

Automation for Propagation: Uniformity Is the Key®

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INTRODUCTION

Normally, the decision to automate production is based solely on the labor cost associated with the process. Since finding and retaining good labor in sufficient quantities is difficult and getting harder all the time and due to the fact that labor represents one of the largest input costs a grower has, this seems to make sense. However, there are other significant benefits to be gained through automation. First, the uniformity gained through automating technical processes often leads to efficiencies of all other associated inputs, through more even distribution and the ability to accurately repeat processes. Second, with the current “green” movement gaining momentum, it also makes sense to waste as little as possible, which is good for both your business and for the environment. As an added benefit, working conditions often improve for the production line workers and machine operators and elevate those jobs to a higher status, empowering the workforce. These things are all harder to quantify and put a dollar value on, but should be considered when making decisions about automation. As each propagator strives to meet the ultimate goal of producing 100% viable plants for sale or for use in internal production, these gains can pay off in a number of different ways in addition to labor savings and should in fact lead to producing higher quality plants, which ultimately preserves their position in the market.

AREAS TO AUTOMATE

In the Beginning. Whether the plant is starting from seed or cutting, it all starts with a uniformly blended soil mix and even tray filling. A uniform fill in the tray is required to achieve even compaction throughout the tray. Compaction and air space requirements can be critical to germination rates of seeds or for promoting root growth in freshly planted cuttings. Just as important as the compaction, is the need to evenly distribute the fertilizers and other media within the soil, so that each plant is given the correct amount of nutrients. Blending soil media thoroughly, but without breaking down the integrity of the input materials is essential to a good soil mix. While batch mixing continues to be popular and provide consistent mixes, not much has changed in the last 20 years.

Propagators that use premixed soils are often limited, either because of logistics or storage issues, from having many different soil mixes available to them. For growers mixing their own soil, the added risk of human error that comes with the complexities of mixing different fertilizers and bulk media at varying rates limits the number of mixes in use at one time. This is where new technologies in electrical components and data processing have provided an improvement to continuous mixing systems. Continuous mixing lines are now available with the added benefit of easily making crop specific recipes for each different production line. The different recipe mixes can be delivered on demand and alternated as required throughout the day. One possibility for savings here could be through limiting the use of expen-

sive, slow-release fertilizers for only the crops that absolutely need them and not having a one-size-fits-all soil mix.

Seed Production. Sowing machine accuracy has greatly improved in recent years and is key to keeping seed and labor costs down. With seed and plant genetics constantly improving, the possibility of achieving very high yields are real. For example; the germination rate for a particular cultivar is 85%. That means that if everything is perfect in propagation, 15% of the soil, fertilizer, water, labor to handle trays, space, and heat are still being wasted. Over-sowing isn't always a good option either, causing the need to either hand-thin crops, (which is very labor intensive) or requires the use of too much greenhouse space.

Vegetative Production. There are a couple of benefits gained by going to a central production line and away from planting directly on benches. The ability to fill trays as you need them takes away the variable drying out that takes place on a pallet of pre-filled trays, allowing moisture levels to be maintained evenly. The consolidation of soil areas to central planting lines also keeps greenhouses cleaner, with less soil spillage and helps to keep weeds under control. While sticking vegetative cuttings is still a function performed by manual labor, it is possible to make the labor much more efficient and have a better work environment at the same time. One person can supply up to 24 other workers with different cuttings and labels. The filled trays come to the workers and are there ahead of when they are needed. Each person then can plant a unique selection and label it. Then the trays can be sent through a water tunnel and or sub-irrigator and sorted at the end of the line and consolidated into groups. This system can have a large visible scoreboard that keeps track of each planting station's output and promotes competition among workers to reach production goals. This system can also be integrated with other production software with possibilities for tracking not only the plant information, but also who planted the tray, for piece rate counts or to keep planting quality in check.

Watering. Whether seeding or planting cuttings, the next step to successful plant propagation is watering. It is best to pre-wet the soil before sticking the cuttings or sowing the seed, just to help keep the dibble holes intact and provide some water for the cell. After planting or sowing, the current popular method of using watering bars from the top is being improved upon by also using a sub-irrigation chamber to soak the trays uniformly from the bottom, through a natural wicking action. This ensures that enough water is being introduced into each cell, with less disruption to the seed or cutting.

Other Significant Areas to Automate. There is a current trend toward growing vegetables and ornamental plants with more sustainable methods. Reducing chemical use is a large part of this movement. Mechanically trimming plants can reduce the need for using expensive, chemical growth regulators and produce more vigorous seedlings through natural means. Trimming plug trays or liners at shipping/transplanting evens out irregularities in plant height and makes for a more uniform looking crop. The additional pinch also promotes growth at around the same time the plant is given more space to grow. Trimming young seedling trays by hand can be very labor intensive and the cleanup takes just as long. The latest trimming machines were originally designed for taking cuttings without damaging the plant material. The cuttings are collected by a vacuum containment system that places

them in a removable bag as they are being trimmed off, to keep trays free of debris. These machines are very mobile and can be transported from house to house, aisle to aisle, to minimize handling time and distance. They can also be powered by a generator for field use or for areas that don't have an electrical power source. An additional set of cutting blades is often utilized so that one set can be disinfecting, while the other set is in use. Re-using propagation trays and flats is another area for possible money savings and is also in keeping with new sustainability practices. Tray-washing machines utilize recycled hot water for washing debris from the trays and a clear water rinse. Chemical disinfecting units can be added directly after the washing machines to sterilize trays or the trays can simply be dropped into a chemical bath for the required amount of time. Steam chambers can also be utilized for sterilizing whole pallets of trays without the use of chemicals. Large-volume plug producers have been successfully grading and consolidating seedlings for several years. The improvements in the vision and camera systems and the speed at which data can now be processed is making them increasingly more cost effective. Implementing automation requires careful consideration and real, long-term planning. While the labor numbers will make the majority of the decisions, don't overlook the less quantitative, cultural benefits also provided by automation. This will ensure that the results are simpler production methods, producing higher quality plants at a lower cost.