

## PLANT PROPAGATION AND SYSTEM ANALYSIS

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I would like to take a little different approach to this problem in order to get down to the “brass tacks” of how to get the most out of these Plant Propagators’ Society meetings.

One of the first requisites is that you must stay awake; that is you must be attentive and, of course, your physical presence is necessary. Not only is the presence of your body needed but also your mind in a clear, open manner. A wealth of information is given out but then what are we to do about it, how do we digest it, how do we take it home and put it to profitable use?

I think one of the most important things to be considered is how we identify ourselves. You may describe yourself as the manager of a nursery, a hard-driving Simon Legree with a good educational background in horticulture, with a complete staff, a fair amount of facilities, and a liberal boss who gives you some latitude in how you run the operation. What is the company philosophy? How does it fit with your identification of this company? You might say you’re a diversified company producing general ornamentals, bedding plants, pot mums, etc. What are the company’s aspirations and outlooks? What do they project for the future — a year from now, 5 years from now, 10 years from now, 20 years from now? How do these align with your own personal aspirations? Where do you want to be in 5, 10, or 20 years?

We might next ask several questions about ourselves. How do we stack up in knowledge? What are your personal traits, such as judgment, imagination, leadership, loyalty, adaptability, integrity, and profit-mindedness? We must first define ourself because what we are will determine how we do things regardless of where we’re working. Most of us come to these meetings, as I like to express it, “big, dumb and happy.” I use the term “dumb” because we come with an open mind ready to receive this wealth of information.

Now let’s look at our Society. It is a completely integrated group composed of growers, propagators, educators, researchers, extension people, and people from arboreta.

Last night, I sat down in an attempt to define the term “plant propagation”. I don’t know how you define it but this is my definition: “a secondary event in the programmed process of placing a desirable plant or plants in the hands of a consumer with a reasonable profit”, and I like to define “program” as “a predetermined sequence of events”. I call this a secondary event because I think the primary event is “writing the program.” In attending these meetings over a

period of many years, we have all heard of the five basics or essentials many times. Many of us, when we think or speak of these five basics, look at the detail and forget the principle. When we look at light we might ask how can we use it, where does it come from, how do we eliminate it? On our tour Thursday, we saw an excellent use of light in the production of a chrysanthemum crop. I don't know how many of you grow chrysanthemums on a year-round basis but this is a crop which normally blooms in the autumn, but with the proper use of lights we can grow and flower chrysanthemums 52 weeks of the year. This is all because of the proper use of lights; the use of light to induce vegetative growth in the propagation stage and the elimination of light when necessary to induce the flowering stage. We also saw the partial elimination of light by the use of greenhouse shading, lath, and other structures. Thus we make proper use of the light to assist us in our production.

Next, let us consider heat. Most of us as propagators will think immediately of bottom heat. We use bottom heat routinely to aid in rooting plants and it is important to consider the location of the thermostat; is it up in the air, down on the ground, in the rooting medium? I think one should be in the medium and one in the air — one to control the temperature of the atmosphere inside the greenhouse and one to control the temperature in the medium. At my own nursery I have observed heat going to the medium area and the exhaust fans and water cooling system going on at the same time. I think it is important that you give consideration on how you apply heat and how you eliminate it.

We also saw the use of cold storage the other day, but the use of cold storage in California is almost nil. We use cold storage but not in the sense that we are going to store plants but rather in the sense that we are going to control their growth or their maturity, as with Easter lilies or the blooming of azaleas. Three years ago we built two refrigeration units 25 ft x 12 ft x 50 ft and we were attempting to build a rack and logistics system within this area. We tried one system, but later by analyzing the system and redesigning it we were able to get 600 bins as opposed to 400 bins previously. This increased our handling capacity one-third without any expansion or investment of extra dollars. This is only one example of a systems analysis.

We have heard a lot about water at these meetings and I like to think of water as an antidesiccant. We use it for mist, we use it to wash, the plant uses it as a vehicle to move nutrients, but we seldom consider the elimination of all of this water we use in our greenhouses. Several years ago I visited a greenhouse range of over 750,000 square feet. The houses were all brand new and one crop, carnations, was being grown. I was appalled to see the drainage system being used in this new range. It consisted of a drainage tile down each bench which drained to a central collection area and then the water was pumped out into a back field. Their back field was the

best patch of tulle grass I ever saw. A simple example of poor planning.

Another area I visited had one of the most sophisticated greenhouses I've ever seen — their mist system was outstanding. It produced a mist so fine that it reminded me of a San Francisco fog. There were sophisticated controls for bottom heat for each bench, concrete walkways, and the logistics problem of getting materials in and out of the greenhouses appeared to have been well-planned. However, I questioned their judgment in building such a sophisticated greenhouse, even though they boasted they could root a juniper in less than 90 days and certain broadleafed evergreens in less than two weeks, because when I walked out of the back of the greenhouse I found that these cuttings which were rooted in such a short time were taken out of the greenhouse and placed under a lath house and left for one year. Was this really a good investment?

We've also heard a lot about plant nutrition — slow release fertilizers versus rapidly available types and nitrate versus ammonium nitrogen. I've always had the philosophy that my plants don't have taste buds. Nitrogen is nitrogen as far as I am concerned but I wanted control of that nitrogen. One of the first sophisticated fertilizer injector systems was born at Oki Nurseries. The system uses water as the vehicle to carry the nutrients and employs chemical feed pumps with a venturi tube to measure the flow of water. The system would operate from 25 to 300 gallons per minute with a minimum of error. Initially, however, we sent out a boy to do a man's work. The principle was correct, but we had to redesign and get a larger size pump to get the maximum out of the system. Fortunately, we were working with a company which had a systems guarantee.

When speaking of nutrition I like to tie it back to the growing medium. We hear a lot about the U. C. system and how it doesn't work. I said the "U. C. SYSTEM". In most instances the grower has applied only the medium and has forgotten the system. It is a system and if it is to work all aspects of it must be employed.

I would also comment here about the use of substitute organics. I have seen many different types of organic materials used in media with the idea of making a more economical mix. But I ask in all sincerity, is it really a more economical mix? We had used some of these materials but eventually went back to our "more expensive mix" of peat, sand and perlite for our bedding plants, and over the past three years we have had practically no problems as far as production is concerned. We have also gone back to pure peat for our azalea plants and have eliminated many of our problems there. So I ask again, do these other organic additives really give you a more economical soil medium?

Another area with which we're all concerned is sanitation. Several years ago at Oki Nurseries, we had been using various methods of

sterilizing or pasteurizing our media and equipment but our disease problems kept increasing. So we sat down and evaluated our procedures to determine if everyone was following the sanitation practices as closely as possible within human tolerances. We could find nothing wrong but as we sat in the greenhouse one day the wind came up and the glass panes began to rattle and it immediately dawned on us that here was the culprit. Now it is a standard practice with us to go into our greenhouses once a year and empty them out, go through the preventative maintenance and, before we go back in, we pickle the house with formaldehyde. After this we go through our sanitation procedures on a routine daily basis. We must occasionally sit down and determine where the neglect is occurring. In this case it was our greenhouses. Perhaps you should go home and take a look at your greenhouses. How proud are you of them?

After you have visited several nurseries you're bound to come to the conclusion that there is a lot of money in the nursery industry — at least in the area of facilities and equipment. It seems to me that the nursery industry ought to attempt to standardize equipment. For instance, there are as many different types of tree diggers as there are of tree farms throughout the nation. I often wonder how many dollars went into what I call "cut and fit" and how many dollars are spent in materials handling. Two years ago at the California Nursery Growers' Association meeting we had a speaker in logistics, or material handling, and I believe he was one of the most informative speakers we have ever had. At one point in his talk he stated that the fork-lift is only to move an object vertically, not horizontally. This statement must have struck home because in the last two years there has been a tremendous increase in pull-carts in California. Along these same lines I think that each one of us should sit down and chart our logistics of the flow of supplies and plants through our operation. I'm sure you'll find that it can be improved.

Another area which needs consideration is standardizing procedures, especially in the use of some of the new growth regulators. This past year we had the opportunity of using a chemical "pinching" agent, Off-Shoot-O, and we were the consistent failures in the university trials in California. We failed consistently for two years. In an attempt to determine why we failed we sat down and made up a procedure to be followed which was: water all plants to be treated, then on the following day apply the correct concentration of Off-Shoot-O. The Off-Shoot-O was never to be applied later than 10:00 a.m. One day the men were running out of time but they decided to go ahead and spray the remaining area anyway, but I wish they hadn't. They saved me 15 minutes of labor for the next day, but they burned out 15,000 azaleas. Standardized procedures and adherence to them is important; many of these new chemicals are tricky but they will work if applied correctly.

How many of you go out and visit other nursery or greenhouse operations on your own? How many of you have taken time to visit a nursery operation different from your own? Plant growers in the cut-flower and floricultural industry are specialists in their own right. In many instances they grow only one or two crops; they have many innovations and practices which can be observed and adapted possibly to your own operation.

We have been hearing more and more of meristem or tissue culture; it is not something that is going to come, it is already here. I recently visited a commercial orchid operation in South San Francisco which had a propagation room about 10 x 15 ft. Under a bank of lights were a series of test tubes going around in an endless chain and others were on a shaker; it was here that they propagated all of the orchids for their operation — it was truly amazing. Dr. Toshio Murashige, of the University of California at Riverside is currently working under a grant from the California Association of Nurserymen to develop techniques so that this system can also be used to produce woody ornamental plants. I am confident that one of these days these procedures will be used for propagating woody plants.

As an example of planning procedures I would like to read a paper which my 19-year-old son was assigned to prepare in order to project our bedding plant production for 1971. He developed the following outline of the things he wanted to do.

- I. Project goals.
  - A. Determination of the quantity of bedding plants sold this current year.
  - B. Calculation of proposed bedding plant production.
  - C. Calculation of next year's flat, seed, label, and other supply requirements.
- II. Methodology to be used in attaining project goals.
  - A. Collection of data.
    1. Tally of each bedding plant variety ordered for the current year whether the order was filled or not.
    2. Inventory of flats, seeds, labels and other supplies in stock.
    3. Percentage increase or decrease of current year's production to match next year's goals.
  - B. Intermediate summarization of data.
    1. Increase or decrease each individual bedding plant variety by a percentage of the current year's demand projected production of each variety.
    2. Calculation of weight of each bedding plant variety

from the individual variety production (assume there is 100% germination).

C. Final summation of data.

1. Comparison of seed weights of each variety of the current year's order and adjustment of any irregularities.
2. Addition of new varieties and deletion of varieties with no consumer demand.
3. Interpretation of data.
  - a. Graphic comparison of all previous year's bedding plant sales to current year's sales.
  - b. Draw hypotheses about bedding plant sales from graphs and other data in regards to plant and material handling, plant schedules and associated logistics.
4. Project conclusion.
  - a. Schedule production.
  - b. Logistics program.
  - c. Purchase supplies.

I thought this was rather good and so I asked him to write it out as a short paper and this is what he wrote:

“Oki Nursery has been engaged in the production of the rapidly expanding bedding plant line since 1968. In order to satisfy the consumer demand for bedding plants and yet to avoid excessive production of bedding plant varieties a format to predetermine and project bedding plant production in all phases involved with the profitable production of these lines was devised. The goals of this project being the determination of the quantity of the bedding plants ordered for the current year, calculation of the ensuing year's bedding plant production estimates, and the projection of the ensuing year's supply and demand. The methodology used in obtaining these goals can be categorized into three steps; (1) collection of all pertinent data, (2) intermediate summarization of data, and (3) final summarization of the data. Initiation of this project began by establishing a tally of all bedding plant varieties ordered. This tally included all orders whether they were filled or not. To define the current year's demand atmosphere a percentage multiple is delimited by matching the current bedding plant production to the projected production plan. Also at this time the inventories of supplies are made. With the necessary preliminary data at hand the intermediate summarization of data takes place. The per-

centage multiple is factored into the demand tally of each individual bedding plant variety. This projected production for each variety is then changed from a number quantity into a weight. The final summarization involves a rigorous double-checking of all figures. Adjustments of irregularities and the addition of new varieties and the deletion of varieties without consumer demand. Bids are placed for supplies and upon receipt of the bids the order is placed. With the question of which varieties and in what quantities to produce them solved, there still remains the situation of improved logistics and production techniques. Graphic analysis of all previous year's bedding plant demand in comparison to current year's demand and an analysis of other pertinent data are the keys to helping the production staff to find the hypothesis leading to the improvement of plant and material handling, planting schedules, facility capabilities and associated logistics. Computers will undoubtedly do all of these computations some day, but for now this project requires 100 man hours of tedious work. A format such as this, however, must be done for the profitable production of any large crop."

I would like to conclude by considering what we should look for in a top propagator, grower, executive or the top nurseryman that each and every one of us should be. I found this in a 1965 issue of *VIP-PLAYBOY* and it's entitled "What I Look for in a Top Executive".

- (1) Integrity. Obviously any executive must be honest in the conventional sense of the word, but top executives must also possess a very high degree of intellectual honesty and integrity. He must support, rather than sacrifice his subordinates and stand ready to fight for what he thinks is right. Under no circumstances can he be a responsibility-dodger or a buck-passer.
- (2) Soundness of judgment. Top executives must be endowed with a large measure of common sense. It is essential that he be realistic, down to earth — a man who is both reasoned and seasoned — and whose mind can recognize and take into consideration all the realities of a situation no matter how harsh or intolerable they might be.
- (3) Imagination. The man at the top must possess the ability to see and seize an opportunity, to build and create, innovate and when necessary improvise. He must have the imagination to foresee possible consequences or results.
- (4) Decisiveness. Much of leadership is decision. The best executives are those who make strong courageous

decisions, calmly and coolly; they do not hedge or vacillate. The top executive must be a man whose decisions are firm, crisp, clear-cut and who is willing to make his decision and implement them regardless of personal risk.

- (5) Breadth of outlook and perspective. The man at the top of any executive pyramid cannot be a narrow specialist. He must be able to view the whole and understand it. Understanding also the action and interaction of the parts which constitute the whole. He cannot allow himself to be preoccupied with any of these parts to the exclusion or detriment of the whole.
- (6) Initiative and leadership. The top executive has to think and act on his own or he is not a top executive. It is essential that he have the intelligence and the ability to generate ideas, originate plans and programs, handle situations and solve problems and to lead and direct others in their work.
- (7) Dependability and stability. The upper echelon manager must be built for rugged, long-term wear. He must be dependable, capable, and willing to do his job day in and day out. He must be entirely reliable in the sense that he will be thorough in his work and will follow through. He must be a consistent performer, one who remains stable and unruffled even under the heaviest of pressures.
- (8) Loyalty. There is no implication here of any blind loyalty to an individual, rather the upper-bracket manager must show a basic and constructive loyalty to stock holders, employees, associates, superiors, and to the company and its customers. The best interest and welfare of all should be considered — the best interest and welfare of all should always be one of his main concerns and the primary consideration in whatever he does.
- (9) Adaptability. We live in an era of constant change and nowhere is there more of it than in the business world. The top executive can not be hide-bound, hewing to preconceived ideas or obsolete methods. He must be flexible, able to adapt himself and his thinking to new and unprecedented situations. He must think and move with the times, taking full advantage of all opportunities presented by changes and developments be they social, commercial, technological, or whatever.
- (10) Profit-mindedness. Surprisingly enough, there are many men who would otherwise qualify for a top executive position but for one reason or another are simply not profit-



minded. The upper bracket manager must always bear in mind the need to make reasonable profits, for without them no business can long survive in our economy. Profit mindedness is an absolute necessity for success and the good executive is constantly aware of the need to keep costs down and production and sales up. He thinks, decides, and acts to the end that the company will earn a fair profit — a fair return on the capital that has been invested in it so that the company can continue to operate, grow and expand.

How do YOU size up?

RALPH SHUGERT: George, I thank you for a very excellent presentation. I think your 19-year-old son is an outstanding young man and I am sure you are proud of him.

## PLANT PROPAGATION AND ECOLOGY

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The term “ecology” has become a household word with many connotations. Ecology in the strict sense is the science that deals with the interrelationships of living organisms and their environment. Frequently this is construed to mean how the environment, particularly the polluted environment, affects plants and animals. However, if one considers the strict definition, the effect of the plant and animal on the environment should also be considered.

What is the relationship of plant propagation and ecology? In a very limited sense this has already been considered in the session dealing with environmental factors. Yet, in the broad sense of the term, ecology goes much beyond this. Every time a new plant is propagated from seed, cutting, or graft the propagator has participated in the modification of the environment, even though the effect of a single plant may be small. If we consider man and his immediate landscaped environment it is interesting to note the many ways in which plants modify the local environment and reduce certain human stresses that exist in cities and suburbs.

The role of plants in modifying the microclimate is recognized by many. The use of trees for windbreaks and in providing shade has been practiced for centuries. This principle is applied regularly in residential and other small scale landscapes. An important question