MR. JIM WELLS: I can make a comment but I don't know whether it is pertinent. We have a couple of plants in the back of the room, rhododendrons which were treated with CCC. This is a growth regulator. It is a dwarfing compound. It is intended to induce budding. I think it does on a strong growing variety of rhododendron like *roseum superbum* which naturally make a third set of growth late in the summer for us. A treatment of CCC in May reduced the size of the plant to some extent, induced budding and prevented this late growth. This is only one treatment and we don't know what the plant is going to do throughout the winter, whether the buds are any good. There are a lot of things to be determined, but it did prevent late growth on this variety.

MR. HILL: (In reference to Ralph Shugert's paper on root pruning). The argument of root pruning versus transplanting or perhaps not even transplanting is perennial in our camp, and we are clearly divided ino two groups, those who are for and those who are against and they are both very strong in their convictions. I think you have upright junipers, the *virginiana,* which are truly difficult to transplant especially in early fall just when that plant is at the very peak in appearance and marketability. We have to a large extent solved that problem by using the *Glauca hetz* as understock rather than the classic *virginiana* or *Chinensis.* We get a root system which is superior to any root system we get with *virginiana,* and they have a higher per cent of livability.

MODERATOR GALLE: I believe this completes our time. I would like to thank all the members of the panel for their participation.

We now have a follow-up on something of what we had in discussion this morning — Systems and Mechanization in a Container Nursery — and Mr. George Oki, of Oki Nursery, Inc., Sacramento, California will present it.

SYSTEMS AND MECHANIZATION IN A CONTAINER NURSERY

GEORGE S. OKI
Oki Nursery, Inc.
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The most urgent need of the California nursery industry, within its present market, is for lowered cost of production. This is the opening sentence of Dr. Kenneth F. Baker's Manual 23 or "The U.C. System for Producing Healthy Container Grown Plants." This Manual 23 was edited in September, 1957.

With annual increases in general operational costs, labor, materials, and all taxations on local, state and national levels, this urgent need is becoming more significant for business survival.

Systems and mechanization is an integral part of the U.C. System along with the general practices as outlined in Manual 23. Some of the important factors in integrating systems and mechanization are:

1. Type of crop.
2. Size of operation.
3. Geographical location and climate
4. Existing facilities.
5. Personnel acceptance.

Oki Nursery's principal crop is standardized to containers of 1 gallon and 5 gallon size. Varieties range from tropical *Hibiscus* and philodendrons to general varieties such as junipers and many deciduous varieties. In all, over 600 varieties are in production. At present, more than 2 million containers are in production covering over 50 acres.

We are located near Sacramento, a scant 75 miles from the cool sophisticated city of San Francisco. Metropolitan Sacramento is rapidly passing the half million mark in population and has access to over 5 million people within a 3 hour drive by auto.

Within this 150 mile radius climatic changes are unbelieveable. Annual rainfall from 70 inches to nil, temperature ranges from desert conditions to minus zero, with just as unpredictable relative humidity can be expected.

In spite of these fluctuations, Sacramento has been gifted with beautiful distinct 4 season weather. A low of 17 degrees is not unusual and can be expected once or twice a year. Our summers are usually in the 90s with 35-65% relative humidity. Our record high occurred in the summer of 1961 with 27 days of 100 degree plus weather. Annual rainfall average is 17 inches, commencing to rain in December to mid-April. The rains are usually gentle with rare thunder showers.

Oki Nursery can boast of its outstanding facilities. There are more than 7 acres of glass and poly-houses, more than 3 thousand square feet of workable area in the propagation houses, complete with refrigeration facilities, and more than 75 pieces of motorized special equipment of all conceivable sorts from orchard sprayers to planting machines as well as fork lifts, fertilizer injectors, and automatic electrical equipment.

We use two basic soil blends. One is used for potting only, mixture being half peat moss and half sand, and brought to optimum fertility range. This soil is put up in small boxes for ease in handling and sterilized by steam. The second soil blend is for all other container planting. The basic mix is 1/3 sand, 1/3 redwood sawdust, and 1/3 rice hulls. Redwood sawdust is used in place of peat moss and rice hull as a cheap organic filler. Both of these are by-products of local industries.

The soil is blended by a rotating drum capable of mixing 150 yards per day and piled in heaping 1200 cubic yard piles. Sterilization is accomplished by the heat generated by nitrogen additives and supplemented with the use of methyl bromides and polyethylene sheets.

Mr. O. A. Matkin and Fred Petersen of the Soil and Plant Laboratories of Orange, California, play a very important role in all phases

of the production program. Soils are blended under their direction to maintain optimum fertility rates. Pathological control, cost analysis as well as monthly feeding programs are just a portion of the services rendered in obtaining the best finished product. Economy and growing techniques are under constant surveillance.

Let us take a typical crop from the beginning. From past production records and its sales performance a new production figure is projected on an annual production tally sheet. These figures are then transposed to a specific variety program sheet. The program sheet informs us of the length of time necessary to complete each phase either from seed or cutting, liner or canned, to the best marketing dates.

The marketing dates and quantities are just determined and then the seeding and cutting dates are determined, compensating for seasonal growing variables in each phase. From the variety program sheets the seedling and cutting schedules are prepared.

The many fast growing varieties need extra attention in programming in order to insure supply. We have also found that many of the deciduous varieties to be heat sensitive rather than being influenced by photo-light periods. The heated polyhouses are extensively used for not only tropical and sub-tropical crops but for many of the deciduous varieties as well.

The variety program sheet is again checked for potting dates as the rooted or seeded plants are ready for potting and only then are the plants planted in either peat or plastic pots. 2¼ inch round peat pots are used for faster growing crops and 2½ inch square plastic pots are used for the slower varieties. The potting operation takes place in heated greenhouses on raised wooden benches where all plants in this phase are grown. The pots and sterilized soil in boxes are conveniently placed in advance to accelerate the potting operation. Potting records are kept daily by variety for reference and then transposed to a history record or performance sheet. History record sheets inform us of the germination or cutting mortality and performance in each phase.

When plants near maturity as scheduled, they are sized and flatted and racked in pallet racks (capacity 2400 plants) for the canning operation or moved for further growing in a cooler polyethylene house.

All benches are then washed and sprayed with copper napthanate solution for pathogen control. Usual crop time in growing in this phase is 20 to 90 days.

We utilize 2 methods in planting into 1 gallon containers. The normal procedure is utilizing the canning machines in the field where the plants are to be placed. The planting machine dispenses tubed plantainers on a spaced conveyor, filled with soil, compressed, and pot dyed. One person then places a peat potted plant into this depression. The canned plants then proceed on a swinging conveyor to be placed in a systematic check or block. Only water is used for soil firming after planting. Since each block holds 2400 plants the pallets with the plants are strategically spaced by forklift for the day's

planting. Personnel required is five; plus the following equipment: 1 planting unit: 1 soil truck and container truck. Daily average capacity is 10 to 12 thousand units per day. Record capacity was attained on August 29th of this year of 13,176 units. The alternate emergency method is placing filled containers in the checks and plugging the peat potted plants into the loose soil. This method is only used in emergencies or when an area is too small to accomodate the canning machine unit. Needless to say this method is costlier and slower.

Daily planting records are again kept by variety. These figures are then transposed to the history performance sheet as we have done in each of the previous phases. The section and area the plants were planted is then recorded. This process aids us in locating plants from records for control in assembly of orders.

Very little remains to be done after the plants are canned. Irrigation is by sprinkler which was designed by Mr. William Fry of the Agricultural Extension Service, Irrigation Department of the University of California at Davis. Each area is designed to receive a half inch of fertilized water through Rainbird #29 heads, this usually takes approximately 2 hours and is cycled by an electric time clock for complete automatic control. Approximately two acres are sprinkled in each cycle, pumping about 275 g.p.m. of fertilized water.

We are on a constant feed fertility program using a R-16 Smith proportioner for the injection of the fertilizer concentrate. The fertilizing program is under the direction of Soil and Plant Laboratories, and may vary after each routine monthly fertility analysis.

For routine insect control a Bean Orchard Sprayer with blower is used. The coverage being nearly 70 feet from the sprayer-blower, we traverse each 80 feet check. Two million plants on the fifty acres can be sprayed in a few scant hours. Special touch up spraying with a smaller power sprayer is done for known chronically vulnerable plants.

There again spraying record sheets are used to facilitate pest control. These records are kept to alert us for future reference for like problems. The information carried on these sheets are:

1. Type of insect or pest.
2. Location of pest.
3. Pesticide type and dosage.
4. Completion of spray and date.

Outside of containers, weed control is attained in the growing areas by using dinitrol, diesel oil and water and a low pressure (less then 20 p.s.i.) power sprayer. Emphasis must be placed on precaution as this mixture is extremely injurious to plants. There should be little or no wind and the operator thoroughly trained and oriented. Persistent and routine spraying is done and usually the 50 acres of growing area can be controlled by just one man in less than a week's time. Usual frequency is 6 weeks.

This leaves us with a segment of a program where mechanization is difficult to implement. Staking and tying still must be manually done as well as pruning and sizing. Perhaps in the near future this

tedious operation can be improved. Time and California sunshine then completes a typical crop cycle.

Since we are all creatures of habit, we seek security in past performances and any alteration or complete change in systems is difficult to implement. I wish to place special emphasis on management and personnel acceptance of ideals and systems. All personnel at all levels must be thoroughly trained and oriented especially to think positively.

When a procedure is altered in any way, the success of the change in system lies strictly with management alone.

Some of our outstanding production performances are:

1. -*Betula Alba,* seed to 8 ft. in height, ¾-1 inch caliper, less than 10 months.
2. *Liquidambar* seed to 4 ft. in height, 150 days, October seeding.
3. *Lantana*: Cuttings to a 12 inch bush, less than 90 days.

With these accelerated production performances, programming is the most essential keynote to success next to market development and market development is another interesting story.

ANNUAL PRODUCTION SCHEDULE

(Estimate For The Yearly Production Is Recorded On This Sheet)

Year ....

Item	Meth. Of Propagation	Amount Needed	Approx. % of Root or Germ.	Approx. Amt. to Cut or Seed	Best Month	Alternate Month

USED FOR DETERMINING THE SELLING DATE OF EACH VARIETY

SOURCE: ..... SEEDS PER .....

YEAR: ..... YEAR: ..... YEAR: .....

	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
CUT																																			
LINER																																			
1 G. C.																																			
FIVES																																			

VARIETY: .....

CUTTING CHECK LIST

By Season

Winter, Spring, Summer, Fall

Item	Amt. Needed	Approximate Amt. to Cut	Total Amount Cut

SEEDING CHECK LIST
By Maturing of the Seeds

Item	Sched. Sowing Months	Ea. Sowing No. of Flats To Sow	Treatments

ACTUAL RECORD OF EACH DAY'S CUTTINGS
Propagation By Cuttings

Date	ITEM	Sticking Count

BOTANICAL NAME .....

COMMON NAME .....

SEEDS			LINERS			CANS		
Date	Amt.	Loc.	Date	Amt.	Loc.	Date	Amt.	Loc.

Source of Seeds ..... Date Gathered .....

Treatments .....

.....

Media .....

% Germination ..... % Take .....

Remarks .....

.....

.....

SEEDS			LINERS			CANS		
Date	Amt.	Loc.	Date	Amt.	Loc.	Date	Amt.	Loc.

Source of Seeds ..... Date Gathered .....

Treatments .....

.....

Media

% Germination ..... % Take .....

Remarks .....

.....

Permanent Record For Each Variety (Seeds)

BOTANICAL NAME _____

COMMON NAME _____

CUTTINGS			LINERS			CANS		
Date	Amt.	Loc.	Date	Amt.	Loc.	Date	Amt.	Loc.

Source of Wood _____

Treatments: _____

_____

Growth Regulator _____ Media _____

% Rooted _____ % Take _____

Remarks _____

_____

_____

SEEDS			LINERS			CANS		
Date	Amt.	Loc.	Date	Amt.	Loc.	Date	Amt.	Loc.

Source of Wood _____

Treatments: _____

_____

Growth Regulator _____ Media _____

% Rooted _____ % Take _____

Remarks _____

_____

Cuttings Permanent Record For Each Variety

PEST CONTROL

1. Agrimycin
2. Bordeaux
3. D.D.T.
4. Diazinon
5. Chlordane
6. Karathane
7. Kelthane
8. Malathion
9. Panogen
10. Parzate
11. .....
12. .....

Date	Location	Variety	Pest	Type	Dosage	Int

PRESIDENT SNYDER: Our International Secretary-Treasurer Louis Vanderbrook will tell about the Western Region meeting held at San Dimas, California, on October 18th through the 20th.

SECRETARY VANDERBROOK: We were wonderfully received and escorted by Don Hartman and his lovely wife over to our motel. In the evening we had a meeting of the board of governors of the International Society. Don was presiding at that meeting and I guess we worked until half past one or two o'clock in the morning. California time. Being a cardiac, I said to Don Hartman, "Do you realize Bill Snyder and I have been working twenty-three and a half hours?" They said it was time to quit and we went to bed.

In the morning we journeyed over to Monrovia Nursery, which many of you may know. It is a fantastic organization. Those fellows know what they are doing. You might call it assembly line culture. I saw many plants that were completely strange to me and a few things I did know I recognized.

Monrovia served us a fine lunch, and then we all were transported over to San Dimas, to the Cal Poly conference grounds where we were duly registered. The boys out there work you more than we do here — every minute, morning, afternoon and evening in session. They don't have any time off. You are on conference ground and there is nowhere else to go. They don't have any bars. If you have bars of any kind they are candy bars.

Their meetings were very interesting. They had some excellent talks there. While they had good speakers on the West coast, the one that kind of impressed me the most, and I thought was really outstanding was that man from the East, Charlie Hess. I have never seen him but what he has done a good job, and he always shows enthusiasm. The whole meeting was arranged and handled by Percy Everett and I publicly commended him on the selection of speakers and his program. Percy did an excellent job.

At the conclusion of the meetings we had another session of the International Board for about half an hour to clean up some of our business and the election of officers. At that electin of officers your President, Bill Snyder, was elevated to the post of President of the International Society, and Herman Sandkuhle, Past President of the Western Region, was elevated to Vice President, and Percy Everett was put on the Board and will proceed up the line later on.

PRESIDENT SNYDER: I am going on to the last part of our program this afternoon. We have our Editor, Charles E. Hess, Department of Horticulture, Purdue University, and his subject is Propagation Facilities on the Continent.