INTEGRATING PRODUCTION, TRANSPORTATION, AND PLANTING OF CONTAINER SEEDLINGS 1/

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Abstract. The detailed planning of the nursery facility, of handling systems and careful selection of container design are of paramount importance in an integrated system of production, transportation and planting. The container design is the most important factor in the totally integrated system. The "single cell" type container has shown the most flexibility in all phases of production, transportation and planting.

INTRODUCTION

The ultimate goal of a sound container program is to produce, transport and plant seedlings in the most efficient, economical and biologically sound method possible. It is to accomplish this goal that one must examine and carefully plan each phase production, transportation and planting. Nursery production design, transportation systems and planting systems must be integrated to provide maximum flexibility and efficiency. The production and planting of several million seedlings requires that logistically sound systems are used in all phases of the container program. What follows will be a primary look at the techniques we used at our nursery to achieve this goal.

THE BASIC DESIGN

Before we could embark on a sound container production, transportation and planting program, the basic production unit, i.e. the nursery had to be designed for maximum production efficiency and a biologically sound growing environment. To accomplish this goal, we designed the greenhouses, roadway system and work center to have the most efficient flow of materials as possible and to have as much environmental control, to achieve the best growth conditions, as were economically possible. First some basic decisions were made as to the type of systems that were to be used.

The first decision that had to be made was what type of handling system would be the best. Since we were faced with using several types of containers of various sizes and shapes pallets seemed to be the most flexible choice rather than fixed benches or racks. This proved to be the most efficient means of moving large amounts of seedlings in a short period of time. As many as one million seedlings can be moved per day if the need arises. Four foot square pallets fit most container systems fairly well. Trees can be shipped on the pallets if circumstances warrant or be taken to the work center for packaging if necessary.

Second, greenhouse size had to be determined. Since we deal with several species and different geographical areas, we decided to use forty by one hundred foot freespan greenhouses separated by a five foot interspace between houses and a twenty-foot roadway on the ends. This is shown in figure 1. Using this arrangement enabled us to culturally treat these areas differently as the geographic location and species dictated. This proved to be extremely important when hardening off seedlings from different areas and different species as they required markedly different treatment.

Third, we designed the roadway system to provide quick and easy access to all the greenhouses and work center. Roadways were kept

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wide to allow several tandem trailers to be used in transporting seedlings to the work center. All roadways and greenhouse areas are asphalt surfaced to aid in efficient handling and to provide a sanitary surface for the pallets to rest upon. Lift trucks will be used in the future for placing palletized containers in the greenhouses.

Last, the work center complex had to be designed to provide all the necessary functions of shipping, receiving, potting, seeding, etc. Several floor plans were made and flow diagrams made for each phase of handling. A fifty by one hundred foot clearspan building was finally decided upon to do the job (fig. 1).

In the whole nursery design, the main objective was to integrate all systems so the flow of materials is constant and smooth. Aside from the growing environment, the entire problem reverts back to moving pallets from one place to another in an orderly and efficient manner. Once this is accomplished, we can grow seedlings in thimbles or barrels or anyplace in between if we have to.

PRODUCTION

Most of the containers currently being used we have tried, at one time or another, at our nursery. In all types of containers tried.3/ soil loading, seeding and other related operations are basically the same. All generally produce an acceptable quality seedling. Cultural techniques are basically the same when raising the same species.

We have found relatively few problems in raising the seedlings. Preparation for shipment has proved to be the limiting factor as far as containers which require seedling extraction are concerned. This has proved to be the most labor intensive operation, aside from the actual planting, that we have encountered.

Let us consider the following example. We can process 500,000 containers per day in the initial seeding operation with a crew of seven people./ This same crew of seven can extract and package from multicavity containers 35,000 seedlings per day. If the nursery was to produce 10 million seedlings and if the seedlings had to be extracted, bundled and boxed, a crew of seven would take 285 days, a crew of 14 about 142 days and a crew of 28, 71 days, and so on. Consider a workday month of

3/Containers used at Hoehnke Nursery include: Styroblock 2 & 8, Spencer- Lamaire, Leach Single Cell, Crown Treetainer, Walter's Bullet, Paperpots, Weyerhaeuser "McCellar Pipes".

4/Based on actual nursery production figures.

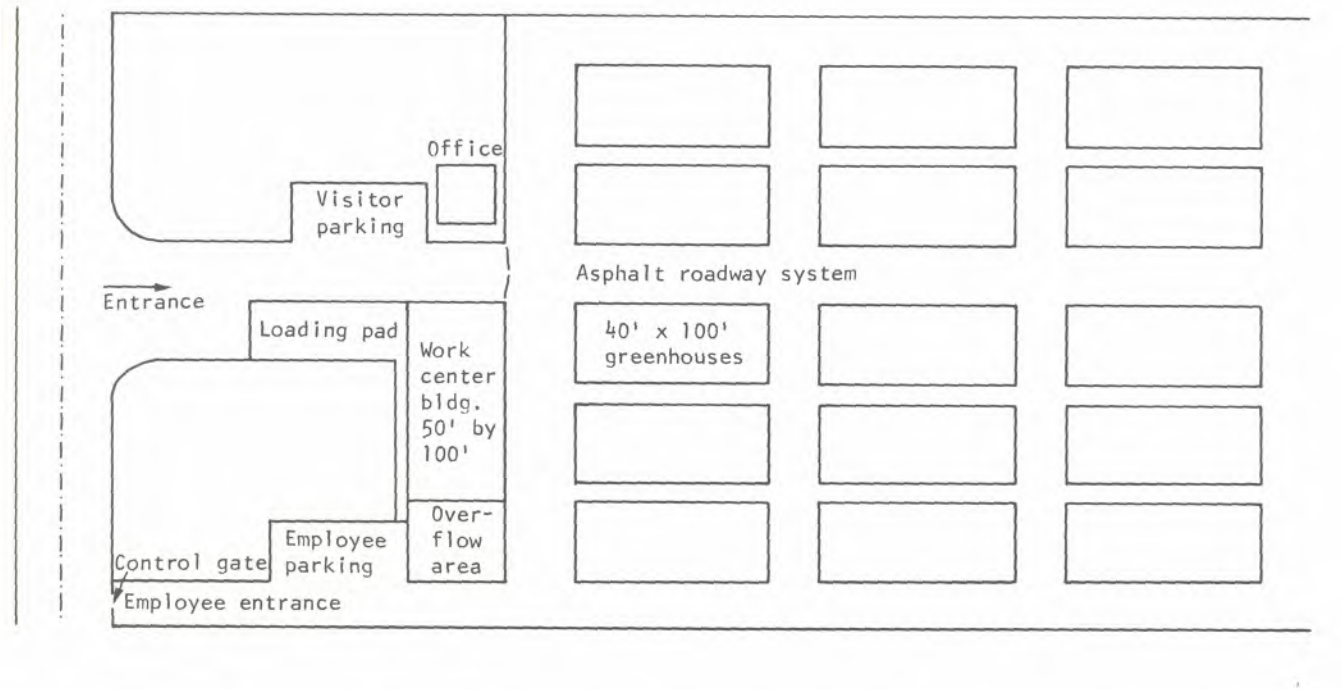

Figure 1.--A 50- by 100-foot clearspan building plan designed as a work center complex.

20 days. A crew of seven would require approximately 13 months to do the job. The second crew of 14 about 62 months. The third of 28 about 3-3/4 months. Our current shipping season lasts 4 to 5 months so we probably would need a crew of 21 or more to get the operation completed. We feel that this is an unacceptable situation but we think there is a solution. Here the "single cell" type container has the most promise. If present projections hold true, by using the single cell, the entire 10 million trees can be handled by the original crew of seven. In the single cell type container, seedling and container remain together until the moment of planting. No additional handling is necessary except placing the cells into shipping boxes. All other phases are mechanized or soon will be.

Multi-cavity blocks can be shipped without extraction at the nursery. They require more shipping space and cause handling difficulties at the planting site. Up to the point of shipping, the multiple cavity blocks are a very efficient means of raising seedlings. We feel that if the soil media could be manufactured to remain intact without using the root system as a binding agent, the entire operation could be mechanized. If this were accomplished, the multi-cavity block would be, in most cases, the best method to follow. However, at the present state of the art, the single cell concept is the most efficient tool in integrating all phases of the container program.

INTEGRATING TRANSPORTATION

Almost all of our seedlings are transported in large vans or trucks. The shipping system must be designed around these vehicles. If specialized vehicles are designed, shipping could be done with palletized boxes or containers. For the most part, however, standard vehicles are used, so boxing is the most versatile system at present. (Shipping palletized containers is a very useful tool when additional adjustments to local climate conditions are necessary.) Boxes must be designed for proper stacking strength and size. I have seen as much as 40% of a truck's cargo space lost because of improperly designed boxes. This is an easily overlooked item that can save valuable and costly cargo space.

The main point of concern, however, should be how it handles at the planting site. Most of the boxes we use are designed to be easily carried through the planting area. Also, they are small enough that the weight is not a big problem either. Poly-lined kraft boxes have been tried but are not as flexible a system as boxes. As far as insuring an efficient flow of seedlings to the planting site, boxes seems to be the answer at least for the present.

PLANTING

In the Pacific Northwest, we have some of the most difficult planting terrain imaginable. It is almost impossible to negotiate this land with anything more than a simple planting tool and planting bag-racks, and backpacks are not very efficient for carrying seedlings on most of the lands our company plants. Using a simple carrying device such as a planting bag necessitates that extracted seedlings be bundled or single cell cavities be used. Transporting large multi-cavity blocks about the planting area is almost out of the question. Our planters feel that the single cell type container is the easiest to use of the different systems. Bundled, extracted plugs also plant easily. but we have experienced the loss of plug integrity on some of the seedlings. Since the single cell seedling remains in its protective sheath until the actual moment of planting, loss of plug integrity is not a large problem. Planting either bundled plugs or single cell plugs does not change planting logistics significantly from established bare-root procedures. The transition from one to another proceeds without much difficulty. Considering all the problems we have encountered in planting of plug seedlings, we feel that the single cell is the most flexible at this point in time.

CONCLUSION

In our entire container program from seed to planting site, we have tried to seek out the systems that best fit all phases of production, transportation and planting.

We have tested almost all of the currently used containers and find the single cell systems to be the most flexible in all phases of production, transportation and planting. One must remember that our area has unique problems and unique solutions, just as other areas have theirs. The actual integration of all phases of a container system will certainly vary as the requirements vary from region to region. Hopefully, the information presented here will aid you in your program.