

Back to Basics

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It is nearly 10 years since my first I.P.P.S. conference. Over that time a huge range of topics have been covered. Many papers have been on leading edge technology. Just as many have revisited some of the real basic principles of plant propagation. I have subtitled this paper "A Walk Through Larkman Nurseries". It outlines some of my philosophies on the basic requirements for running a successful propagation nursery.

PROFIT

Profit is a basic necessity of running any business. If you are not making a net profit before tax of 10% of turnover or 7% return on investment then you are not running a successful business.

Sure you may be getting 110% strike rate, but you must still sell each plant for more than it costs you to produce. If you aren't then you must increase your prices or reduce your costs. Cost reduction is not an answer alone and any cuts must not detract from customer satisfaction. Profit increases can be achieved by putting up your prices and/or removing your discounts. Discounts are hard to justify. Whilst price increases do not cost a lot in terms of lost sales.

STAFF

As we all become more technologically literate the major difference between our businesses will be our staff. To run your business at its optimum level you need reliable and motivated staff, and their greatest motivating factor is job satisfaction. This involves making the job as interesting as possible, having good staff morale, and plenty of positive reinforcement from supervisors, managers, and owners. People also like to be involved (in decision making, etc.) and to know what is happening around them. Encourage your staff to contribute ideas, thoughts, and observations, while at the same time be as open as you can.

CUSTOMERS

I have long held that the most important aspect of any business is its customers. Without them you are working for nothing (literally). The customer can always find stock, while the reverse doesn't hold true. As staff are the integral factor in production, service is the key in customer relations. That is service, service, and service. You must treat each and every customer as someone special, they are an integral part of your business. Your customers must be able to trust you (and your staff), and must feel that your product will at least meet their expectations if not exceed them. Your challenge is to increase your customer base without losing any current customers.

This does not mean that all customers are good customers. Indeed some customers are better off being sent to your competitor. These are easily distinguished by the fact that your staff all seem to disappear when they come onto the premises. In general they always complain about the price and will usually tell you that the guy

down the road is 20% cheaper. They want special service, and will complain vociferously if you don't meet their every whim. They will generally want an account but will be slow to pay or want a further discount if they pay COD. Good business practice is to give them to your competitor.

It is important to know what your average sale per customer is, and the average purchases per customer per annum. If you know these figures you can set about increasing them. We would all like to have a 30% increase in sales (especially if the increase comes with a higher margin). Sounds a bit high, well perhaps a 10% increase sounds more achievable?

If you can achieve a 10% increase in your number of customers, plus a 10% increase in their average expenditure, and a 10% increase in the number of purchases per year, then you will have achieved a 30% increase in sales.

THE PRODUCT

Whatever you put your name on should accurately reflect the image you are trying to create. If you are projecting the image of a professional business that insists on top quality, then make sure that your stock looks that way. You need to set standards that are clearly promoted both within the business and to your customers.

Granted, if you are selling to the bottom of the market where price is the only influencing factor and quality can be overlooked if the price is right, then don't spend any extra resources on producing a better-than-expected product. It is critical that you are aware of your customers expectations and individual requirements. If you go too high you will go broke, and if you go too low you will not sell your product. It is your job to find out what the correct balance is and then deliver it to your market. You can be assured that if you don't, your competitor will.

During the 1980s when there were large stock shortages many a customer was told when they would get their stock, what size it would be, where they could collect it from, and how much they were going to pay. I found this an amazing form of customer awareness and liken it to going into a restaurant and being told what you will eat, when you will eat it, what sauce you will have, who you will sit with, and how much you will pay. I suggest that if you went into a restaurant which operated in this way, as soon as you stopped laughing, you would be out the door to another one. The same goes for our industry. Now that there is ample competition, your customer will soon go elsewhere if they feel that they are being taken for granted.

STOCK PLANTS

Quality starts at the source. The first principle is to have good healthy stock plants. They must be correctly identified and labelled. Your customers rely on you to get the labelling right. Once they have bought and potted up your stock they have invested heavily and cannot afford to be wrong. As propagators' we have a moral obligation on behalf of the industry to make sure that we have the nomenclature and identification correct.

When selecting your stock plants make sure they are true to form and are strong in the morphological criteria for which they are named (e.g., for *Rosmarinus officinalis* 'Prostrate' make sure your stock plants are very flat and not just low growing). Any poor performers should be removed.

Stock plants need to be kept healthy and vigorous. Often at past I.P.P.S. conferences papers have been presented discussing the concept of juvenility. Without getting too involved in the details, it refers to the physiology of plants that

are either kept in a juvenile stage (e.g., *Metrosideros* and *Eucalyptus*) or just kept pruned and actively growing. It is often the case that one propagator is able to obtain a good strike rate, yet when you try to repeat their method your results are nowhere near as good. I believe that this is directly related to juvenility. If the other propagator is regularly propagating a plant, logic dictates that it must be being cut back on a regular basis. However when you attempt to strike a new species your plants are being cut for the first time.

There is a strong debate as to whether stock plants should be grown in ground or in pots. We grow ours in the ground and find that we get better results this way. I feel that this is because we are better able to look after them in ground. If we had the resources to give them the adequate care in pots I believe we would get the same results. In other words the ground versus pot debate will depend on your own resources and preferences.

Another debate regarding stock plants is whether they should be replaced every few years. In fact we often debate this within our own company. I personally feel that in most cases they do not need to be replaced regularly but do need to be fertilised and pruned on a regular basis.

The fertilising has to be more than just NPK. Indeed, many plants run very short of the secondary nutrients and some of the trace elements. Some nutrients are very mobile within the plant and are reused, others cannot be moved around the plant and are fixed into the leaves or stems. If the plant is being cut on a continual basis and replacing this with new growth it will need a regular supply of the building blocks necessary for that new growth.

For example, calcium is a major component of cell walls, it is also an immobile element and is not always in abundant supply in the soil. Calcium should be applied at least annually, if not biannually. There is a growing body of research and anecdotal evidence indicating that calcium deficiency may be a major reason for poor strike rates, especially in cuttings from older stock plants. There are several ways to apply calcium to your plants. It can be given as calcium carbonate, gypsum, calcium nitrate, blood and bone, etc. Each product has different properties that may have either a beneficial or deleterious affect. It is important that you understand the genera and species that you grow. In many cases a good knowledge of the natural range and habitats of the wild plant will assist in predicting the conditions for propagating. It will also help to avoid disastrous fertiliser or chemical applications.

CUTTINGS

This is one of the critical steps in the propagation process. It can be nigh on impossible to turn a poor cutting into a good plant. It is not high tech but needs a sensible approach. I have long held the belief that the heart of a good propagator is their record keeping and statistical analysis.

The only way to improve you production rates is by improving your systems. This can be done through the introduction of new technology or by changing work practices. Whichever happens, trials are critical. It is imperative that we continually try out different methods and record the tests and the results. Then next time these plants are propagated refer to the results and either change the method, discard the new method as being of no benefit, or conduct further trials.

In many cases, simply recording details about the plant material each time it is propagated will enable a gradual improvement in propagation. I remember at previous conference one I.P.P.S. member reporting that they had observed a

substantial reduction in the successful acceptance of grafts when the scion material was taken after rain or heavy dew. It took accurate record keeping and several years to deduce this but it made a huge improvement in their production.

The preparation of cutting material can also be a slow process. The trick is to balance speed with accuracy. It is no use if your staff can propagate at 700 per hour but only get a 20% strike rate. Similarly it is pointless if they can get a hundred percent 100% strike rate but can only produce 10 cuttings per hour.

You should remember basic rule number 1 - profit. You can only make a profit if the propagation staff can produce enough cuttings each hour to cover their wages, the wages of all the ancillary staff, your overheads and all other incidental costs. At Larkman Nurseries this means an average rate of at least 320 cuttings per hour. [Includes: preparing the cuttings, dipping the cuttings, sticking the cuttings, watering them in, putting the trays away, and filling out the relevant paperwork.]

A propagation nursery is, in general, a production line. As such, units per hour are critical which means that every movement has to be as short and as productive as possible. Once you get your system running then it is time to start counting seconds. This can be illustrated through the following:

For an hourly average of 300 units, with 40 min cutting and 20 min sticking, a propagator must stick at 900 per hour. This equates to one every 4 sec (3600 sec in an hour). If the procedure can be cut by as little as 0.5 sec then a 12.5% reduction in the cost of this part can be achieved. Remember half a second is a very short time. A change in the way your staff stand can take 1.5 sec of each cutting. Having sharp secateurs can reduce the time by 0.5 sec, changing the size of the secateurs and the way they are held can take 2 sec off the time. There are dozens of other ways to reduce your production times, all you need to do is stand and watch your staff at work and watch other staff at work. Don't be afraid to implement new work practices, even though there will be a great deal of initial reluctance to embrace them.

Be careful that you don't strain the staff. Take a serious look at your work practices from an Occupational Health and Safety viewpoint. Repetitive Strain Injury is a common syndrome in any production line and the chance of it occurring can be greatly reduced by varying their tasks and/or the way they sit or stand. Things like bench height, seat style, and floor covering can be major contributors to worker fatigue and injury as well as slow performance.

Finally, examine all movements and remove any unnecessary ones. Teach the propagators to be ambidextrous and move everything closer. We keep the empty tubes less than 50 cm away from their bodies so that there is no stretching. The rooting hormone is in a jar that sits on the propagation tray.

In preparation of the cuttings there are several areas of concern.

First is the rooting hormone. Rooting hormones are often used simply because the books and the "experts" say they are necessary. This is not always true. In many cases plants perform as well without hormone as with it. In other cases the hormone actually burns the cutting and maybe the cause of disease. It is also true that more does not equal better. For all species and cultivars there is an optimum strength, which can be found by trial and error. Similarly there several different forms of rooting hormones. There is IBA, NAA, IBA plus NAA combinations, and several others. Add to this that they come in powders, gels, liquid in alcohol, and liquid in water and you have mass confusion, which is in turn aggravated by the fact that which form is best will also depend on the time of year and condition of the cutting. Once again trial and error followed by analysis of results is the only way to correctly ascertain which is the best hormone for your system.

Second is how you prepare the cuttings. Once again this varies greatly from plant to plant and season to season. Some of the items to watch are:

- With none, one, or multiple nodes — some plants will only root from nodes.
- To strip or not to strip — in some cases by stripping the plant you greatly reduce the chance of rotting. If you do strip then you need to test to see whether it can be done by pulling off the leaves or if they need to be cut off.
- Cut leaves — with some of the larger leaved plants it is helpful to cut the leaves in half.

These procedures need to be determined through trial and error. Granted you can point yourself in the right direction by asking others, coming to I.P.P.S. conferences, or by reading the I.P.P.S. conference proceedings, but you will still need to do tests within your own nursery.

The final issue is hygiene. Nothing substitutes for prevention in disease control. All your equipment, benches, and hands should be cleaned between batches (even gloves, we had one girl who said that she didn't need to wash her hands between batches because she wore gloves). I cannot overemphasise the need to be hygienic in all production areas and propagation houses.

It is also important for the health of your staff and the viability of your workers compensation record that your staff are informed of the potential hazards of the products they are handling. All of them are safe if used properly, but can be dangerous if not. Even potting mix has been declared as a hazardous product (if ingested) and needs to be handled properly.

The make up of the propagation media is extremely variable and the interplay between the water-holding properties of media, the watering system, and the plant type will be one of the influences on the strike rate. Your mix should be sterile, weed free, have good drainage, a pH of around 5.5 to 6.3, and a low EC. It should also be consistent both within and between each batch. If you mix your own then the ingredients need to meet specific standards, whilst if you buy it in then your supplier should be given very specific parameters. If the mix falls outside these parameters, then it should be rejected.

We have specified the pH, EC levels, bark size, and nitrate levels. We have also stated that these must be measured and communicated to us the day prior to delivery. This may sound onerous on the supplier but once they have the formula set it is not hard. It is also critical that the bark be aged and composted sufficiently. Once again if there is any sign that it is too fresh, do not accept delivery. Remember that a metre of bad mix may cause you to lose up to 30,000 cuttings, which translates into \$15,000 to \$20,000 of lost sales.

MANAGING THE ENVIRONMENT

The aim is to create the optimum conditions for each plant with special regard to root and air temperatures, light levels, and "irrigation".

Bottom heat is necessary for some plants whilst with others this is a waste. Approximately 70% of our propagation is done on heated beds. They are all heated by hot water that is pumped through pipes placed in the sand beds. We have found this the most efficient method. There are two heating systems. One is an in-line LPG-fuelled hot-water service, whilst the other is a water storage system that is heated with off-peak electricity. This is inexpensive to run but requires a good electricity supply.

The general aim is to have the root zone warmer than the leaves. The starting point

is around 23C. By trial and error you will find that some plants like it a bit cooler whilst others prefer it a bit warmer. Some even do better with a root zone temperature above 30C. Be careful though as it is possible to burn the young root tips and thus slow down or even prevent further root growth. Again, the key factors in determining the optimal temperature are testing and good record keeping. Optimal root and air temperature can vary for each plant species and even within a species for different seasons.

Every few years there is a new piece of “must have” technology. During the early nineties it was fogging. There are several different types of fogging but they all essentially keep the humidity at high levels so that the plants do not stress. This reduces the need for additional watering and keeps the tunnel drier. Fog creates a substantially different environment from traditional mist and can take several years to adapt to it. Not all plants like it and some love it. Either way you must have an open mind and be willing to experiment.

We initially had a lot of *Botrytis* problems which were mostly overcome by the installation of fans to improve air circulation. The air is in effect continually being exchanged with that from the outside. At first we thought this would work against the fogging but soon found that it was beneficial. In fact, during the warmer months we often open the doors as well. This also assists in keeping the temperature down during summer.

We still use conventional misting systems with a weather-watcher controller. These are for those plants that don't respond to the fogging or prefer not to have heated root zones (all our nonheated beds have misters). We also use the misters for hardening off the plants prior to them being tubed up. We have other growing beds that have no misting or fogging as some plants prefer these conditions. It is a matter of having several microenvironments available to provide the optimal conditions for whatever plants you are growing.

The physical layout and construction of a good propagation tunnel can also be quite varied. We have both brick and polycarbonate tunnels and fully plastic igloos. They have differing light transmission properties, especially as they age. It is necessary to make sure that they match the needs of your plants. Both have advantages and disadvantages with the governing factor being the initial construction cost. With the increasing durability of modern film plastics, the cost of a more solid construction is becoming harder to justify. Other aspects to consider include the size, shape, and orientation of the tunnel. Once again there is no right and wrong but more a matter of trying to design your tunnel with respect to the plants you are growing and the layout of your nursery.

All but one of our propagation tunnels have raised benches. The main fogging tunnel has raised benches that have been backfilled with scoria to help with heat retention. Our other benches all have black plastic skirts to help reduce heating costs, whilst the tunnel without benches has a good base of gravel. This keeps out disease and weeds, and also acts as a heat sink.

Finally it is advisable to make sure that your propagation tunnels allow for efficient access by your staff and for ease of stock movement. It is best if they are close to your production area so that the new cuttings do not have to be moved too far. This is important to reduce stress during the hot months, as well as helping to control labor costs. Also, if the production staff are close to the propagation tunnels they are more likely to check them regularly.

TUBING

Quality is as important here as anywhere. The rooted cuttings must be removed properly, taking care to not damage the roots. With trees and large shrubs it is important too make sure that the roots are not twisted, bent, or “J-rooted” as this will result in the adult plant falling over. Root problems are avoided by making sure the roots are not too long and that they are placed in the pots before the soil and not “dibbled”. This is a quality-control issue and the consumers of your product will rely on your methodology. One customer of ours used to insist on bare rooting at least one or two plants prior to accepting delivery. If the roots weren't right he would not accept the plants (which never happened to us).

As with the propagation, a balance between accuracy and speed must be determined and maintained. The issues that govern this are almost identical to those governing the propagation and the procedures used to improve production rates are much the same.

The tube mix should be compatible with the plants and your growing environment. Once again we specify a set of criteria for the mix. The results must be phoned through to us the day before and on the day of delivery. If the pH and EC aren't within our specified range we don't accept. Also the pH has to be stable and between 5.8 and 6.3, with a stable EC of between 0.7 and 1.3 (dS/m). This is very important for many species of plant as the sudden shock of going from an EC of around 0.2 or 0.3 to an EC in excess of 1.5 will result in a severe deterioration or death of the young plant. Similarly the mix must not be fresh.

As with the propagation mix, if the consistency is wrong you could lose thousands of tubes. We also do our own tests when the material arrives and then every month so as to ensure it remains within the correct parameters. This enables quicker diagnosis of problems when they occur, as it allows you to either confirm or exclude pH and EC as the cause. It is also advisable to keep samples of each mix for 12 months.

FINISHING AREAS

The use of tunnels to grow in is dependent on where you are located and the type of plants you grow. We grow 80% in plastic tunnels. The balance is grown in our two shade houses. The tunnels keep the plants warmer during the colder winter months and protect them from frost damage, whilst also helping to reduce heat stress during summer. They have drop-down sides to allow good air movement during summer and warmer winter days. They are also white washed in late spring to prevent burning from the summer sun.

All except four of the tunnels have the plants growing on benches. Benches allow for better work practices and reduces weed and disease contamination. They are expensive to set up and can reduce the amount of useable space but this is recovered in improved productivity. In the four tunnels without benches there is a 4-inch-deep bed of gravel for the same reasons as in the propagation tunnels.

FINISHED PRODUCT

This is what we are all about—producing good quality plants ready for sale. Even if you are propagating for in-house use it is still essential that you treat the potting crew as an internal customer with the same quality requirements as a paying customer.

If consistent quality and attention to detail at all stages have been the *modus operandi* then all your tubes should be ready at the same time and looking the same.

However, as this is not always the case the plants should be graded prior to dispatch. It is not a matter of grading out the order and discarding the rest but more a case of grading to sizes and shapes with reference to the requirements of the specific customer. If a fair percentage are heading to the scrap heap then your procedures at an earlier stage need review.

Any crusting, algae, or weeds in the tubes should be removed, the labels checked, and the plants watered ready to go to the customer. Any dead leaves should be removed and errant branches trimmed so that the plant looks “just right”. Ideally there should still be some fertiliser in the mix so that the plants will shoot away as soon as they are potted up. It is no good if your plants look great but fall over soon after the customer receives them.

Well, that ends the “walk through Larkman Nurseries”. I set out thinking that this would be a short paper that was both easy to write and easy to deliver. I soon found myself running out to well in excess of ten pages, and still only half way through. It seems that the basics of running a propagation business are quite extensive.

There is one final word of advice: you only have one life so enjoy it. Your business is there to help and not hinder this objective.

Staying Alive and Using Potting Mix

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It's amazing what a flamboyant headline can do. I titled my presentation “Staying Alive” after reading the headline “Potting Mix Killer Fear”. Both are in some way a misrepresentation of the facts, while neither is factually wrong. The newspaper headline talks about a death where potting mix is implicated. If you read the copy it is not what you may be first lead to believe. Likewise the title of my paper has led some to believe that there is an immediate life threatening risk every time we use potting media. That is certainly not the case.

It is a case of illogical thinking like “have you stopped beating your wife”. No matter how you answer you will be wrong. The questioner will be able to manipulate the situation to draw a conclusion that suits his/her purpose. It is alarmist, and so useful to attract peoples attention. But it does not give a true or complete story. Cynics here will agree with the old journalist adage, “Never let the truth get in the way of a good story”.

To get some clarity we need to cut to the facts. So here is the bottom line message of my paper. Potting media, composts, and other organic compounds are a potential health risk. You should examine and, if needed, change the way these products are handled in your nursery. These changes will result in nursery workers having a reduced risk of disease. So let's get back to the perception side of what is happening. Here I would like to talk about something that has nothing to do with our industry. It is a stomach bug called *Cryptosporidium parvum*. The bug causes diarrhea, and is spread in the main by body to body contact. It is a notifiable disease.

There has been a recent outbreak in NSW with more than 200 cases reported in Western Sydney. It is not normally considered life threatening, but as you can imagine there is somewhat of a discomfort. The Health Department has been checking to see if they can find the source of the infection.