COST PARAMETERS FOR CHOOSING CROPS FOR MICROPROPAGATION

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We began growing foliage crops at Santa Rosa Tropicals in 1972. By 1973 we were using tissue culture propagation at a time when the techniques for commercial tissue culture were only 8 years old. Today we have a laboratory that occupies 4000 square feet, and 40,000 square feet of greenhouses. We are known predominantly for our ferns but we also do a great deal of speciality propagation of other crops such as Syngonium, Spathiphyllum, Ficus, Anthurium, Nandina, Gypsophila, and *Tupidanthus* species.

It is necessary to define certain terms that are common among tissue culture propagators. The industry has a naming convention that refers to the theoretical stages that plants go through in culture.

Stage I: The establishment of the culture in the laboratory.

Stage II: The expansion block in the laboratory. (This can sometimes be used as the final step in the lab. It can also be used several times before going on to another stage).

Stage III: Root initiation stage (or final adjustment prior to transplanting into potting mix).

Stage IV: Establishment into the world outside the culture vessel.

In the nursery industry there has always been a trend to do cost accounting by looking at the bank account . . . if there is money in the till, our pricing is right, etc. This practice has continued despite the excellent accounting formats available to the industry from many sources. Micropropagation in a laboratory responds to cost analysis just as any other production operation. Unlike the rest of the industry, there is less resistance to trying to analyze the costs of the production process, but this cost analysis is rarely detailed in the literature in a manner that gives some understanding of the variables involved. Proof of this misinformation comes from listening to telephone conversations that come in to any micropropagaton lab in a normal day. "Hi! I have just purchased this one of a kind sport of ________. I want your lab to grow some for me." When you tell the caller (for the thousandth time) that he has to agree to pay a minimum of thousands of dollars, that you are probably going to kill his "one and only", since it doesn't break at the lateral buds, and that it will take 1½ to 3 years (if we're lucky), you are told ". . . that's crazy, I read that it only costs 7 cents and that it is fast, etc, etc, etc."

The usual, over-simplified published format for figuring laboratory plant costs takes *Materials*, adds some figure for *Direct Labor*, and uses this total for *Cost*. This *Direct Labor* amount is usually obtained from a theoretical geometric reduction of costs that occurs each time a technician handles the same culture through another pass of Stage II. Another figure is thrown in for *Overhead* and there you have your *Total Costs*. Add whatever markup you feel fair, and there . . . is the miracle of tissue culture propagation. Millions of plants for only pennies, just like nuclear power that was going to be so cheap that they wouldn't even have to bill us for it!!!

Actually, laboratory cost accounting is just like crop cost methods for the greenhouse. The elements are:

Materials

+Direct costs per sq. ft., × time on shelf

+Overhead costs per sq. ft., × time on the shelf

+Packaging + Delivery + Sales commissions

This is known as the rental method and has been used in nursery operations as the standard method for calculating costs because it avoids the need to have each employee record the exact time elapsed for work with a particular planting step. Trying to estimate how many plantlets a technician can handle in one hour has led to the misleadingly low figures would-be customers love to believe in.

The costs would look something like this if detailed out in cents per plant:

Materials	$0.015	
Direct	0.051	(0.0051 per plant per week for 10 weeks)
Overhead	0.025	(0.0025 per plant per week for 10 weeks)
Markup	0.045	
Packing, etc.	0.035	
Selling	$0.171	(10 week crop, zero empty benches!)

However, theoretical numbers don't matter. If your crop occupies only half the space available, and you don't put anything immediately in that empty space, then your area rent goes up by 1.5 times which jumps your selling price to $0.209. A crop time of 20 weeks would do the same, so that this could be $0.247, if both the vacancy rate and crop time came into effect.

This shows that for 17 to 25 cents you could get a *very* tender seedling equivalent from Stage III culture. This is only if the crops are production items that are regularly scheduled, subcultured, and planted according to a master schedule. You must, therefore, compare what your costs for a standard plant "start" would be when you are considering micropropagation. Monrovia Nursery, Azusa, California, (*American Nurseryman*, 9/1/81) estimates their costs for liner production *after* collecting and sticking the cutting to be 24 cents. We feel that this parallels quite closely the cost of establishing a Stage III plant into a liner. Would your proposed crop take a 43 to 51 cent price including lab. and greenhouse costs?

This makes the assumption that the YIELD from each stage is reasonable. YIELD is the laboratory equivalent of pot size. When you take the "rent" format and apply it to container crops, or to pot crops, one of the key elements is the size of the container and the spacing. Parallel factors in the laboratory are the number of multiplications that you get at each "stage". As an example, our laboratory was approached by a plant biogenetics systems company. They had developed a tissue culture system for a plant that is very difficult to clone, had booked orders, and now wanted to sub-contract the production to a production facility such as ours.

We reviewed the entire prospectus that was submitted. We found a bit of information that might have been overlooked if we were not equating yield with pot size (so to speak). The Stage II multiplication rate was 1.5:1 (that is they got three plants from two cuttings). Our own area cost figures are for multiplication rates ranging from 10 to 20:1. This means that this proposed plant would be priced at $1.50 to $3.00 each and it would take our entire facility to produce the crop because it was the equivalent of switching from 4 in. pots to growing 15 gal. containers in the same area.

In conclusion, then, what are the correct crops to propagate in a lab? Plants with no standard, successful, competitive method of propagation and which are needed in large numbers. It is also a valuable tool when crops are needed for expansion to become a stock block where the high costs will be later amortized (as in strawberries, Malling apple rootstock, *Nandina domestica* 'Harbour Dwarf', etc.) Another valid application would be when clean stock is needed regardless of price. Currently drug and chemical production is also a major area of plant tissue culture research.

Micropropagation isn't a panacea for all crops that are difficult (or apparently impossible) to propagate. It can be a valuable tool if the parameters noted above are applied carefully.