nursery when any one of or all of three different vehicles may be utilized by that department at any one time? I won't go further on this — doubtless you see my point.

Those whose firms are using data processing will probably echo my comments when I say to those who are contemplating data processing in the future, allow yourselves at least a year to get the system 100% operational. In spite of the efforts of N.C.R., our chartered accountant, and with myself having had some previous data processing and accounting experience, our first six months was pretty rough.

The cost analysis system I have outlined can be used in a small business without dadta processing. It is also adaptable to other nurseries; one other nursery that has no greenhouse operation is using the system.

The system is not perfect, but I hope that by sharing our experiences with you, you may obtain ideas for your business. I would be most willing to go into more detail or answer any questions you may have if you contact me.

MODERATOR PINNEY: Our next speaker is Dr. John McGuire. His paper is entitled, "A Propagation Schedule for Container Plants".

A PROPAGATION SCHEDULE FOR CONTAINER PLANTS[1]

JOHN J. MCGUIRE
University of Rhode Island
Kingston, Rhode Island

Container plant production has been increasing in the Northeast for the past ten years. It has not yet developed to the levels found in the South or Far West but the rate of increase indicates it may one day be a major form of plant production in the Northeast. Growers in this area have been faced with problems not encountered in the milder climates. Specifically, the relatively short summer season requires a very efficient production program. This, and overwintering problems, have been the major reasons for slower development of this method of plant production in New England.

Most growers have now overcome the problem of overwiner storage by use of Quonset poly-houses. These houses are constructed over the plants in the growing areas, eliminating or reducing labor costs for moving plants. To make use of the short growing season, growers have also met the challenge by developing an efficient growing program. This parallels the

[1]Contribution No 1342, Rhode Island Agriculture Experiment Station

year-round problems of the commercial florist. His problems are very much like those of the container grower. He is limited to growing his crops within the walls of his greenhouse and to make it profitable he must get as many crops as possible each year from the limited space. The container grower is limited to a short season while using an expensive method of production.

The problem of getting maximum growth, while not forsaking quality, has been solved by use of specialized media with good porosity and low exchange capacity and by using adequate irrigation and constant or frequent fertilization. Such practices have resulted in growth almost double that obtained in the field in the same locality.

There is one other step to maximize the short season completely. This is to time young plants, just as the flower grower does, to have them ready for planting at the right time.

In Rhode Island the canning season is usually from mid-May to the end of May. If plants are canned before that time, late cold weather often checks growth and hardens them, which offsets any advantage that may have been obtained from early planting. If canned much later, valuable days of the relatively short New England season are lost. Plant material used for containers must be more than a rooted cutting. They require some finishing after rooting. Young plants must be available in quantity in the right sizes. If they are not available in sufficient quantity the canning operation becomes overly expensive. If they are small the space they occupy in containers is not justified and they will require an extra year in the container to reach saleable size. If they are too large, efficient canning cannot be done and plants will be potbound before the end of the season. This will require additional potting in the middle of the season or a loss of quality if not potted.

It is obvious that not all plants can be handled the same way. Approximately 5 to 6 thousand plants are produced in containers each year for research purposes at the Rhode Island Agricultural Experiment Station. This paper will explain how these plants are produced each year so they are ready for canning over a ten-day period in mid-May.

This is a small operation by commercial standards but the principles should be the same. It must also be emphasized that the conditions are those experienced in Rhode Island and modifications would have to be made for other regions of the country.

Azaleas & Rhododendrons. Cuttings are made in late July and early August. They are removed from propagation beds in September, October and November. They are potted in 3″ plastic pots and grown under a light break (fluorescent lights from 11 p.m. to 2 a.m. at night temperatures of 65°F). Plants are pinched three or four times during the winter to develop branching. They are fairly well potbound by mid-May.

Azalea cuttings made in the earlier summer months

(June-July) are potted in July and grown on until fall. They are then overwintered in unheated plastic houses.

Other broadleaved evergreens (*Ilex, Buxus, Pyracantha, Euonymus, Cotoneaster*). Cuttings are made in late December. They are normally four inches or more in length and well-branched when taken. They are treated with a moderate growth regulator (1.6% IBA in talc). They are potted in February and placed under the light break as described above until spring. They are fertilized weekly with 20-20-20 (200 ppm N).

Narrow-leaved evergreens (*Juniperus, Chamaecyparis, Thuja*). Cuttings are made between December and January. Heavy, well-branched shoots four to six inches in length are selected. They are treated with 3 to 4.5% IBA in talc. They are potted in April and fertilized weekly.

Deciduous plants (*Forsythia, Viburnum, Ligustrum*). Hardwood cuttings 6″ long are made, in February and early March and placed in flats under mist. Leaves and roots develop simultaneously and when rooted they are moved in the flats to a bench without mist. They are fertilized weekly until canning time.

Seedlings (*Rhododendron, Azaleas, Pieris*). Seeds are sown in March under mist, potted in early summer, and maintained in the container area the first summer. They are then carried in the greenhouse under the light break the following winter. They are ready for canning the following spring.

With the exception of rhododenron, most plants are produced to canning size within a few months. This is done by pushing them under long days under a regime of moderate fertilization and optimum temperatures. One method tried this past summer was to propagate cuttings directly in a propagating medium containing slowly-available fertilizer.

In summary, few new principles have been applied. When possible, large, sturdy cuttings have been used. Stock has been maintained under long-day photo periods by means of a light break during the night throughout the fall and winter. Plants have been fertilized from the earliest possible moment, at times when still under mist. Cuttings have been made as late as possible to reduce time under greenhouse care but early enough to produce a well-rooted plant suitable for putting in a container.

MODERATOR PINNEY: Thank you very much, John. This is certainly an interesting area and it can be a lot of fun. Sometimes we even tend to scare ourselves when we see what we can really do by efficient scheduling. Are there any questions?

HANS HESS: Do you know approximately what it costs per plant for supplemental light and maintaining the temperature at 65°F to get this maximum growth?

JOHN MCGUIRE: It would be fairly expensive under greenhouse conditions; the light would not be expensive but

the heat certainly would be. We do not attempt to keep the plants under these conditions very long. Most of them are in the greenhouse for only a short time but with rhododendrons this is a rather expensive production.

HANS HESS: Have you used this "pill", that we've heard about, in your production and if so, what results have you had?

JOHN MCGUIRE: We have used the Agriform Plant Tablet; the results depend a lot on the irrigation program used in growing the plants. Our containers are getting ¾" to 1" of water per day and under this irrigation regime the tablets run out about early August. If you want to push the plants you would have to give them a shot of fertilizer at this time, but I don't — under our conditions I stop them right there. The best results we've had with slow-release fertilizers has been with MagAmp, with Osmocote running next.

MODERATOR PINNEY: Thank you again, John. We're going to have to move on now. Our next speaker will talk on "Mechanization at Medford Nursery". I am not personally acquainted with his nursery operation but I understand he is doing an excellent job and it is my pleasure at this time to introduce Mr. Earl Robinson to you.

MECHANIZATION AT MEDFORD NURSERY

EARL H. ROBINSON
Medford Nursery, Inc.
Medford, New Jersey

I would like to speak to you on mechanization at our nursery in five main categories: 1) Propagation, 2) Greenhouse Growing, 3) Field Growing, 4) Over-wintering and 5) Shipping.

PROPAGATION

Most of the plants we grow are produced from cuttings although we have grafts and a little seed production. Our cuttings are prepared in the customary way with one exception; that is, they are prepared in the "Propagation Room" and are stuck in the flats there in assembly line fashion. Approximately 100 cuttings are placed per flat. The hormone treatment varies with the plant and the timing of cutting. We wound our cuttings and after the cuttings are stuck, the flats are watered down with Aqua-Gro and Morsodren. The flats are then accumulated on racked carts and held there for moving to the propagating houses.

After being moved to the "Propagation House" on carts, they remain there until rooting is initiated. As soon as the cuttings are rooted, the flats are moved to the "Hardening-Off House", where the cuttings finish rooting and are hardened-off by hand syringing only.